A NEW CONDENSER PRINCIPLE—BY HANS VOGT

Practical Wireless

3D

Published every Wednesday by
GEORGE NEWNES LTD.
Vol. 2.——No. 40.
JUNE 24th, 1933.
Registered at the G.P.O. as a Newspaper.

Building the

THREE STAR NICORE

All About Permeability Tuning

Why & Wherefore of Grid Bias

Tele-Talkie Topics

Fashions in Design

Practical Notes on Drills, etc., etc.

VARIABLE-MU DETECTOR & PENTODE With IRON CORE COILS

Long-Distance Wireless Secrets A book every listener has been waiting for. This practical work will solve your difficulties and enable you to obtain the best possible results of which your set is capable.

FINDING FOREIGN STATIONS By R. W. HALLOWS

Obtainable at all Booksellers, or by post 3/9 from George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. 3/6

ADVT

KINGS OF THE AIR

"MAINS VOLUME" from BATTERY SETS

WITH

COSSOR CLASS "B" VALVES

By adapting your present Battery Set to use a Cossor Class "B" Valve you can obtain volume at least equal to that of the average Mains Receiver without extravagance in High Tension Battery Consumption.

TWO TYPES:

COSSOR 240 B

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 Va = 100, Vg = 0 (each half) 1.5 mA. Price **14/=**

COSSOR 220 B

Filament volts 2.0; Filament amps 0.6; Normal Anode volts 120; Max. Anode Current Swing 35 mA.; Max. Peak Applied Signal (Grid to Grid) 40 volts; Static Anode Current at Va = 100, Vg = 0 (each half) 1.25 mA. Price **14/=**

To A. C. COSSOR LTD.,
Melody Dept., Highbury Grove, London, N.5.

Please send me, free of charge, a copy of Folder No. L93, which tells me how to use Class "B" Amplification.

Name .....

Address .....

PRAC. 24.6.33.

Send for a copy of Folder L93 which tells you all about Class "B" Amplification—what it is—how it works and how to use it. Please fill in the coupon.

A. C. Cossor Ltd., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff & Dublin.

3017

THE PAPER WHICH SETS THE STANDARD, STYLE, AND PACE!

ROUND *the* WORLD *of* WIRELESS

Athlone's Relay Station

AS the transmissions from the Athlone high-power station are not well heard by owners of simple crystal sets in and around Dublin, the Irish Free State authorities have decided to bring the old 1 Kw. station into operation. It will relay the programmes on 218 m. (1,373 kc/s).

Japan's Super-super Stations

THE Japanese Government has earmarked in this year's budget a sum exceeding one million *yen* for the construction of two 500 kilowatt transmitters. New broadcasting stations are also to be erected at Ashigawa, Tokushima, and Nagasaki.

Poste Parisien, Paris

SOME of the older radio fans may recall *Radiolo*, the original announcer of Radio-Paris in the early days, who since the Parisien 60 Kw. station has been launched, fulfils the same duties in that studio. From this Paris transmitter, however, you will now also hear a female voice giving details of the programmes, as following an election by listeners, Jacqueline Aldo presides at the microphone during certain hours of the day.

Radio Svizzera Italiana

IT is in this way you hear the call of the new Swiss *Monte Ceneri* station now testing on 1,150 metres. Until the station has been officially launched only skeleton programmes are broadcast between B.S.T. 8.30 and 11.0 p.m. The entertainment opens with gramophone records followed at 9.0 p.m. by a concert from the Lugano studio orchestra. A short news bulletin in Italian is sent out at 9.10 p.m., and from 10.20 p.m. listeners may hear dance music or some other light musical items. The wavelength used is a provisional one subject to alteration at short notice.

The Luxembourg Transmissions

ALTHOUGH the 1,191 metre channel arbitrarily adopted by this station is a bone of contention at the Lucerne conference, the studio merrily broadcasts on this wavelength every day from B.S.T 7.0 until 10.30 p.m. Each day of the week offers a special entertainment to foreign listeners and the *rota* of countries to which the broadcasts are destined has now been fixed as follows: Monday (Italy); Tuesday (Belgium); Wednesday (Luxembourg); Thursday (Germany); Friday (Holland); Saturday (France); Sunday (Great Britain). There are three announcers in the studio (two men and one woman) and all calls and details of the programmes are clearly given in German, French and, according to the day of the week, in the language of the interested foreign listeners. The transmitter is now working at full power.

UNRIVALLED SERVICE!

Every "Practical Wireless" Receiver is guaranteed to perform as claimed. Every Reader's question is answered free.

No other similar Reader Service exists. The finest technical staff in the world at your Service

FREE!

Imminent French Radio Scandal

ACCORDING to reports published in a Paris newspaper, questions are to be asked in the Chamber of Deputies regarding the purchase of Radio-Paris by the French State authorities. It is stated that the sum of thirteen million francs was paid for this transmitter, notwithstanding the fact that experts valued the station at less than half that amount.

Listen to Hendon Aerodrome

THE annual *Royal Air Force Display* at Hendon on June 24th will be relayed in the National programme. Amongst the events described by Squadron-Leader W. Helmore as commentator will be one which should provide a special thrill. All the aircraft taking part in this item will be linked together by light cables to which streamers are attached. The least inaccuracy on the part of any one 'plane would break the cable and spoil that part of the show.

B.B.C. Relays German Opera

ON July 1st listeners to the Regional programmes will hear a relay from Dresden in co-operation with the Central German Broadcasting Company, and the Reichs-Rundfunk Gesellschaft. The programme, which will last one hour, will consist of Act I of *Arabella* by Richard Strauss with Eva Plaschke van der Osten as soloist.

Broadcasts from the Stratosphere

THE Belgian engineer, Max Cosyns, and the aeronaut Demuyter, accompanied by a Dutch engineer, propose to make another balloon ascent with a view to beating Professor Piccard's altitude record, during July. Although the actual date has not yet been definitely fixed—it will depend on weather conditions—the start will be made from the valley of the Lesse in Belgium. During the flight it is proposed to broadcast a running commentary on 41.1 m. and 21.4 m. and everything will be done to remain in two-way communication with European stations. Until their departure, tests of the short-wave apparatus will be carried out under the call letters XXON4AU between B.S.T. 15.00 and 18.00 every Thursday and Sunday. The practice transmissions will be carried out from an aeroplane.

Brazilian Short-wave Broadcast

THE *Imprensa Naçional* sponsors a daily transmission of a news bulletin in English, French, Spanish and Portuguese at 7.30 p.m. (local time) or B.S.T. 23.00 through PRAB on 31.58 m. The aerial power of the station is roughly 500 watts.

ROUND *the* WORLD *of* WIRELESS *(Continued)*

Efficiency

THE arrangements made for the broadcast of the proceedings of the World Economic Conference at the Geological Museum, South Kensington, London, were more complete and elaborate than any hitherto attempted. From a local control room leads were run to three points in the main conference hall, including a glass walled observation box from which running commentaries were given. Microphone points were installed in all committee rooms, and a special studio was built to enable delegates to broadcast summaries to their own countries. The speeches relayed from the museum through the local control point were passed to Broadcasting House and then despatched over the trunk telephone cables. In many ways, but on a smaller scale, the elaborate equipment installed at the museum resembled that used by the B.B.C. at its own headquarters in Portland Place.

Radio Wien from 5.0 p.m. Only

VIENNA-BISAMBERG has not yet taken over its full duties, neither does it yet utilise for its broadcasts more than 100 kilowatts. This new station comes on the air daily at 5.0 p.m. B.S.T., the previous programmes being assured by the old Rosenhügel station. Occasionally from Vienna you may now hear interesting talks in both French and English, as a series of lectures on the beauties of the Austrian watering spas is being given by prominent foreign residents in the capital.

French Television Transmissions

LISTENERS to Paris PTT may occasionally have picked up television signals from this station at odd hours. A regular programme of broadcasts according to the Baird-Natan system has now been instituted. Transmissions are carried out on Mondays, Tuesdays and Fridays between B.S.T. 3.0 and 4.0 p.m., and on Wednesdays, Thursdays and Saturdays between B.S.T. 9.0 and 10.0 a.m. On Mondays, Wednesdays and Fridays the "sound" portion of the programme is broadcast through Radio Vitus, Paris (308.9 m.) or Eiffel Tower (1,445.8 m.). In addition, Paris PTT is also experimenting with a new system of television on Tuesdays and Fridays between 4.15 and 5.30 p.m. on 447.1 m., sound being broadcast by a private station, F8VU, at Montrouge (near Paris) on about 250 m.

Berlin's High-power Transmitter

WORK on the new station destined to take over the duties of the Berlin-Witzleben transmitter is being hurried forward with a view to its official opening simultaneously with the Radio Exhibition in the German capital in September next. The wavelength, so far as can be foreseen, will be 339 metres, namely, the channel at present used by Brussels (2).

Hearing Buenos Aires

REPORTS on the reception in Great Britain of broadcasts by Radio Excelsior, the new Buenos Aires station on 361 metres, have been sent to the Argentine. The newcomer on the ether is a "super," with a nominal power of 200 kilowatts. Although during the summer months its signals may not be heard regularly, there is little doubt that the station will appear in many logs in the darker months of the year. The call is *Ella-air-Cinco Radio Excelsior, Buenos Aires.*

INTERESTING and TOPICAL PARAGRAPHS

THE WORLD'S YOUNGEST RADIO OPERATOR

Although she is only 8 years old and has to sit on a dictionary to properly operate her typewriter, little Jean Hudson, of Laurel, Delaware, has just passed the examination for amateur radio operator's licence. She is the youngest person in the United States, and probably in the world, to own such a licence.—(We merely add that this announcement comes from America.—Ed.)

Pocket Wireless Sets for Police Use

AS the tests recently carried out at Brighton with pocket wireless sets have proved so successful, the Home Office has approved the adoption of such apparatus, and has agreed to share the cost of thirty sets. As greater improvements are made this practical invention will become indispensable to the police force.

Dearth of German Announcers

AS in some of the decrees made by the Hitler Government a large number of studio officials have been discharged from their duties, many of the German broadcasting stations find themselves sadly short of suitable announcers. At Frankfurt-am-Main, a special school has been established to train persons for this vocation; they are to be drawn from the ranks of unemployed stage artists.

New Jerusalem Short-wave Station

THE Zionist organisations in Palestine, according to a report, are busily constructing a short-wave station in the neighbourhood of Jerusalem for the broadcast of programmes from that city. The wavelength will be in the neighbourhood of 50 metres, and entertainments will be made in both Yiddish and Arabic.

New Interval Signal

BUCAREST on 394 metres now possesses a melodious interval signal; it consists of the first four bars, repeated *ad lib*, of an old folk song entitled *Hai Lelitzo*. The metronome has now been completely discarded from the studio. Bucarest has a woman announcer.

Bordeaux-Lafayette PTT

THE French broadcasts heard almost immediately below the wavelength of Western Regional emanate from the French State station at Bordeaux transmitting on 304.9 m. (983.9 kc/s). Its power is 13 kilowatts. Most of the daily programme is relayed from *Ecôle Supérieure* and when such is the case the Paris PTT call is heard. Local entertainments are, however, given frequently, and are announced as from *le poste de radio-diffusion des postes et télégraphes de Bordeaux Lafayette.* The studio does not use any special interval signal.

Anonymous Broadcasts

CONTRARY to what might be expected, the inhabitants of Toulouse are not dissatisfied with the present state of affairs concerning their local station. Although no permit has been obtained to use the St. Agnan high-power transmitter, Radio Toulouse broadcasts a concert every morning and afternoon without giving any calls. As, moreover, these entertainments are free from the habitual publicity *puffs* local listeners consider that they have no cause for complaints.

SOLVE THIS!

Problem No. 40

Smith built up the Fury Four, but when he switched on no signals could be heard. Faint oscillation was audible from the loudspeaker, but nothing more could be obtained. After a few attempts at solving the trouble, he removed the grid bias negative plug (without first switching off the receiver) and immediately this was done the signals came through very loudly but distorted. What had he done 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, Strand, London, W.C.2, and mark your envelopes Problem No. 40. Do not enclose any other correspondence with your solution.

SOLUTION TO PROBLEM No. 39

The spark gap fitted on Blackman's aerial-earth switch was responsible for the trouble, as it was uncovered and had become corroded with the result that the gap shorted by the sooty deposit usually found on copper exposed to the air. This resulted in the loss of signals as they leaked to earth.

The following two readers receive books in connection with Problem No. 38, as they were the only correct solutions received:—

R. Debens, 7, Avenue Road, Bow, E.3; J. A. Fontnam, 10, Queen's Road, Thame, Oxford.

What is PERMEABILITY TUNING?

A Practical and Interesting Article Dealing With the Possibilities of This New Tuning System. By "LAMBDA"

AFTER a period of comparative stagnation, 1933 has seen considerable changes in the design of tuning coils. For several years steady progress has been made in the design and improvement of other types of components in a receiver, such as loud-speakers, low-frequency transformers, and, quite recently, valves. Now attention is being focused on the tuning system. Iron-cored tuning-coils are becoming very popular, and further developments are foreshadowed. During the past two years the small diameter air-cored coil has been popular, and although not so efficient as the large litz-wound coils of six or seven years ago, they were quite suitable for use with modern valves.

In the same manner as other components have evolved so has the tuning condenser; the earlier types of square-law tuning condensers were expensive, and could hardly be described as fine examples of engineering skill and ingenuity. Real precision components are now available in which the angular displacement of the moving vanes gives an equal variation in each section of a ganged tuning condenser, so that single dial tuning can be achieved with considerable success. Condensers are now totally screened, and manufacturers generally guarantee each section to be accurate to within about half of 1 per cent.

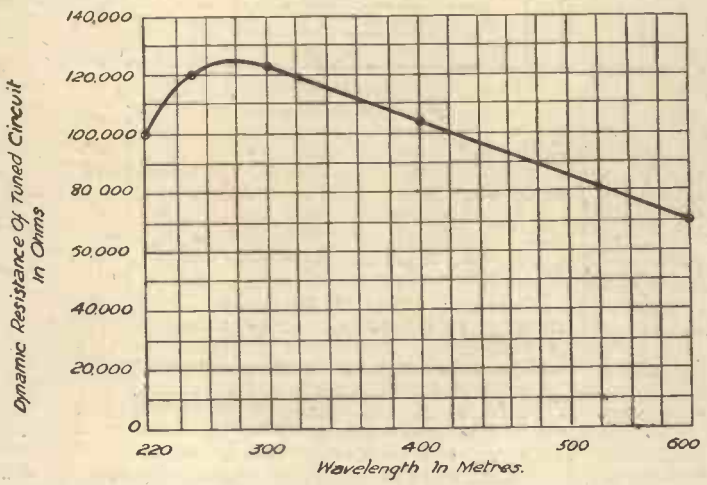
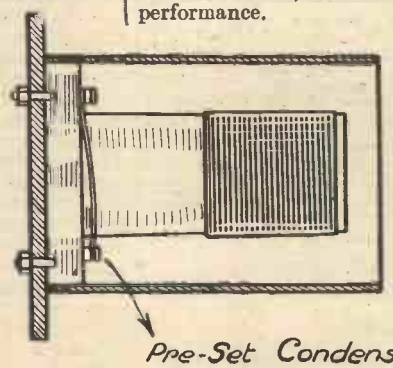


Fig. 1.—Curve showing variation in resistance of a tuned circuit at different frequencies.

Disadvantages of Condenser Tuning

Unfortunately, the chief difficulty with existing tuning systems is that they are inherently incapable of producing uniform performance, selectivity and sensitivity not being constant over the whole of the tuning range.

Efforts have been made from time to time to overcome this difficulty, but, so far, results have not been entirely successful. An early system was variometer tuning, which was employed in receivers some years ago. This fell into disuse because its resistance varied with frequency in the same way as the fixed inductance, and it could not, therefore, produce uniform performance.



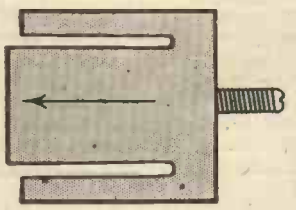


Fig. 4.—Showing arrangement of coil with core withdrawn.

Other methods have been tried, one being the employment of a metal shield which, when brought into close proximity with the coil, decreased its inductance, but this method also increased the losses and was also incapable of producing uniform performance.

With ordinary air or iron-cored coils the coil is fixed and, therefore, the inductance remains constant, tuning being effected by the usual variable condenser. At the lower wavelength the selectivity is relatively poor, and at the upper end of the scale selectivity improves, but sensitivity falls off. This defect appears to be inherent in all condenser-tuned circuits, and an examination of the curve in Fig. 1 shows the falling off in the dynamic resistance at the 600-metre end of the coil. The dynamic resistance of a coil is ascertained from the formula $\frac{L}{CR}$ where L represents the inductance of the coil, C the capacity of the tuning condenser at any particular setting, and R the high frequency of the coil.

We know that the quantity C varies over the tuning scale, increasing as the moving vanes of the tuning condenser are gradually brought into closer proximity with the fixed vanes until the maximum capacity, usually 0.0005 mfd. is reached and there is a loss of sensitivity. A slight compensation is effected as R decreases somewhat, but this is not sufficient to compensate completely. Selectivity in terms of actual ability to reject signals on undesired channels can only be constant over the range when the ratio of inductance to resistance does not change.

A good tuned circuit may have a resistance of about 4 ohms at 550 kc/s. and 30 ohms at 1,500 kc/s. If the resistance can be maintained at 30 ohms, we then have constant selectivity over the tuning scale, and it will be just as broad at 550 kc/s. as it now is at 1,500 kc/s. What we desire is a tuned circuit so designed that the

(Continued on page 476)

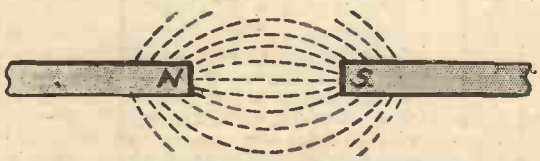


Fig. 2.—The lines of force set up between two magnets.

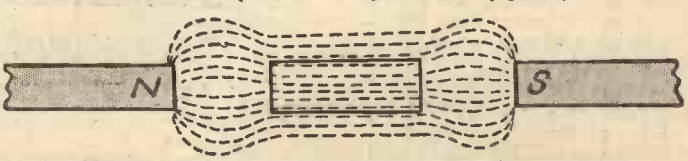


Fig. 3.—How the lines of force shown in Fig. 2 are concentrated when a piece of soft iron is interposed.

(Continued from page 475)

inductance and resistance will increase together, and the ratio remain constant. The permeability tuning system appears to have achieved this. The tuned circuit is designed at the high-frequency end 1,500 kc/s. (200 metres) to have such properties as we desire to obtain high gain and selectivity by using a relatively small inductance and a relatively large fixed condenser, both designed to have low losses. This combination will then be tuned down to 550 kc/s. by gradually inserting an iron core into the inductance. This will increase both its inductance and its resistance.

Permeability

In order to appreciate the merits of permeability tuning which comes to us from America, it will be advisable now to consider the meaning of permeability. For practical purposes we regard every substance as possessing a certain power of conducting lines of force and of offering a certain resistance to the passage of the lines, and this can be deducted from the following experiments.

First of all, take two bar magnets as shown in Fig. 2. Place them about 1in. apart and arrange a piece of thin paper on top of them. On the paper place a small quantity of iron filings so arranged that they are in close proximity to the pole pieces, N and S. The position which they will adopt should be somewhat similar to that shown in Fig. 2.

Now repeat this experiment with a piece of soft iron placed in between the poles N and S (see Fig. 3). You will notice that the iron filings will re-arrange themselves, appearing to crowd into the iron, as if they found it easier to go through the iron than through the air. The lines of force indicated by the arrangement of the iron filings will now appear as shown in Fig. 3. We therefore deduce from these two experiments that iron has greater permeability than air. Now we can define permeability as the ability of a substance to conduct lines of force as compared with air and, therefore, we are now in a better position to appreciate this new system of permeability tuning.

Having considered the existing tuning system, let us see what permeability tuning has to offer. The tuned circuit consists of a coil wound on the usual bakelite former, and a core of Polyiron, as the new material is called, which is so arranged that it can slide into the coil. This core is made up of very fine iron particles, which are reduced to a dust so fine that they will float in air. The individual particles are insulated by a special process. This insulated iron powder is now moulded with bakelite, and any desired form that is capable of being mounded can be obtained.

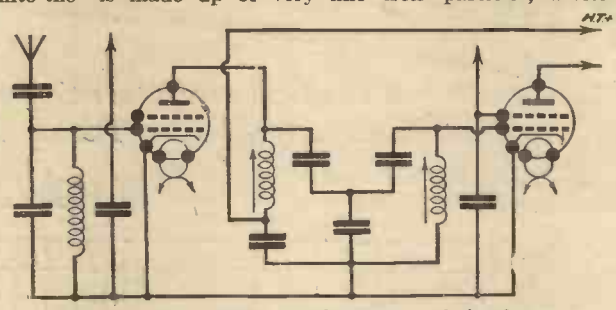


Fig. 5.—Permeability tuned circuit with band pass intervalve coupling.

It is now necessary to secure initial resonance at 1,500 kc/s. This is achieved by withdrawing the core, and placing a semi-variable condenser across the coil. By adjusting this condenser the circuit is tuned to a minimum wavelength of 200 metres (1,500 kc/s.). The coil and condenser are then mounted inside a screening cover of copper or aluminium, and we may expect that they will increase together, since both depend upon the amount of iron which is actually inserted in the magnetic field. What really happens is that we are not only increasing the inductance of the coil, but the permeability of the surrounding medium as well, hence permeability tuning.

With ordinary tuning systems employing coil and variable condenser, there is always a certain minimum capacity which cannot be avoided. This is equal to the maximum spacing obtainable between the rotor and stator of the variable condensers, and also by the various stray capacities existing in the circuit itself. In designing a coil to tune over a given waveband this minimum capacity must be taken into consideration, therefore the maximum value is also determined so that taken with the same value of inductance it must tune to 550 kc/s.

With permeability tuning the inductance of the coil may have any value desired to produce the required performance. Whatever the value of the inductance may be it will be increased approximately eight times by the insertion of the core, and also whatever the resonant frequency of the coil and condenser may be, it will be decreased approximately one third of this value when the core goes into the coil. Therefore, we can assume that if we have two coils of different inductance but of the same physical dimensions, and if we insert two cores into them, the percentage change in inductance will be the same. One unique advantage claimed for the system is that we now have a method of tuning the aerial circuit of a receiver, and keeping it exactly aligned with the other tuned circuits.

This, therefore, is permeability tuning. How far this system can be applied in practice remains to be seen. Great things are being claimed for it, and if they materialize the constructor can look forward to an entirely new type of receiver which will be unique.

We shall watch the development of this system with the closest interest and pass on developments immediately.

NEW FERROCART COILS

THE special iron-core coils made by Messrs. Colvern and sold under the name "Ferrocart" are now available in a different combination. Hitherto these coils have been assembled only in a set of three for use as a band-pass aerial tuner followed by an intermediate H.F. coil with reaction winding. The theoretical circuit of this combination is given in Fig. 1. The great utility of this type of coil has inspired Messrs. Colvern to develop a different combination of the same type of coil for use in a more powerful type of receiver. The combination now consists of a single-aerial coil, an intermediate H.F. band-pass tuner, and an H.F. coil with reaction. The theoretical circuit of the new coils is given in Fig. 2. The third circuit is not shown in this diagram, as it follows the lines of coil F.3 in Fig. 1. This combination should enable a most powerful and selective receiver to be built, and a great many of the difficulties of matching the two halves of the band-pass tuner should be removed as the variability of the aerial circuit is now removed from one-half of the tuner, and the two sections may therefore be more accurately adjusted with the knowledge that the adjustment will remain. Naturally, the receiver will be slightly larger as the four coils will be mounted on a rather long baseplate, the actual length being just over 12ins.

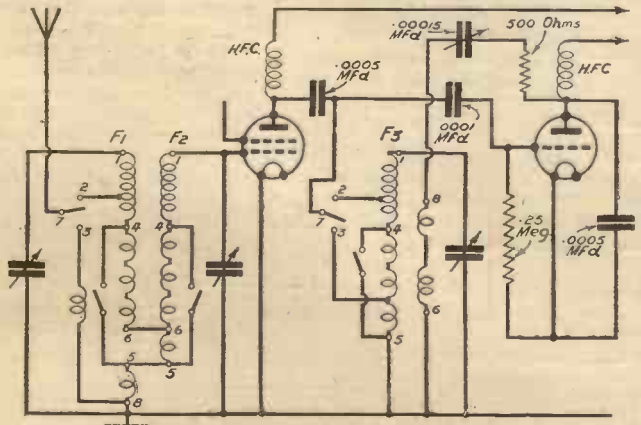


Fig. 1.— Connections of the first models of the Ferrocart Coils.

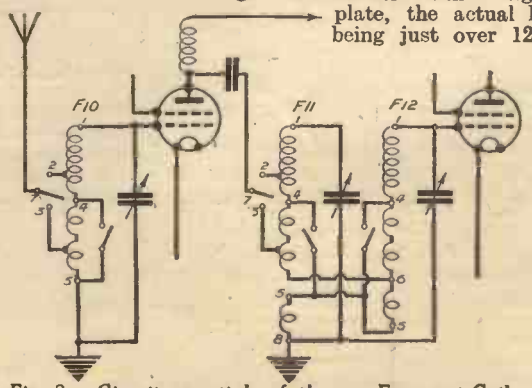


Fig. 2.—Circuit essentials of the new Ferrocart Coils.

A NEW CONDENSER PRINCIPLE

An Important Article Describing a New Compression-type Condenser

By HANS VOGT (*Inventor of Iron Core Tuning Coils*)

UNTIL recently, radio components were considered to be of definite construction, and fundamental improvements were believed to be out of the question. The development of the Ferrocart coils, however, I think has shown

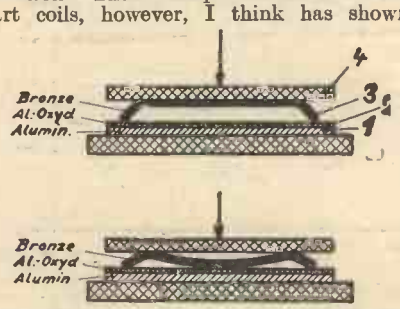


Fig. 1.—The principle of the new Vogt flat condenser.
(1) *Circular stationary electrode of aluminium.*
(2) *Special low-loss dielectric material.*
(3) *Elastic counter electrode of bronze.*
(4) *Press plate of insulating material.*
Stage (a) Initial position — minimum capacity.
Stage (b) Intermediate position—increased capacity.

that there is still a wide field open for new discoveries and improvements, and personally I feel sure that the new development thus initiated will still disclose various other surprising new things.

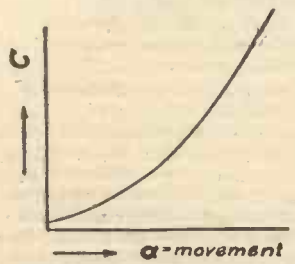
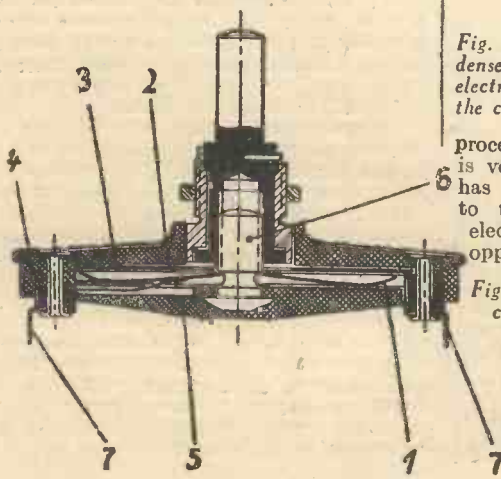


Fig. 2.—By a careful choice of curve the quadratic capacity characteristic shown above results, thus giving an equally divided wavelength scale.



Starting from this conviction, besides the research work on the Ferrocart coils, I developed a tuning condenser of novel principle. As in the case of the tuning coils, the variable condensers did not give rise to any fundamental improvement since the beginning of radio technique. True, the losses in the condensers are practically eliminated by using air condensers, but these condensers are large and expensive, and, therefore, cannot be used for cheap one and two-stage sets, rejector circuits and the like. The hard paper condensers, on the other hand, which now are used for these purposes, produce considerable dielectric losses, and thus will increase the damping, and reduce the selectivity and sensitivity.

Component Parts

I therefore undertook to create a small and cheap variable condenser with very low losses. The new principle will be seen from Fig. 1. A circular stationary electrode of aluminium (1) is covered with a very thin layer of a special dielectric material (2), which is produced electrochemically on the aluminium plate by a special process. The dielectric layer thus produced is very hard and thin, and in particular has very low dielectric losses. Opposite to the stationary electrode an elastic electrode of bronze (3) is arranged, two opposite edges of which are bent down to the stationary electrode. Now, when pressing down the press plate (4) by a sort of angle lever effect, the medium part

(*Continued on page 478*)

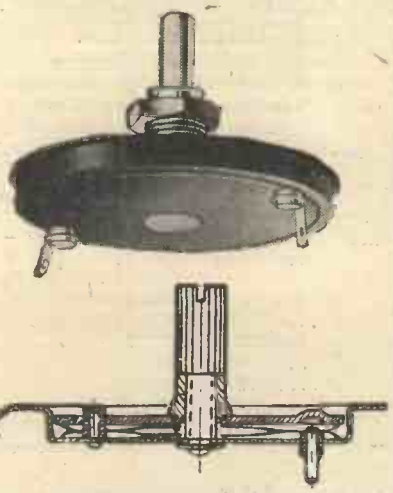


Fig. 4.—A very cheap type of the new condenser, having two elastic and two rigid electrodes, one of which is movable to vary the capacity.

Fig. 3.—Practical execution of the new condenser :
(1) *Elastic bronze electrode.*
(2) *Stationary aluminium electrode.*
(3) *Special dielectric layer.*
(4) *Insulating casing.*
(5) *Movable cover.*
(6) *Adjusting axis.*
(7) *Terminals.*

Hans Vogt in his laboratory at Berlin-Dahlem.

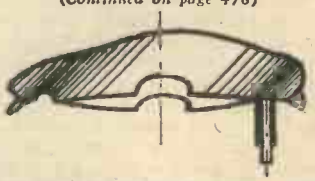


Fig. 5.—The electrodes of the new condenser.

Fig. 6.—A highly selective rejector circuit embodying a Ferrocart coil and a Vogt flat condenser.

Fig. 7.—A high efficient selection circuit with Ferrocart coil and Vogt flat condenser, compared with an air circuit of similar characteristics.

(Continued from page 477)

of the elastic electrode is first approaching the stationary one, so that the increase of capacity is accelerated. When further pressing down the plate (4) only the remaining portions of the elastic electrode are moved down, and the further progression of the capacity takes place more slowly accordingly. By properly choosing the curvature of the elastic electrode, the increase of capacity can be so arranged that a quadratic capacity characteristic (which means an equally divided wavelength scale) results, as shown in Fig. 2.

Low Losses

Regarding losses, the new condenser is almost identical to an air condenser, especially in the critical range of the shorter waves. The two electrodes are in the position of maximum distance, and the condenser is practically acting as an air condenser; only with longer waves, when the plates are in close face to face position, the solid dielectric is of no influence at all. As explained, however, it likewise has very low losses, and by the curves, Fig. 3, the low losses of the new condenser will be demonstrated.

The new condenser is not suitable for multi-stage sets, at least, in its present form it is difficult to be ganged in mass production. I am, however, working further in the matter to make it fit for this purpose, too. Anyway, it is the ideal condenser for one and two-stage sets, for rejector and selection circuits, and for reaction and coupling condensers, in other words, for any purpose where ganging is not necessary.

Fig. 8.—Damping curve of: (a) an air condenser. (b) a Vogt flat condenser. (c) a hard paper condenser.

Fig. 4 shows a practical example of the new principle. Fig. 5 is another example, consisting of two elastic and two rigid electrodes, one of which is screwed down to vary the capacity. The bilateral example means a further reduction of size and cost as the capacity is the double one, so that the diameter may be smaller accordingly.

Figs. 6 and 7 are radio components, embodying Ferrocart coils combined with condensers employing the new principle.

VALVE ABBREVIATIONS EXPLAINED.

An article explaining the meanings of some of the peculiar designations which are given to modern valves.

By W. J. DELANEY.

THE newcomer to wireless is undoubtedly confused upon looking down a catalogue of valves, as the valves are all represented by initial letters and figures which at first sight have no bearing on the particular use of the valve. For instance, one valve-maker's list which I have before me shows that there are four screen grid valves, the references being SG.215, S.215A, S.215B and S.215VM. It is fairly easy to see from these references that the letter S stands for "screen," and this is straightforward. But upon referring to another well-known valve-maker's list the two screen-grid valves which this firm makes carry the references P.M.12A and P.M.12V. In this instance there is not the slightest indication that the valve is of any particular type. However, in general, the following references will be found to hold good through most of the different ranges, and the exceptions will be fully referred to as they are met. The letters usually denote the use to which the valve is to be put, and the figures give the actual rating of the filament or the heater. Thus a valve bearing the reference H.210 will be found to be one designed for use as a high-frequency amplifier and has a filament which consumes .1 of an amp. at 2 volts. It would, perhaps, be better to deal with the terms in two sections, taking the letters first.

The Letters

If you refer to the PRACTICAL WIRELESS Data Sheets Nos. 10 and 11, you will be able to see that the majority of valves are divided into classes. A valve of the three-electrode type (triode) may be used as a high-frequency amplifier, a detector, a low-frequency amplifier or a power valve. A valve of the five-electrode type (tetrode) may be used as an H.F. amplifier or as an output valve, and so on. In general, therefore, the letter or letters which are included in the reference show for what purpose the valve is most suitable, and these may be tabulated as follows:—

H ....High-frequency.
HL. ..High- or low-frequency.
HF. ..High-frequency.
D ....Detector.
L ....Low-frequency.
LF ...Low-frequency.
P ....Power.
SP ...Super Power.

The screen-grid valves are of the ordinary or the variable-mu type, and therefore in addition to the letters S or SG, the letters V or VM are added to signify that the particular valve is of the variable-mu type. The pentodes are referred to as PEN, PT, HPT, or PP. This should be quite straightforward and should enable a valve to be picked according to the position in the set which it is to occupy.

The Figures

The figures which are appended to the name are a little more confusing, and it is these which seem to give the novice the greatest difficulty. Actually, it is quite simple in the majority of cases, and it will be found that it gives the voltage and consumption of the filament (or heater). In practically every case it may be taken that the first figure is the voltage, and the succeeding figures are the consumption expressed as the decimal part of an amp. Thus, 210 may be taken as 2 volts .10 amps. There are, unfortunately, exceptions, and these are the stumbling blocks which render the system a failure. Thus in the 6 volt class will be found a valve by one maker which is known as the 256, which instead of being a 2 volt .56 amp valve is actually a 6 volt .25 amp. type. In this case the figures are reversed. It should be noted that this particular valve maker does not endow his valves with any indication of type, and it will be found that in the two-volt class every valve bears the initials P.M., and the only difference between a 2 volt .2 amp super-power valve and a 2 volt .3 amp. pentode is the addition of the figure 2. Thus the former is known as the P.M.2A and the latter as the P.M.22A. In general, however, it should not be difficult for the novice to choose a valve if he bears the above notes in mind. The letter states the purpose and the figure denotes the rating of the filament.

NEXT WEEK!

Another Important Article by HANS VOGT, entitled: "IMPROVEMENTS IN IRON-CORE COILS."

A Suggestion to the B.V.M.A.

Perhaps it would not be out of place now to suggest that the British Valve Makers' Association should in future adopt the system which is adopted in America and give a number for each type of valve, irrespective of the maker. Thus a valve bearing the number 10 would be a screen-grid valve; a number 12 could be a variable-mu; a 15 would be a detector, and so on. To identify the individual make this number could be followed by the initials or first syllable of the maker. This would remove all difficulty, and if you wanted a Marconi screen-grid valve you would ask for a 10MAR, or if you preferred a Cossor it would be a 10COS.

Second Article

CHANGING FASHIONS in SET DESIGN

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

BY the end of the second year of broadcasting, the position, as far as the average home constructor of sets was concerned, was this: He was able to make a receiver having from two to four or five valves, and capable of receiving, say, a dozen stations at what we should now call medium loud-speaker strength, but at a quality which no modern listener would tolerate for a moment. Selectivity was not so essential as to-day, yet the sets of the period were so flatly tuned that interference was one of the most frequent topics in the technical Press.

The receivers at this time may be conveniently divided into three groups. First were those with detector and one or two low-frequency stages, corresponding to a form of set which is even now not entirely obsolete. Then there were similar sets with the addition of one high-frequency stage, and finally others with two or more high-frequency amplifiers. At first the circuits of all were much the same; leaky grid detector, transformer coupled low-frequency stages, and either tuned anode or tuned transformer H.F. stages, or else aperiodic high-frequency couplings of the transformer type.

Three typical circuits are reproduced in Figs. 1, 2 and 6, from which it will be seen that there was nothing very striking about the sets from the design point of view, and I can assure you there was nothing very striking in the performance either.

Valves with a Dual Purpose.

The need for economy in low-tension current brought about some interesting developments. Chief among these was the "reflex" circuit—or rather circuits, for there were several variants of the principle. The idea was to make use of a valve for a dual purpose. By various ingenious systems of feed back, one valve would be made to function as both radio frequency and low-frequency amplifier, or as both amplifier and detector. In one of the most popular arrangements, a crystal was employed as detector, and of the two valves, one acted in the dual capacity of high-frequency and low-frequency amplifier, while the second valve was simply the output stage. In another, a single valve served as H.F. and L.F. amplifier and was supplemented by a crystal detector, while in a third type of set no crystal was used, but one valve acted as H.F. amplifier and detector while the other looked after the audio-frequency side.

It was about this time that special power amplifier valves came into common use—bright emitters, consuming about one ampere at 6 volts, but capable of handling more power than the general purpose valve. With them came the need for negative grid bias—hitherto practically unknown in the average set. Once the idea of special purpose valves had gained a footing, the number of types began to increase. First of all valve makers began to grade the general purpose bright emitter valves into H.F. and L.F. types. The differences between the two were not great, and I believe I am right in saying that at first, at any rate, the grading was done by selection from each batch manufactured, and not by any differences in design.

Studying the Problems.

Problems of reception and of set design were being studied systematically and mathematically, however, so that it was not long before the desirable characteristics of a valve for any particular purpose were fairly accurately known, and the methods by which these characteristics could be assured in manufacture were discovered.

Having now obtained more efficient valves, from the receiving point of view—although still very uneconomical in current consumption, set designers were now faced with difficulties in using them to the best advantage.

(*Continued on page 480*)

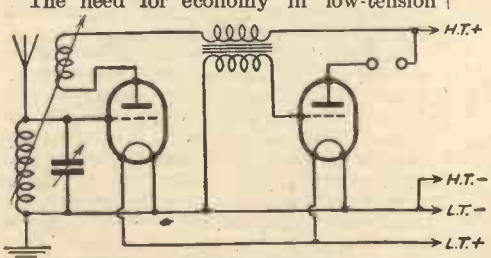


Fig. 1.—Early 2-valve detector with magnetic reaction.

Fig. 3—An early type loud-speaker.

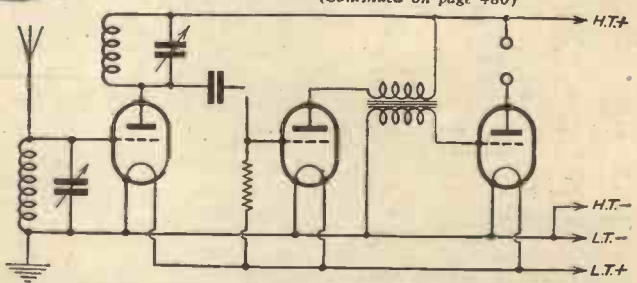


Fig. 2.—Early H.F. detector and L.F. with tuned anode coupling unneutralized.

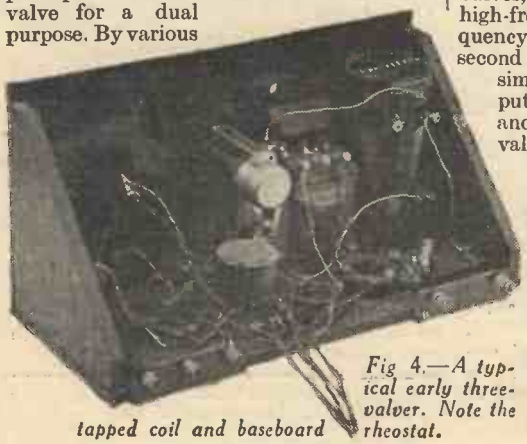


Fig 4.—A typical early three-valver. Note the tapped coil and baseboard rheostat.

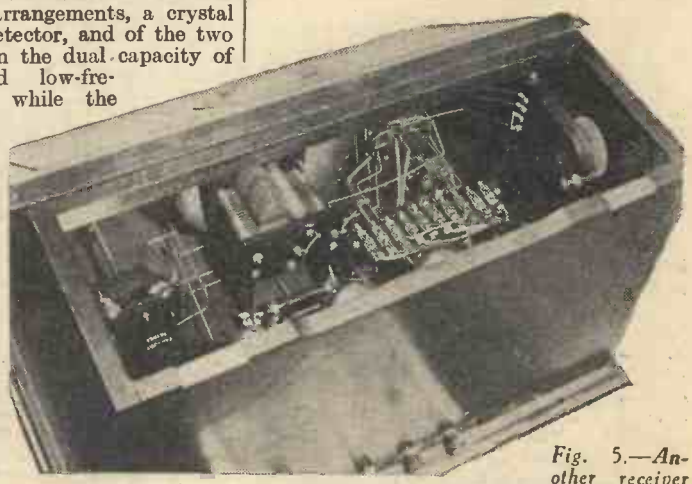


Fig. 5.—Another receiver showing elaborate switching and coil connecting devices.

(*Continued from page 479*)

The actual difficulty which designers had to face at this time was that the three electrode valve, used as a high-frequency amplifier, could only be employed very inefficiently. In those days, the inter-electrode capacity of the average valve was appallingly high, and a substantial portion of the amplified high-frequency energy in the anode circuit of the H.F. valve was transferred back to the grid circuit through this capacity. Besides, no attempt was made to screen components and circuits from each other. It is true that it was generally recognized that wiring and components should be spaced widely apart to prevent interaction, but even in the best sets a very serious amount of unwanted high-frequency coupling took place.

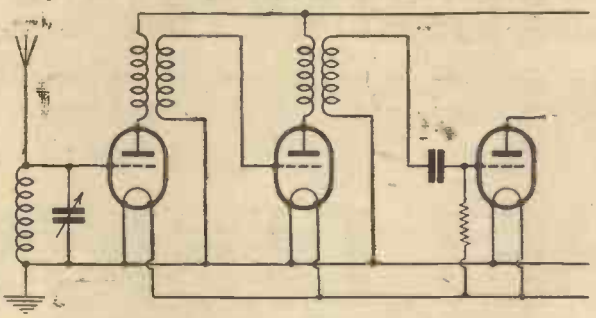


Fig. 6.—Typical untuned H.F. transformer coupling.

Instability.

As a result, high-frequency stages were very prone to instability, especially if, by careful design of the tuned circuits, anything like a high-stage gain was attempted. In fact, stage gain was chiefly limited by considerations of stability. In order to maintain stability damping was often deliberately introduced in the grid circuit of an H.F. valve—curing one trouble by creating another! So the overall efficiency remained still very low.

Then came the first of the revolutionary discoveries—that of the neutralized high-frequency stage. The new principle worked on these lines. The chief cause of instability was feed back between the anode and grid circuits within the valve, the practical effect being that energy so fed back was reamplified again and again until the valve went into oscillation, that is, generated more energy than was put into it, and more than the circuit could absorb. The solution—neutralizing—was found in permitting a similar amount of energy to be fed back, not through the valve, but through a special outside circuit, in such a way that the two feed backs cancelled out each other.

Fig. 7 shows how this was done. The dotted condenser C1 represents the inter-electrode capacity of the valve—actually there was no condenser, but the valve electrodes acted as one. The neutralizing feed back was taken from the outer end of a centre tapped anode coil, through a small adjustable condenser, the capacity of which was varied until the two feed backs were identical in amount.

Different Reaction Control

This invention immediately increased the efficiency of high-frequency amplification several hundred per cent., for it enabled more efficient tuned couplings to be used without introducing instability. It did not go all the way, however, because even then no one had thought to prevent unwanted magnetic coupling between components by screening. But there was, undoubtedly, a great improvement in spite of this.

Simultaneously with these developments in high-frequency amplification, improvements in other parts of the circuit were taking place. The crude swinging coil magnetic reaction, which was difficult to control to any degree of delicacy, began to give place to capacity controlled reaction on the Reinartz principle, a modification of which is still the normal method of applying reaction to-day. By the new form of reaction control, the tuning of the set was not so greatly affected by changes in reaction—and this was an important point because, although there was no "ganging" to be upset, most receivers with any pretence to sensitivity and selectivity had at least three tuned circuits, all of which had to be separately adjusted, and matters were not made any easier if the tuning of one coil varied with the degree of reaction.

Dull Emitter Valves

It was then that the valve manufacturer stepped in again and made a further contribution to radio progress. Their next effort was the production of the first dull emitter valves. As early as late 1923 the "peanut" or "Weco" valve appeared—

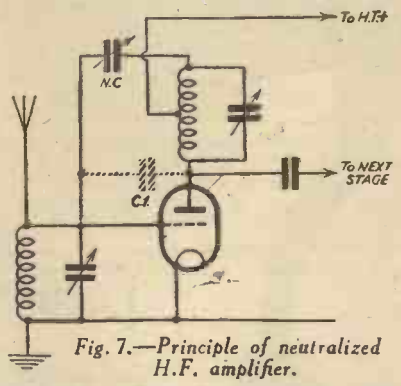


Fig. 7.—Principle of neutralized H.F. amplifier.

a diminutive tube for dry-battery operation, taking a quarter of an ampere at 1 volt. These valves, however, did not gain a very firm hold in this country. They were of American origin, and required special holders; and before they could be firmly established British dull emitters were forthcoming. With a low tension consumption of about .3 amp. at 4 volts, the first types were rated as H.F. and L.F. valves, and represented a great reduction in battery power over the old bright valves. These were closely followed by dry battery valves taking .06 amps. at 3 volts, but in spite of this still greater economy, dry battery valves did not "take on" very well, and the 4-volt accumulator still held the field, valve types being rapidly produced in H.F., L.F. and power classes, and taking about .1 amp. at 4 volts for filament heating.

This brings us to the autumn of 1925 and the early days of 1926, and we may here pause to glance through a file of old catalogues and magazines of that period.

Circuits Again

The chief constructional circuits cover four and five-valve sets—and even some six valvers having so called "straight" circuits, as opposed to super-hets. By the way, super-hets. had come in a year or more earlier, but deserve, and must receive, a special chapter to themselves. Four tuned circuits are not uncommon—each individually adjusted. Panel sizes are, of course, inflated in proportion. Here is a specification for a 5-valve set—ebonite panel, 24ins. by 8ins.—and to-day we do without ebonite entirely!

Here is another set. Detector and two L.F. circuit much as employed in thousands of homes to-day—but oh! those variable components! There are variable grid leaks, three filament rheostats, main tuning condenser with vernier reaction condenser, as well as several jacks for inserting 'phones and loud-speaker. Another five-valver has neutralized H.F. valve, detector, and three resistance capacity low-frequency stages.

But here is something distinctly new—a five-valver with a three-gang condenser and canned coils. So it has been found out at last that every little bit of unnecessary coupling must be avoided if the full benefit of neutralized valves and high-efficiency tuned circuits is to be reaped. In fact, so efficient has high-frequency amplification become, it would appear that it is necessary in some of the more advanced sets to make provision for volume control. The methods adopted are crude in the extreme—a filament rheostat in the low-tension supply to the high-frequency valve.

Even Push-pull

Another straw which shows the way the wind is blowing—some of the more advanced sets have condensers fitted with slow-motion drives. It is evident that tuning is getting sharper! And no wonder, for the number of "plug in" coils used is growing less and less. Efficient low-loss coils, with aerial taps, sometimes wound with "litz"; special so-called "low-loss" condensers—all must be having a profound effect on the efficiency of tuning.

But the point which stands out most prominently at this period is the comparatively small part that valve choice plays in the design of the set. Description after description can be seen in the technical Press of the period, in which no mention whatsoever is made of the type of valve to be employed. As a matter of fact, in most cases valves of the general purpose type were used throughout, including the output stage, and I have before me, as I write, a specification of a five-stage set in which two general purpose valves are used in push-pull! Fancy trying to operate a loud-speaker nowadays with two detector type valves in push-pull in the last stage!

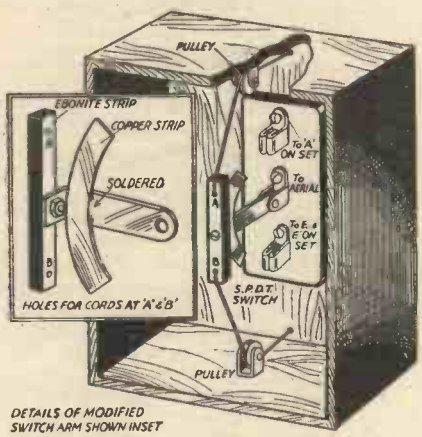
Actually, the period 1925–1926 was one in which circuits and circuit components were passing through the fire, and many of the foundations of modern radio technique were being laid. Both manufacturers and listeners were learning their lessons, and upon the work done at that time much of the present-day achievement is based. But at the same time, important developments were being hatched in the research laboratories and factories. The time was rapidly approaching when valve makers would fire off another of their wonderful bomb-shells which would turn reception models inside out, and register a direct hit on another milestone in radio history. For in the very next year there appeared two entirely new types of valve, leading to radical changes in set design.

ACCUMULATORS:
CHARGING, MAINTENANCE AND CARE.
1/- from all Newsagents.

READERS' WRINKLES
The HALF-GUINEA Page

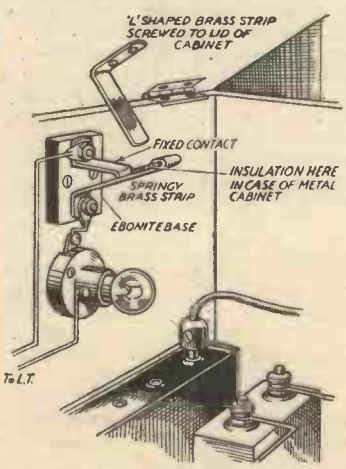
An Enclosed Aerial-Earth Switch

THE accompanying sketch shows an earthing switch I have used for some time. It saves opening the window or going outside to switch the aerial on or off. The device consists of a single pole double-throw switch, the knob on the moving blade being removed, and a strip of ebonite about 2½in. long by ½in. wide bolted in its



An enclosed aerial-earth switch.

place, for keeping the cord away from the copper contact strip, which is a little longer than the ebonite, as shown. The curtain runners should be placed so that when the cord is pulled the copper strip is well home in the aerial clip. I use Bowden brake wire joined on to the cord, and the wire passes through a small hole in the beading round the window, between the frame and the window sash and through a small hole in the inside beading, and finishes with an acorn as a pull-button. When the top wire is pulled the aerial is connected to the set, and when the bottom wire is pulled the aerial is earthed. The box can be screwed to the mast or wall.—R. D. LUCAS (Stockwell).



A simple arrangement for switching a pilot light.

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.

Interior Set Lighting

THE sketch illustrates a simple arrangement for lighting the interior of the set whilst adjusting G.B. plugs, coil tappings, etc. It is made as follows: A lamp-holder and bulb are conveniently placed inside the set (say, at the back of cabinet). Immediately above the lamp-holder a switch device is mounted, consisting of a small panel to which is screwed two strips of brass, one of which is slightly longer than the other (see sketch) and is, if desired, tipped with a piece of insulating material. The switch is actuated by means of an L-shaped piece of strip brass, which is fitted to the lid (just above the switch) and is so arranged that it comes into contact with the longer strip of the switch when the lid is lowered, thus parting the contacts and opening the circuit. When the lid is opened the contacts come together again, thus closing the circuit and lighting the bulb.—J. G. SIMPSON (Durham).

A Cabinet for the Experimenter

THE chief drawback of the new type of cabinet described some time ago in PRACTICAL WIRELESS is the difficulty in fixing the hinges so as not to spoil the cabinet (Fig. 1). A much simpler way in which to accomplish the same object is to remove the nails or screws which fix the sides of the cabinet to the bottom (Fig. 2) and to replace these with four hooks and eyelets. In the majority of cabinets the back is cut away at the bottom to allow for the terminal strip, and no adjustment is therefore necessary at the back. To remove the section of the cabinet it is then only necessary to disengage the four hooks and the side, back and top may be lifted off in one piece, leaving the panel, baseboard, terminal strip with all connections intact and accessible, Fig. 3.—CHARLES E. KIDD (Scarborough).

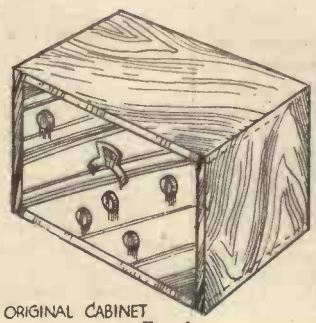


Fig. 1.

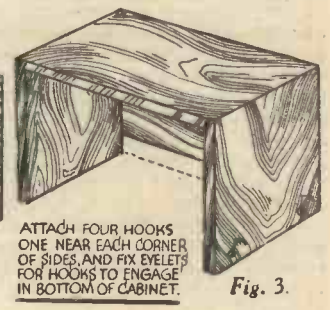


Fig. 3.

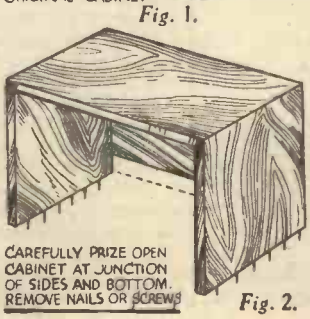
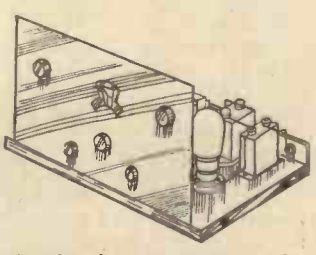
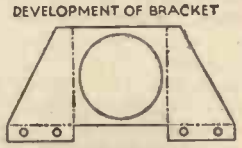
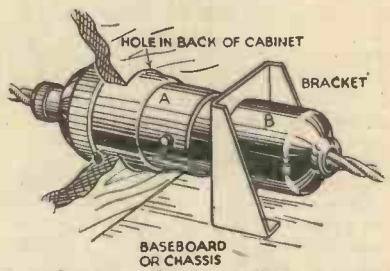


Fig. 2.



An idea for an experimenter's cabinet.





A useful dodge for interlocking a mains-connector.

An Interlocked Mains-Connector

THE accompanying illustration shows how to interlock an eliminator or mains set so that it cannot be opened until the current is off. The flex from the mains terminates in an ordinary lamp socket A. This goes through a hole in the back of the cabinet, and connects to a lamp adaptor B, which is mounted on a bracket on the baseboard. The baseboard cannot be pulled out without first removing the lamp socket. In addition to being inexpensive, this arrangement has the advantage over more complicated switch interlocks, that, although unauthorised persons are prevented from gaining access to live parts, the experimenter can conveniently connect up the set for test purposes without replacing it in the cabinet.—F. G. R. (Newcastle-on-Tyne).

(Continued overleaf)

RADIO WRINKLES

(Continued from previous page)

Fig. 1.

Fig. 2.

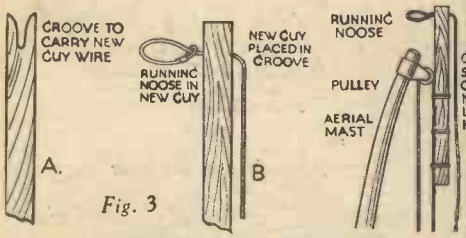


Fig. 3

Method of fixing an aerial straining wire.

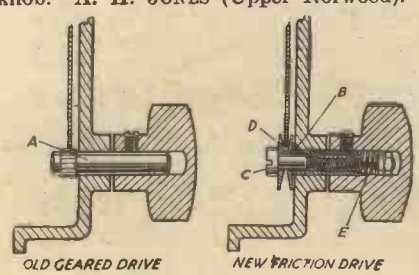
Fixing an Aerial Straining Wire

IF you have an unsightly aerial, as shown in Fig. 1, and desire to make it appear as in Fig. 2; or, not having a straining wire already, and wishing to place one on your pole, the following method shows how it can be done without having to remove pole from the ground.

The method is to obtain a stick or broom handle about 4ft. long, make a cleft in one end as at A (Fig. 3). The cleft stick is fastened to pulley rope, tying it in two or three places, but leaving 2ft. from the top free. Now make a loop in the wire with a running noose, and secure this in the cleft of the stick as indicated at B (Fig. 3). Proceed to hoist stick and wire carefully, and you will find that the looped wire can be raised above the top of aerial pole, providing pulley is within 18in. of top. By carefully twisting the pulley rope, the loop can be manœuvred over the top of pole, when, by lowering pulley rope and tugging at the wire, the new strainer will bind itself at a point above the pulley. The straining wire can then be pegged down where required.—E. DAVEY (Plymouth).

An Efficient Friction Drive

THE accompanying sketch shows a way of utilizing a geared slow-motion dial which has been scrapped because the teeth have stripped, or because of backlash, if the teeth are well worn. The method is to convert it into friction drive. Most of these geared drive dials have a large spindle, as shown at A. This is removed, and a piece of brass tube (which is an easy fit in the hole) has a bevelled washer sweated on one end, as shown at B. A screw, C, has another washer, D, also bevelled (with a file) slipped on it, passed through the tube, then a spring E and two small nuts, as shown. All that remains is to fit the knob.—A. H. JONES (Upper Norwood).



An efficient friction drive.

Economizing in H.T.

IT is seldom realized, and, as far as I know, no attention has ever been drawn to the fact that where a battery set is fairly heavy on H.T., or where another L.F. stage is added to a set which has previously worked on a standard battery, a more economical scheme than purchasing new, double-capacity batteries can be effected by obtaining a further standard capacity battery. In the case of some sets using three or four valves the arrangement shown in the sketch (Fig. 1) will be cheaper and more efficient. Take a 3-valver as an example. (*Do not couple a new H.T. to an old one.—Ed.*)

I have naturally omitted decoupling reaction, etc. In view of the fact that many people to-day make use of the cheaper H.T. batteries, from necessity, this method is cheap and efficient. I have used a 60-volt block for Det. and 1st L.F. with good results.

An alternative method is also practicable, although slightly less efficient. The leads from detector and 1st L.F. are taken to

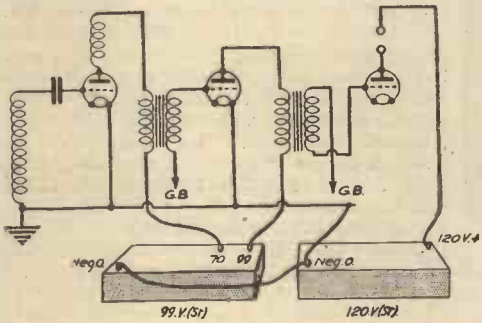


Fig. 1.

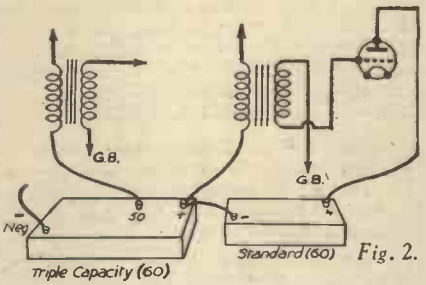


Fig. 2.

Connecting up batteries for economizing in H.T. current.

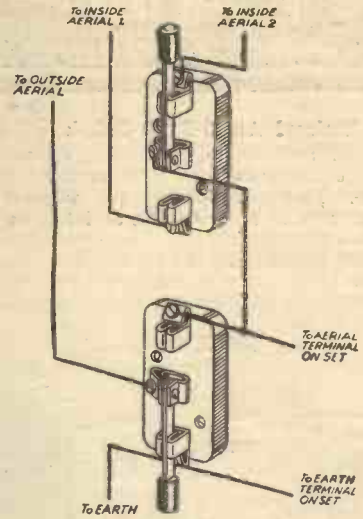
60 v., and the last H.T. lead to 120 v., as shown in Fig. 2.—F. PALMER (King's Lynn).

An Aerial Switching Arrangement

FOR the short-wave listener, who usually has a separate aerial, or perhaps two, for the short waves, and also retains one for the broadcast band, this wrinkle should be useful, for it will save the necessity of plugging in the appropriate aerial and also save any possibility of confusion, at the same time providing an earthing switch. The switches used are the single throw type, as used for earthing the aerial.

With the top switch open and the bottom switch up, the outdoor aerial is connected to the set, and with the top switch still open and the bottom switch down, the outdoor aerial is earthed. With the bottom switch open, the top switch may be closed up or down, thus connecting the desired aerial of the other two.

If you wish to go all out for the 100ft.

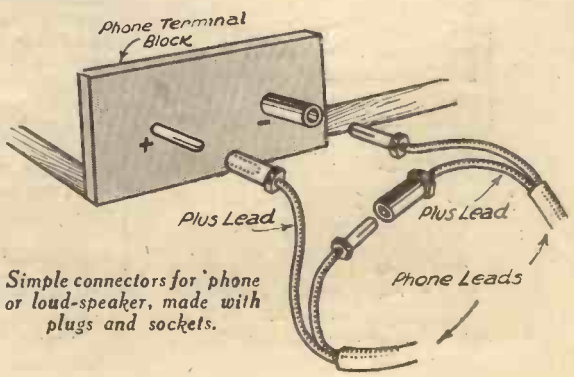


An aerial switching arrangement.

allowed by the B.B.C. licence, close the bottom switch up and the top one either way, thus connecting two aerials. You will find there are many variations of this idea. For instance, if you wish to try a counterpoise earth, the switches can be connected to include this, instead of one of the aerials. The connection to the set need never be undone, and I have made mine a permanent job.—ARTHUR COOK (Manchester).

Simplified 'Phone or Loud-speaker Connection

THE alteration made to the telephone or loud-speaker leads, shown in the accompanying sketch, has been found to be exceedingly useful, firstly because it is impossible to connect the leads wrongly to the set (as if this is done the magnets will become demagnetized) and, secondly, that it is a very simple matter to connect an extra pair of 'phones or loud-speaker. The sketch is practically self explanatory, an ordinary plug being substituted for the plus terminal on the set, and a socket for the other terminal. The existing tags are then removed from the 'phone leads, and the plus lead connected to a socket. The other 'phone lead is joined to a plug. Additional 'phone or loud-speaker leads may be treated in a similar manner.—F. N. P. (Ruislip).



Simple connectors for 'phone or loud-speaker, made with plugs and sockets.

NEW - FROM FILAMENT TO ANODE -

not a re-hash but an entirely new manufacturing technique

SMALLER SIZE

FAR GREATER STRENGTH

NON-MICROPHONIC

UNIFORM CHARACTERISTICS

PERFECT SHIELDING

ANODE TERMINAL DIRECTLY CONNECTED / LOOSE CAP IMPOSSIBLE

INSULATION BETWEEN ANODE AND SHIELD

PRECISION INSULATORS LOCKING ELECTRODES

HEXAGONAL SCREEN GRID

AIR COOLED ANODE

CONTROL GRID STRAIGHT WIRE CONSTRUCTION

METAL ANODE TO GLASS VACUUM TIGHT JOINT

PRECISION INSULATOR LOCKING ELECTRODES

FILAMENT CONNECTIONS THE ONLY WELDS IN THE ELECTRODE SUPPORT SYSTEM

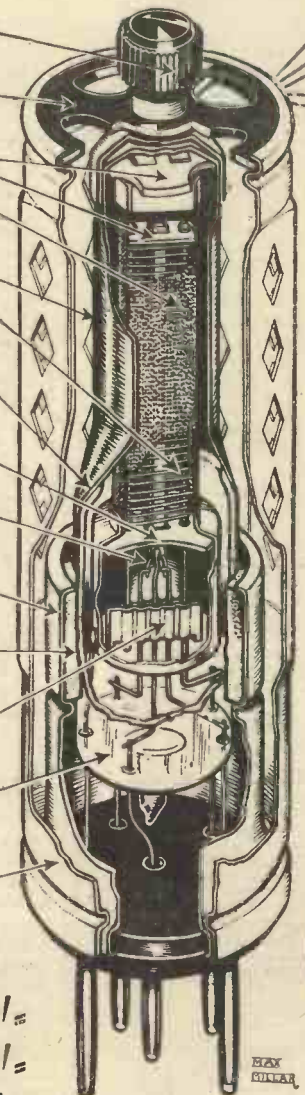
METAL CAPPING SHELL GIVING MINIMUM GRID - ANODE CAPACITY

RUBBER MOUNTING ANTI - MICROPHONIC

INSULATED STEEL CLAMP SUPERSEDING DELICATE PINCH OF GLASS VALVE

GLASS CIRCULAR SEAL GIVING MAXIMUM INSULATION SPACING BETWEEN WIRES

METAL SHIELD GIVING MECHANICAL PROTECTION AND ELECTRO STATIC SHIELDING



MAX MILLAR

Metal *instead of* Glass

Superseding the glass bulb the OSRAM "CATKIN" VALVE of metal construction represents an undoubted contribution to improved set performance. Rigid construction with greater precision in the setting up of electrodes together with better cooling combine to enable the valves to give better results than hitherto. A radical revision in the method of bringing the leads out at the base of the valve reduces losses to a minimum and improves insulation — all-important requirements in the modern set. The valve is unbreakable and cannot become loose or detached from its socket. It is carried in a non-microphonic mounting and is totally screened, while the small dimensions render the OSRAM "CATKIN" VALVE eminently suitable for compact receiver design.

WRITE AT ONCE *for folder O.V. 6572 which gives full particulars of OSRAM 'CATKIN' VALVES. Sent POST FREE.*

TYPES AND PRICES

MS4B High Efficiency Screen-Grid Valve PRICE **19/-**

VMS4 Improved variable mu Screen Grid Valve PRICE **19/-**

MH4 High Magnification Detector Valve - PRICE **13/6**

MPT4 Power Pentode Valve - - - - PRICE **20/-**

FOR A.C. MAINS RECEIVERS

Sold by all Wireless Dealers.

Covered by World Patents

MADE IN ENGLAND

Osram (CATKIN) Valves

FOR A.C. MAINS RECEIVERS

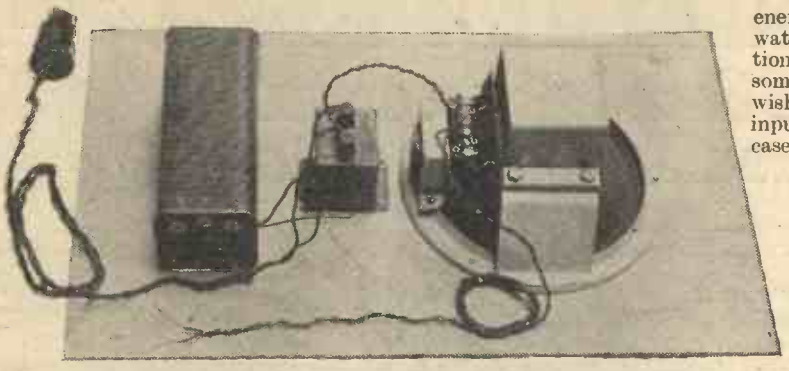
THE VALVE WITH THE IRON CONSTITUTION

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

ENERGIZING MOVING-COIL LOUD-SPEAKERS FROM A.C. MAINS

With Particular Reference to Westinghouse Metal Rectifiers. By A. P. ROGERS.

THE question of providing a suitable source of supply for operating moving-coil loud-speakers from A.C. mains, is one of some importance, as it will generally be found when purchasing this type of loud-speaker where no rectifier is provided. The reason for this, of course, is that in some cases the speaker field winding will be required for use in receiver circuits as an extra smoothing choke, in which case the rectifier is unnecessary.



From the foregoing remarks it will be realised that when it is required to excite a moving-coil speaker separately from A.C. mains, some form of rectification must be employed.

The Westinghouse metal rectifier will be found to be particularly suitable for this work, as apart from giving a permanent output, it provides a very economical method of obtaining the required D.C. supply, as in the majority of cases no mains transformer is required. Excluding the permanent type of speaker which requires no field excitation, the models on the market at present may be

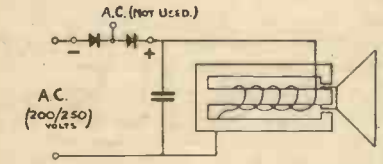


Fig. 1.—Half-wave rectification without a mains transformer.

roughly classified into two divisions, *i.e.*, high and low resistance field windings. We will consider the high resistance type first—this class covers those having resistances of 2,500 ohms to 7,500 ohms or more.

It will be noted that the majority of speakers in this class are wound for voltages between 110 and 190. This enables half-wave rectification to be employed direct from the mains, without the use of a mains transformer, the speaker being energized at its maximum wattage even after the voltage drop through the rectifier has been accounted for. This, of course, only applies to cases where the speaker is operated from 200-250 volt mains.

The circuit is shown in Fig. 1, the H.T.8 rectifier being recommended for field windings, of resistance between 2,000 and 5,000 ohms while the H.T.7 rectifier may be used for values above 5,000 ohms.

It must be noted that in all cases where a transformer is not used, it is imperative to avoid any earth connection on the D.C. side. The reason for this is that in many cases one side of the mains supply is earthed, it is therefore possible to short-circuit the live side of the supply to earth, resulting in serious damage.

The Voltage Doubler Circuit

Where the loud-speaker is to operate on mains of 110-120 volts A.C., the voltage doubler circuit should be used. This circuit is shown in Fig. 2, and may also be used for speakers requiring a greater watts input, *i.e.*, consuming 100 milliamps at 200-250. In the latter case a transformer must be used to provide the correct input voltage to the rectifier.

It is sometimes advisable to use the voltage-doubler circuit for field-windings of the high resistance class. For example, a field winding of 6,500 ohms or 7,500 ohms may be wound for a voltage of 200-250. It is obvious that if half-wave rectification is used, and that the mains voltage is 200, the speaker will not be energized at more than 3 watts. Although this excitation should be sufficient for some speakers, users may wish to use a greater watts input to the field, in which case the voltage-doubler circuit should be employed in conjunction with a suitable mains transformer. This will increase the field excitation to 6 watts.

Field-winding Resistance.	Recommended Rectifier.	Circuit.	Speaker excitation in volt-amps.
2,000 or 2,500 ohms.	H.T.8.	Half-wave, with 4 mfd. Reservoir Condenser.	5—9
4,700 ohms.	H.T.8.	Half-wave with 4 mfd. Reservoir Condenser.	4—8
5,500 ohms.	H.T.7.	Half-wave, with 8 mfd. Reservoir Condenser.	3—6
7,500 ohms.	H.T.7.	Voltage-Doubler with two Resr. Condensers of 4 mfd. each, and suitable mains transformer.	5
6 to 8 ohms.	L.T.4	Rectifier and Mains Transformer as in Fig. 3.	6
12	L.T.5.	Rectifier and Transformer as in Fig. 3.	12

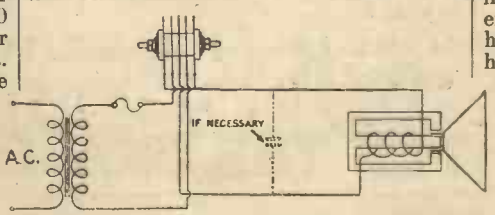


Fig. 3.—Low voltage energized speaker field.

Low Resistance Field Windings

We now come to the low resistance types of speaker, these usually have field windings between 6 and 12 ohms. The rectifiers recommended are styles L.T.4, L.T.5, L.T.6, A.4 and A.6. These rectifiers operate in the bridge circuit, which gives full-wave rectification, and usually no reservoir condenser is required, as the inductance of the field winding is found to give sufficient smoothing.

It may occur, however, that a low inductance winding is used, in which case an electrolytic condenser of 1,000 to 2,000 microfarads should be connected across

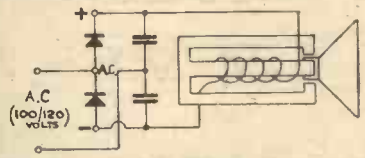


Fig. 2.—A voltage doubler used with an energized field.

the field-winding. It will be essential to use a mains transformer with all the low-tension rectifiers in order to provide the correct input voltage. The circuit is shown in Fig. 3.

It may be of interest to constructors to have a table giving the recommended rectifier for use with the field-windings most commonly met with. It is obvious that it would be impossible to compile a table giving the required particulars for every combination of field-winding, mains voltage and input watts required.

The tabulated data shown, therefore, applies only to mains voltages between 200 and 250, and for field-windings encountered in general practice.

It should be remembered that the installation of a moving-coil speaker, with its greater sensitivity to low frequencies, may reveal faults in the receiver which in the past have been unnoticed. For example, it may be found that a slight hum is present after a moving-coil speaker has been installed, with the result that the excitation of the magnet is blamed. It must be realised that if the eliminator circuit is insufficiently smoothed, this would be apparent by the greater sensitivity of the speaker. It is recommended that if hum is experienced, the search should first be made in the smoothing and decoupling circuits.

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

ETA valves are now sold with labels of distinctive colour and shape on the ends of the cartons. Ask your dealer to show you this new idea and refuse to accept any ETA valve the carton of which does not carry one of these new labels.

FREE: Ask for the ETA "Comparative Table No. 13.F." showing which ETA valves to use in places 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

ETA

THE INTERNATIONAL VALVE

As low in price as a really good valve can be

THERE ARE NO QUERIES ABOUT THE EFFICIENCY OF A.C. MAINS RECEIVERS IF THEY ARE EQUIPPED WITH

WESTINGHOUSE METAL RECTIFIERS

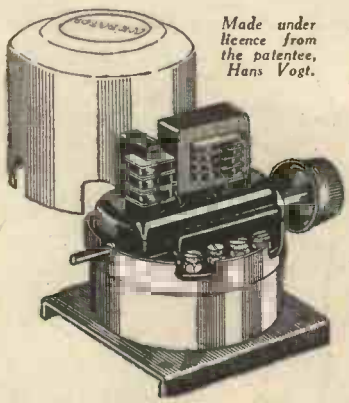
THE WESTINGHOUSE BRAKE & SAXBY SIGNAL Co. LTD.

82, YORK ROAD, KING'S CROSS, LONDON, N.1.

COLVERN FERROCART COILS

COLVERN ..... always associated with all that is best in radio frequency coils.

FERROCART Coils are synonymous for outstanding selectivity, compactness and efficiency.



Made under licence from the patentee, Hans Vogt.

TYPES F1 F2 F3
For single S.G.H.F. stage receivers
37/6 per set.

TYPES F10 F11 F12 F13
Suitable for 2 S.G.H.F. stage receivers
50/- per set.

Mounted on sub base with ganged wave change switches.

COLVERN LTD., ROMFORD, ESSEX

London Wholesale Depot:—
150, King's Cross Road, W.C.2.

ANOTHER GUARANTEED RECEIVER!

An Outstanding Receiver which b... Leading Wirel...

THE first part of this receiver to be constructed is the baseboard, and this should be carefully carried out in order to ensure that the mounting of the components, the wiring, and the final stability of the receiver are made easy and certain. It will be seen from the illustrations that the baseboard is supported on side runners in accordance with the system which has now been adopted by us as standard. This enables the majority of the smaller components to be mounted below the surface of the baseboard and makes for neatness, and short and efficient wiring. The side runners in this particular receiver are one and a half inches deep, and two of these will be required, ten inches long. The baseboard is supplied with the cabinet and is fourteen inches long by ten inches wide. For the runners it is preferable to use three-eighths or half-inch batten and not ordinary plywood, as this can be obtained ready cut to width, and it is therefore only necessary to saw off the two lengths and true edges are available for attaching to the baseboard. Two screws, one at either end, will hold these runners in position, but they should not be affixed until all the holes have been drilled. From the wiring diagram (or the blue print, if you obtain one) place all the components on the baseboard and carefully pencil round them lightly. This will enable you to position screw holes, clearance holes for the valveholders, and the small holes used to pass the wiring from one side of the baseboard to the other. When marking the position of the valveholders, use a 4-pin holder, and mark the centre through the hole which is left in the centre of this component. It should, of course, be stood upside down for the purpose. When this preliminary marking out has been accomplished, cut out the large holes and drill an eighth of an inch hole for wiring purposes, with a small hole to start all the screws at the requisite positions. Now affix the side runners, and proceed to mount the individual components.

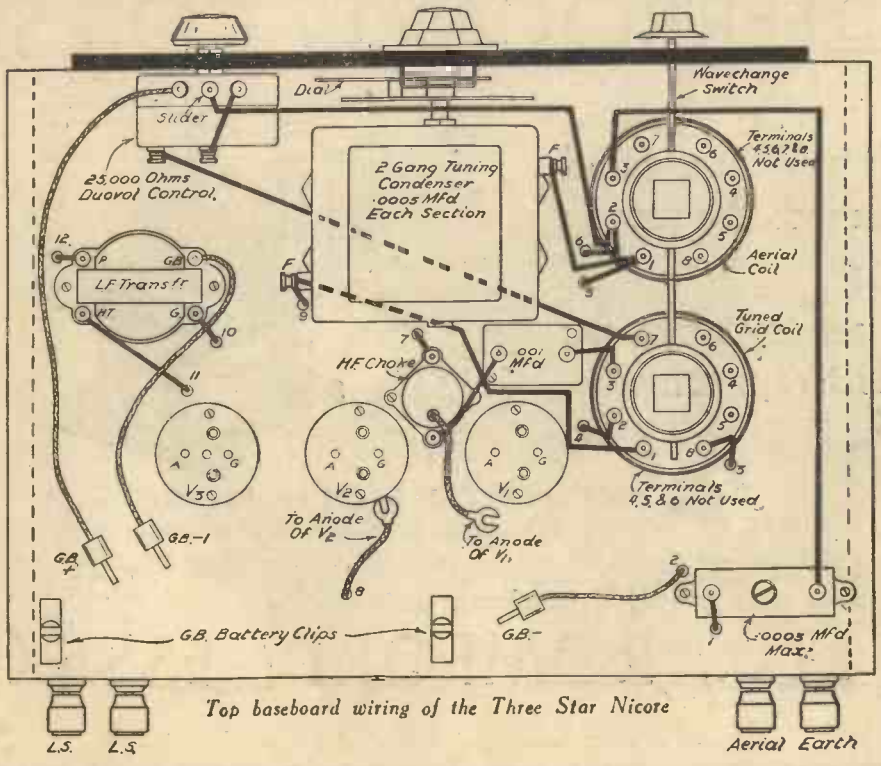
Side view of the Three Star Nicore

Mounting the Components

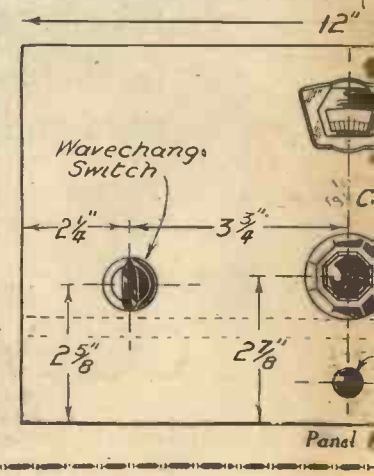
The valveholders should be mounted first, noting carefully the arrangement of the valve pins. Next turn the baseboard upside down and mount all the sub-baseboard components. When this has been completed turn the base over and mount the remaining components, remembering to replace the coil and condenser screens as soon as

LIST OF COMPONENTS FOR

One pair Varley Nicore Coils.
One J.B. Two Gang Unitune Condenser (.0005 mfd.).
One British Radiophone Duovol Control with 25,000 ohm resistance.
One Igranic Midget 3-1 L.F. Transformer.
One Wright and Weaire H.F. P.A. Screened Choke.
One Lissen H.F. Choke (L.N. 5092).
Four Graham Farish Ohmite Resistances—5,000, 10,000, 20,000 and 150,000 ohms.
One Graham Farish 1 megohm Grid Leak.
One T.C.C. "S" Type Condenser, .01 mfd.
One T.C.C. Type "S" Condenser, .0001 mfd.
One T.C.C. 50 Type Condenser, .25 mfd.
Three T.C.C. Type 50 Condensers, 1 mfd.
One T.C.C. Type "S" Condenser, .001 mfd.
Two Clix 4-pin valveholders.
One Clix 5-pin valveholder.
One Bulgin Junior 3-spring switch.
One Sovereign pre-set condenser, .0003 max.
One Belling-Lee 5-way Battery Cord.
Two Belling-Lee Terminal Mounts.
Four Belling-Lee Type B Terminals (Aerial, Earth, L.S.— and L.S.+).



Top baseboard wiring of the Three Star Nicore



Three Star NICORE

Full-Size Blueprint may be obtained for 1/- from the Offices of this Journal.

mbodies the Ideas of Three of the less Designers

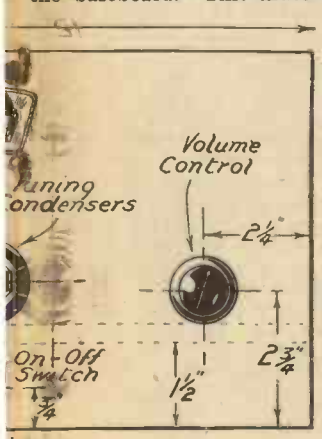
the mounting is completed. By doing this there will be little risk of damage occurring to these components. Now take the panel and mark a centre line from top to bottom, and with the baseboard and wiring diagram as your guide, mark a line along the panel

THE THREE STAR NICORE

- One pair Bulgin Type 3 Grid Bias battery clips.
- Three Belling-Lee Wander Plugs—G.B.+, G.B.1 and G.B.2.
- Two coils Glazite, odd length flex, screws, etc.
- One Becol Ebonite Panel, 12in. by 7in.
- One Carrington "Aston" Senior Cabinet, with baseboard, 14in. by 10in.
- Two Side Runners, 10in. by 1½in.
- One Cossor 220 V.S.G. (metallized).
- One Cossor 220 S.G. (metallized).
- One Cossor 220 H.P.T.
- One Smith's "Anodex" 120 volt H.T. Battery.
- One Smith's "Anodex" 16 volt G.B. Battery.
- One Smith's 2 volt, 40 amp. L.T. accumulator.
- One Blue Spot 29 P.M. Loud-speaker.
- One British Radiophone Receptru Lead-in.
- One Graham Farish Filt for earth.
- One Bulgin Indicator Q.M.B. Lightning Switch.

Approximate cost of all the above parts, £12 15s.

corresponding with the upper surface of the baseboard. This must be done very carefully or the condenser escutcheon will be found difficult to set in its correct position. The template supplied with the condenser should then be trimmed up and laid on the back of the panel with the baseboard line and centre line in their respective positions, when the escutcheon window and spindle clearance hole may be marked. The window may be cut out by drilling a number of small holes, or a fretsaw may be employed for the purpose. The clearance hole for the spindle may be slightly smaller than recommended by the makers, provided it is accurately positioned. If you are at all uncertain regarding the accuracy of your marking out, use the drill size recommended, and there will be no risk of the spindle binding on the side of the hole. Now place the panel up against the baseboard with the spindle coming centrally through its clearance hole, and make certain that the table, workbench, or object upon which the baseboard is standing is perfectly level. Make a mark corresponding to the level of the spindle which controls the switching in the Varley coils, and check this by the wiring diagram. This should be 3¾ in. from the centre line, and three-quarters of an inch above the level of the baseboard. On the opposite side of the centre line mark a similar hole to accommodate the Duovol control, and three-quarters of an inch from the lower edge of the panel, and on the centre line, make a hole to accommodate the Bulgin switch. Two or three small screw holes, countersunk, should finally be drilled in order to attach the panel to the baseboard.



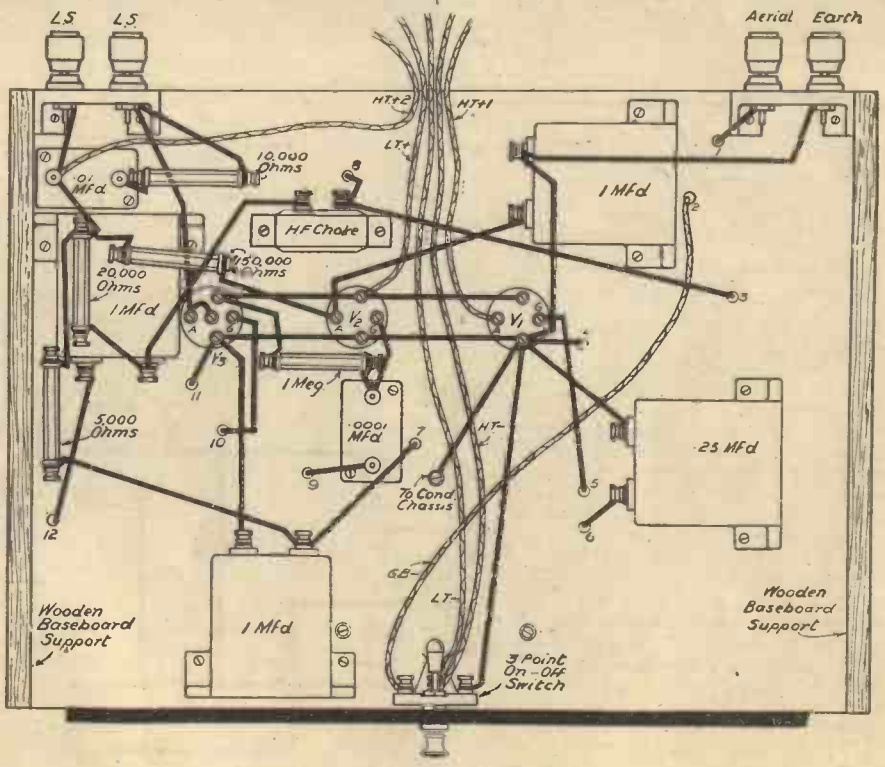
layout


The finished Three Star Nicore in the Carrington Aston Senior Cabinet

Wiring Up

Mount the switch on the panel, and then the Duovol control, noting its correct way round from the wiring diagram, and attach the panel to the edge of the baseboard. Three-quarter-inch screws will be found quite suitable for this purpose, as there is no weight to be carried by the panel, and the condenser control knob and switch knob of the coils help to hold it in position.

(Continued on page 500)



Sub-baseboard wiring

The Why & Wherefore of GRID-BIAS

In this Concluding Article, FRANK PRESTON, F.R.A., Explains the effect of Grid Current and Voltage and its Relation to Selectivity

The Effect of Grid Current.

Now let us go to the other extreme and suppose the valve is given a normal bias of 1 volt negative. The result is shown in Figure 6. Although the grid is made negative to the extent of 1 volt, each positive half-cycle of signal voltage "wipes out" the negative bias and actually makes the grid positive. When this happens some of the electrons shot off by the filament are attracted to the grid itself and therefore current will flow between the grid and filament through the transformer secondary or grid leak (depending upon the form of inter-valve coupling employed). It is rather difficult to explain fully in simple language, but the grid current causes a voltage drop across the coupling component, and results in a lower voltage being passed on to the grid. Thus all the positive half-cycles will be reduced in intensity so that the anode current variation will be as represented by the broken line to the right of Figure 6. Again the wave-form has been changed, and in consequence, distortion is the inevitable outcome.

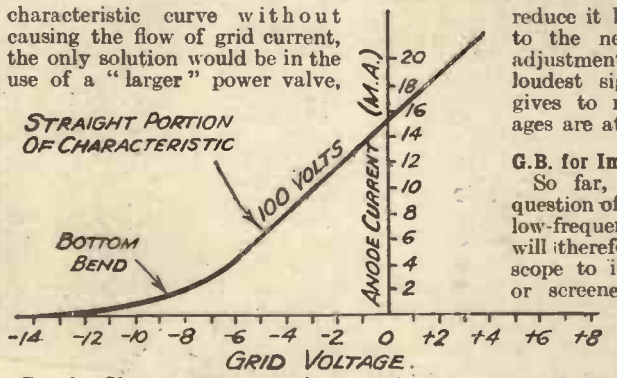


Fig. 6.—Characteristic curve for typical small power valve. This shows how anode current varies with grid voltage.

Correct G.B. Voltage

We have observed that the result of too much or too little grid bias, so it is not difficult to appreciate how it should be adjusted to be "just right." Obviously it must be somewhere between the two extremes we have considered. It must be so arranged that the signal voltages cannot drive the valve past its "bottom bend" or at any moment cause the grid to become positive (Fig. 7). The valve in question could be biased to any voltage between about 5 and 2 volts negative, but for the sake of economy we should naturally employ the higher voltage in practice, so as to keep down the current consumption to its lowest limit.

The figure we have just decided on would, of course, only apply when the signal voltage applied to the grid was 4. If it was less than this, slightly more bias could safely be employed, but if it was more, the bias voltage would have to be reduced. Should the signal voltage be so great that it could not be accommodated on the straight part of the characteristic curve without causing the flow of grid current, the only solution would be in the use of a "larger" power valve, that is one having a longer straight part in its characteristic curve (Fig. 8).

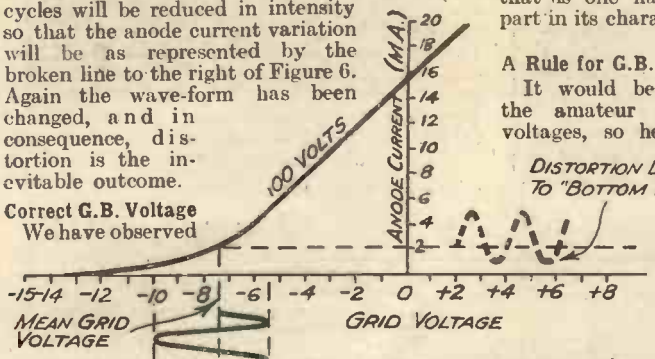


Fig. 7.—Showing the effect of signal voltages on the valve when it is biased to 7½ volts negative. "Bottom bend" distortion occurs.

A Rule for G.B. Adjustment.

It would be quite impossible for the amateur to measure the signal voltages, so he must adjust his grid bias by "ear." The simplest rule to follow is to increase the bias step by step until (bottom bend) distortion is just perceptible; then reduce it by moving the wander plug to the next lower tapping. This adjustment should be made on the loudest signals which the set ever gives to make sure that their voltages are at maximum.

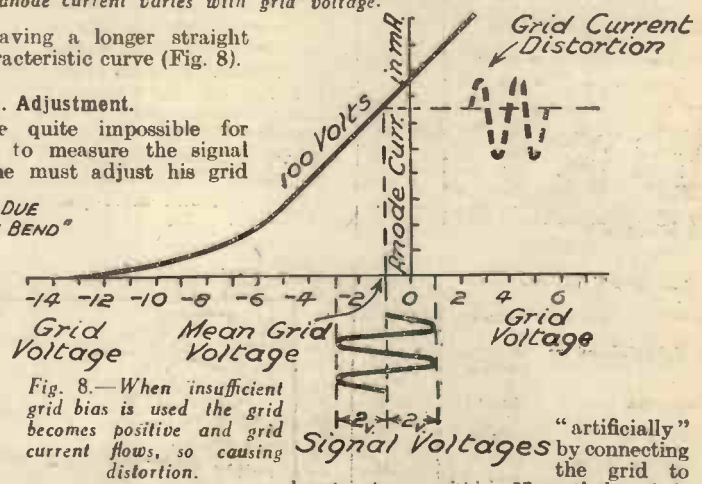


Fig. 8.—When insufficient grid bias is used the grid becomes positive and grid current flows, so causing distortion.

G.B. for Improving Selectivity.

So far, we have considered the question of grid bias only as applied to low-frequency amplifying valves. It will therefore be well to extend our scope to include the high-frequency or screened-grid types. It is not customary to employ "direct" negative bias with such valves since a sufficiently high potential can generally be provided "artificially" by connecting the grid to low-tension negative. Nevertheless, it is a fact that much better selectivity can frequently be obtained by the use of a small additional bias up to about 1½ volts. The reason is that on powerful signals the grid is likely to be made slightly positive. When this occurs there is a flow of grid current, as we saw before, which "damps" the tuned circuit and produces a noticeable lack of selectivity. To anyone who finds that his S.G. receiver does not tune sharply enough I would strongly recommend the use of grid bias for the H.F. valve. The modification required is very slight and is shown graphically in Figure 9; the connection between the end of the aerial tuning coil and earth is broken and a .25 mfd. non-inductive fixed condenser inserted; a lead is then taken from the coil to a tapping on the G.B. battery.

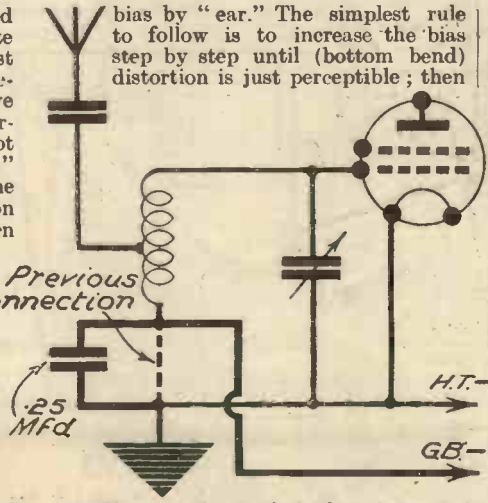


Fig. 9.—Showing the method of applying grid bias to a high-frequency valve.

Test the voltage of your grid bias battery every few months and replace if it has fallen by any appreciable amount.

One other point; do not forget that the G.B. voltage might have to be reduced periodically, as the H.T. battery runs down.

Would YOU like £100 or £50... or £30... or £10?

...then you must enter for the

LION

H.T. BATTERY SLOGAN COMPETITION

ASK YOUR DEALER FOR DETAILS TODAY

Think of a good slogan which adequately states the merits of Lion Patent H.T. Batteries . . . that's all you have to do to win a BIG MONEY PRIZE in this simple, straightforward competition. Enter to-day! Your dealer will give you full details.

Vinces Dry Batteries Ltd., Lion Works, Garford St., London, E.14. 'Phone: East 1902

DRIVERMU TRANSFORMERS AND CHOKES

MAKE 'CLASS B' EASY

Whether you have any knowledge of "Class B" or not, you can go to your dealer to-day and select immediately an R.I. "Class B" transformer of the right ratio and decide the correct matching of the R.I. output choke between any Class B valve and speaker for any output required. The

R.I. 'CLASS B' BOOKLET

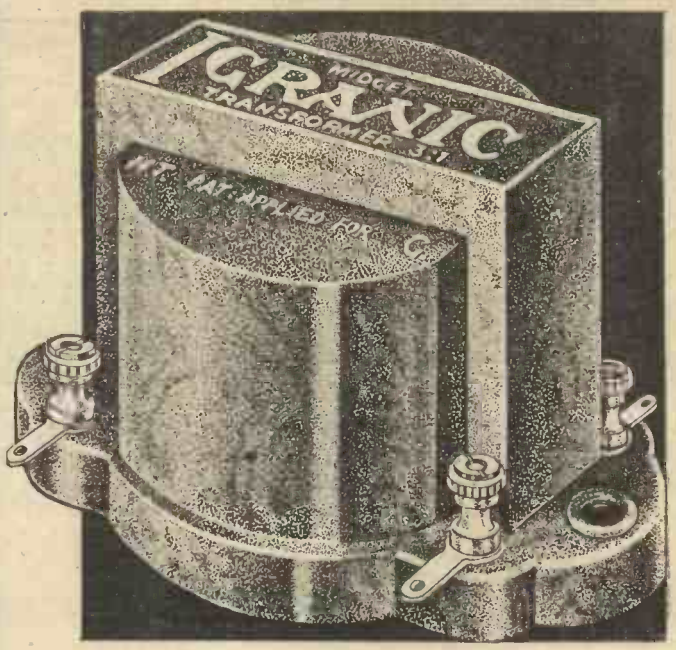
enables you to do this. This amazing little booklet explains the system at a glance and shows exactly how to convert an existing battery set to 'Class B' or how to apply this method of amplification to a new model.

Get a copy to-day—every up-to-date dealer has a supply.

R. I. "Drivermu" Transformers are priced at 15/- & 11/- (plus 1/6 royalty) and the Choke at 12/6.

RADIO INSTRUMENTS LTD., CROYDON, SURREY.

IGRANIC MIDGET TRANSFORMER SPECIFIED FOR THE "THREE STAR NICORE"



It may interest you to hear that in my present Receiver, coils, coil holders, valve holders, L.F. transformers and switches are all "Igranic" and when I can find better I shall buy it. Extract of a letter received from Mr. Anthony Fletcher of 62, Raleigh Road, North Hyde, Southall, Middx.

IGRANIC MIDGET TRANSFORMER

The designer of the "Three Star Nicore" made sure of the efficiency of his transformer by specifying the Igranic Midget. Igranic have specialised in Transformer manufacture since radio began, and years of experience and research have led to the production of the "Midget" Transformer—unsurpassed for quality and performance. This wonderful Transformer renders the highest standard of tonal purity without a trace of "drumming." Its reproduction reaches a standard never previously attained by a Transformer of such reasonable price. Supplied in ratios 3–1 and 5–1. Price **10/6**

RADIO IGRANIC DEVICES

Write for fully illustrated Catalogue No. J. 1253 of Igranic Quality Components.

Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.

IGRANIC COMPONENTS WILL BE THE MAKING OF YOUR SET

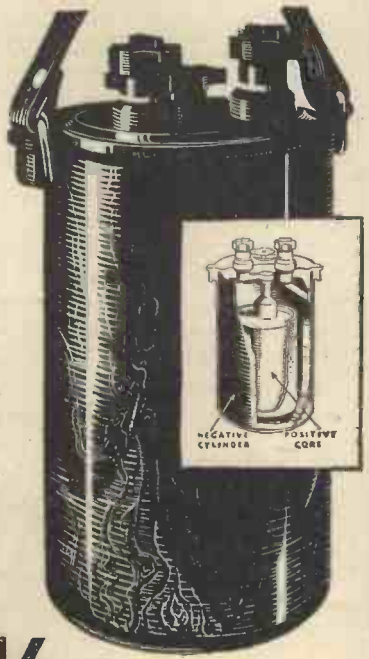
CVS 83

What the turbine meant to ships, this new invention means to radio

As a power-source, the turbine doubled the practicable speed of ships. To-day, just as dramatically, radio power has been doubled—by the invention of the plate-less form of accumulator.

double capacity accumulators

1. *No weight-wasting plates—just a core within a cylinder (itself the acid container.)*
2. *Far more thorough action (the plate-grids cause interference).*
3. *Total result—not only greater strength, but twice the amp. capacity per lb. weight!*



THE new accumulator takes all the bother out of re-charging; for though no bigger than the existing standard 40 a.h. type, it lasts twice as long per charge—gives 80 a.h. Stronger—it is almost unbreakable. And handsome, too, in its coloured bakelite! It is the power source of a new day! Get one now.

BLOCK plate-less accumulators

2 v. **80** AMP. HRS. **11/6**D.

BLOCK BATTERIES LTD., ABBEY RD., BARKING, ESSEX. TEL.: GRA 3346

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 Street, Strand, London, W.C.2

The Camco "Tablegram."

A COMPACT RADIO-GRAM CABINET

This cabinet is specially suitable for converting your set into a modern radiogram—takes up very little room. Ample space for batteries, speaker, set, motor, pick-up, etc. Price 55/-, finished shaded walnut. **Specified exclusively for the "Aston Senior."** Send coupon for FREE Camco Cabinet Catalogue.

Carrington Manufacturing Co. Ltd.

Showrooms: 24, Hatton Garden, London, E.C.1. Holborn 8202

CAMCO Aston Senior

Works: S. Croydon.

Post in ½d. envelope.

NAME .....

ADDRESS .....

10PRW .....

Automatic Volume Control

Inventor: F. PLEW. *Patent Pending No. 13651/33.*

Battery users can now fit A. V. C. without the slightest difficulty to any existing set having one or more stages of H.F. or I.F. **Eliminates fading, overloading and distortion.**

Brings in Home or Foreign stations at the same volume. **No special valve required. Send for "Plew Anti-Fading Unit,"** together with full explanatory and wiring diagrams. **Price 10/-**

Post Free U.K. and Northern Ireland.

Write for descriptive Leaflet No. 33 for Battery Models: No. 34 for Mains.

Dimensions of Unit 2 × 2½ × 1⅜

PLEW & DEAR

RADIO MANUFACTURERS,

22, George St., Hanover Square, London, W.1 Phone: MAYFAIR 5742

Trade Enquiries to:

R. F. PAYNE-GALLWEY, 53, Haymarket, S.W.1. Whitehall 1922

The BEGINNER'S SUPPLEMENT

THE EASY ROAD TO RADIO

Conducted by F.J. CAMM

Kathode *See CATHODE.*

Kilocycle
A thousand cycles. See *CYCLE* and *FREQUENCY.*

Laminated Core
Transformers, chokes, etc., used in the low-frequency part of a set have iron or iron alloy cores around which the wire is wound. The object of the iron core is to increase the number of lines of force which pass through the coil or coils of wire. The iron concentrates the magnetic field. If, however, it is made of solid iron it has one great disadvantage. Electric currents known as eddy currents are set up in the iron and this leads to a waste of power and so makes the transformer or choke less efficient than it might be. To stop these currents, the core is broken up by constructing it from a large number of separate sheets of iron as in Fig. 1. These are usually varnished on one side or else separated by thin sheets of paper. The separate sheets are known as *laminæ* and the core is called a *laminated core.*

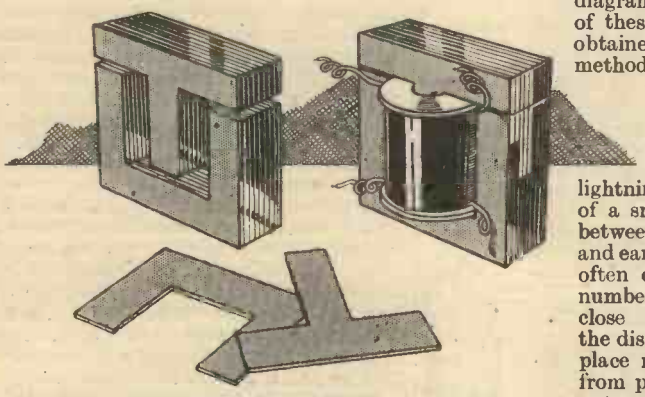


Fig. 1.—How a laminated core is built up showing its use in a transformer.

Lines of Force
A magnetic or electric field (see *FIELD*) is supposed to consist of definite lines along which the force acts. These are called *lines of force.* If the lines are close together then the field is strong, and if they are wide apart then it is weak. The concentration and distribution of the lines of force around a coil or a magnet can be controlled to a certain extent by means of shielding with metal screens or by the introduction of iron cores, etc. A simple experiment illustrating the position of the lines of force around a magnet is shown in Fig. 3. A piece of paper is placed over the magnet and iron filings are sprinkled on the paper. The filings will arrange themselves as shown. In the same illustration is given a clearer diagram of the disposition of these lines than can be obtained with the filings method.

THE BEGINNER'S A B C OF WIRELESS TERMS

(*Continued from June 17th issue, page 459.*)

Lightning Arrester
A device for protecting the aerial from damage by lightning. It usually consists of a small spark gap placed between the aerial and earth. This gap often consists of a number of points close together as the discharge takes place more readily from points. It is not necessary for a spark to actually jump the points for the device to work, since a heavy charge will ionise the air between the points and leak across in that manner. Examples of lightning arresters and how they are connected is given in Fig. 2. The use of a lightning arrester does not in any way affect the working of a receiver since there is no actual connection between the aerial and the earth.

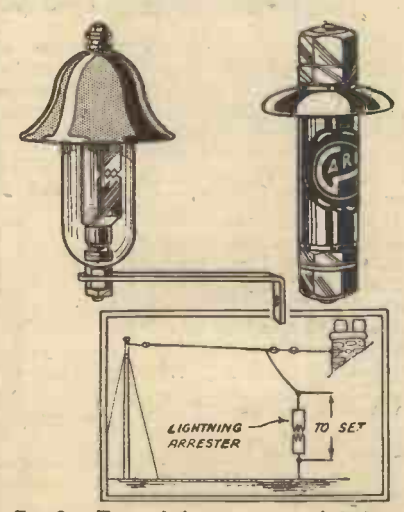


Fig. 2.—Two different types of lightning arrester. Inset shows how an arrester is connected.

Loading Coil
A coil connected in series with the aerial coil to increase its range.

Log-law Condenser
A variable condenser with vanes of a certain shape. With nearly all the early types of variable condenser the plates were semi-circular. This, of course, made the change in capacity for a given degree of movement of the vanes the same over any part of the scale. With the log-law, or logarithmic to give it its proper name, the vanes are shaped differently. As the knob or dial is turned the increase in capacity for each degree on the dial becomes greater as the upper end of the scale is approached. Actually, the term "logarithmic" is derived from the fact that the angle of movement of the vanes is proportional to the logarithm of the change in capacity.

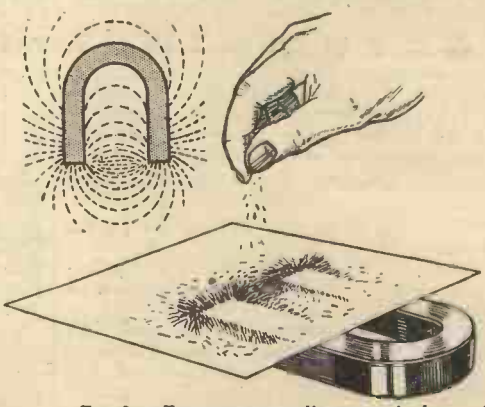


Fig. 3.—Experiment to illustrate the lines of force around a permanent magnet.

The advantage of the logarithmic type of condenser is that the various stations being received are more evenly spaced over the dial. With the old type condenser stations spaced equally apart as regards wavelength or frequency tune-in bunched together at the lower end of the dial and spread out at the upper end. Thus, as the knob or dial is turned, starting from the minimum setting of the condenser, stations appear in quick succession for the first few degrees of movement and then gradually spread out until they are quite wide apart towards the upper end of the scale.

WORKSHOP HINTS FOR THE RADIO EXPERIMENTER

DRILLS AND DRILLING

By W. H. DELLER.

THE best known type of drill is that of the twist or spiral flute type, but there are several other types, notably the straight flute type, such as are included and contained in the hollow handle of some of the better makes of hand drills, and the flat or harpoon drills. For general purposes the twist drill is the best, as it permits being reground until worn out, has a constant cutting rake during its life, maintains its size, and is self clearing. Straight flute drills are handy, particularly for drilling brass and aluminium. Flat drills are useful for drilling small holes in fairly thin material, but for hand work are very liable to run when drilling deep holes.

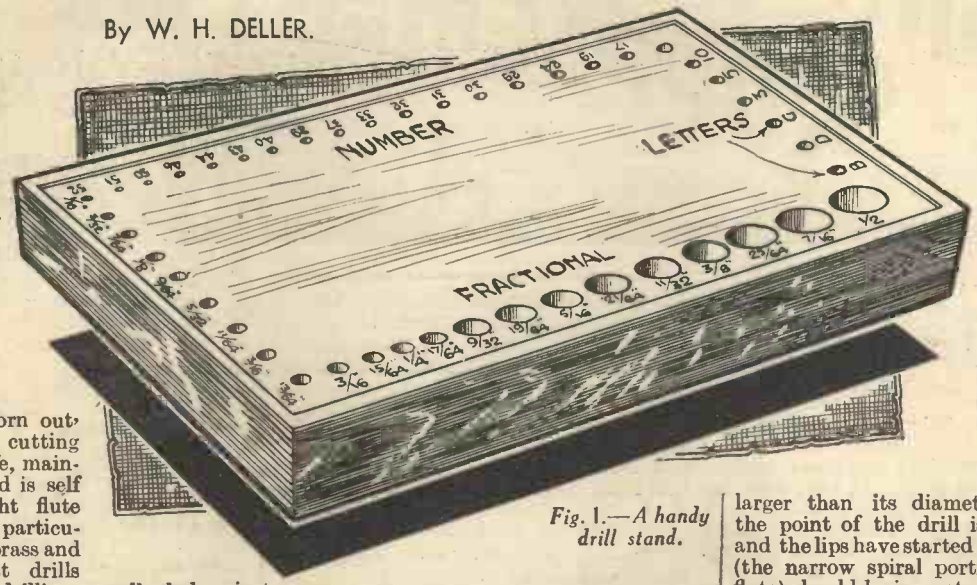


Fig. 1.—A handy drill stand.

Standard twist drills are commercially obtainable in fractional sizes ranging from 1-64in. diameter to 1in. diameter by increments of 1-64in., in wire sizes from No. 80 (.0135in. diameter) to No. 1 (.2280 in. diameter)—80 different sizes in all, and in letter sizes from Letter A (.2340in. diameter) to Letter Z (.4130in. diameter).

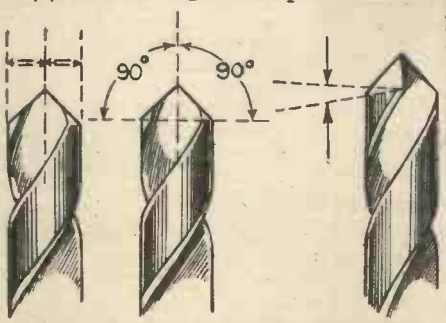
These drills may be purchased separately, or are to be had made up in sets and mounted in wood or aluminium stands provided with holes to suit the drill shanks. Each hole is distinctly marked with its respective drill size, so the task of selecting a correct drill is made easy.

For wireless work, however, most requirements are covered in the tables given in our Free Gift Data Sheets.

These drills, and a 7-16in. and ½in. diameter and possibly a few extra fractional sizes below ½in., should complete the range required. To keep them together and instantly found, a drill stand might be made as shown in Fig. 1.

When resharpening becomes necessary this should be done by grinding. Drills that do not get a lot of use may be sharpened with an oil stone to restore a keen edge. When regrinding, follow the original ground faces as close as possible, grinding from the back and finishing at the cutting edge of each face. After grinding examine the drill for the following points :—

(1) That the point is central.
(2) That the angles are equal.



Figs. 2 and 3.—Make certain, after grinding, that the backing off and angles are equal

(3) That the backing off is equal (see Figs. 2 and 3).

Where any appreciable thickness of metal has to be drilled it is a good practice to thin the point of the drill, that is, where the same is unduly thick. This will make the drill cut faster, and also less pressure will be required on the drill. Fig. 4 shows how to do this.

It is very noticeable, when drilling brass, aluminium, or ebonite, how the drill is inclined to "bite" into the material. A remedy for this is to grind the face at the cutting edges slightly to reduce the cutting rake (Fig. 4).

When using an ordinary twist drill for countersinking, to prevent chattering occurring during cutting, the cutting clearance on the drill lips should be reduced to a minimum, so that the drill is almost rubbing. This will produce a clean-cut countersink in any material.

To produce flat-bottomed holes, such as are required to accommodate the heads of cheese-headed screws, the hole or holes are first drilled to take the shanks of the screws and opened out with another drill to take the head. This drill is then ground off flat and backed off, as seen in Fig. 5, and the drilling continued with it to the correct depth.

When a drill is incorrectly ground it will cut a hole larger than its diameter. As soon as the point of the drill is into the material and the lips have started cutting, both lands (the narrow spiral portions against each flute) should be in contact with the edge of the hole (Fig. 6); if as shown in Fig. 7, it indicates that either the point is out of centre or that the angles are unequal.

Holes requiring to be drilled at an angle with a square face or through the edge of a piece of round material as shown in Fig. 8 should be started by commencing to drill square with the work until a hole about 1-16in. deep (full diameter) has been drilled, and then gradually bring the drill over to the desired angle, keeping the drill cutting slightly whilst so doing. Holes that have started slightly out of position may be pulled over in this manner.

Rose cutters, such as that illustrated in Fig. 9, are used for countersinking; resharpening when necessary is done with a small oil stone.

Two types of counterbores for larger holes are shown in Fig. 10. These are used by first drilling a small hole for the pilot to work in, and afterwards using as an ordinary drill until the desired depth is obtained. Large holes may be drilled out in this manner, but when dealing with ebonite, to prevent any raggedness when breaking through, the material is best drilled from either side.

(Continued on page 498)

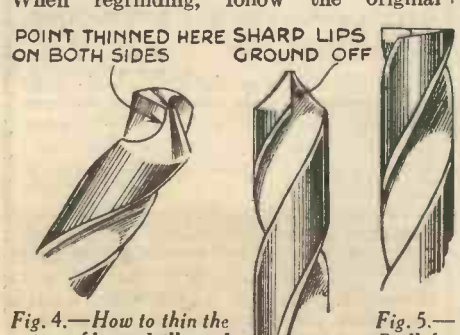


Fig. 4.—How to thin the points of large drills and how to avoid "greediness" when drilling soft metals.

Fig. 5.—Drill for flat-bottomed holes.

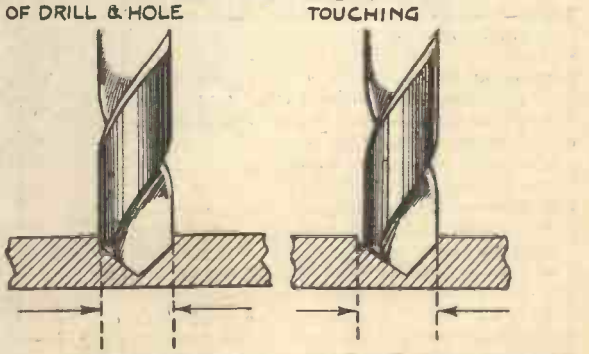


Fig. 6.—A correctly ground drill.

Fig. 7.—A drill incorrectly ground will cut a hole larger than its diameter.

TELE-TALKIE TOPICS

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

HAVING seen how our single turn spiral of holes punched in the disc (which is made to rotate anti-clockwise) causes the scanning at the receiving end to take place, so that hole movement is from bottom to top, and we see an experimental television receiving apparatus built up for reproducing such images of long, thin shape.

No doubt as the science progresses, international uniformity will ensue, otherwise it will be impossible to tune in the different transmissions on one machine alone and watch intelligible images.

Let us, however, confine our initial remarks to the present B.B.C. transmissions which conform to the Baird standard. With our disc scanning we shall have a resultant area of light exposed which resembles somewhat the shape shown in Fig. 3. There are two concentric arcs, AB and DC, with two radial lines, DA and CB, inclined to one another at an angle of twelve degrees for the thirty line image, the hole shown as a square at B being the first hole of our spiral, while that at D is the last one.

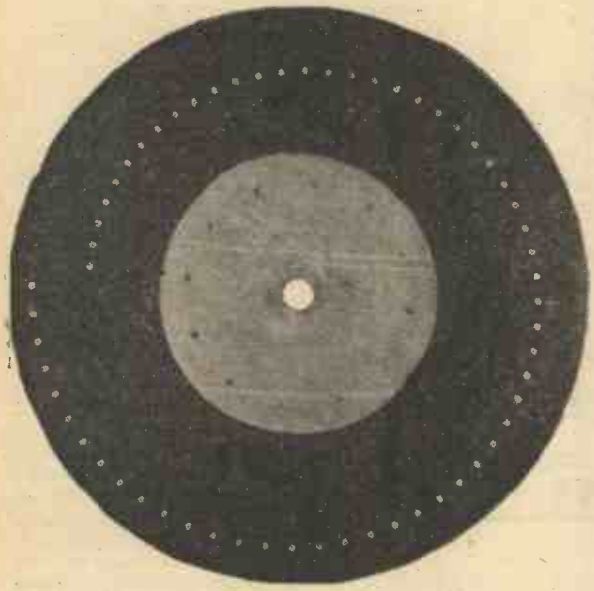


Fig. 1.—Showing how a disc can be marked out to give a long narrow picture.

Proper Relationships

First of all the true *height* of the picture according to present reckoning is the chord AB and not, as one might generally expect, the arc AB. The actual measurement should be made on the circle traced out by the outer edge of the first disc hole. Coming to the *width*, this is the radial distance CB, or the difference in radii between the inner edge of the last hole and the outer edge of the first hole. With strip movement from right to left, we must examine our disc problem a little closer. It is not simply a case of saying that one requires a picture width of, say, one inch, and then dividing this distance by thirty (for the present B.B.C.'s transmissions) and marking off these lengths along consecutive radii.

(*Continued overleaf*)

Picture Ratio

The first thing is to ascertain what "picture ratio" is employed for the particular television transmission it is desired to watch. Unfortunately at the moment there is no uniformity in this connection. In this country we have an image field which is seven units high and three units wide, in Germany they have four units wide and three units high, while in America the bulk of the television transmissions are worked on a square picture.

To give the reader some idea of how this picture ratio business works out, Fig 1 should be studied. Here we have a disc with sixty holes (actually it is a transmitting disc) and the resultant picture secured with this is a long oblong one. It is very suitable for the transmission of printed messages, such as one sees in the form of a moving news bulletin above big stores. This particular use for television is referred to as Telelogoscopy, and in Fig. 2

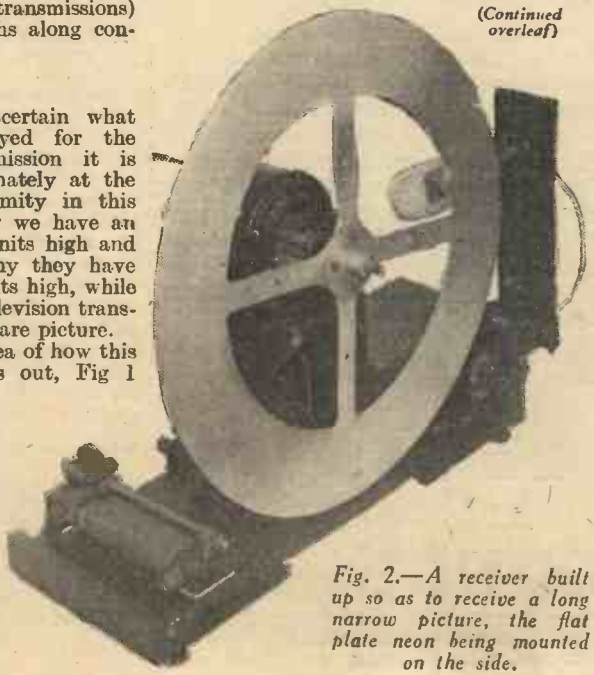
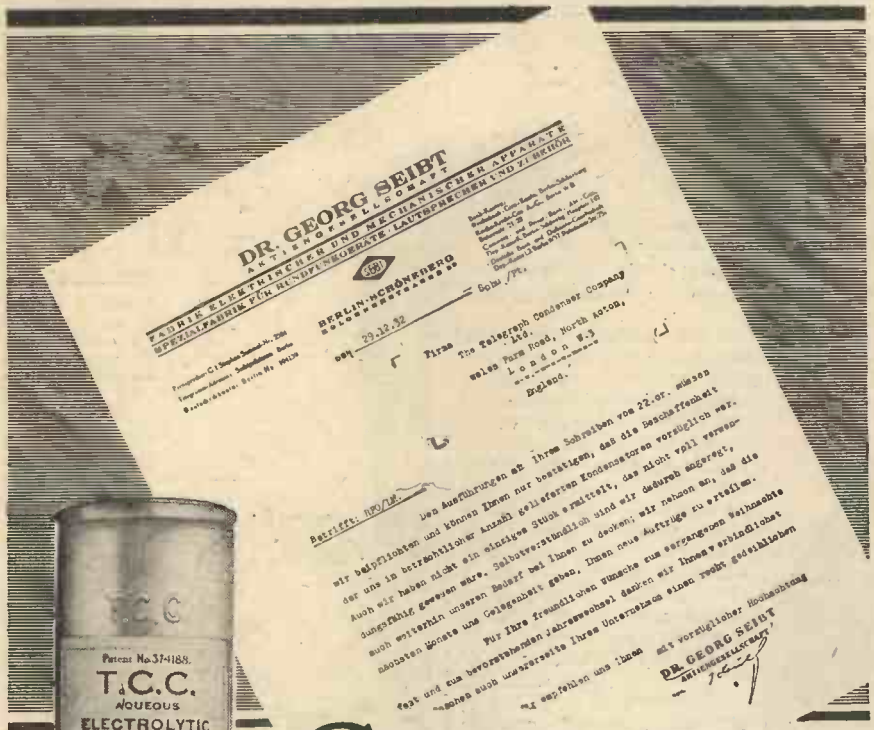
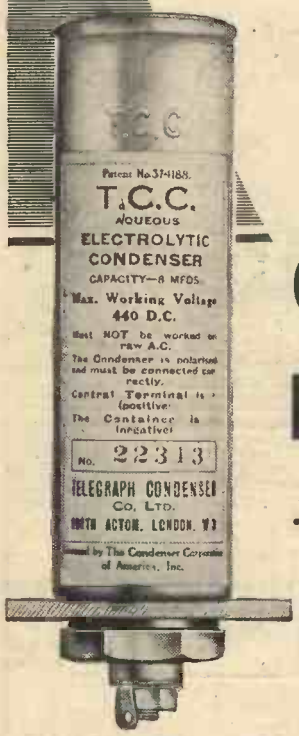


Fig. 2.—A receiver built up so as to receive a long narrow picture, the flat plate neon being mounted on the side.





GERMANY *buys*

ALL-BRITISH

WET ELECTROLYTIC

CONDENSERS

—and acknowledges T.C.C. Supremacy

21,000 T.C.C. Wet Electrolytic Condensers have been supplied to a leading German Electrical Manufacturer —without a single reject—high tribute to the efficiency and dependability of British products from acknowledged authorities on condenser practice. Every condenser was put into commission and not one service return has been necessary. This does not surprise us, for these T.C.C. Wet Electrolytic's are practically indestructible. Where excessive voltages are applied a mere leakage occurs, components in circuit are thus protected from damage. After an apparent "break down" they recover immediately the normal load is applied, and function perfectly again. Such are the characteristics of T.C.C. Wet Electrolytics—characteristics that are your safeguard.

Made in the following ranges

8 mfd. 440 v. working 6s.
4 „ 440 v. „ 5s.
7 „ 460 v. „ 6s.

● *Made under SOLE Licence from the Condenser Corporation of America Inc. British Pat. No. 374188.*

TRANSLATION

We have pleasure in acknowledging receipt of your letter of the 22nd inst., and we can but confirm that the service of the large quantities of condensers you have supplied us with has been excellent. We have not received a single one which could not be utilised with complete satisfaction.
Naturally this incites us to cover our future requirements with you and we hope to place further orders with you during the coming months.
Please accept our thanks for your kind wishes for the past Xmas and the coming year, and on our side we wish your Company a really prosperous future.

T.C.C.

ALL-BRITISH CONDENSERS

The Telegraph Condenser Co., Ltd., Wales Farm Road, N. Acton, W.3. ♡3027

(Continued from previous page)

the present standard we are, therefore, able to establish the very simple relationship that :—

$$\frac{\text{Chord AB}}{\text{CB}} = \frac{7}{3}$$

Now both these quantities can be calculated very simply, but unless readers expressly ask for it I will not worry them with the slight amount of mathematics involved in the derivation of the equation below. Generally, what we desire to know in our disc construction is the width or distance CB for any given disc radius. As a rule the outer edge of the first hole is punched so that it is half an inch inside the outside periphery of the disc, so if we let the letter R be the distance from the disc centre to this first hole's outer edge, we have the equation:

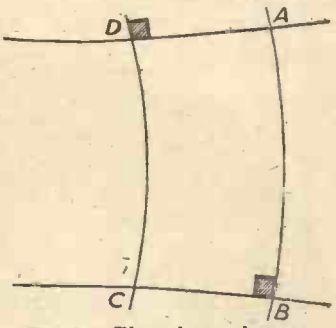


Fig. 3.—The relation between width and height of the television picture.

$$\text{Width CB} = 0.08959\ R$$

Now our disc hole must have a given area and the most economical way of using this area is to make it up in the form of a square. If we had a circular hole of diameter equal to the square side, then we should lose light equivalent to the shaded area shown in Fig. 4. Hence, if you desire to secure the *best* possible results, have square holes in your scanning disc and the size can be calculated very simply from the equation given for the width CB. In the case under review, namely, thirty line scanning, it is necessary merely to divide this distance by the figure 30.

Fig. 4.—The dark areas which appear when using a round hole in the scanning disc.

Hole Sizes

To help readers I have compiled the table shown below (all dimensions in inches). The first column gives sizes for the radius R, which is the distance of the *outer* edge of the first hole from the disc centre, the second column gives the actual picture width, while the last column is the size of the square hole which must be punched in the disc. The most popular size of disc is one with an external radius of ten inches, having the first hole starting-half an inch in from the edge. R in this case, therefore, becomes 9.5 inches and our hole size 0.0284 inch. In my next article I will give a you few hints on marking out and punching the disc holes.

Radius R.	*Picture Width.*	*Hole Size.*
12.0	1.0751	.0358
11.5	1.0303	.0343
11.0	.9855	.0328
10.5	.9407	.0313
10.0	.8959	.0299
9.5	.8511	.0284
9.0	.8063	.0269
8.5	.7615	.0254
8.0	.7167	.0239

RADIO RAMBLINGS

By JACE

Jottings from my Notebook

G.B. and Class "B."

ALTHOUGH I feel ashamed to admit it I recently fell into a very foolish trap whilst making myself a Class "B" set. Everything was to be really up-to-date so I used one of the new short grid base variable-mu valves, Ferrocart coils, automatic volume control, tone compensation and—as mentioned—a Class "B" output stage. Following the idea of making everything foolproof it was decided to use automatic grid bias for the "driver" valve. Being a battery set, the only way to do this was to include a resistance in the H.T. negative lead. Well, the correct value was calculated, taking the average H.T. current as a basis, but on trying out the set there was hopeless distortion. Why?

This is not given as our weekly "Problem," but you have probably solved it already. It took me quite a few minutes to realise what I had done wrong. Of course, it is impossible to use automatic G.B. with a Class "B" set because of the constant variation in high tension current. Assuming the use of a 500 ohm bias resistance the grid bias applied to the "driver" valve would vary from 5 volts at minimum (say 10 mA.) H.T. current to 25 volts at maximum (about 50 mA). Consequently the "driver" valve would quickly be changing between the completely "choked" to the "grid current" state, and only at rare intervals would it be correctly biased.

A New V.-M. Valve

IN the last paragraph I referred to the new short grid base variable-mu valve. Perhaps you have not yet heard of this, for it has only just come on to the market. As the name implies, this valve requires only a small change in G.B. voltage to regulate its amplification from maximum to zero. Actually, the valve is capable of reducing the volume of a nearby station down to a mere whisper when given 4½ volts negative grid bias. It should become very popular for Class "B" sets which only require a small bias voltage for the "driver" stage, since it will remove the necessity for an unduly large G.B. battery.

It is still more useful when A.V.C. is employed, and will make possible the incorporation of quite effective automatic volume control even with comparatively insensitive battery sets in which the signal voltage on the grid of the detector is small. As yet the short grid base V.-M. is only made by one firm, but others will doubtless follow suit in the near future.

Catkins

VARIOUS reasons have been given in the Press for the naming of the recently-introduced "Catkin" valves which have previously received mention in PRACTICAL WIRELESS. I saw it stated in one journal that the name bore reference to the shape of the copper anode, but I must say that I can see very little resemblance between this valve and the "pendulous inflorescence of the willow birch" (*vide* my dictionary). Actually the word "Catkin" is evolved from the letters C.A.T. which mean "cooled anode transmitter," and are applied to certain transmitting valves which dissipate an enormous anode wattage, and require to be cooled by passing a constant stream of water round them. You know, of course, that huge radiators on the principle of those used on cars, are employed for this purpose at all the B.B.C. transmitting stations.

Catkin valves are for receivers only, and do not require to be water cooled. But at the same time their anodes are cooled by being exposed to the air; the valves are, therefore, of the cooled anode type. This is an undoubted advantage for mains valves and should result in longer valve life.

Non-Microphonic

ANOTHER advantage of Catkins is that they are entirely non-microphonic due to the use of a rubber bush between the electrode system and the cap. Besides this, however, the electrodes are very rigidly supported by mica washers so that they are very nearly immune from vibration.

For those readers who intend to try out the new valves it should be mentioned that they have characteristics identical with those of existing types, so that absolutely no circuit alterations are required. Due to the larger anode area efficient screening is essential, but this is adequately provided for in the V.-M. and detector patterns by the fitting of an efficient perforated screening can.

The Waveband Question

ONE is constantly rubbing up against the difficulty of waveband nomenclature. We speak of long, medium, short and ultra-short waves, but whilst some regard those wavelengths between 200 and 600 metres as "short," they are "medium" to others. The same difficulty occurs lower down the scale; ultra-short waves are sometimes regarded as those below 50 metres, sometimes as below 20 metres and yet again as below 10 metres.

The trouble has been brought about by the increasing use made of shorter and shorter wavelengths for broadcasting purposes, but it should soon be overcome if a definite ruling on the question is given at the Lucerne Conference. The proposal to be submitted there is that the various wavebands should be split up as follows:—long waves, from 3,000 metres upwards; medium waves from 200 to 3,000 metres; medium short waves, from 50 to 200 metres; short waves, from 10 to 50 metres and ultra-short waves, below 10 metres.

A SUN DRIED EARTH IS INEFFICIENT

A damp earth all the year round is essential to good reception. Filt the ever-damp Earth keeps damp without attention, thus maintaining the efficient conductivity of the soil in the hottest weather.

2/6

BUT FILT KEEPS WET

Sold by all Dealers or post free from Sole Makers.

Graham Farish Ltd., Masons Hill, Bromley, Kent.

Specified by the Experts

SOUND SALES

The Editor of PRACTICAL WIRELESS substantiates our claims and applauds the introduction of the New Sound Sales Universal Driver Transformer.

Specially designed with a Tapped Primary which ensures accurate matching conditions with ALL makes of Class "B" Valves.

UNIVERSAL THREE-RATIO DRIVER TRANSFORMER

Type U.B.

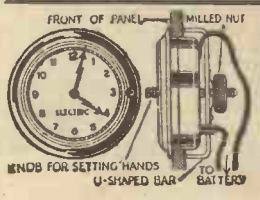
Ratios 1-1, 1.5-1, 2-1

10/-

Write for leaflet "N."

SOUND SALES LTD.,

Tremlett Grove Works, Junction Rd., Highgate, N.19



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 3¼in. dia. in any panel up to ¼in. thick. Easy to fix—no screws required. Only ¾in. 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

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

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

BRITISH RADIOPHONE SLOW-MOTION DIALS

THE new geared dials which are being produced by The British Radiophone Company are rather more elaborate than those already obtainable. As may be seen from the illustration below, they take the form of a straight-line dial or the usual semi-circular scale, and the pointer is the chief part of interest. In place of the customary rotating scale and fixed hair-line, the scale in these models is fixed, and a thin pointer moves across the dial. The method by which this is driven may clearly be seen from the right-hand dial, and it proves a much more efficient arrangement than the moving scale drive as the whole scale is exposed to view, and the direction of rotation is clearly seen for any desired station. Although the condenser plates, and consequently the control-spindle has to rotate through 180 degrees, the scale does not occupy such a large section owing to the method of driving the pointer. This results in a really neat escutcheon and window, the latter being already attached to the scale. Fitting is very simple, as the base of the drive is fitted with feet drilled to accommodate fixing screws. The movement is very smooth and free from backlash, and the appearance of the escutcheon is really handsome. It will be found worthy of a place in the very best of receivers and may be thoroughly recommended to our readers. The price is 8s. for the straight-scale model and 8s. 6d. for the curved, and either model may be obtained with frosted glass to facilitate the marking of individual stations.

New British Radiophone slow-motion dials.

WATBRO ACCUMULATOR CHARGER

FROM Messrs. Watkins Bros. we have received an interesting trickle charger designed to enable the listener to charge his own accumulators from A.C. mains. This particular model is rated at 1 amp., and is designed for 2 or 6 volt cells. A small plug is fitted underneath the case and two sockets are provided on an insulated strip. These sockets are clearly marked 2 volts and 6 volts, and the plug is inserted into the appropriate socket before connecting the accumulator to the red and black sockets on one end of the case. The latter is finished in a neat blue crystaline, and the rectification is carried out by means of a Westinghouse Metal Rectifier. The price of this model is 25s. 6d., and a further model is available at 22s. 6d., giving .5 amps. Where larger accumulators are in use, up to 12 volts, a special 1 amp model is obtainable at 29s. 6d. A robust transformer is fitted, and adequate ventilation is provided. The charger proves a sound investment, especially where the normal charging rate is excessive or the charging station is situated some way off.

Watbro accumulator charger.

CLIX AMERICAN-TYPE VALVEHOLDERS

TO the interesting range of Clix Chassis-type valve-holders, three new models have now been added. These are illustrated on the centre of this page and it will be seen that the valve-leg spacing is rather different from that to which we are normally accustomed. This is on account of the fact that they have been designed to accommodate the American valves, which, as most of our readers are aware, do not employ the British method of spacing. The particular models shown employ 4, 5 and 6-pins and the prices are 7d., 8d. and 9d. respectively. American valves are obtainable from several firms in this country, and although at the present moment an action is pending regarding the sale of these valves in England, there are no doubt many readers who are desirous of trying receivers employing the chassis method of construction and American valves. To these experimenters the holders will no doubt prove invaluable. They are of the same type as the standard Clix holder, having self centring legs and adapted to accommodate solid pins. The ends of the legs are slotted for enabling the connecting wires to be soldered into position.

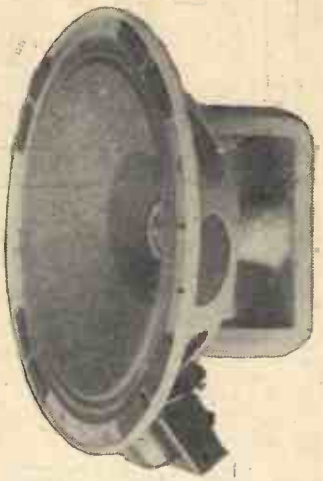
Clix American valve chassis-type holders.

THE MARCO AERIAL ELIMINATOR

THIS is a simple little device selling at 2s. It consists of a small cylindrical box with two coloured leads projecting from one end and a single long lead from the other end. The instructions are to connect the coloured wires to the aerial and earth terminals of the receiver, and the long single lead to any good earth connection, when the device functions in place of the usual aerial and eliminates static, lightning risk, etc. Upon examination the device was found to consist of a small cylindrical type of fixed condenser which was included in series between the long lead and one of the short leads, whilst the remaining short lead was wrapped round the fixed condenser and sealed in place. On test it certainly gave very good results, and although not so good as a really efficient outside aerial, it provided a good choice of stations on the receiver with which it was used. It is guaranteed against any manufacturing defect for twelve months, and cannot wear out or break down in any way. To those who are situated in such a position that they are unable to erect a good outdoor aerial this device will be found most useful. The arrangement is, of course, much favoured in America.

BULGIN 7-PIN HOLDERS

A NEAT 7-pin valve-holder is announced to be released to the home-constructor by Messrs. Bulgin. It will be available in two types, one selling at 6d. and the other at 9d. The cheaper model is fitted with split contacts, and the other model has resilient wiping contacts. These were primarily designed for manufacturers' use, but it has now been decided to release them for the use of the home-constructor.



R.K. Model P.M. major loud-speaker.

NEW R.K. SPEAKER

THE Edison Swan Electric Company announce a new addition to the range of R.K. loud-speakers. This is the P.M. major, and is illustrated on this page. A special 8in. moulded cone is employed in conjunction with a high-grade permanent magnet. A 3-ratio output transformer is fitted suitable for use with triode, pentode or class B valves. The impedance of the speech coil is 2 ohms, and the power which can be handled is 4 watts undistorted. The primary resistance of the transformer is approximately 360 ohms with an inductance of 20 to 30 henries. The makers of this speaker recommend the following values for a filter when using a pentode valve. Condenser .01 and resistance 25,000 ohms. The speaker is finished in a cadmium plating

BLUE SPOT MODEL 45 P.M.

THE loud-speaker illustrated below is the Model 45 P.M., manufactured by the Blue Spot Company, and this retails at 45s. It is a very well-made model and embodies several interesting refinements. This is the speaker which is incorporated in the cabinet model which was described on this page in our issue dated June 3rd, and the reproduction is naturally of the same order. A simple and ingenious method of mounting the transformer is utilized, where the rear of the foot upon which the speaker stands is provided with sockets very clearly marked. There are four sockets, and combinations of these enable any type of valve to be matched correctly to the speaker. The magnets are enclosed by dust-proof plates so that there is no risk of metal fillings or other foreign matter getting into the air gap and so giving rise to distressing noises or mechanical damage. It is a very good speaker and may be thoroughly recommended.

The Blue Spot 45 P.M.

COSSOR MODEL 533A—CORRECTION.

IN our issue of June 17th, the price of the Cossor All-Electric Model 533A (A.C. Mains) Receiver was given as £17 17s., complete, or with pedestal, £1 1s. extra. These prices should be £13 15s. and £1 respectively

Practical Letters from Readers.

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

"Really Invaluable"

SIR,—I must thank you for the prompt attention my letter, asking for the encyclopædia, has received. I am delighted with it; it is indeed a splendid piece of work, and Mr. Camm and the staff of PRACTICAL WIRELESS are to be heartily congratulated. Also the data sheet binder is amongst my treasured possessions, and I might add that the data sheets have already solved many a problem for me. In your volume and data sheets I have something really invaluable. —P. C. VIVIAN (Johannesburg).

"Sez Us!"

SIR,—I thoroughly agree with the thought you express on page 351, column 3, of your issue for May 27th. I refer to the paragraph "Tele-Controlled Radio" (lines 2 to 5), and to which I might add an Americanism, "sez you!"—W. R. CUMMINGS (Dumfries).

"Always First"

SIR,—I should like to thank you for PRACTICAL WIRELESS. It is a paper we have wanted for a long time, and it is a pity it was not brought out earlier. You are wrong when you say PRACTICAL WIRELESS became first; it already was first when the first issue was published, and still is first, and at its present high standard always will be.—A. COOK (Manchester).

Congratulations from South Africa

SIR,—I would like to add my congratulations to those of your other numerous correspondents. I have been an experimenter in wireless before broadcasting as such commenced in South Africa. Apart, however, from the entertainment side of wireless, I am interested in the subject, (as well as its associated branches) of thermionic valve telephone and telegraph repeaters and carrier current systems, as part of my profession. In order to keep abreast of the latest developments I have constantly perused the various publications and periodicals, only to find that in almost every case the information contained was either out of date or of little or no value to me. One day I noticed that a new publication, PRACTICAL WIRELESS, was about to be produced. I obtained the first number, and was so pleased with it that I immediately placed an order with my bookseller. I am glad to say that PRACTICAL WIRELESS is keeping abreast of the latest developments, and that I have been able to derive great pleasure from the perusal of each issue. If I may make a suggestion, I think that articles on the mathematics of wireless, dealing with such subjects as aerial resistance and radiation, etc., would be welcomed by thousands of your readers. I would also like to see a really good constructional article for an A.C. all-wave set.—Wishing your journal every success.—H. G. BERTHOLD, B.A.(Sce), (Johannesburg).

Rectifier Valve Economy: A Correction

SIR,—With reference to a Radio Wrinkle by "Practicus" in May 20th issue of PRACTICAL WIRELESS, I should like to

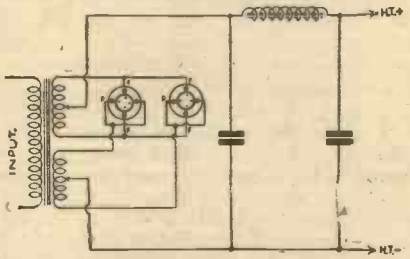


Diagram illustrating Mr. R. Sharman's letter.

point out that a mistake has occurred in the wiring diagram. There is a short-circuit of H.T. plus to negative through the filament of the valve-holder on the left.—R. SHARMAN (Wickford).

[*The accompanying diagram shows the correct connections.*—ED.].

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT a broken valve-base makes a very good plug-in attachment for coils, chokes and other home-made accessories.

—THAT a square of ebonite with four plugs may be made up to use when trying L.F. transformers. By fitting four sockets to the receiver the transformer may be easily removed and another substituted without disturbing the wiring.

—THAT the aerial wire, lead-in, and wire to the aerial terminal of the receiver should preferably be one unbroken length of wire.

—THAT small crocodile clips are invaluable for rapid circuit connections when experimenting.

—THAT serious experimenting is best carried out by building a receiver in separate stages, or units. In this way the effects of different couplings, etc., may more readily be appreciated.

—THAT a new form of tuning is being developed, where the loud-speaker is silent until the station is accurately tuned in. It may be fitted to any receiver.

—THAT to enable you to know when the station is actually tuned in a light behind the scale lights up.

—THAT the above idea is very popular in America and is known as "Shadow Tuning," "Flash Tuning," and sundry other names.

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.

GREAT RADIO SALE

T.C.C. 15 mfd. Cond. (as new, boxed), 3/6; 10 mfd., 2/6; .0005 variable, 1/-; .0003 fixed, 3d.; W.W. Resistances, 4d. Dual Range Coils (guaranteed), 1/6. Brownie L.F. Transformers, 5—1, 2/6. Chokes from 2/-. Mains Transformers from 4/6. 2v., All-mains Sets, Metal Rectifier, Illum'd Dial, complete, £2. New 5v., Portable Set, great station-getter, British valves, £3. Massive Zenith Mains Transformer, 500-0-500v., 300 watts, weighs 40lbs., worth £6; absolute snip, 30/-. Thousands of other bargains too numerous to list. Send your requirements.
FROST RADIO CO., 21, Red Lion Street, London, E.C.1

FAMOS 2 magnet bal. arm. speaker units, large 4 pole type. List price, 21/-, to clear 6/-.
AMPLION cone speaker unit in Walnut domed-top cabinet, 7/6 complete.
ERICSSON 2-1 (suit 3-1) L.F. Transformers. Listed 17/6; each, 3/3.
AMPLION speaker units. Over 75 per cent. reduct. Each 2/3.
All new and guaranteed and sent carriage free U.K.
PIONEER RADIO MNFTG. CO., LTD., COPTIC STREET, W.C.1. Museum 9607.

(Continued from page 492)

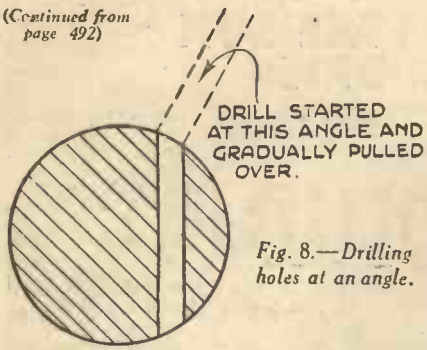


Fig. 8.—Drilling holes at an angle.

Large holes in sheet metal, or circles from ebonite for formers, can be cut out with the fly cutter shown in Fig. 12. A centre hole is also necessary in this case to accommodate the pilot, and the cutter is adjustable to suit different diameters.

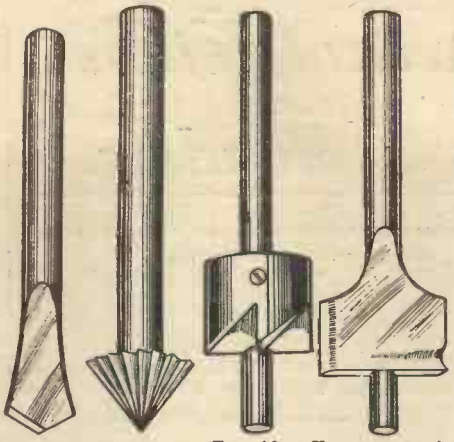


Fig. 11. Fig. 9.—Countersink and rose cutter. *Fig. 10.—Two types of counterbores.*

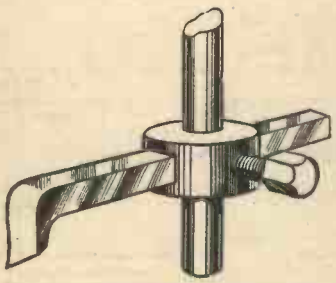


Fig. 12.—Expanding or trepanning cutter for large holes.

To deal with a hole of a special size, and the right sized drill is not available, a flat drill may be made to overcome the difficulty. A piece of silver steel smaller in diameter than the hole required (if the hole is ¼in. diameter 3-16in. dia. silver steel will be about right) is heated at the end in the gas to a dull red, and flattened out with a hammer. After allowing it to cool slowly the steel is carefully filed up to the shape shown in Fig. 11, the width of the point being made equal to the diameter of the required hole. The end of the drill is reheated to a dull red and cooled quickly in water. After polishing with emery cloth it is tempered in the gas until the polished portion assumes a yellowish brown tint; very little heating is required to accomplish this.

THREE products of unquestionable dependability united in one aim; the perfection of Class "B" Amplification. Ensure the success of your circuit by using only guaranteed components made by the pioneers—Amplion.

M.C.22 P.M. Class "B" Speaker - - **39/6d.**
"B" Driver Transformer - - - - **9/6d.**
Tapped Output Choke - - - - **9/6d.**

Amplion (1932) Ltd., 82-84, Rosoman Street, London, E.C.1.

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.

SLADE RADIO

It was a members' night at the last meeting of this Society, and was set aside for "questions and answers." A number of interesting questions were raised and were very satisfactorily dealt with by Messrs. A. S. Freeman, G. T. Peck, and N. B. Simmonds. A short "Junk Sale" of parts suitable for D.F. (direction finding) sets was held, at which a quantity of components were disposed of. Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

BURTON-ON-TRENT AMATEUR RADIO SOCIETY

At the meeting of the above Society, held on May 30th, a debate was held on Class B and Q.P.-P. v. All A.C. Receivers. Mr. J. Ballinger opened the proceedings for A.C. receivers and he was ably partnered by Mr. B. Cooper. At the conclusion of the case for all A.C., Mr. A. Brittan, for Class B and Q.P.-P., proceeded to pull to pieces the statements made by the other side, and in this he was assisted by Mr. W. Mead, G5YY, who went a stage further and explained how Class B could be used off quite a small H.T. eliminator, and still give the same output as an A.C. receiver costing two or three times as much. The Society has room for new members, and all interested should write to the Hon. Sec., 180, Burton Road, Burton-on-Trent, who will be pleased to forward particulars.

THE BLACKPOOL AND FYLDE RADIO SOCIETY

There was a good attendance at a meeting of the above Society, which was held on Tuesday, May 23rd, at Booths Café, when Mr. C. H. Jones gave an address on "The New Metal Catkin Valve," which has recently been put on the market. Of the many advantages of this revolutionary new valve, he mentioned: 1, Uniformity of characteristics; 2, All microphonic troubles at an end; 3, Danger of breakage minimised; 4, Ease of packing for transport and considerably less room required for stockage. After he had concluded, many questions were asked, and there was a short discussion until the meeting closed. Hon. Sec., G. F. Howard, 43, Cumberland Avenue, Blackpool.

INTERNATIONAL SHORT WAVE CLUB (LONDON CHAPTER)

A very enthusiastic audience attended a meeting of the above Club, held at the R.A.C.S. Hall, Wandsworth Road, S.W.8, on Friday, June 9th, when Mr. A. S. Radford gave a lecture on the "Catkin Valve." Mr. Radford spoke about the construction of these valves and also of the many advantages they have over the ordinary glass valve. Reception was compared with a receiver using both catkin and the ordinary glass valves. The performance of the receiver using catkin valves was equally as good, if not better than, the receiver using ordinary valves. It was agreed by all present that the "Catkin" is a great step forward in valve construction, and it was hoped that battery types will soon be available. These meetings, which are becoming very popular with listeners, are open to anyone interested in wireless. Not only can they witness demonstrations and hear lectures, but they can meet others who have the same interests as themselves. Further particulars can be obtained from the Secretary, A. E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

The Motor Cyclist's Enquire Within.

THIS is the only Reference Year Book covering every phase of Motor Cycling. Contains complete and comprehensive information with practical illustrations relating to all makes of machines and accessories, facts and figures regarding competitions, records, clubs, legal matters, overhauling and repairing, tuning, classified buyers' guide, etc.

THE MOTOR CYCLIST'S REFERENCE YEAR BOOK.

Edited by F. J. CAMM.

1932-1933 Edition.

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

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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.

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.

MICROPHONIC VALVE

"My set keeps on breaking into a loud whistle. When the music is coming through signals are quite clear sometimes for the whole evening, but suddenly the noise gradually comes in, getting louder and louder until I have to switch off. After a few minutes I can switch on again and it is all right. Can I stop this?"—(W. K. S. F., Stepney.)

The trouble is no doubt due to a microphonic valve and the cure rests in protecting the valve from all sound waves. Some of the methods of doing this are as follow: sticking lumps of plasticine or similar substance on the glass; wrapping the valve with thick flannel or cotton wool; mounting the valve in an anti-microphonic valveholder; fitting a cardboard box over the valve, or a combination of some of the above arrangements. No doubt you will find one of these which will effect a cure.

INDUCTION COIL FOR H.T.

"I should like to know the correct windings for a coil to work direct off a 25 volt D.C. circuit to give 220 volts with sufficient milliamps to work any of the commercial all-mains sets. I should expect a little interruption from the make-and-break, but I think if it were screened and earthed the trouble could be overcome."—(E. S., Athboy, Co. Meath.)

The primary of the coil should consist of 300 turns of No. 18 D.C.C. and the secondary 2,000 turns of No. 22 D.C.C. The core should be 1in. in diameter. When testing-out the coil use a variable resistance in the primary circuit to cut the current down to a minimum.

USING METAL VALVES.

"I have recently seen in my dealer's shop window a placard advertising some new valves which are made of metal. It seems that these have great possibilities, and I now see an advertisement in your pages regarding these valves. I should be glad if you could let me have a three-valve circuit of a set suitable for these valves, as I would prefer them to the old breakable ones which I have got at present."—(W. J., Clapham.)

As has already been pointed out in our pages, no special circuit is required for these valves. They may be plugged into any mains receiver where the existing valve has characteristics similar to the new valves. Obviously, the metal pentode could not be plugged into a simple output socket without slight circuit alterations, but the new valves have identical characteristics to the glass valves which bear the same reference numbers, and provided this is borne in mind they may be used in a similar circuit.

SHOCKS FROM D.C. RECEIVER.

"My receiver is a commercial make three-valve D.C. set. It has functioned for a long time quite satisfactorily, although on one or two occasions my wife has complained that she got a shock whilst tuning in. I have not experienced this until yesterday, when I distinctly felt a tingling when tuning in. Can you help me to trace the cause of this and make it safe, as we are rather afraid that there may be some growing leak which might eventually lead to serious results."—(N. D. S., Redcar.)

There may be nothing wrong with your receiver at all, and the fact that the slight shocks have only been felt occasionally, coupled with the fact that the receiver is commercially made, leads us to the following conclusion. Firstly, no firm of repute would turn out a receiver which was not entirely safe. Secondly, the tuning control should not be connected to any source of high-voltage. Therefore, we think the following is the solution to the problem. The small grub-screw which is used to lock the control knob to the spindle is sunk only slightly below the surface of the knob. When you take hold of the knob for tuning you naturally always touch the knob in a different position. Occasions arise when your finger or thumb comes direct over the grub-screw and the flesh sinks into the slight depression and makes contact with the screw. If your flesh is dry nothing is felt, but on occasions when slightly moist a slight tingling would be experienced. You can try out this and ascertain whether or not we are correct. We shall be pleased to know the result of your test.

DATA SHEET No. 40

Cut this out each week and paste it in a notebook.

WOOD SCREW PROPORTIONS.

No. (or size of screw)	Diameter of neck or shank	Twist Drill size for wood or metal.
1	.066	S.W.G. Drills 51
2	.080	46
3	.094	41
4	.108	35
5	.122	30
6	.136	28
7	.150	23
8	.164	18
9	.178	14
10	.192	9
11	.206	4
12	.220	1
13	.234	Letter Gauge Drills B
14	.248	E
15	.262	H
16	.276	K
17	.290	M
18	.304	O
19	.318	P
20	.332	R
21	.346	S
22	.360	U
23	.374	V
24	.388	X
25	.402	Z
26	.416	27/64
27	.430	7/16
28	.444	29/64
29	.458	15/32
30	.472	31/64
31	.486	½
32	.500	33/64

FOUR-RANGE COIL.

"I wish to build up a plug-in coil with a four-pin base to cover the ordinary broadcast band as well as the very short waves round about 5 to 10 metres. Could you please let me have details of the gauge of wire, size of former and method of connection, please?"—(T. Y., Winchester.)

We do not recommend you to attempt to make up this type of coil. Apart from the normal difficulties of correctly arranging the different windings, there is the added trouble of arranging satisfactory switching. The losses on the 5-10 metre band must be kept at the very minimum, and if you introduce any of the normal types of switch you will get very poor results indeed on this band. A much better idea is to build a complete detector stage for the lower band, and arrange this on your baseboard with flexible leads and plugs from the anode of the detector valve-holder. Arranged at the same end of the baseboard, but adequately screened, build a detector portion for the normal broadcast band with a similar flexible lead from the anode. You may then use either section at will by plugging in the valve and connecting the anode lead to the L.F. stages.

LOOSE VALVE.

"My valve has been in use for some time now and the glass has become loose round the ebonite base. As it is rather dangerous in its present condition, what cement should I use to repair it? I suppose it will not affect its working in any way by letting the air in?"—(R. N., Long Eaton.)

The air cannot get in through the loose base, as the glass bulb is closed round the lower end, and the wires from the electrodes brought through the foot of the glass. The looseness may, however, give rise to microphonic noises, and you should therefore mend it by using some adhesive which is not affected by heat. Chatterton's Compound is as good as anything, or one of the cellulose cements may be used if preferred.

LOUDSPEAKER POSITION.

"Whilst experimenting with my loudspeaker, I made some important discoveries. Originally, I had the speaker on top of the cabinet, but as the majority of radio-gram cabinets use the speaker in the bottom near the floor I thought this might be a better position, so I tried it. I found it gave very poor results, and could not be heard so loudly. Some of the instruments in the orchestra also seemed to be missing. I then tried it high up on the wall, and found that when it was near the ceiling it gave the best results of all. Can you explain the reasons for this and tell me the ideal position?"—(G. C. E. R., Barking.)

There is no ideal position, as the shape of the room, the contents of the room, the position of the listener, the draperies in the room, and many other factors contribute to the result. For instance, when you placed the speaker low down the sound waves were broken up by chair legs, table legs, etc., as well as absorbed by carpets, etc. In addition, you were no doubt standing up and your ears were well above the centre of the speaker. When you placed the speaker up near the ceiling the sound waves were able to travel to the opposite wall uninterrupted and were in addition reflected back. Therefore, you should try different positions, as well as pointing the speaker in different directions, towards curtains, away from curtains, etc.

UNSTABLE S.G. STAGE.

"I have built up a mains receiver using a variable-mu H.F. stage, power grid detector and pentode output. I cannot get the volume control full on."—(T. B., Kentish Town, N.W.)

The trouble is rather difficult to locate from the above brief notes, but there is a possibility that it is caused by the fact that the output from the mains unit is such that variation in the H.F. bias alters the total current drain on the unit and so affects the voltage applied to the S.G. anode and screening grid. We do not know what method of voltage dropping you are using, but this is a possible solution. To ensure that the H.T. positive line remains sensibly constant, irrespective of the variable volume control, you should connect a resistance (of suitable wattage rating) across the H.T. positive and negative terminals so that a more or less constant H.T. drain is imposed. By working out the value of your present H.T. consumption, and the rating of the mains unit you should be able to find a resistance which will give you this "artificial load" and so stabilise your set.

FREE ADVICE BUREAU COUPON

This coupon is available until July 1st, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 24/6/33.

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.

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.

IGRANIC COMPONENTS

A FINE range of components is listed in an attractive booklet issued by Igranic Electric Co., Ltd. Amongst the various items shown are plug-in short-wave coils, H.F. chokes, fixed and variable condensers, slow-motion dials, L.F. transformers, mains transformers, potentiometers and a series of push-pull and other switches. For radiogram work there is also the "Igranovox" pick-up and a response corrector, which is designed to afford the requisite compensation for the deficiencies of the record at the lower frequencies. Constructors who look for high-class workmanship in their components should make a point of obtaining a copy of this booklet. The address is 149, Queen Victoria Street, London, E.C.

WEARITE H.F. CHOKES

FULL particulars of a new range of their high-frequency chokes are given in a leaflet issued by Wright and Weaire, Ltd. There are nine different types altogether, and all the characteristics and data concerning each is given, together with some circuit diagrams. Messrs. Wright and Weaire are well known for the care given to detail in the manufacture of their components, and the stringent tests to which they are put. Each choke listed is tested for resistance, inductance, and self capacity, etc. Readers interested can obtain a copy of this leaflet (H.F. 3133), on application to 740, High Road, Tottenham, London, N.17.

THE COMMERCIAL DEVELOPMENT OF THE FERROCART IN GREAT BRITAIN.

READERS will be interested to learn that the Ferrocart raw material in future will be manufactured by the General Electric Company. Considering the progress in radio-coil design involved in the use of this material, the English radio trade will appreciate being able to buy British material, thus saving the import duty.

The commercial development of the Ferrocart matter in England has now come to a definite stage, the situation being as follows :—

Colvern Ltd., Mawney's Road, Romford, Essex, acquired the sole right of making and selling Ferrocart components and kits.

General Electric Company Ltd., Magnet House, Kingsway, London, W.C.2, acquired

(*a*) the sole right of making the Ferrocart material,

(*b*) the sole right for the use of Ferrocart material for electric communication on wire,

(*c*) a licence for making Ferrocart coils for their own receivers and kits.

Electric and Musical Industries, Ltd (The Gramophone Co., Columbia Graphophone Co., Marconiphone Co.), Blyth Road, Hayes, Middlesex, acquired a licence for making Ferrocart coils for their own receivers.

Marconi's Wireless Telegraph Co. Ltd., Marconi House, Strand, London, W.C.2, acquired a licence for the use of Ferrocart material for radio transmitting purposes and commercial receivers.

Licence agreements with other prominent firms for Ferrocart receiver coils will shortly be made.

Replies to Broadcast Queries

W. F. M. (Blackwood) : W8CTE, W. Boyer, Box 709, Johnstown, Penna ; VE3HE, G. V. Priestly, 87, Douglas Av., Toronto 12 ; VE2AH, W. H. Oke, 105, Irvine Av., Hampstead, Montreal, P.Q. ; W5CCB, F. L. Mason, 1108, S. Atlanto Av., Tulsa, Ok. ; regret, cannot trace VE1HC. W. W. WOODMAN (Willesden) : (1) Rocky Point, New York (20.311 m.) ; R.C.A. Communications Incorporated ; (2) possibly WEA, Rocky Point (28.275 m.) ; R.C.A. also ; (3) cannot trace unless call letters are given.

The following amateur transmitters cannot be traced in the latest published lists : for F8PU write to *Réseau des Émetteurs Français*, 17, rue Mayet, Paris VIe. ; for CT1SO, Rede do Emissores Portugueses, Rua Primeiro de Dezembro 33-3, Lisbon ; for OK2EA, C.A.V. Box 69, Praha 11, Czechoslovakia ; for EARLN, Asociacion EAR, Apartado de Telegrafos, Santander, Spain ; for ON4MOK and ON4ROD, *Reseau Belge*, 33 rue Alphonse Renard, Bruxelles, XI, Belgium.

Interesting items relating to the latest developments announced as we go to press. Where desirable further details will be given later.

WEARITE IRON-CORE COILS

APROPOS our recent note concerning the Wearite Nucleon Iron-core Tuning Coils, we are advised by Messrs. Wright and Weaire, Ltd., 740 High Road, Tottenham, London, N.7, that these will be manufactured in four types, namely, A.D., B.P.1, B.P.2, and T.G. These are the senior models, and are priced at 12s. 6d. each. They are also producing two junior models at 8s. 6d.—J.D.A. and J.T.D. The senior model has the excellent Wearite gilt finish, and the junior model is finished in the popular battleship grey. The senior model is a closed circuit coil, and the junior model is open circuit. Mr. J. G. Wright tells me that they have built several experimental sets employing these coils and the performance is exceptionally brilliant. We hope to describe and illustrate them in an early issue.

BULGIN TRANSCOUPLER

WE have received a sample of the Bulgin L.F.10 transcoupler, in which an improvement has lately been effected, in that the turns ratio of the small feed transformer included in the bakelite case has been raised from the original 3-1 to 4-1, thus giving an increase step-up and higher voltage amplification. Quite naturally, inductance varies according to the strength of the signal received, but in the sample submitted we found it varied between 75 henries and 96 henries. The price of the transcoupler is unaffected and remains at 11s. 6d. retail.

NEW OSRAM VALVE—THE MHD4

WE have received for test one of the new Osram MHD4 valves, which will retail at 15s. 6d. It is, of course, a double Diode Triode employing the standard 7-pin base and operates from A.C. mains only. The valve is employed primarily as a detector to offset the disadvantages of the usual methods of detection when triodes are employed. It, of course, also provides a simple means to effect automatic volume control. Further information regarding this valve will be given later.

The valve has the following characteristics :

Triode Nominal Rating.	
Filament Volts	4.0 A.C.
Filament Current	1.0 amp. (approx.)
Anode Volts	200 max.
Amplification Factor	40
Impedance	18,200
Mutual Conductance	2.2
Optimum Load Resistance	30,000 ohms.

BUILDING THE THREE STAR NICORE—(*Continued from page* 487)

The receiver is now ready for wiring, and this should be carried out in the following order. Cut off a length of Glazite about two feet long, and stretch it slightly by gripping one end in a vice (or standing on it) and pulling on the opposite end with a pair of pliers. As soon as you feel a slight give, stop pulling and you will find that the wire will remain very straight and rigid. Measure the length between the first and third valve-holder, and cut off sufficient Glazite to reach from the filament legs of No. 1 to those of No. 3. Join up the three pairs of filament legs first. Next connect up the fixed condensers, and then proceed, with the wiring diagram as your guide, to complete the wiring, leaving the battery leads until last. Notice that the screw which is used to bolt the variable condenser to the baseboard is utilized as the earthing screw for the condenser, by attaching one end of a piece of wire underneath the head of the screw, and connecting this to the filament negative lead.

The Battery Leads

When all the wiring has been completed with the Glazite, the flexible battery leads should be fitted. The ends of the H.T. — and L.T. — leads are attached to one contact on the three-point switch, and H.T.1 is attached to the normal anode leg of the first valve. H.T.2 is joined to one of the L.S. terminals (or the .01 fixed condenser if preferred, and the L.T. positive is attached to the filament connecting wire as shown. The grid bias leads are cut from ordinary twin flex, and if the red and black variety is purchased the leads are more readily identifiable. Cut off the required lengths, and attach red and black plugs, suitably marked to the ends. The positive lead (red) should be attached to one terminal of the set of three on the Duovol control, and this should be long enough to reach to the positive end of the grid bias battery. The G.B. negative terminal of the L.F. transformer is fitted with the remaining bias lead, and this should be black and brought through the hole in the baseboard with sufficient length to reach to the 9-volt socket on the battery.

EASY TERMS

Everything wireless supplied on lowest terms. Prompt delivery guaranteed. Price list free on request.

* * *

With Order

NEW BLUE SPOT 99 PERMANENT-MAGNET MOVING-COIL UNIT. Cash Price £2/19/6 And 11 monthly payments of 5/6. → **5/-**

CLASS "B" KIT, consisting of Multitone driver trans. and output matching choke, Cossor 240 B valve and special valveholder. Free instruction book with every order. Cash Price £1/15/3 or 6/- with order and 6 monthly payments of 5/8.

J2 EXIDE W.H. HIGH-TENSION ACCUMULATORS (120 volts, 5,000 M/a.). The cheapest and best High Tension Supply where Mains are not available. Cash Price £3/15/-. And 11 monthly payments of 7/-. → **7/-**

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

ALL CARRIAGE PAID. QUOTATIONS BY RETURN.

To avoid delay will customers kindly send first payment with order.

THE LONDON RADIO SUPPLY CO., Ltd.,
Dept. PR.,
11, Oat Lane, Noble Street, London, E.C.2.
'Phone : National 1977.

ADVERTISEMENT INDEX

PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD., 146b, Qn. Victoria Street, E.C.4, offer "Advice Handbook" and Consultations free. 47 years' references. Write, call, or 'phone (Central 0682). Director, B. T. King, O.I.M.E., Reg. Patent Agent, G.B., U.S.A., and Canada.

FIRST AND BEST TIT-BITS

This Week:

The WIZARD Behind the B.B.C.

PARENTS Who Seek TRAGEDY

CHILD SLAVES of BRITAIN

A POWERFUL DRAMA of CHINA TOWN by SAX ROHMER

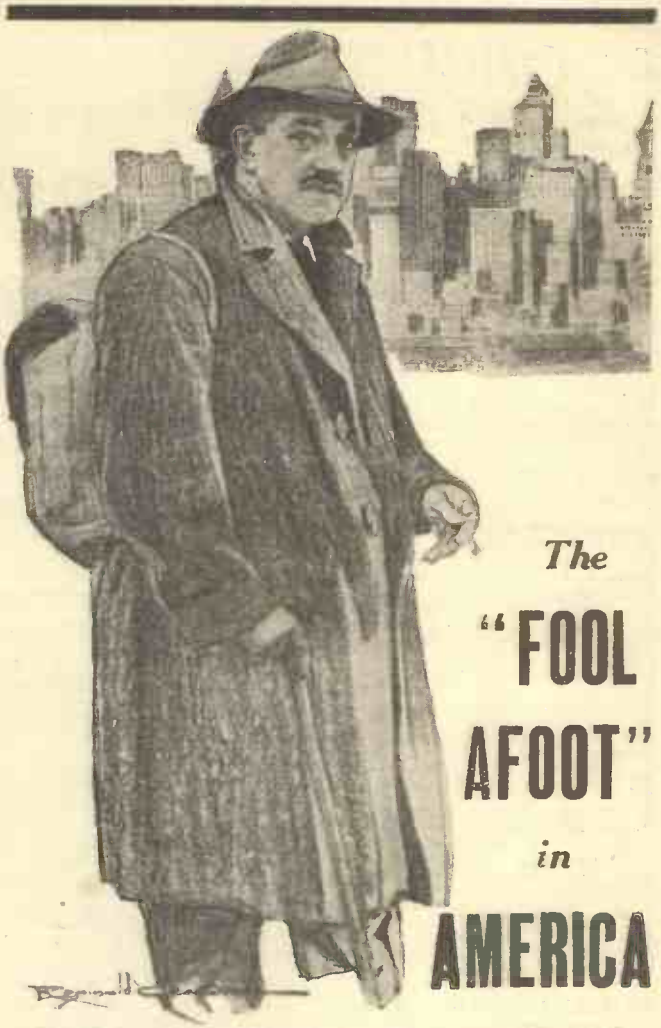
£475 CASH AWARDS FOR WIRELESS LICENCE HOLDERS

TIT-BITS

NOW ON SALE

TWOPENCE

Geo. Newnes, Ltd.



The

"FOOL AFOOT" *in* AMERICA

HAVING wandered over the greater part of Europe, our Travelling Commissioner decided that he would like to have a look at the United States. It would be a welcome change, he thought, to visit a country where he could at least understand the language; and he aspired to discover an America different from that depicted in travel books and films. Arriving in New York he took the train to New Orleans, and then began a haphazard pilgrimage of some sixteen hundred miles, traversing a dozen different States. As usual, Mr. Gibbons met with some curious experiences, which he describes in his own quaint fashion. The first instalment deals with his voyage across the Atlantic and the long Journey South to New Orleans.

Commencing in the July

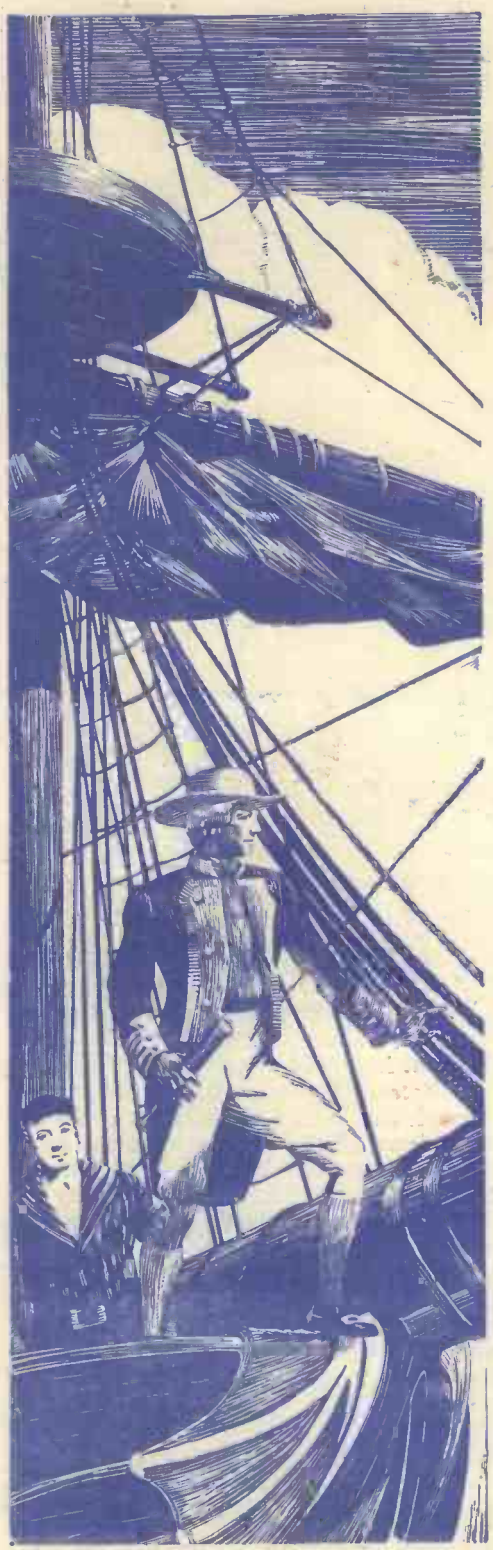
WIDE WORLD MAGAZINE

On sale at all Newsagents and Bookstalls or by post 1/3 from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

1/-

Geo. Newnes, Ltd.

Parallels of History No. 4



CAPTAIN JAMES COOK

hero of many triumphs; author of many adventures; discoverer of New Zealand and many of the Oceanic islands. His name has been famous for over 150 years, and because of his determination and fearlessness, he has earned the respect of the whole world. It is this same spirit of determination to accomplish an ideal that has enabled Dubilier to bring their products to the high standard of efficiency that they enjoy, an efficiency that is the climax of 21 years successful trading.

DUBILIER CONDENSERS

BRITISH MADE DUBILIER

DUBILIER CONDENSER CO. (1925) LTD. DUCON WORKS VICTORIA ROAD NORTH ACTON W.3

T.11

P. W. Gift Stamp No. 39

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.