

THE T. &amp; R.

## BULLETIN

THE INC.  
RADIO SOCIETY  
OF GT. BRITAINAND THE  
BRITISH EMPIRE  
RADIO UNION

Vol. 9 No. 7

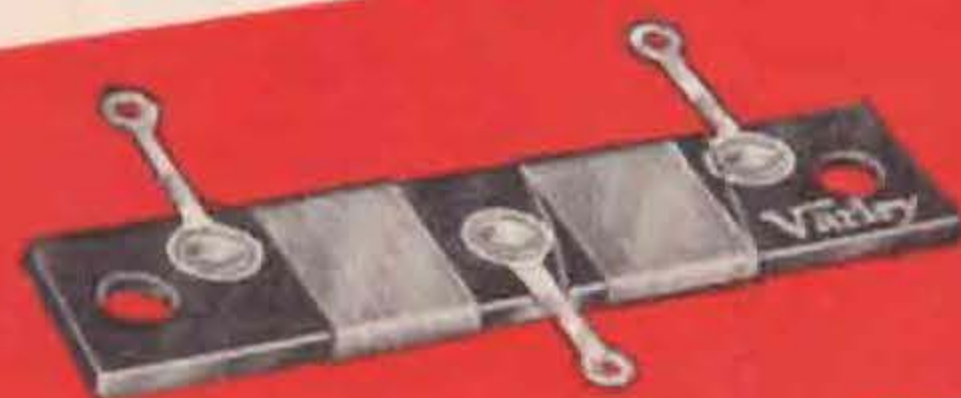
JANUARY, 1934 (Copyright)

Price 1/6



## OUTPUT TRANSFORMERS

There is an extensive range of Varley Transformers and resistances. Illustrated is a Varley Output Transformer. Carefully designed to match the impedance of a speaker to the impedance of the valves in the output stage. Also illustrated is the Varley centre tapped type of resistance which provides an artificial centre tap for untapped L.T. windings of power transformers.



## RESISTANCES

*Write to-day for full particulars  
of the whole range of Varley  
components.*

## OUTPUT TRANSFORMERS.

Low Resistance Impedance Matching  
Ratios 8:1 10:1 12:1 15:1 20:1 25:1  
D.P.14. 18/6.

High Resistance Impedance Matching  
Ratios 0.75:1 1:1 1.5:1 2:1 3:1  
D.P.20. 18/6.

Pentode Impedance Matching  
Ratios 20:1 24:1 28:1 33:1 38:1 45:1 53:1  
D.P.32. 21/-.

## CENTRE TAPPED RESISTANCE.

Suitable for filaments of A.C. valves  
Resistance 40 ohms. C.P.15. 1/6.

# Varley

Proprietors: Oliver Pell Control Ltd.



# HIVAC

THE SCIENTIFIC  
VALVE

BRITISH MADE

Do not fail to add to your 1934 Reference file, *full* technical details of these wonderful low-price high-quality British-made Valves. "Hivac" have been fully approved, used, and recommended or specified by all these authoritative radio publications:

"T & R Bulletin"  
"Wireless World" "Practical Mechanics"  
"Amateur Wireless" "Practical Wireless"  
"Popular Wireless" "Scottish Radio Dealer"

Write NOW for latest folders.

The Hivac range covers an exact replacement for every 2-volt valve now in general use

PRICES FROM

## 4/6 to 15/6

### HIVAC TYPES AND PRICES

H.210. Grid Det. or Oscillation in Super-hets.....	4/6	L.210. 1st stage L.F. Amp. or Anode Bend Det. and Driver.....	4/6
D.210. Special Det. with electrode internally shielded.....	5/6	P.220. Power Valve	5/6
PP.220. Super Power Valve.....	6/6	P.X.230. Super-Super Power Valve...	7/6
S.G.210. H.F. Amplifier. Low current consumption.....	10/6	V.S.210. Vari-mu H.F. Amplifier.....	10/6
Y.220. Multi-grid, low consumption.....	12/6	Z.220. Multi-grid large power output Q.P.P. ....	12/6
B.220. Class "B" Anode-anode load 14,500.....	10/6		

And the NEW HIVAC "DRIVER + B."

The latest development in class B technique.

D.B.230. Gives in ONE valve a combination of the characteristics of types L 210 and B 220. Price 15/6

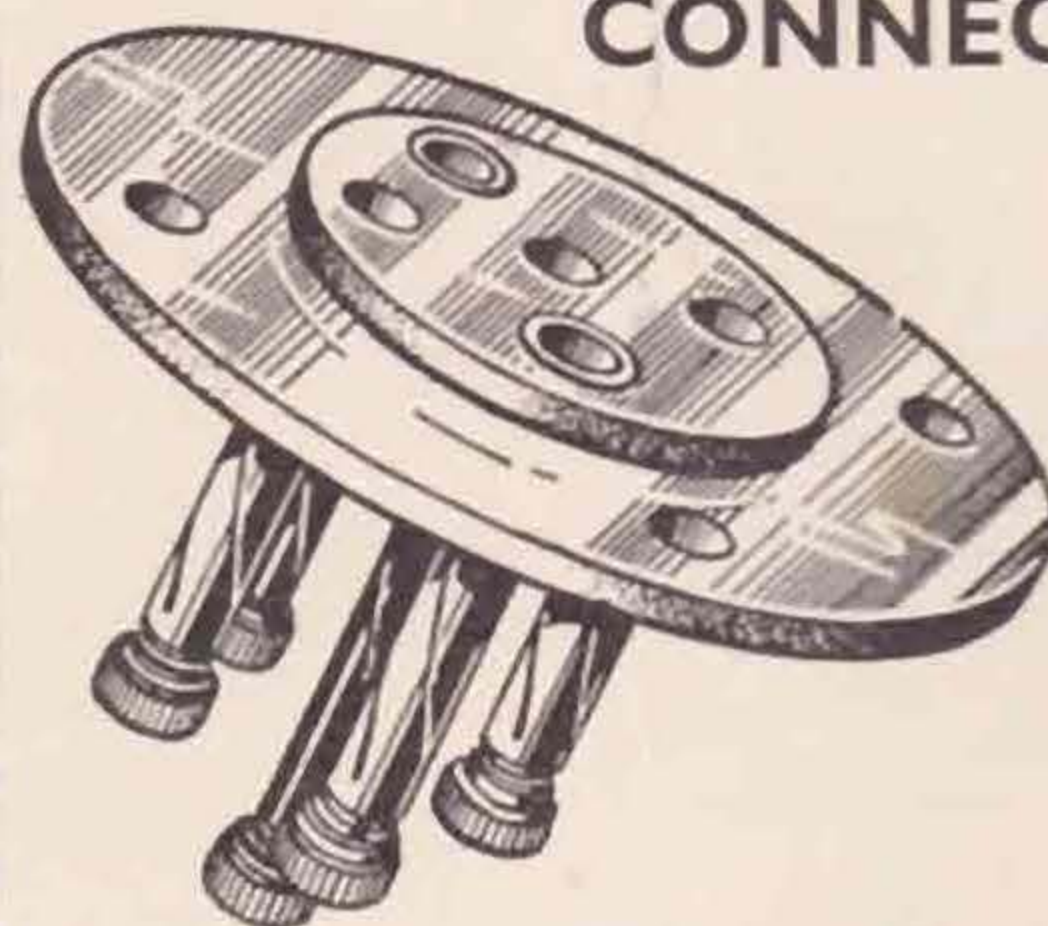
THE HIGH VACUUM VALVE CO. LTD.  
113-117 Farringdon Rd., London, E.C.1

Telephone: Clerkenwell 7587.

## CLIX. The ONLY

Chassis Mounting Valveholders fitted with

### TERMINAL CONNECTIONS!



Every possible requirement is covered by the following types:

STANDARD		"AIRSPRUNG"	
4-pin ... ..	8d.	4-pin ... ..	1/2
5-pin ... ..	9d.	5-pin ... ..	1/3

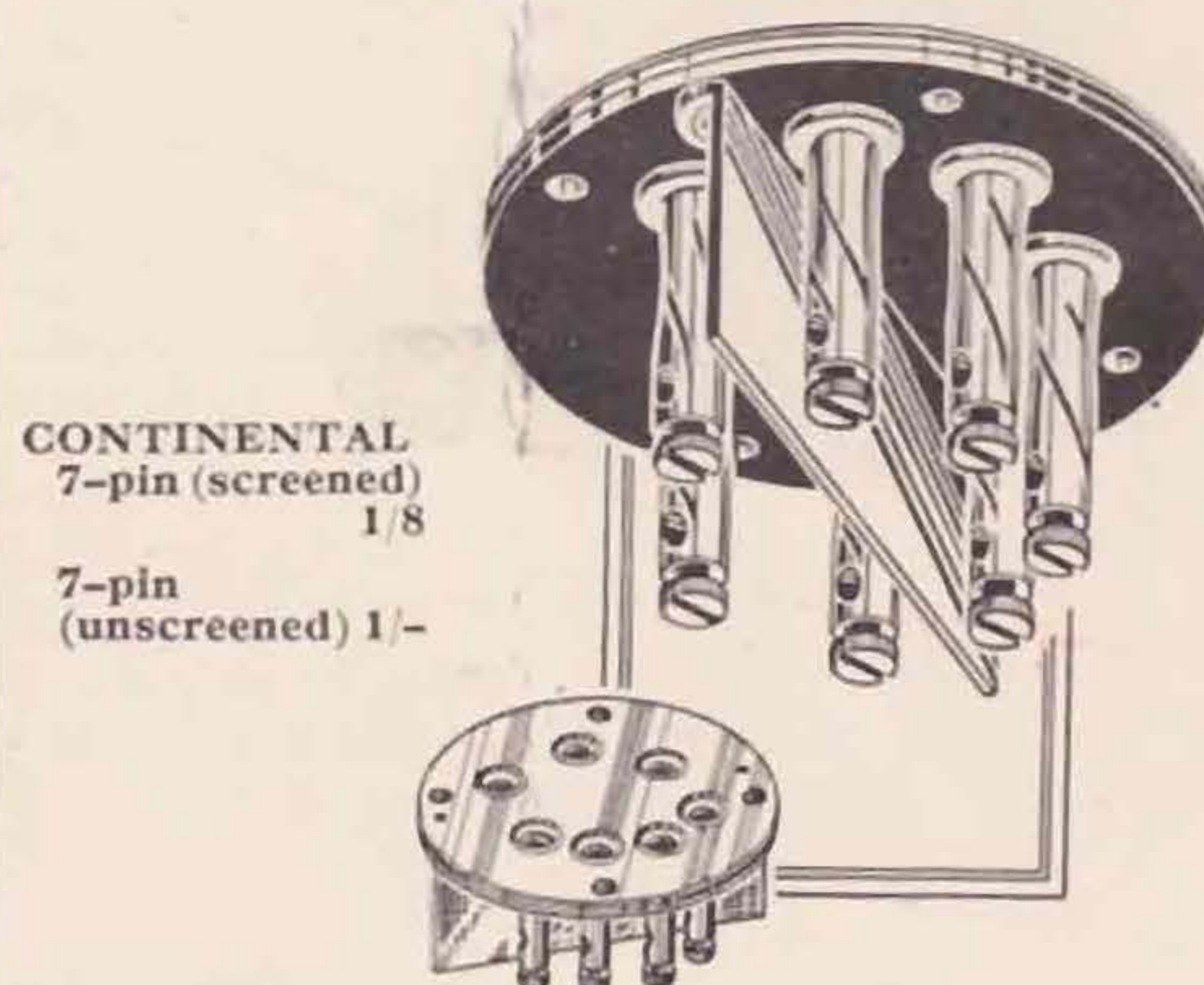
As illustrated above.

FLOATING  
7-pin ... .. 1/-

All the above are supplied WITHOUT terminals for 3d. less than prices shown.

## CLIX CONTINENTAL TYPE

For use with Ostar-Ganz, Tungstam and other Continental type of valves.



CONTINENTAL  
7-pin (screened) 1/8  
7-pin (unscreened) 1/-

AMERICAN Type, 4, 5 and 6-pin also available. Details on application.

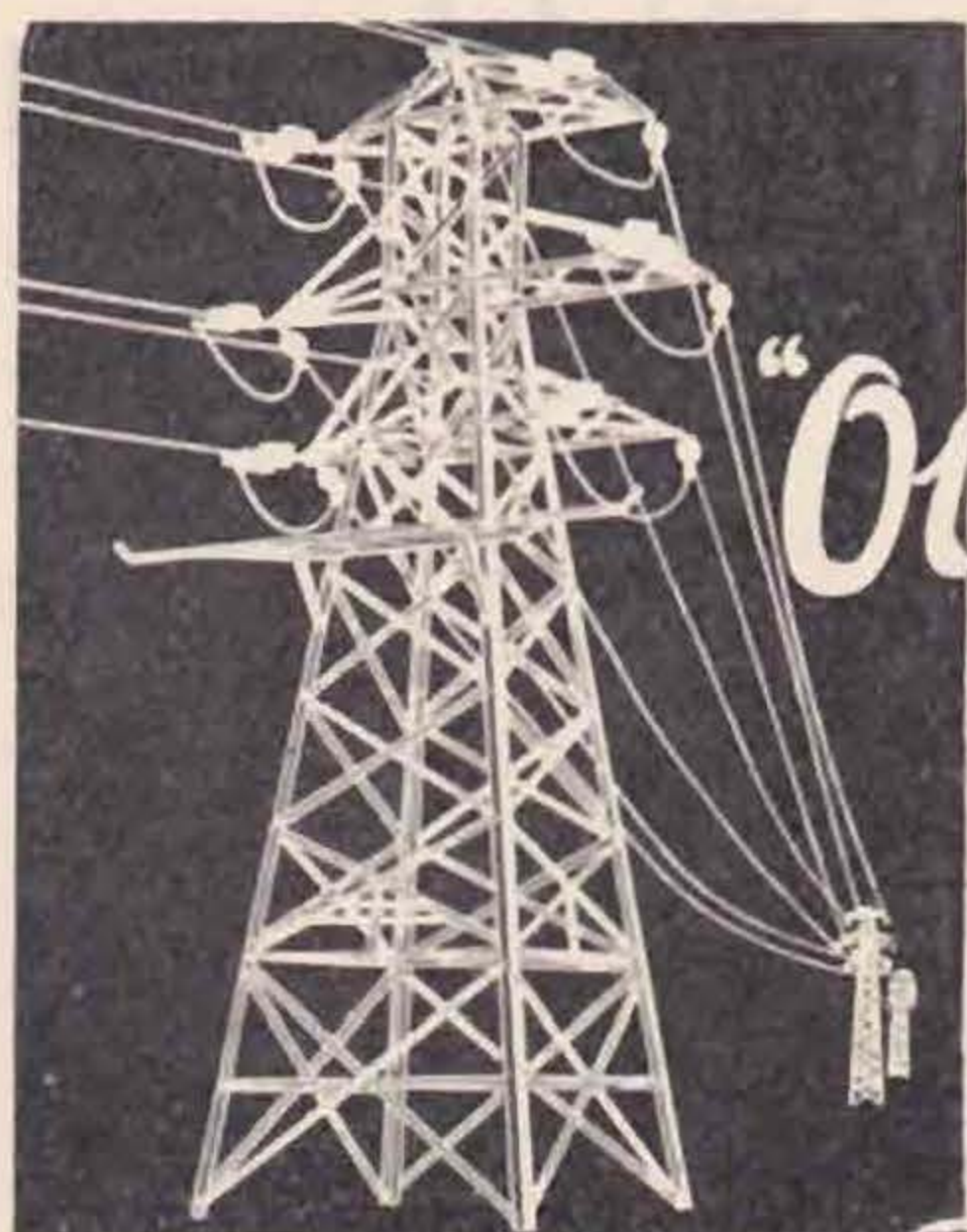
Literature "T.R." on request.

## LECTRO LINX LTD.

79a, ROCHESTER ROW, LONDON, S.W.1

Telephone: Victoria 3541/2.





*"Overheads."*

**"THE ALL METAL WAY, 1934"**

*contains full particulars and prices.*

*A 3d. stamp to Dept. T.R. will bring you a copy.*

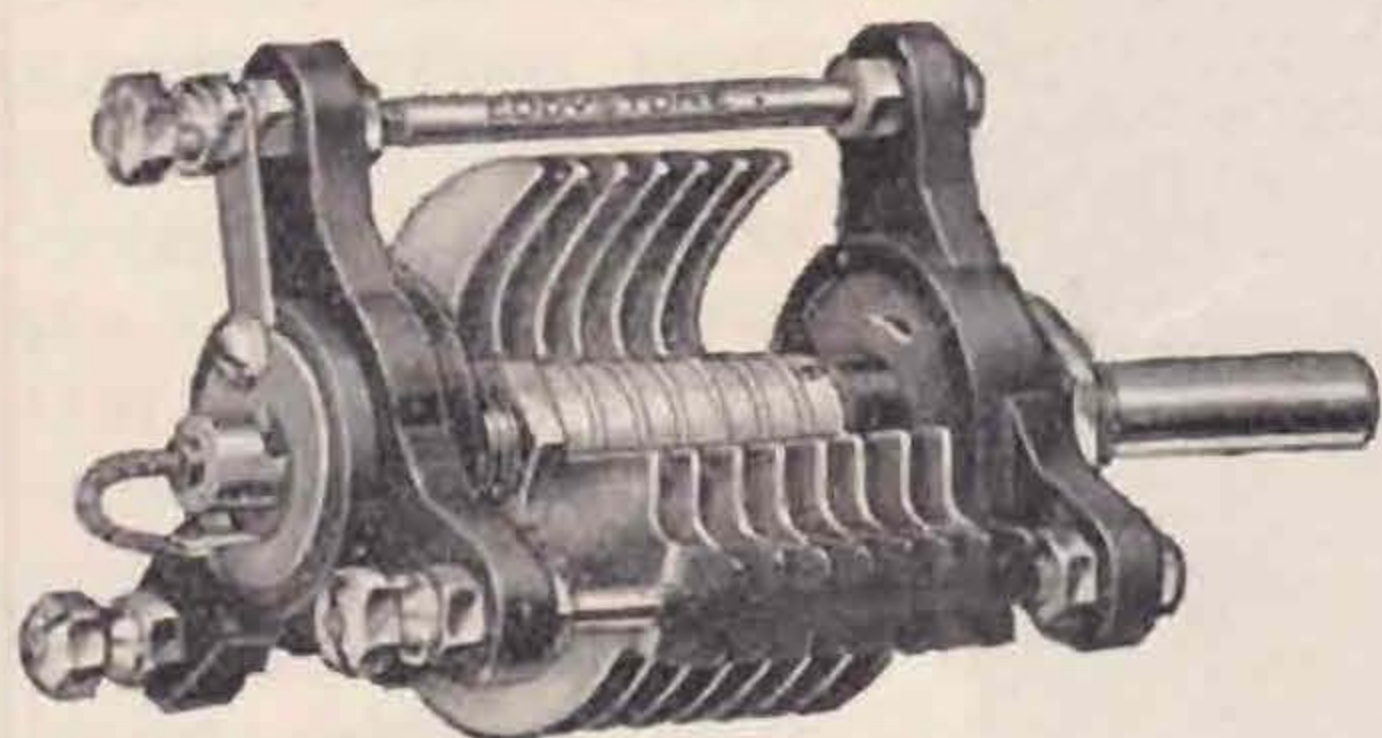
WHEN installing new apparatus, or renewing obsolete components, the financial aspect . . . not only the initial outlay, but also the subsequent upkeep costs . . . naturally receives much attention.

Westinghouse Metal Rectifiers cannot burn or wear out, and you can use them in your battery eliminator with the sure knowledge that, many years hence, they will still be delivering their rated output and that no renewals whatsoever will be required.

## WESTINGHOUSE METAL RECTIFIERS

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO. LTD. 82 YORK RD. KING'S CROSS, LONDON, N.1

## SPECIALISED DESIGN —PAYS!



**EDDYSTONE "SCIENTIFIC" SHORT WAVE CONDENSER**

35 m.mfd. 6/-	100 m.mfd. 7/-
60 m.mfd. 6/6	150 m.mfd. 7/6

**Sole Mfrs:—STRATTON & Co., Ltd.**  
**Bromsgrove Street, Birmingham.**

London Service Depot:  
**WEBB'S RADIO AGENCIES, 14, Soho St., W.1.**

Good results always follow good design. "EDDYSTONE" short wave parts are always basically sound for their purpose. This patented "EDDYSTONE" S.W. Variable Condenser is an outstanding example. Noiseless bakelite bearings, soldered brass vanes, low self-capacity, non-inductive insulated pigtail, low H.F. resistance and special isolex end-plates, are some of its features. You cannot fit a better S.W. Condenser.

**EDDYSTONE STAND OFF INSULATOR**

Made from finest grade vitreous porcelain, glossy brown finish, with hollow centre. N.P. metal parts and wing nut. A quality insulator for those proud of the appearance of their apparatus.

**PRICE 1/-**



# EDDYSTONE SHORT WAVE COMPONENTS



*THE INCORPORATED*  
**RADIO SOCIETY OF GREAT BRITAIN**  
*AND THE*  
**BRITISH EMPIRE RADIO UNION**

53, VICTORIA STREET, LONDON, S.W.1. (PHONE: VICTORIA 4412)

PATRON: H.R.H. THE PRINCE OF WALES, K.G.

**R.S.G.B. CALENDAR.**

*Unless otherwise announced, all meetings are held at the  
 Institution of Electrical Engineers, Savoy Place, W.C.2  
 commencing at 6.15 p.m. Tea is served at 5.30 p.m.*

**January 26.** Presidential Address,  
 followed by a lecture "*Electrolytic  
 Condensers*" by N. C. Moore, Esq.  
 (British N.S.F.)

**February 23.** "*Radio Communica-  
 tions with the 1933 Mount Everest  
 Expedition*," by David S. Richards,  
 Esq.

**March 28.** Subject to be announced  
 later.

**April 20.** Subject to be announced  
 later.

**OFFICERS FOR THE YEAR 1934**

*President:* ARTHUR E. WATTS (G6UN)

*Vice-President and Honorary Treasurer* - - - E. Dawson Ostermeyer (G5AR)  
*Honorary Editor* - - - - - H. Bevan Swift (G2TI)

**COUNCIL**

J. D. Chisholm, (G2CX), E. A. Dedman (G2NH), A. D. Gay (G6NF),  
 J. W. Mathews (G6LL), H. C. Page (G6PA), G. W. Thomas (G5YK),  
 J. C. Watts (BRS246).

*Secretary:* J. CLARRICOATS (G6CL).

All correspondence should be addressed to The Secretary (or other officer concerned), The Radio  
 Society of Great Britain, 53, Victoria Street, London, S.W.1. Insufficiently addressed letters may be  
 considerably delayed.



# THE T. & R. BULLETIN

## CONTENTS.

	Page
Editorial .. .. .	201
The Year in Review .. .. .	202
Grid Modulation .. .. .	205
A Victory for Low power .. .. .	212
Magnetron Oscillators .. .. .	214
First Annual Convention .. .. .	216
"Soliloquies from the Shack" .. .. .	217
An A.C. Short-Wave Super-Heterodyne Receiver .. .. .	218
Trade Notices .. .. .	221
Annual General Meeting .. .. .	222
District and County Representatives	
1934, News and Notes .. .. .	225
Contact Bureau Notes .. .. .	231
Hic et Ubique .. .. .	232
Empire News .. .. .	234
Correspondence .. .. .	236

Honorary Editor.—

H. Bevan Swift (G2TT)

Advertising Manager:—

Horace Freeman, Esq.

Vol. 9

No. 7

## TEST B.E.R.U.

It is appropriate at this time, as we bid welcome to our new President, Mr.

Arthur E. Watts (G6UN), that we should comment upon the forthcoming Empire Contest, for it is almost entirely due to his foresight and untiring efforts that the B.E.R.U. of to-day stands unrivalled as the main link between the amateurs of the British Empire. Four years ago, when the then Honorary Secretary of the New Zealand Amateur Radio Transmitters' Society suggested that one day in each year should be set aside for Empire Contacts, few of us imagined that from his suggestion would spring the inspiration which made B.E.R.U. Contests possible.

Those who were present at the 1930 Convention will remember Neville Shrimpton, ZL4AO, since then the hero of many wonderful Empire QSO's,

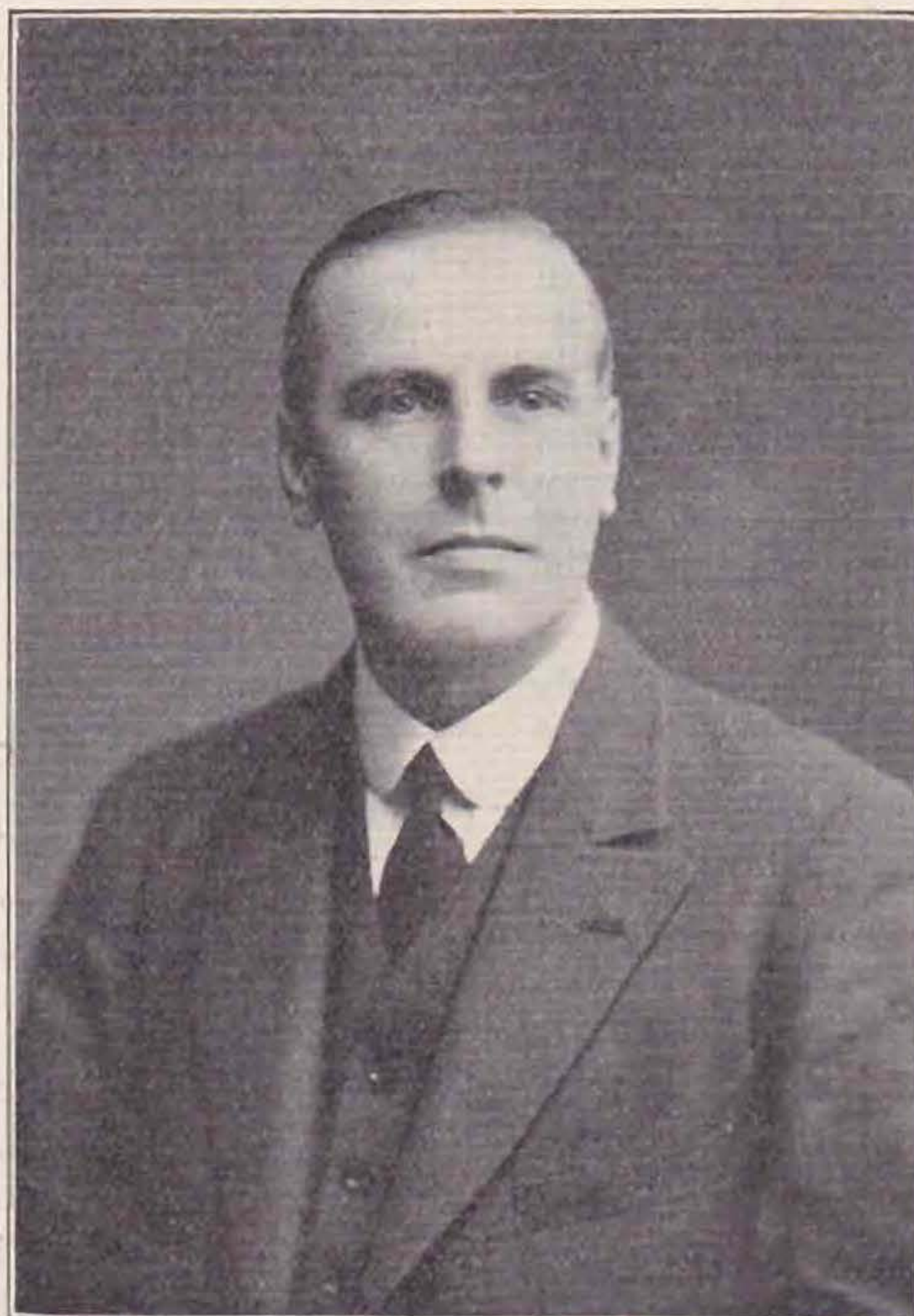
formally proposing that steps be taken to inaugurate a B.E.R.U. Week.

Already the day had been extended to a week. February 1931, saw the first Empire Contest in amateur history, and Trevor Evans (VK2NS), of Bathurst, Australia, the winner. A mere 58 entrants, but an encouraging start, was the view of those responsible for its organisation.

The contest that followed saw the adoption of new scoring methods and more interest being shown overseas. B.E.R.U. was becoming known, for even foreign amateurs were heard calling "Test B.E.R.U.," whilst three separate Beru's were located on the map of the world!

Fred Miles (G5ML), of Kenilworth, brought the trophy back to England in grand style.

Another year passed and still, gaining  
(Continued on page 204.)



ARTHUR E. WATTS—G6UN  
(President, 1934.)



## THE YEAR IN REVIEW

[We publish below the Secretary's Report for the year. As an historical record of progress it should be of interest to those who were unable to attend the Annual General Meeting.—ED.]

IN presenting this report, an attempt has been made to cover as briefly as possible the more important of the many activities undertaken by the Society during the past year.

### *Membership.*

This has shown a steady increase, and it is anticipated that within the next few months the total will have reached the gratifying figure of 2,000. When it is remembered that less than five years ago this figure was only just over 1,000, it is clear that interest in short wave amateur work is rapidly increasing. Every endeavour has been made to prevent members from dropping their subscription, and whilst these efforts have been successful to a marked degree, there is still a tendency for persons to join the Society in a burst of enthusiasm, and then resign after one or two years. In the majority of these cases, the loss of interest is attributed to the fact that few facilities are available for attending local meetings.

### *Prospective Members.*

During the year more than one thousand prospective members were supplied with details of our work. A number of enquiries were initiated, through the courtesy of members who had noted the fact that certain persons reporting on their transmissions were non-members.

### *Publicity Pamphlet.*

Probably the most important achievement of the year centred around the preparation and publication of the Society's new handbook, "A Guide to Amateur Radio." Written by members with a long experience of short wave work, and with a knowledge of the subjects likely to appeal to both present and prospective members, the book has had a sale far in excess of our most optimistic expectations. Furthermore, arrangements have recently been made for its display by well-known booksellers throughout the country. We anticipate using the present edition as a basis for what should eventually become an official R.S.G.B. Handbook, but the fulfilment of this ambition will probably be delayed for a while.

### *Madrid Conference.*

The work of the Madrid Conference was briefly commented upon in our last annual report, and at a later date detailed information was presented to the membership through the medium of the Society's Journal. As anticipated a year ago, the transmitting facilities available to amateurs are to remain unchanged during the next five years, a condition brought about in no small measure through the energetic and active representation of the amateur cause at Madrid by the delegates from the I.A.R.U., who included amongst their number our President-elect, Mr. Arthur Watts.

The necessity for safeguarding our present allocations is of paramount importance, and we take this opportunity of impressing upon all concerned the necessity of making good and proper use of the transmitting facilities given them by the Post Office.

### *Transmitting Licence Matters.*

There has been a satisfactory increase in the number of licences issued during the year, many of which have been granted to Society members who have progressed from B.R.S. or A.A. grades. Help in connection with licence matters has been rendered by headquarters and by responsible district officials.

Excellent contact has again been maintained with the Post Office authorities responsible for the issuance of licences. Numerous high power applications have been dealt with by Council, and in most cases their recommendations have been accepted. It was found desirable in the early part of the year to draw up rules governing Council's method of dealing with requests for additional facilities, and in general these rules have proved entirely satisfactory. Approximately 100 members have been recommended for the use of the 3.5 mc. band, whilst during the Junior B.E.R.U. Contest, special permission was obtained for members to use inputs up to 25 watts in cases where their permit allowed a maximum of only 10 watts.

### *Band Occupancy Checks.*

The importance of the band occupancy checks carried out by a group of members, under the direction of Mr. L. Hill, of Bristol, cannot be too strongly emphasised. The results obtained during the first three checks were fully dealt with in the May issue of the Society's Journal, and this report gives us an opportunity of mentioning for the first time the salient information obtained during the fourth series of checks made in September last. During the four Sundays in that month no less than 706 individual British stations were heard in operation, on one or more bands, which is an increase of nearly 200 over the March total, and indicates that nearly 70 per cent. of the licensed British amateurs were active during the short period of the check. Greater occupancy was reported on all channels from 1.7 to 56 mc., with the largest increase on 7 mc. On this latter band, 446 individual stations were heard active, whilst over 200 were reported in operation on both 1.7 and 3.5 mc.

The value of this information to Council may not on the surface be apparent, but those who have a knowledge of the international aspect of amateur work will readily realise that it is essential to prove conclusively that each one of the six bands allotted to our use is consistently occupied.

### *Commercial Interference.*

On numerous occasions during the year complaints have been received regarding the intrusion of commercial stations into the amateur bands. Protests have been directed to the Post Office authorities, and it is anticipated that an improvement will occur when the Madrid Convention becomes operative in January, 1934.

### *B.E.R.U. Contest.*

The successful third annual B.E.R.U. Contest was reported upon in detail in the June issue of the Society's Journal. It is safe to assume that these



contests are now looked upon as one of the most important events of the year, both at home and in the Empire, and with the passage of time their popularity will still further increase. For the first time a separate contest was organised for stations using low power.

#### *B.E.R.U. Membership.*

The individual B.E.R.U. membership has shown a steady increase each month, and although service duties and trade depression has resulted in the loss of many old members, their places have been more than filled by newcomers. Representatives and sub representatives have been appointed in all parts of the Empire, and regular contact with them has been maintained through the medium of periodical B.E.R.U. bulletins.

It is hoped during the coming year to issue the B.E.R.U. Constitution in final form, the draft of which has been submitted to all honorary affiliated societies.

#### *Empire Link Stations.*

Excellent work has been effected by certain of the appointed Empire Link stations, the results of which have been reported upon regularly in the Society's Journal. For the fourth year in succession these stations were successful in handling the messages of loyal greeting to the Prince of Wales on the occasion of his birthday. The latest achievement and one deserving of much praise was that of Messrs. Samson and Hunter, who transmitted and received a complete technical article *via* amateur radio. This appeared in the October issue of the Society's Journal.

The link which has been maintained between G2ZQ and ZL4AO has enabled us to keep in very close contact with our sister societies in New Zealand and Australia.

It will have been noticed that the majority of overseas reports appearing in the T. & R. BULLETIN are now received *via* the Empire Link stations, thus enabling us to publish more up-to-date information.

#### *Transmitting Contests.*

The usual series of local contests were arranged, all of which received a fair measure of support. A notable feature was the success of Scottish stations, who finished first in each of the three contests.

The November 3.5 mc. Contest, which commenced the 1933-4 series of tests produced even more keenness than those organised earlier in the year.

#### *Reception Tests and Contests.*

Throughout the year, with the exception of a few months in the summer, Mr. T. A. St. Johnston has organised regular reception tests for the benefit primarily of our B.R.S. members. These tests have proved of great value, and have been instrumental in giving the incentive to many members to apply for radiating aerial facilities. Contests have also been devised for B.R.S. and A.A. members, and whilst the support in general has been lower than anticipated, the number of entrants for these events shows an increase over previous years. The interests of non-transmitting members have been adequately catered for in the Society's Journal throughout the year.

#### *National Field Day.*

The first National Field Day, held during June, was an outstanding success, and it is anticipated that this will now become an annual event. Criticism was directed against the rules of this contest,

but these are due for revision before the next event takes place.

#### *Ultra High Frequency Work.*

The past summer produced considerable enthusiasm for work on the 56 mc. band, and it is gratifying to know that many valuable achievements stand to the credit of Society members. Little progress has been made in overcoming the technical difficulties attendant upon work on these frequencies, but we anticipate that new methods will be devised in the near future for generating stable oscillations in such a manner that they can be received in a manner more in keeping with the practices adopted on the lower frequencies.

#### *Convention and Exhibition.*

The Eighth Convention held during August was attended by well over 200 members. The arrangements for this gathering were slightly modified, and were regarded as an improvement over those of previous years. The Society's stand at Olympia was well patronised, and many new members were obtained as a result of the publicity given.

#### *District Matters.*

Over 600 members attended District Conventions held in twelve centres, a figure which speaks well for the enthusiasm shown by our provincial members. Headquarters were represented at all meetings, except one at Cardiff.

Thanks are extended to our District Representatives for the valuable services they have rendered to the Council. Unfortunately several of these members have for various reasons been compelled to relinquish their positions during the past few months, but we are confident that their successors will continue the good work started by those they have replaced.

#### *County Representatives.*

The work carried out by our County Representatives has been much appreciated, although a few of those elected or nominated for office last January were unable to render the full assistance demanded of their office. In many counties sub-representatives rendered useful help by arranging local meetings and visits.

In certain parts of the country regrouping of counties and districts has enabled better contact to be maintained between members.

#### *Local Societies.*

A number of local amateur radio societies and clubs have recently come into existence, the majority of which are officered by members of the parent body. Local clubs of this type are of great value, and we are convinced that the more they are sponsored, the more certain the Society is of maintaining the interest of its members.

#### *Interference Committee.*

One of the most important duties undertaken by the retiring Council was the appointment of a sub-committee to investigate all forms of broadcast interference attributable to amateur transmitters, with particular reference to interference caused by those working on the 1.7 and 3.5 mc. bands with telephony systems. The work of this Committee continues, and technical advice prepared under their jurisdiction will be published in the Society's Journal from time to time.

#### *R.S.G.B. and W.L. Joint Committee.*

Early in the year a decision was reached by Council to wind up the Joint Committee Traders'



Scheme operated by the R.S.G.B. and the Wireless League, it being the opinion of Council that the scheme was redundant, and not in accordance with the present policy of the Society.

#### *Awards Committee.*

Important work has been carried out by the Awards Committee, under the chairmanship of Mr. T. A. St. Johnston. This Committee had the task of preparing rules for contests, and approving awards, duties which demand a great deal of careful thought and consideration.

#### *R.N.W.A.R.*

In February last the Acting Vice-President and the Secretary were appointed to serve on the newly formed R.N.W.A.R. Committee; this Reserve has been well supported by many members, and it is worthy of record that all District Commanders appointed to date are, with two exceptions, R.S.G.B. members. A review of the first year's work of the Reserve appeared in the November issue of the Society's Journal.

#### *T. & R. Bulletin.*

The Society's Journal continues to reflect the work of its members into all parts of the world. The editorial staff have spared no pains in endeavouring to meet the wishes of members who have expressed a desire for information on a specific subject. Sound and reliable technical advice has been published, together with items of general interest.

The resignation of Mr. G. W. Thomas from his position as Honorary Editor was received with regret in June last, and since that date the duty has been undertaken by the President, Mr. H. Bevan Swift.

Advertising has again been in the hands of *Parrs Advertising, Ltd.*, and whilst the revenue from this source shows a slight decrease over previous years, we are satisfied that, bearing in mind the condition of the radio trade, our Journal has received its fair share of support. In an honorary capacity, Mr. A. W. Alliston has again rendered considerable help in connection with advertising.

#### *Q.S.L. Section.*

The Society's Q.S.L. Section has handled upwards of 300,000 cards in a thoroughly efficient manner under the direction of Mr. J. D. Chisholm. Negotiations in connection with the handling of non-transmitters' cards by the A.R.R.L. have been successfully undertaken, whilst close and personal contact has been established between our own Bureau and those of other countries.

#### *Contact Bureau.*

The Society has again been fortunate in having the assistance of Mr. H. C. Page in organising its Contact Bureau section. With a membership of over 200, and groups engaged on all phases of amateur activity, there should be little excuse for the keen experimenter ploughing a lonely furrow.

In the past certain members have been inclined to withhold their support from Contact Bureau, but we hope the re-organisation which we anticipate will take place shortly will produce more interest generally in this most important sphere of society life.

Our thanks are due to Mr. Page and to his Group Managers for the excellent manner in which the work of the section has been conducted.

#### *Calibration Section.*

This section has been under the control of Mr. A. D. Gay, who has been responsible for developing many improved methods in connection with frequency measurement. Numerous calibration checks on members' transmissions, frequency meters, and quartz crystals, have been undertaken, and information regarding the work of the section has appeared monthly in the Society's Journal. During the latter part of the year arrangements were made for standard frequencies to be transmitted on the 3.5 mc. band.

#### *General.*

During the coming year we hope to celebrate in some appropriate manner the coming of age of the Society, which should do much to bring our aims and objects before the notice of the general public.

Before concluding this report, I wish to express my deep appreciation to you, Mr. President, for your confidence and the confidence of your colleagues on Council, in appointing me full-time Secretary last December. The effectiveness or otherwise of my work I leave others to judge, but I have implicit faith in the belief that the future of our Society will be progressive and prosperous.

I desire to thank Mr. Bevan Swift, Mr. Arthur Watts, and Mr. E. D. Ostermeyer for their invaluable help at all times, and I would finally ask that my two assistants, Miss Gadsden and Miss Spence, be remembered for the work they have done in helping forward the amateur cause in this country.

#### *Editorial—(continued from page 201).*

knowledge from experience, new rules and methods of scoring were evolved. GAV. Sampson (ZL4AI), co-partner of Shrimpton, saw to it that New Zealand landed the Senior award that year. It had become a Senior award by then because, thanks to the generosity of Capt. G. C. Willmot (ZD2A) we were able to present a Junior Trophy to the leading station in the Low Power Contest which followed the Senior event. In this same year one of our West Country members donated a Trophy for the non-transmitting entrants, and a Birmingham amateur in Eric Adcock, now G2DV, became first holder.

Thus we come to 1934, the fourth B.E.R.U. Contest. Keeness has increased each year, competition has been more intense, while more and more non-members of this Empire fellowship of amateurs have begun to realise the importance of co-operation. As our President wrote recently: "We hope in the future to view all amateur matters through the aspect of Empire rather than individual needs."

This Contest more than any other event in the course of our radio year helps us to get closer to our colleagues overseas. The object of the Contest is to make Empire Friendships; therefore all who can, be he the possessor of the finest transmitter or the humblest receiver, do something during the four week-ends of February to further that object.

Let Empire Friendships continue.

Corporal S. Conway, VS6AQ, R.A.F. Base, Kai-Tak, Hong Kong, is on the air for G QSO's from 18.00 to 22.00 G.M.T. on Friday and Saturday evenings. His input is 100 watts and QRG 7,151 kc.

*Consult the new Guide.*



# GRID MODULATION.

By G. G. LIVESEY (ex. VP3SRB) AND A. E. LIVESEY, D.F.H. (G6LI).

IN presenting the results of certain tests and investigations into the unfamiliar theory and practice of grid bias modulation, extending over the past year, we would address a few words of caution to any reader who, after glancing swiftly and easily through our notes, finds himself able to direct at our heads either a noble collection of destructive mathematical criticism or some practical notes of an infinitely superior value. We would, in the first event, ask him to withhold his fury until such time as he has tested our work to his own dissatisfaction and, in the second event, request him to spare himself the public shame of having so long withheld his knowledge. Rather, ought he for ever to hold his peace.

We have observed the analytical mode of attack in the excellent articles which have appeared in the BULLETIN upon the matter of anode modulation, and we understand the necessity of arriving at the solution of a problem by the method of reduction to first principles before one can accept a phenomena as recognised and fit for precise repetition under different conditions. Some of the methods of grid modulation will not tolerate mathematical destruction, as we shall presently notice. Anode modulation, however, is a well-established, clearly understood fact long since placed by the physicist upon a thoroughly firm mathematical basis. Grid control is generally little more than a pale figure of speech in too many minds, associated with no simple laws, no characteristic graphs although, nevertheless, a practical if mediocre means of telephonic communication of a purely third-rate nature. Such an opinion is fortunately far from the truth.

Surprisingly few realize that grid control can produce speech of the same order of depth and quality (as well as sinusoidal fidelity) as anode control. Almost every experimenter, attracted by the alleged cheapness, is disappointed to find that he obtains singularly poor results. Further, the great lack of informative literature aggravates the situation.

We hope, at least, that our notes will clear the foggy notions surrounding the heads of the puzzled and help them to realize results as excellent as those which we have achieved.

We have examined standard works upon radio communication and the theory of valves, but we prefer, in offering "the goods," to present our verbal interpretation rather than groups of figures—useless to the "ordinary ham."

In addition we have been most obliged to the Technical department of the Mullard Wireless Service Co. for their assistance towards compiling this material and their permission, for publication in this journal, of their diagrams and data supplied.

## The Simple Example.

In our low-powered experiments, we have, in common with most others, attempted something after the style of Fig. (1), and we notice that this example is usually thrown generously forward as being adequate explanation of the behaviour of grid control! The simple oscillator has its average grid bias potential varied by the action of the e.m.f. set

up by the microphone in the secondary winding of its associated transformer. The instantaneous voltage "e" impressed upon the grid is:—

$e = E \sin \omega \cdot t + E_m \sin \omega_m \cdot t$  . . . . . (1), where  $E$  is the maximum value of the H.F. voltage.  $E_m$  is the maximum value of the modulating voltage.  $\omega$  is the angular velocity of the radio frequency voltage ( $2\pi f$ ), in cycles/second.

$\omega_m$  is the same for the modulating voltage.

Neglecting the grid circuit and considering the

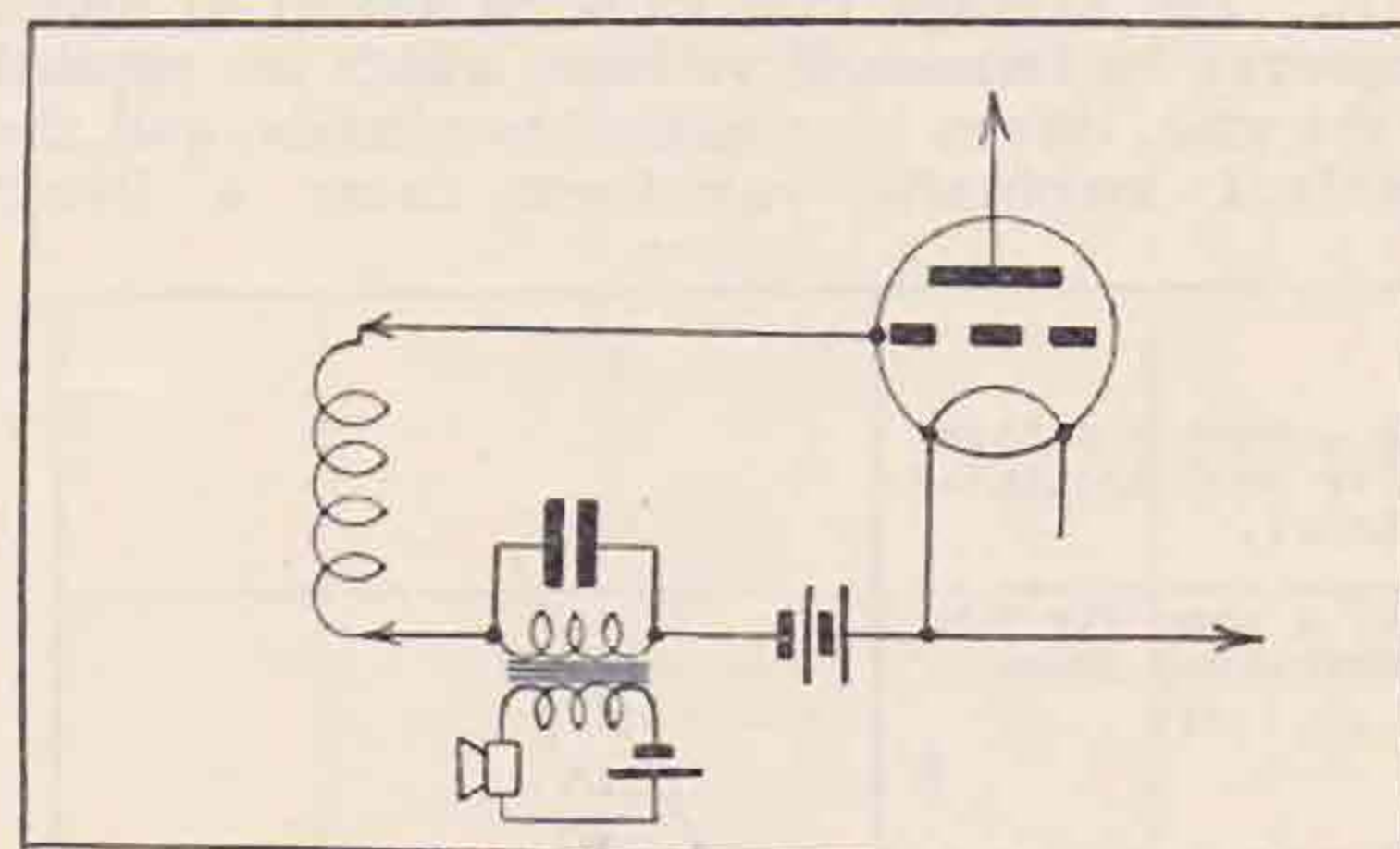


Fig. 1.  
A simple grid control circuit.

equivalent circuit in Fig. (2), in which a voltage of  $\mu E_g$  is impressed upon the anode circuit, it can be shown that the expression for the e.m.f. becomes:—

$$\text{E.M.F.} = M \left( \frac{R_a}{R_a + Z} \times \mu E_g \right) \dots \dots \dots (2)$$

where  $M$  = the modulation factor,

$R_a$  = the A.C. anode resistance of the valve,

$Z$  = the impedance of the anode load.

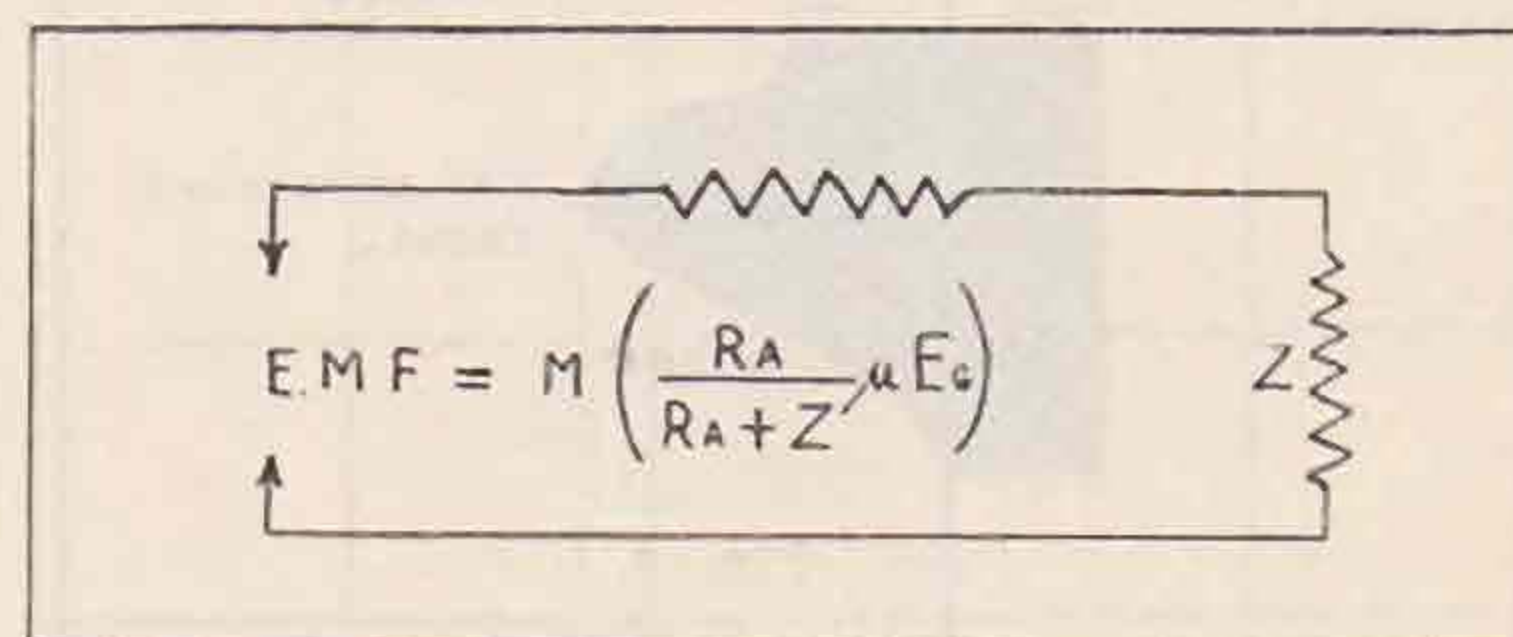


Fig. 2.  
Equivalent grid circuit.

By applying this equation to equation (1), it can be shown that, if the value of  $Z$  is low for audio frequencies, the anode current contains frequencies of  $\frac{\omega}{2}$ ,  $\frac{\omega - \omega_m}{2}$  &  $\frac{\omega + \omega_m}{2}$ .

so that it can be termed a modulated current, and the greatest value of the modulation obtains when  $Z = R_a/3$ .

Although this gives some proof for the elements of grid control and can be applied with quite good effect, it results not only in an amplitude modulation of the aerial circuit but also a frequency modulation on account of the changing anode impedance as the mean grid bias is varied.



### The Application of Grid Control to Modern Crystal Controlled Transmitters.

In these days of frequency stabilization, sharply-tuned circuits and crowded bands we cannot tolerate frequency modulation, and whatever form of control is employed must be applicable to a driven circuit.

To produce anode modulation, the power applied to the modulated valve is caused to vary over a wide range whilst the grid bias is essentially constant.

There are two ways in which grid modulation is brought about, in both of which the working is precisely the reverse.

(1). The average bias value is varied at audio frequency by impressed voltages which are applied at the grid, driven at constant amplitude, and the resultant amplitude variations cause a linear

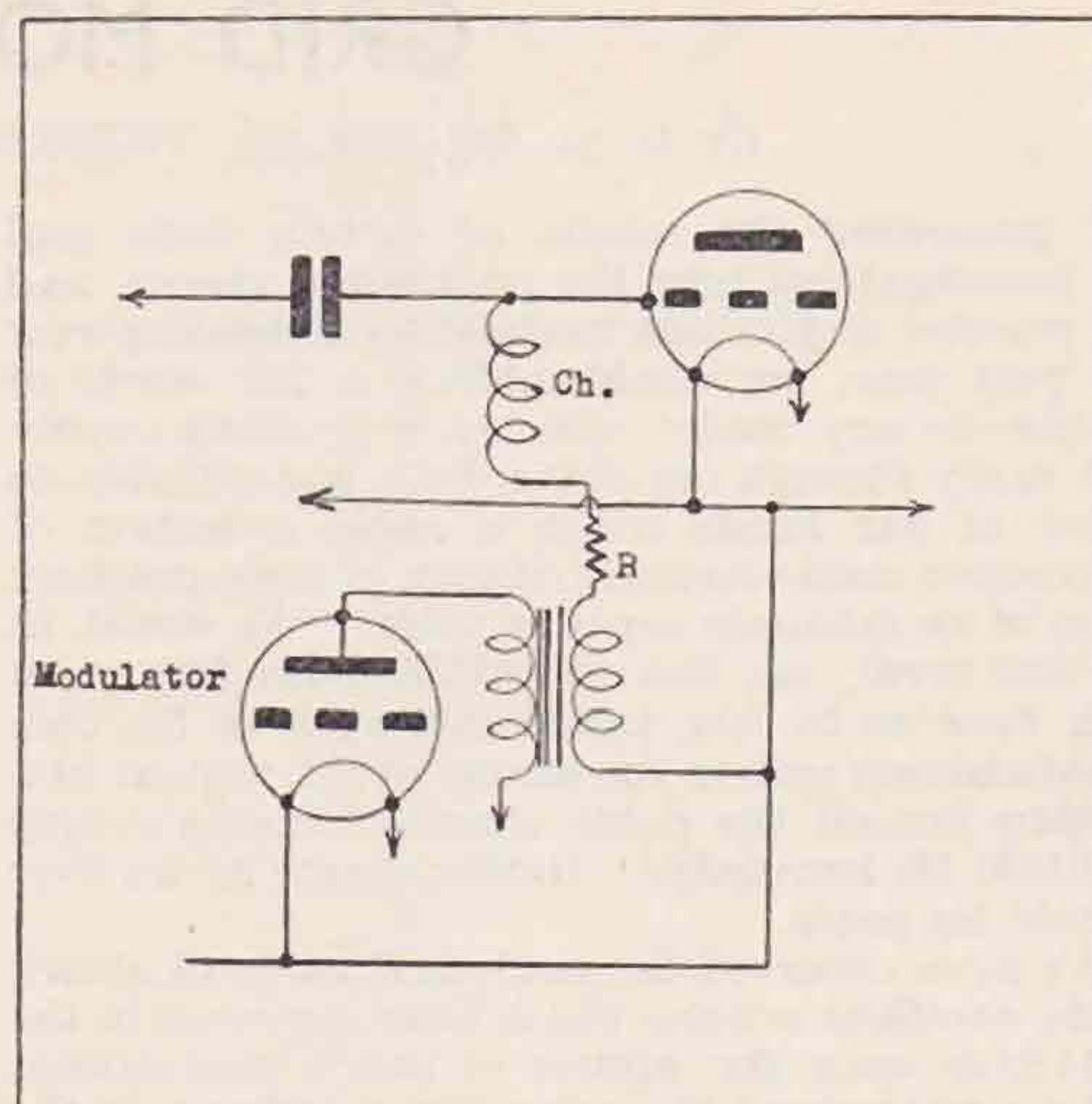


Fig. 4.  
Modulator Valve working into an incorrect load.

It does NOT necessarily depend upon the depth of control effected at the modulated stage in the initial instance. The meaning of this last remark is made clear in Fig. (3). The control is again only an efficiency regulator.

We are actually concerned, however, with the initial stage of modulation at the grid of some stage be it low or high powered and the outstanding advantages of the particular system are the following:—

- (1). Practically unlimited audio frequency range.
- (2). Ease of operation.
- (3). Cheapness of outlay, running and power consumption.
- (4). Quality, under the correct operating conditions, is quite equal to that of anode control.
- (5). Quick change from C.W. to Telephony.
- (6). Simplicity of application to existing or new transmitter.
- (7). Exceptionally efficient with Push-Pull stages.
- (8). Apparatus of an additional nature can be by the side of the operator.

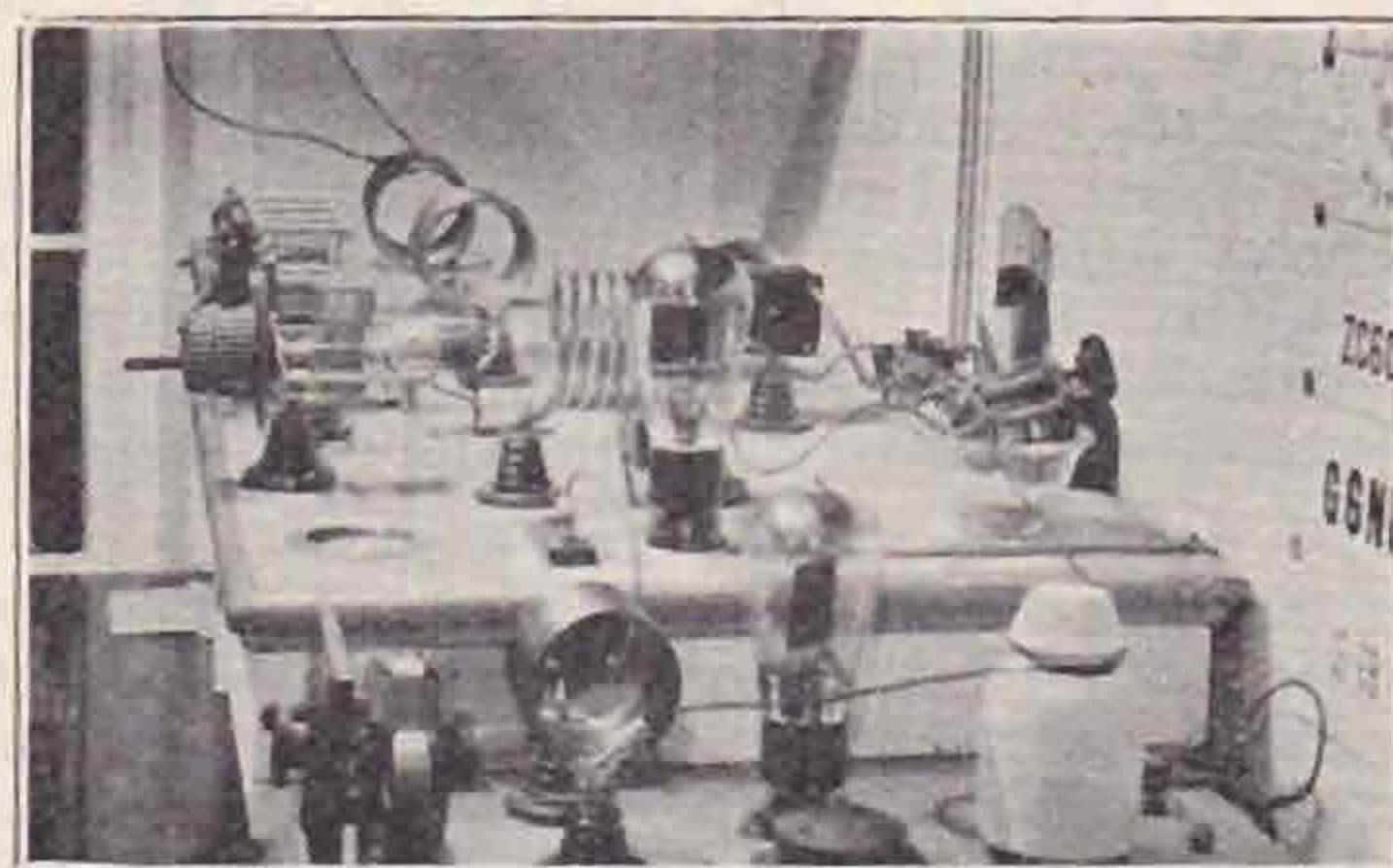


Fig. 5.  
A general view of the transmitting gear in use at G6LI.

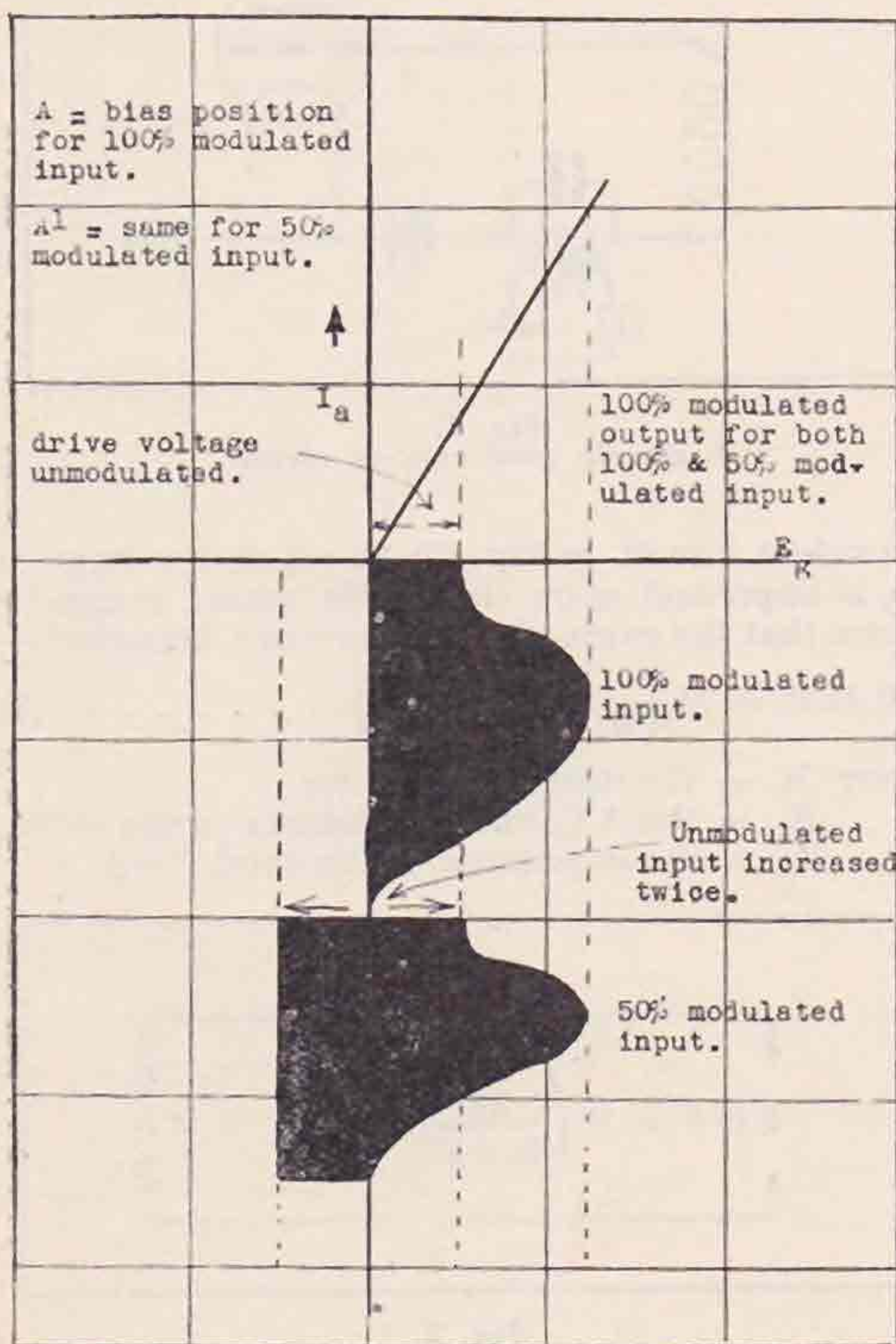


Fig. 3.  
Shows how 100 per cent. modulated output is irrespective of input control.

pulsating tank circuit current which is a real modulated current. No saving of power is accomplished and the scheme is merely an efficiency control.

(2). The bias is a fixed quantity and the input drive, already modulated in an early stage, is applied to the grid. This is called the "low powered" system of modulation and the depth of control appearing at the output circuit depends upon the following factors:—

- (a). Output valve bias setting.
- (b). Input drive voltage amplitude.

*Are you contemplating applying for an A.A. call?*



Certain disadvantages also appear:—

(1). A low carrier output under modulation and a lower one still in the "idle" state unless a very careful choice of characteristics is selected as suitable for the modulated valve (under proper operating conditions of bias).

(2). Distortion of the input sine wave if grid current is permitted to flow (incorrect operating conditions).

(3). Some difficulty in obtaining high values of control depth with incorrect methods of grid control.

(4). Following the usual Laws of Nature, the wrong way is generally the sweetest! That is to say that incorrect or unorthodox methods of control appear to give best D.X. results and greater power output in spite of theoretical distortion.

*The Authors' Preliminary Test Circuit.*

Fig. (4) which is simply an enlarged Fig. (1), will help to show what may happen to the uninitiated

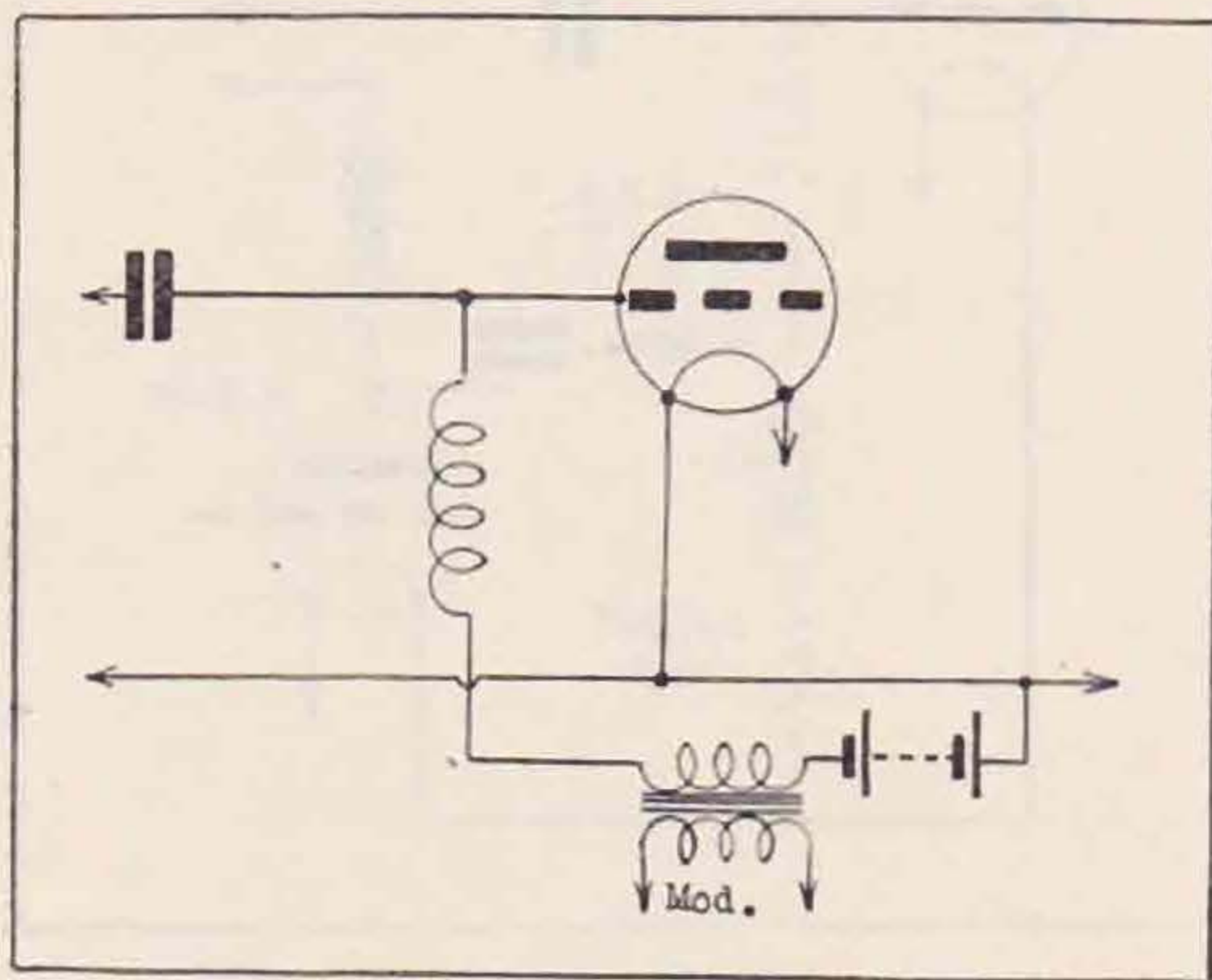


Fig. 6.

Circuit showing grid leak replaced by battery.

amateur who attempts the use of grid bias control without properly understanding the effects. For a transmitter above about 20 watts input, it is necessary to have a *modulating* valve working into the amplifier grid, since a fairly large amplitude modulation at the grid bias will be needed. Normally, the driven amplifier is swung between the bottom bend limit and the saturation curvature limit and the best bias position or grid leak value is determined experimentally by most amateurs with a view to keeping the dissipation within the safe limit and the aerial current as high as possible.

Our original tests, working upon these lines, although producing speech of poor quality and a downward modulation, are probably very much in common with those of most other amateurs who attempt such incorrect working.

*The Fault.*

An examination of Fig. (4) reveals that the modulator valve is working into an impossible load consisting of the 50,000 ohms grid leak in SERIES with the input grid circuit impedance.

Such a load is a variable one, but its average value might not be utterly outrageous if the grid leak was not of high value. This, however, would cause the modulated valve to run towards increased positive bias, which produces even greater input resistance variation. To prevent this happening,

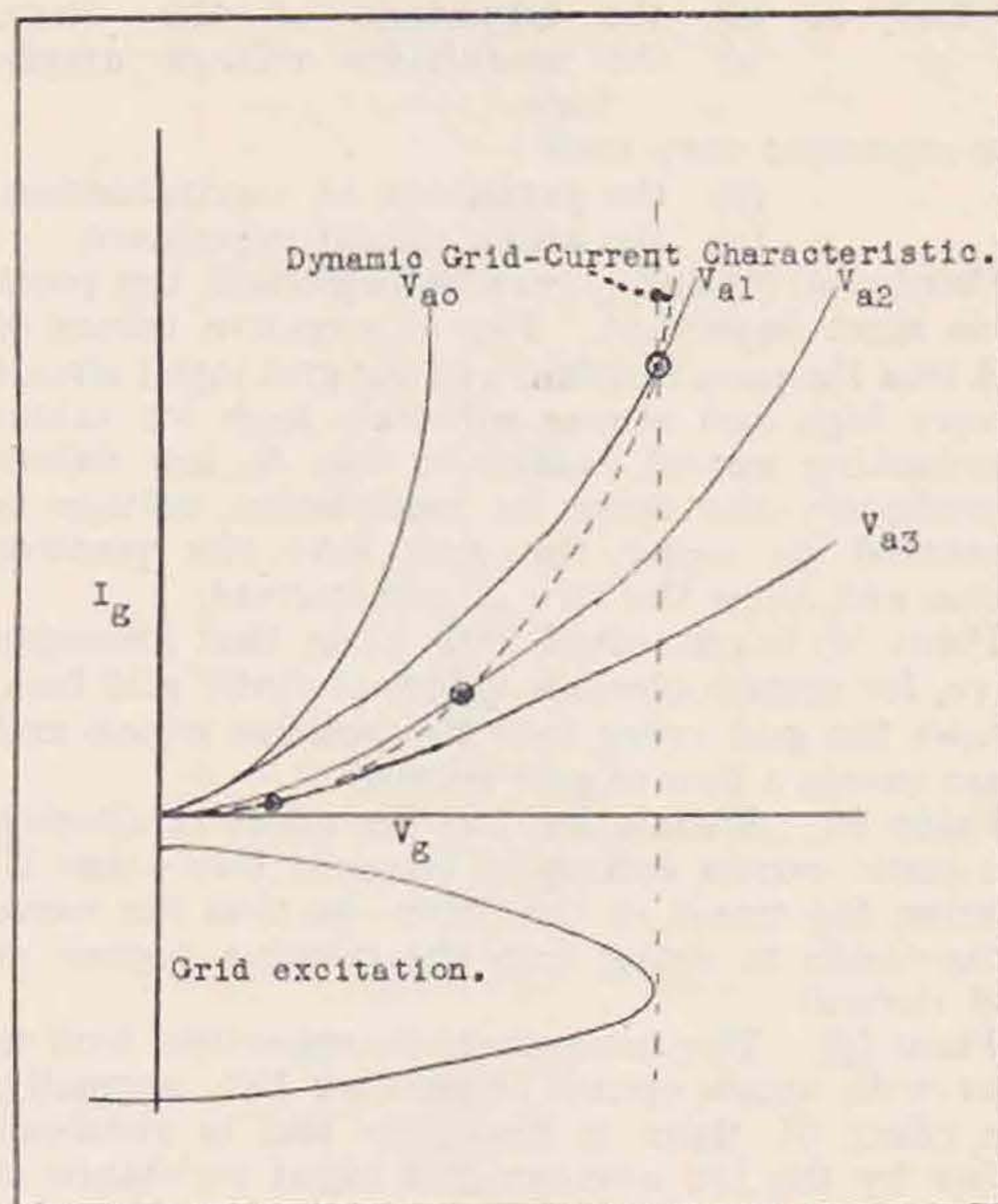


Fig. 7.

Showing non-linearity of input circuit loading due to anode voltage variation over cycle.

the grid leak value might be increased so as to bias back the modulated valve towards the negative region, but the modulation power developed in the load would then fall.

*Input Grid Circuit Loading Effects.*

The input load is a mixed impedance composed of the two capacities grid to filament and grid to anode and also the variable pure resistance of the input. This latter varies:—

- directly as
- (a) Filament current,
  - (b) Anode potential,
  - (c) Grid Bias,

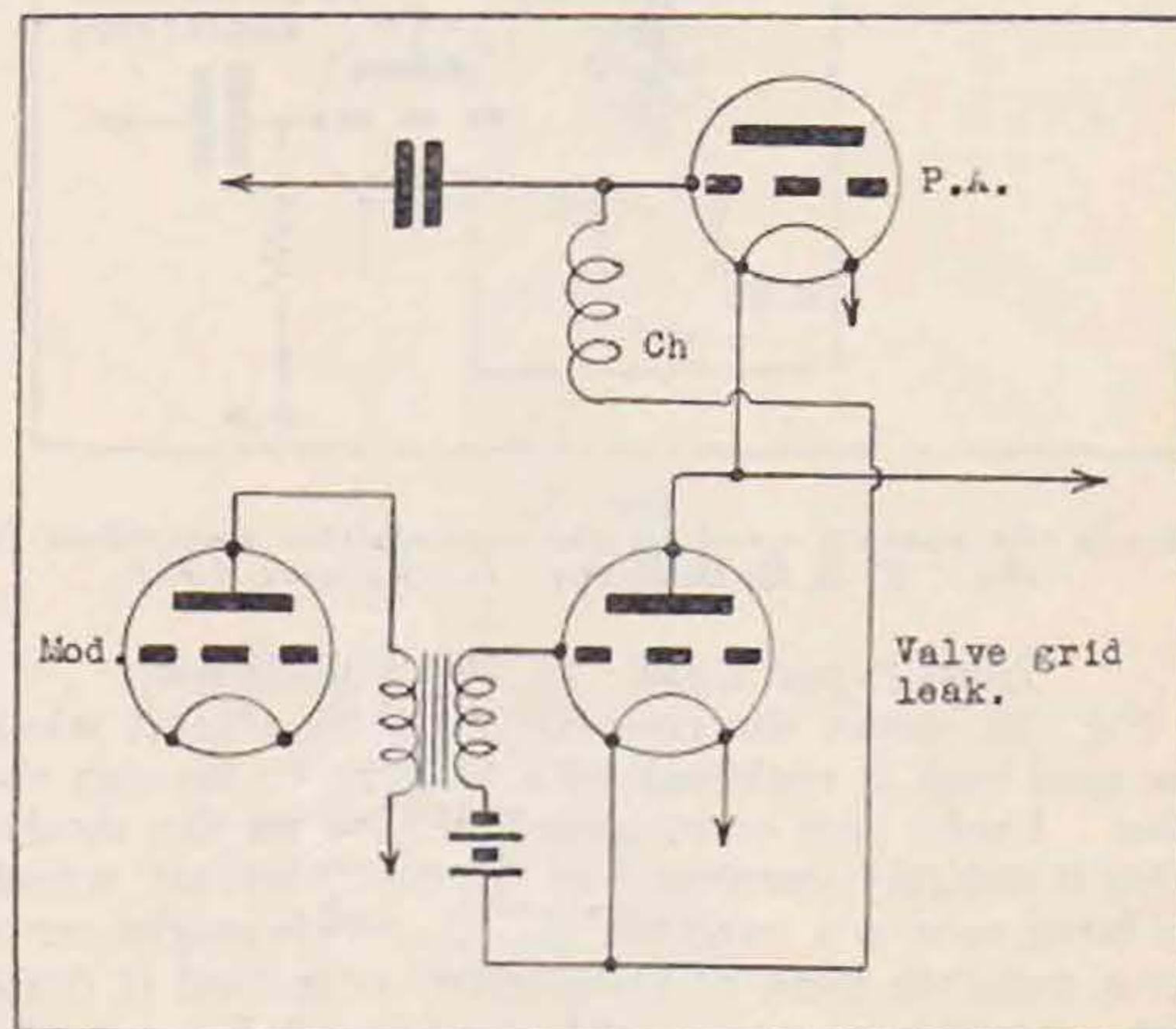


Fig. 8.

Another grid modulation arrangement making use of a valve grid leak.

*If so, consult the new Guide.*







employed. Fig. (12) gives a graph showing the relations existing in the circuit of the modulated valve during the process of modulating. There is a DOWNWARD movement of the anode and aerial current and an upward movement of the grid current. In the preliminary tests a PM202 was used to modulate but sufficient drive was available only for work on 80 M. and above. It appears that more power is required to perform modulation as the transmitter frequency is increased. It is assumed that the valve load varied in some respect with frequency and anode circuit impedances.

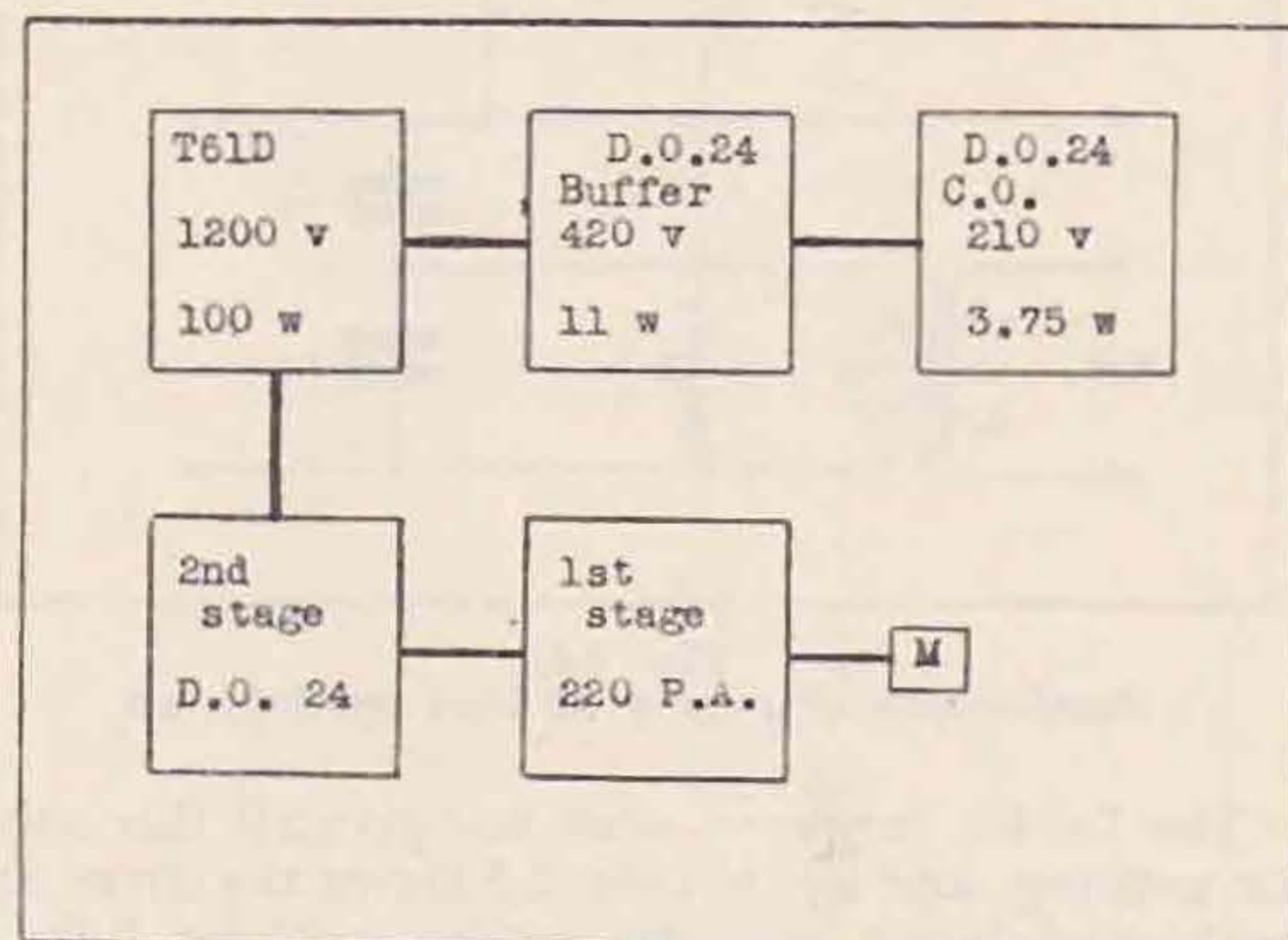


Fig. 11.

Valve chain arrangement in use at the authors' station.

As the next stage in the Mullard range, we tried a PM256 which still failed to work properly at 14 mcs. A DO24 solved the problem finally, and it is believed that the optimum load of this valve is probably more nearly adapted to the circuit than that of the PM256, whilst the reason for such a small valve as the PM202 working at all well is the same.

The system of control is partly grid bias and partly absorption. Although it is feared that the results might be difficult at first to duplicate with different valves, it should be possible to determine experimentally the right kind of modulator.

#### Operation.

The P.A. valve is set to any safe normal continuous dissipation and bias. The modulator works purely into the asymmetrical grid input resistance which falls to sufficiently low values to swamp the capacity load at all but the highest frequencies. The grid leak, although in shunt with the load takes no part in the work since it is so high relatively. We therefore excluded its distributed capacity from taking part by including in series with it an L.F. choke as shown.

#### Variation of the Control.

It is found by indicating meters that, as modulation voltage is increased the anode current deflection reaches a maximum value before that of the grid after which further increase merely runs up the grid current and does not increase the modulation proportionally. This appears to show that grid bias control is being effected into the positive grid range. A maximum anode current deflection of 30/35 mas. is obtained with Mullard type T61D. It is thought that this effect is due to the modulator causing the drive voltage to swing the valve too far into the positive regions. It is known that, as drive is

increased towards excess, the grid current increases rapidly without any higher voltage appearing at the input since the driver is obliged to make up the unusual losses in the driven stage, brought about by grid current. The efficiency falls and the results are the same for leak or bias battery, but are less remarkable in the former instance since the increased grid current performs the operation of forcing back the static negative bias and actually prevents itself from rising!

#### True Grid Bias Modulation.

This is the system in which results are comparable with choke control modulation. The requirement is principally that the load on the modulator shall be practically constant, which necessitates:—

- (1) Constant input resistance.
- (2) Absence of grid current.
- (3) Correct grid bias.
- (4) Correct value of drive voltage.

Fig. (13) reveals the correct static relations for the above condition. The grid of the Power Amplifier is biased to the point "C"—1.5 times the cut-off bias, for a given anode voltage  $V_A$ . The drive peak voltage swing must then be adjusted to cut-off bias voltage value—the value which just swings the grid as far as  $E_G = \text{zero}$ , for full modulation. The applied modulation then moves the point "C" back and forth from "D" to "B" at audio frequency. With this condition, the anode current fluctuation is essentially linear.

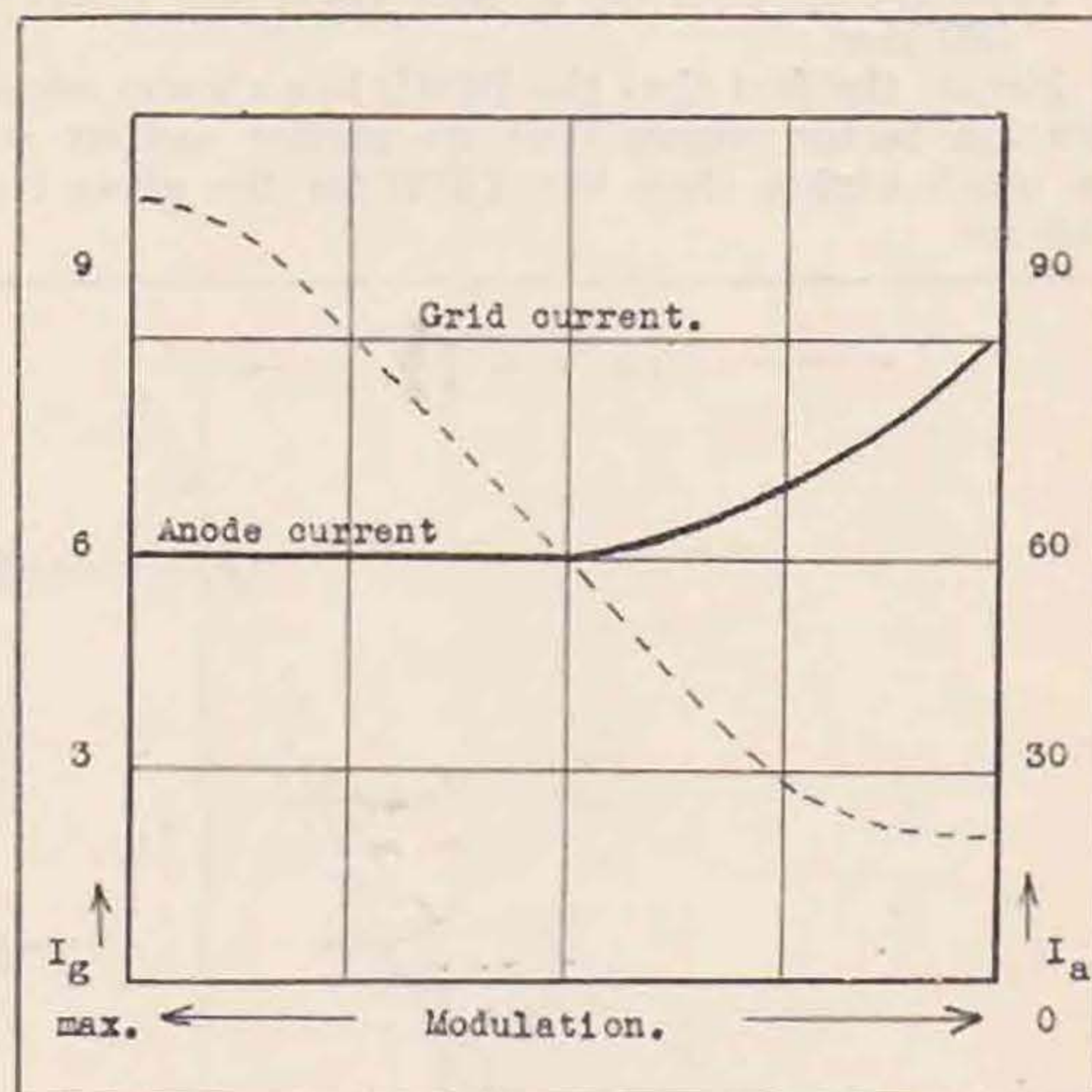


Fig. 12.

Graph showing conditions existing in the circuit of a modulated valve during the process of modulating.

#### The Working Load.

Since no grid current is permissible—i.e. the input resistance of the P.A. is kept at a high and almost constant value—this load is neglected and an artificial load imposed in its place. This is accomplished by "R" in Fig. (14), where  $C_1$  and  $C_2$  are radio frequency by-passes. Although this load is in series with the valve load, as it has to be to obtain modulation, the latter is *not* in shunt with the output transformer, and therefore does not play any part in the loading of the modulator, and no audio power need be developed in the P.A. grid resistance. The power is developed in



"R," and the potentials set up across it give rise to linear potentials affecting the mean grid bias. The value of "R" is chosen to the same value as the optimum working load for the particular modulator—4,000 to 6,000 ohms, when the output transformer ratio is assumed to be 1/1. Under these conditions an upward modulation is obtained, and the theoretical modulation percentage is 100.

#### Observations

Certain subsidiary points must be noticed:—

- (1) The cut-off bias of a valve can be taken from the characteristic curves, calculated or derived experimentally. In the latter case, the anode voltage is applied to the valve without any drive, but with the filament alight and, upon application, no anode current should flow. A slight reduction of bias produces anode current immediately. By calculation, the working anode voltage divided by the amplification factor of the valve gives the correct value.

Assume that we had two transmitters working under the same conditions, one utilising a T61D and the other a DO40. Both have 1,000 volts on the anodes, are biased to 1.5 times cut-off bias, and driven to zero bias only under full modulation. We shall find from the curves that:—

Type T61D cuts off at 47.5 volts and peaks its anode current at 140 mas.

Type DO40 cuts off at 125 volts and peaks at 180 mas.

Hence, the fact that the DO40 has a lower amplification factor shows that its carrier output will be much higher than the T61D for the given conditions.

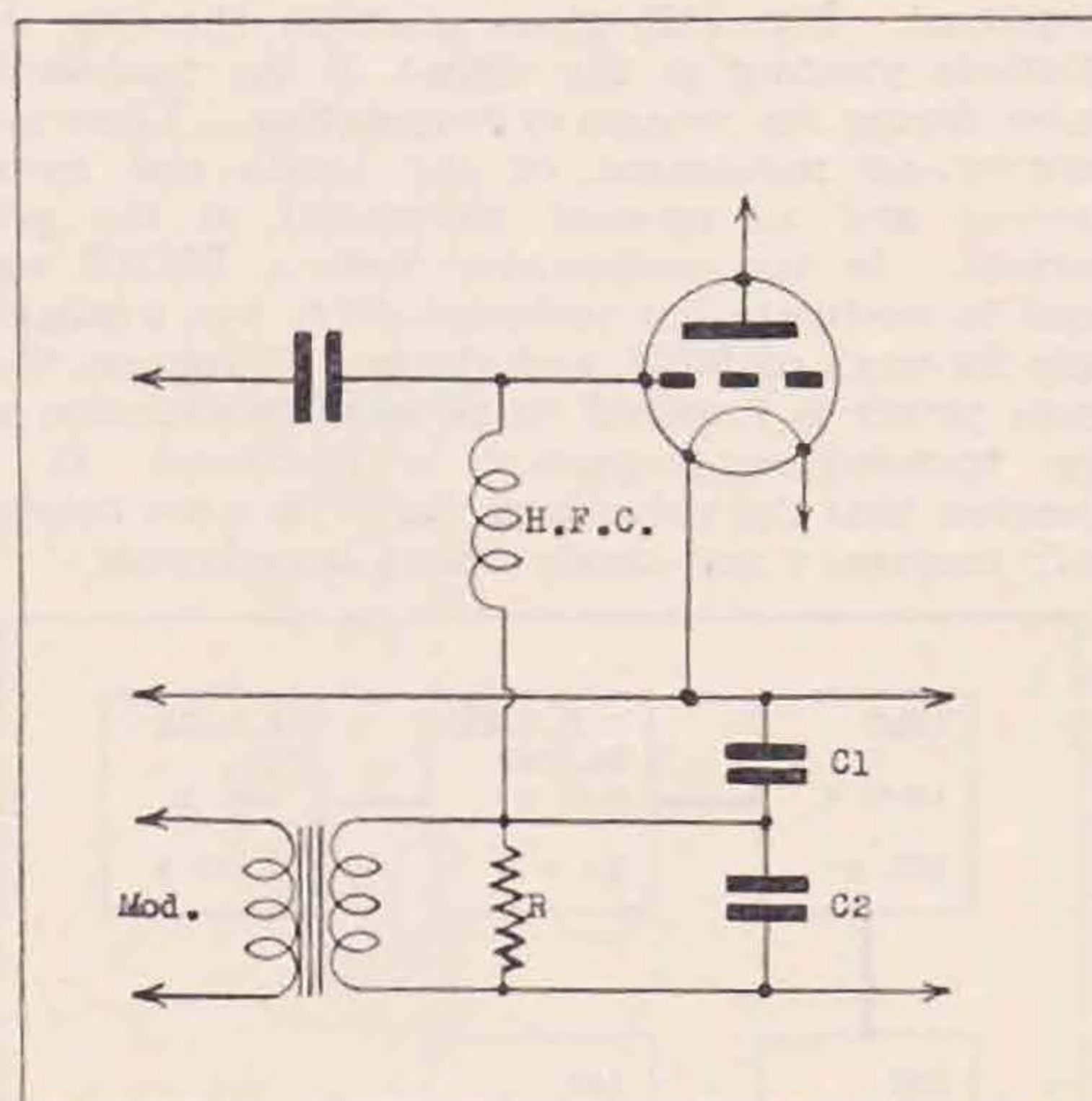


Fig. 14.  
Application of true grid bias modulation.

The DO40, however, does not give all this away for nothing, and needs over 2.5 times the drive and peak modulation voltages before working fully.

- (2) The carrier output is definitely rather restricted, although efficiency is high, and care must, therefore, be exercised in choice of a suitable valve for the system of modulation.
- (3) For a given anode voltage, the carrier is directly proportional to mutual conductance, although inversely proportional to amplification factor.
- (4) Modulation can be properly accomplished in the above manner upon any subsidiary stage when the subsequent amplifiers must be biased to operate as ordinary class "B" amplifiers, running into grid current which is then of no appreciable effect. In the case of the authors' transmitter, a Mullard DO26 would make a better grid-modulated buffer, on account of its low amplification factor. However, sub-amplifier modulation of this style has the drawback of limiting the necessary drive and, unless the whole chain of previous stages can be made more powerful, loss of power in the aerial circuit is bound to come about.
- (5) A highly effective arrangement used in good commercial practice is the Push-Pull circuit shown in Fig. (15), which has the advantage of reducing the production of harmonic distortion by correcting the bottom-bend curvature effect.
- (6) It is hardly possible to calculate easily the buffer stage input required for necessary peak voltage drive, which is a very important factor, so that this must be varied until correct operating conditions are shown to be taking place.
- (7) The modulator output peak voltage is the same value as the peak drive—refer to Fig. (13)—and this can be calculated rapidly. The load line of the modulator is drawn to its characteristic curves, for the value of

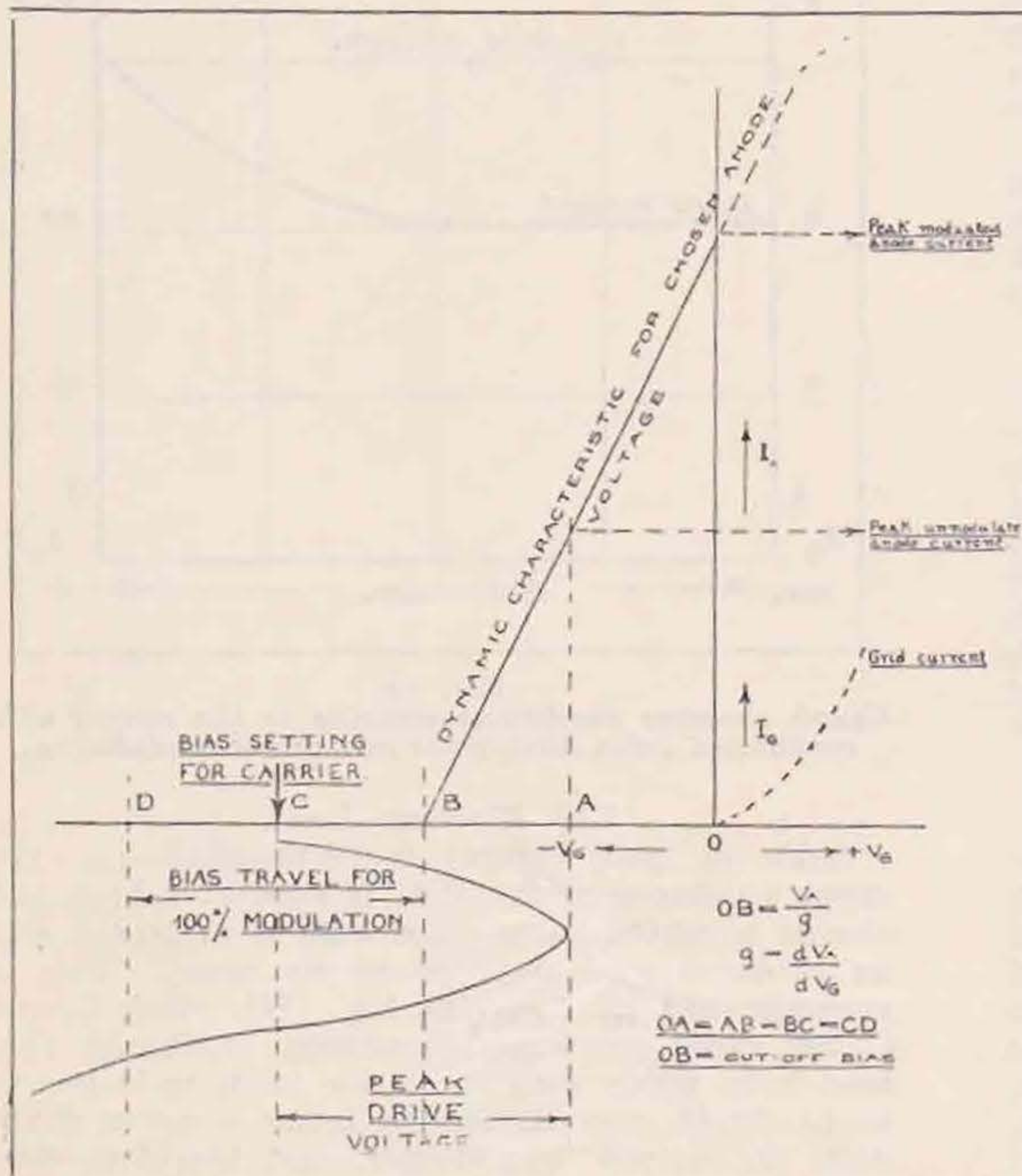


Fig. 13.  
Static conditions for true grid bias modulation. (Battery bias is recommended by the authors).



artificial load chosen, and the peak anode voltage swing observed and read off for full grid excitation. This leads one to a suitable design for a general purpose low-powered amplifier/modulation unit.

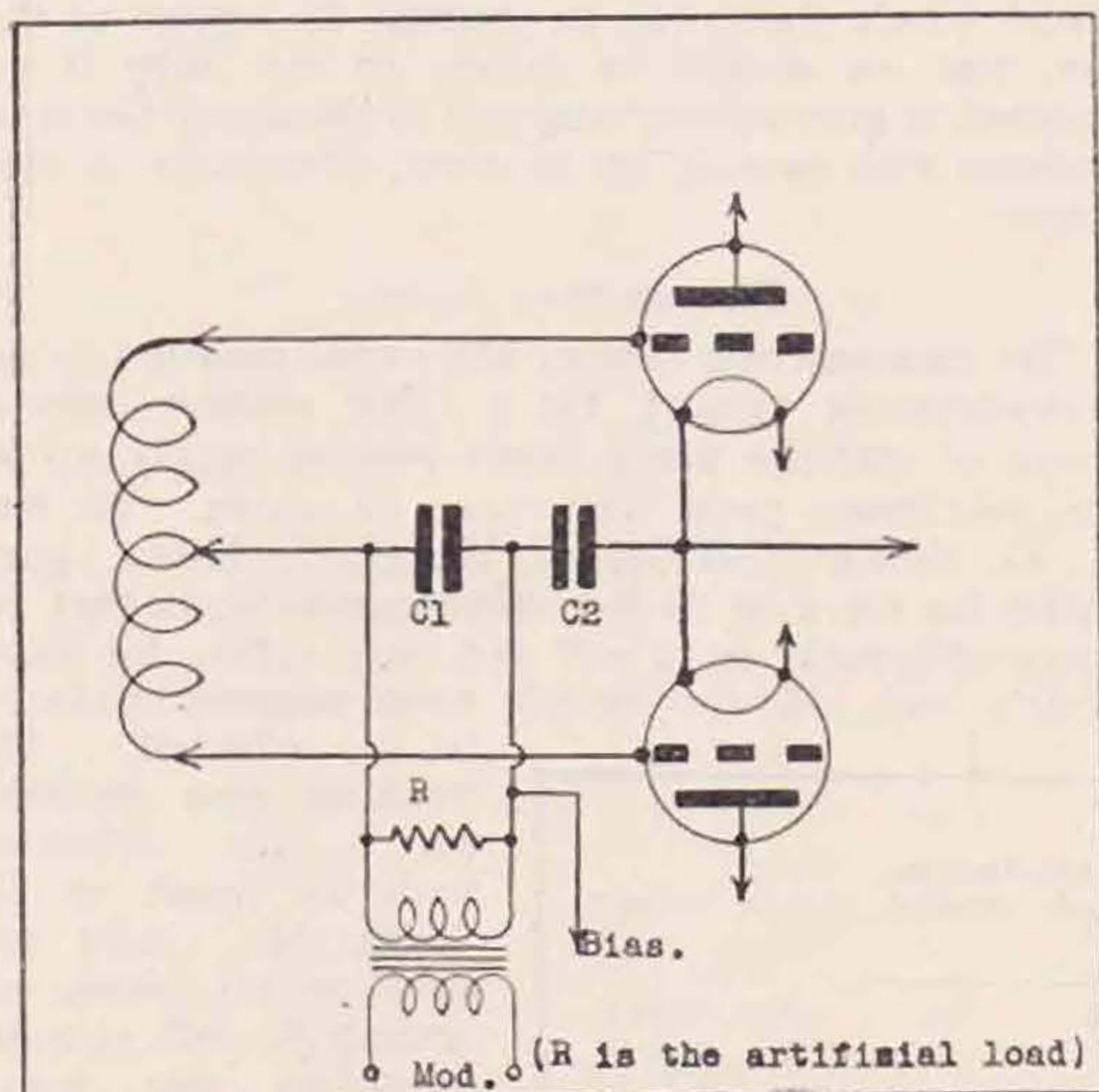


Fig. 15.

A push-pull arrangement of grid modulation.

#### A Modulation Amplifier.

The authors employ a rather sensitive carbon microphone at the sacrifice of a little quality to obviate the need for three stages of L.F. amplification. Fig. (16) shows the circuit design of a two-stage amplifier having a DO24 as output valve, operated by a small power valve of high gain which must possess the double advantages of high amplification factor and low anode current.

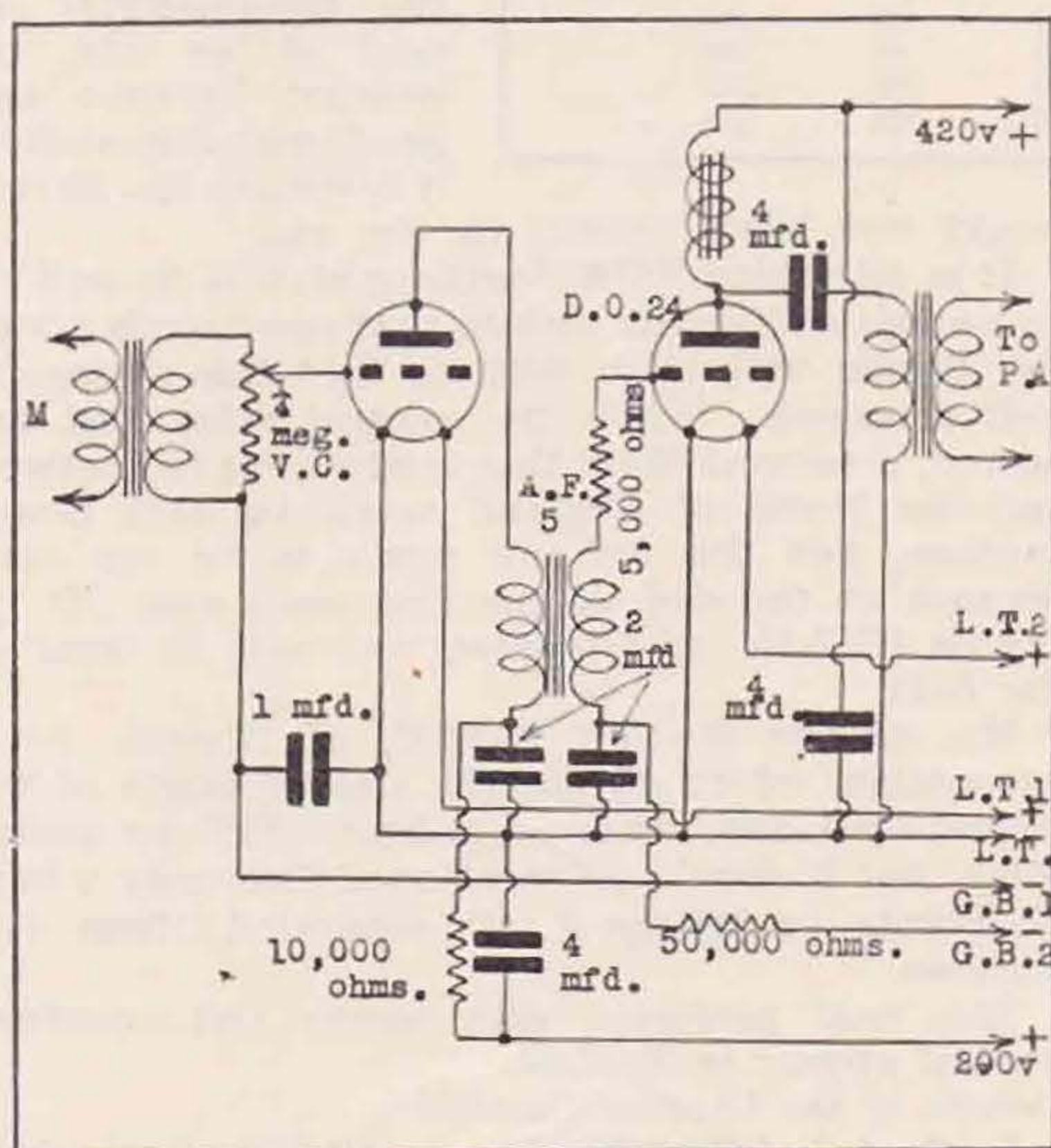


Fig. 16.

Circuit diagram of modulated amplifier for transmitters of 50-100 watts input.

If the anode current is high, the first stage must be shunt-fed, and the cost of good parts needed for this is not worth the while. The components must be of the highest quality if the user expects good speech. The output of the DO24 is 5.5 watts A.C., and since the grid only accepts a peak voltage of 25 volts, full excitation should not be very difficult to obtain. The first stage of all such amplifiers should be fed from batteries, otherwise ripple and instability will be introduced into the output. The consumption is low and proportionate batteries should not be a heavy cost. We have never experienced trouble from H.F. getting into the L.F. amplifier, in spite of the supply for the last stage and the filament also being taken from the 4 and 400 volts supplies common to the transmitter. The amplifier is located close by the side of the operator, about 14 feet away from the transmitter and no chokes are used in the lines connecting the two.

#### Finale.

With the authors' method of "mixed" modulation, the minimum of apparatus gives the maximum useful modulation with the full carrier output. One must waive aside the objections of theory and try all these spurious methods of working, if one wishes to be a real "ham"—one who gets really solid results! During October, at G6LI, we were able to put our telephony into U.S.A., Canada, India, Hong-Kong, Palestine, and over all Europe. Several post cards arrived from the U.S.A. reporting R6-R7 speech. India was worked on both 7 and 14 mcs. The input power of the transmitter using telephony is 95 watts. Reports upon the quality are most flattering.

In taking our leave of those readers who have had the patience to work entirely through our notes, we would stress the point that this article seems to cover material which has never before appeared in the pages of the BULLETIN, and that the greater part of it fails to appear in even the best text-books. If anyone should happen to know more of the subject than we have outlined, we would ask him not to rush too hurriedly into print, unless he can show good reason for having so long withheld his knowledge from public scrutiny!

#### Low Power Trans-Atlantic Fone Work.

With reference to the "Stray" published on page 174 of our last issue, we now understand that Mr. Jeapes is interested solely in telephony work. Members who have succeeded in effecting a really sound telephony QSO across the Atlantic with input powers of less than 10 watts, are invited to communicate direct with him at 2, Salisbury Villas, Cambridge.

#### "Harmony House."

We are asked by Messrs. Parrs to state that owing to a printers' error the address of "Harmony House" was incorrectly given in their advertisement published in our last issue. This should have read 116, Cambridge Road, Stockport.



# A VICTORY FOR LOW POWER.

## November 3.5 M.C. Contest.

**S**ELDOM has a local R.S.G.B. contest aroused so much keen interest as the 3.5 mc. event staged during the first two week-ends in November last. For several days prior to the start of the tests a general increase in activity was noticed on that band, but during the actual contest, 3.5 mc. resembled our old friend 7 mc. more closely than it has done for years.

We could not resist a smile as we listened to some of our crack DX men queueing up to work "common or garden" Continental stations who seldom enter into their reckoning at other times of the year. One incident stands out in our memory quite clearly, during the Sunday morning of the first week-end, a Frenchman all unsuspectingly sent out a short CQ call, probably expecting to find an isolated G or a fellow European waiting to reply. We would have given much to have seen his face on switching on his receiver, for practically every G on the band would have been heard calling him. We forget now who succeeded in getting in first, but the instant the last dot of the QSO finished, the band sprang to life again, and a dozen Gs were back to him with chance calls. For those who were not interested in this contest, it should be pointed out that by the rules, the total points scored were multiplied by the number of countries worked, and at the particular time in question, a contact with France meant probably 50 or more points. This incident was typical of many during both week-ends, for the moment a new station or more particularly a new prefix came on the air, the "Armada" went into action with flags flying! Our Dutch friends played up to us well, and seemed to enter into the spirit of the event, but a few of the Continentals have yet to learn that it is not necessary to repeat at 8 per, their "Dr Ob foto" stuff when they have been reported QSA5 R8 by a G. Furthermore the methods of calling employed by some stations, not all Continentals either, left much to be desired.

We are not in agreement with the school of thought that insists on "three calls and then sign," because from experience we know that calls are missed by this method, but we fail to see the necessity for a person sending another's call sign upwards of fifty times before signing his own once. Oh yes, it happened and often at that. Then, too, there were those Gs who replied to contest calls; they were not in on the contest itself, and in several instances did not know a contest was taking place. How we loved them!

Snappy operating which would have delighted friend Uncle Tom was in general the order of the day, and we should be failing in our duty if we omitted to give a deserving pat to the many German stations who showed up to great advantage in this respect.

### Transmitting Entries.

The transmitting side of the event resulted in an overwhelming victory for a QRP station over a group of stations using input powers nearly up to the maximum permitted, viz., 50 watts. To Mr. H. G. Collin (G2DQ), of Wickford, Essex, goes credit for showing to his fellow contestants that 10 watts efficiently used will not only suffice for local QSO's, but will also enable trans-oceanic contacts to be effected. By working two stations across the Atlantic with an input of 10 watts, Mr. Collin set up a record which we anticipate will remain unbroken for some years.

The secret of his success was undoubtedly due to the fact that he was able to employ an efficiently designed aerial in an open elevated location, and this, coupled to an equally efficient transmitter did the trick. Tribute should, however, be paid to the psychological aspect of his win, for without patience and good operating ability, it is certain his station

Name.	Call.	Power used (watts).	Countries worked.	Stations worked.	Total Points.	Remarks.
1. H. G. Collin	G2DQ	10	20	92	1,968	W8UV and VE1AV worked
2. R. A. Bartlett	G6RB	50	17	80	1,462	WIPK and VE1BV worked
3. J. Wyllie	G5YG	48	15	96	1,440	
4. W. A. Clark	G5FV	50	15	81	1,260	VE1BV worked
5. R. D. Dutton	G6QQ	10	13	68	884	
6. E. G. Ingram	G6IZ	10	14	55	770	
7. A. N. le Cheminant	G6AC	10	12	63	756	
8. I. Auchterlonie	G6OM	50	13	51	663	
9. J. Witty	G5WQ	50	13	49	637	
10. C. A. Jamblin	G6BT	9.8	13	44	572	
11. H. W. Sadler	G2XS	40	11	48	561	VE1BV worked
12. R. G. Drewery	G6OY	10	12	36	468	VE1BV worked
13. N. E. Read	G6US	50	10	43	430	
14. A. O. Milne	G2MI	25	10	40	400	
15. J. Clarricoats	G6CL	30	9	27	243	
16. G. A. Chapman	G2IC	10	8	26	208	

would not have figured in the van.

It is refreshing for a Southern station to pull off an award, and we are certain that our friends across the Border will agree with us that this success is well deserved. When the contest rules first appeared, it seemed likely that contestants in Scotland and the North of England would be at a disadvantage, but this did not prove to be the case, because at the end of the first week-end, Mr. J. Wyllie (G5YG), of Glasgow, was well in front of the field.

Mr. Arthur Bartlett (G6RB, of Bristol), by a tremendous effort during the closing hours of the second week-end, managed to beat G5YG for second place, but it should be mentioned that only a bare 22 points in nearly 1,500 separated these two stations.

The final positions with scores and countries worked appear in Table 1.

### Details of the Leading Stations.

In the belief that other competitors and members concentrating on 3.5 mc. work will be interested, we give below the salient features of the gear used at the first six stations.



G2DQ.—Transmitter CO, BA, and PA. Power on CO, 2.5 watts; on pentode buffer, 17.5 watts; on PA, 10 watts. Buffer, 500 volts, 35 milliamps, P.A., 340 volts, 30 milliamps. Valves used in P.A., two Ediswan Super-power type PV625A (now obsolete). These valves were found to be more efficient than LS5s at the voltages used, and only take 0.25 amp. on the filament. Aerial: half-wave Hertz, zepp. fed, pointing due East and West, feeder end to West, in open position 90 ft. above sea level, height of mast 37 ft.

G6RB.—Transmitter crystal controlled, locked power amplifier. Input 50 watts, aerial one side of 14 mc. Zepp and counterpoise.

G5YG.—Transmitter crystal controlled. Input 48 watts from CO, PA, PA, PA. An A.O.G. aerial was used.

G5FV.—Transmitter crystal controlled. Input 50 watts. CO, and PA's arranged in push pull; valves used, LS5D and DET.1. Aerial half-wave, direct tap; first week-end, and half-wave A.O.G. second week-end.

G6QQ.—Transmitter crystal controlled T.P.T.G. Input 10 watts. Aerial system 99 ft. long, arranged as suggested by G5QY, the last 33 ft. at right angles to the main span. Valve used in output stage, PX4.

G6IZ.—Transmitter CO PA crystal controlled. Input 10 watts. Push pull used in both stages; aerial, single wire half-wave designed for maximum efficiency on a frequency of 3,575 kc.

#### COMMENTS.

G2DQ considered that the method of scoring was in every way satisfactory, and agreed with others that the contest was one of endurance! He was active for the full 36 hours during the last week-end. Amongst his list of stations worked were UN7VN (who he waited for for an hour), and OGE, a Finnish coastal station. Estonia and Italy were elusive countries worked from G2DQ.

G5YG, in commenting on Mr. Collin's performance, stated, "I consider it is amazing, and makes me feel that we do not know the first thing about transmitting." Mr. Wyllie is in agreement with G2DQ regarding the period of these tests being too long, and suggests that future contests should be shortened from six to twelve hours.

G6QQ said: "I have several times seen remarks made about the small percentage of Continental stations who understand the meaning of QSO, but out of 24 German stations worked, who I asked to QSO, 21 did so."

G6BT had some interesting remarks to make regarding the results obtained by the 10 watt and the 50 watt stations, and summed up his views by enquiring whether the aerial is not mainly responsible for the results obtained. Mr. Jamblin criticised the QRO phone stations who were not taking part in the contest; these stations caused unnecessary QRM, and he with others considered that for two

week-ends in the year, they should have kept off the 3.5 mc. band. He also suggested that a statement should be published to the effect that QSL cards cannot be sent for Contest QSO's unless especially asked for, and concluded his report by recommending that the hours for future contests should be from 12 noon to 12 midnight each day.

G6OY, who was one of the few stations to contact Canada, found the contest particularly interesting, and his score would have been much larger if he had been able to work all the time. A particular vicious local tramway system makes it practically impossible to receive anything on 3.5 mc., while the trams are running. Mr. Drewery's contact with VE1BV was made at 05.35 G.M.T., November 12, when his signals were QSA 3 R4. An input of only 10 watts from a 200 volt supply was employed.

#### RECEPTION CONTEST RECEIVING ENTRIES.

The contest was well supported by a number of keen B.R.S. members, and was won by Mr. G. C. Allen (BRS250), of London, with a score of 2,482 points. Mr. Allen employed an O-V-1 modified Reinartz receiver with a 35 ft. semi-vertical east to west aerial with a counterpoise as earth. Mr. Greenaway (BRS1011), of Leigh-on-Sea, Essex, finished second with a score of 2,416, and C. A. Bradbury (BRS1066), of Burton-on-Trent, was third with a score of 2,320.

In most cases these entrants used either straight receivers with no high frequency

stage, or S. valves as detectors.

The interest shown by the non-transmitting members, many of whom are comparatively new members of the Society, is particularly gratifying.

The final positions of all stations is set out in Table 2.

TABLE 2.

Position.	Name.	Call.	Receiver.	Countries Heard.	Points Claimed.	Total Points.
1.	G. C. Allen	BRS250	0-V-1	17	146	2,482
2.	C. J. Greenaway	BRS1011	0-V-2	16	151	2,416
3.	C. A. Bradbury	BRS1066	0-V-2	16	145	2,320
4.	L. F. Viney	BRS1186	0-V-2	18	112	2,016
5.	C. E. Jefferies	2AMN	SG Det. and Pen.	15	106	1,590
6.	W. A. Laidlaw	BRS1213	SG Det. and LF	14	79	1,196
7.	A. A. Hammond	2ANM	0-V-1	15	70	1,050
8.	F. H. Cooper	2BGR	SG Det. and Pen.	15	62	930
9.	H. J. Houlding	BRS720	SG Det. and Pen.	13	65	845
10.	A. E. Lambourne	2AGK	0-V-1	14	60	840
11.	P. Seymour	2AZX	1-V-1	14	58	812
12.	J. Alexander	BRS822	0-V-2	12	34	408
13.	R. M. Flavill	BRS884	0-V-1	9	37	333
14.	D. A. Dyer	BRS727	SG-V-1	8	19	152

## STANDARD FREQUENCY TRANSMISSIONS.

SUNDAY, JANUARY 28th, from G6NF  
London.

09.30 GMT. 3525 KC.

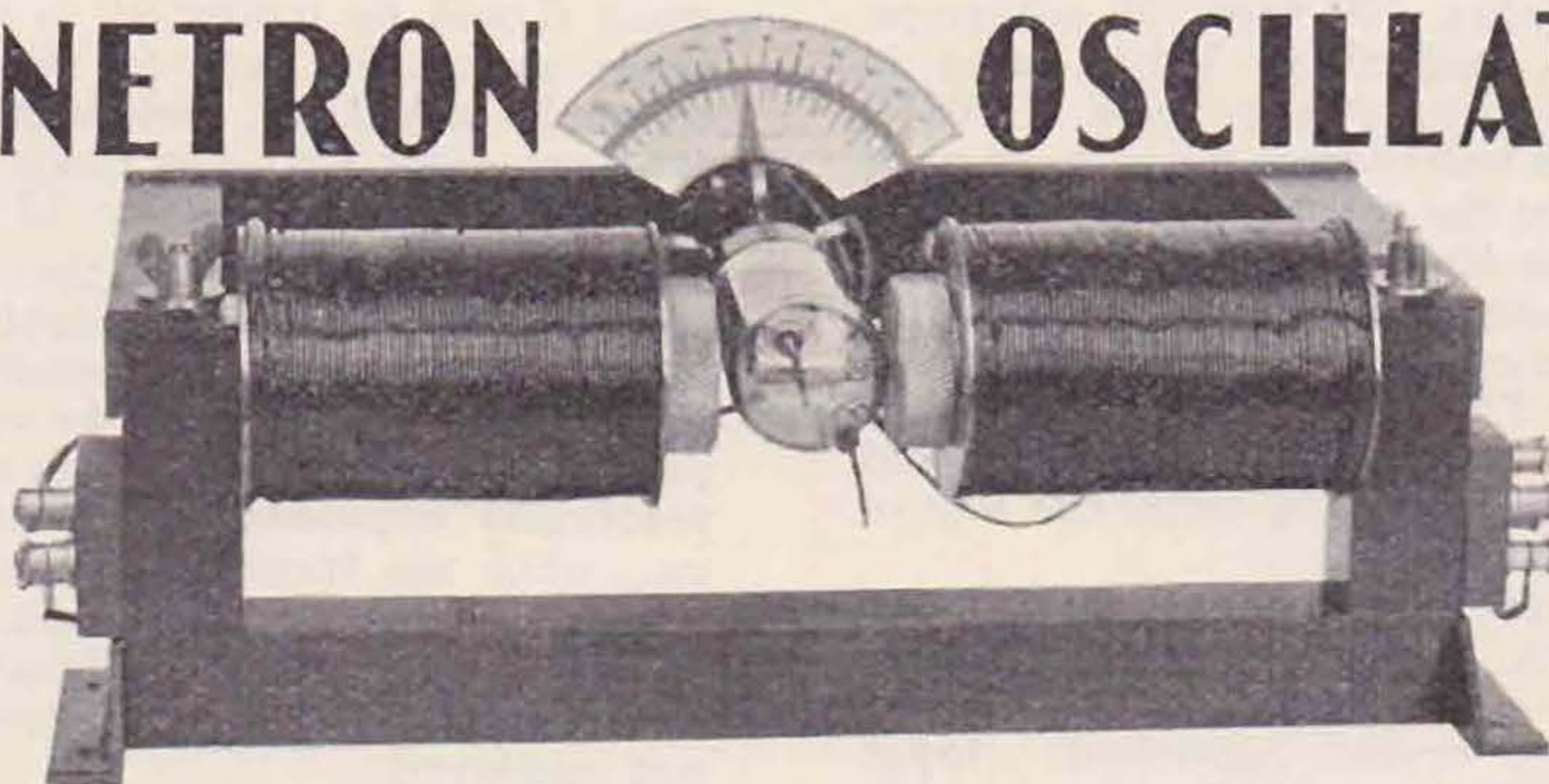
09.40 GMT. 3625 KC.

09.50 GMT. 3725 KC.

Accuracy within 0.01 per cent.



# MAGNETRON OSCILLATORS



*(Lecture delivered before the Society on November 24, 1933, by E. C. S. Megaw, B.Sc.,  
Research Staff of the M.O. Valve Co., Ltd.)*

**D**URING the last few years there has been a rapid growth in the use of very high frequencies for radio and other purposes. This has led to new requirements in valve and circuit design. Much has been done to meet these requirements with ordinary triode oscillators by reducing stray inductance and capacity, and by the use of symmetrical circuits. The effect of such improvements is, however, limited, and other methods of producing high frequency oscillations have recently been developed. The purpose of this paper is to describe how valves operating in a constant magnetic field, generally known as magnetron valves, can be used as high frequency generators.

The kind of valve used is shown in Fig. 1. It has a straight filament and a cylindrical anode which is split lengthwise into two equal segments separated by a small gap. Leads from the filament and the anode segments are brought out at opposite ends of the bulb. The valve is mounted between the poles of a field magnet which provides a uniform magnetic field between filament and anode. A typical arrangement of valve and magnet is shown in the title heading.

Before describing how such an arrangement can be used as a high-frequency oscillator, it will be well to consider the effect of a magnetic field on the electrons flowing from filament to anode in a simple cylindrical diode. Fig. 3a represents the radial flow of electrons from the filament to the positively charged anode when there is no magnetic field. Now if a weak magnetic field is applied parallel to the filament, the electrons will be deflected from their straight paths, and will describe curves as indicated in Fig. 3b. If the magnetic field strength is increased a point will be reached at which the electrons only just touch the anode surface (Fig. 3c). With still greater field strength, no electrons reach the anode (Fig. 3d). By plotting anode current against magnetic field strength, with constant anode voltage, a curve like Fig. 4 is obtained. As the field strength is increased, a critical value is reached at which the anode current falls almost to zero. This critical field strength depends on the

anode voltage and anode diameter. It is given approximately by:

$$H = \sqrt{180 E_a / d_a} \quad \dots \quad \dots \quad (1)$$

where

$H$  = magnetic field strength (gauss).

$E_a$  = anode voltage.

$d_a$  = anode diameter (cm.).

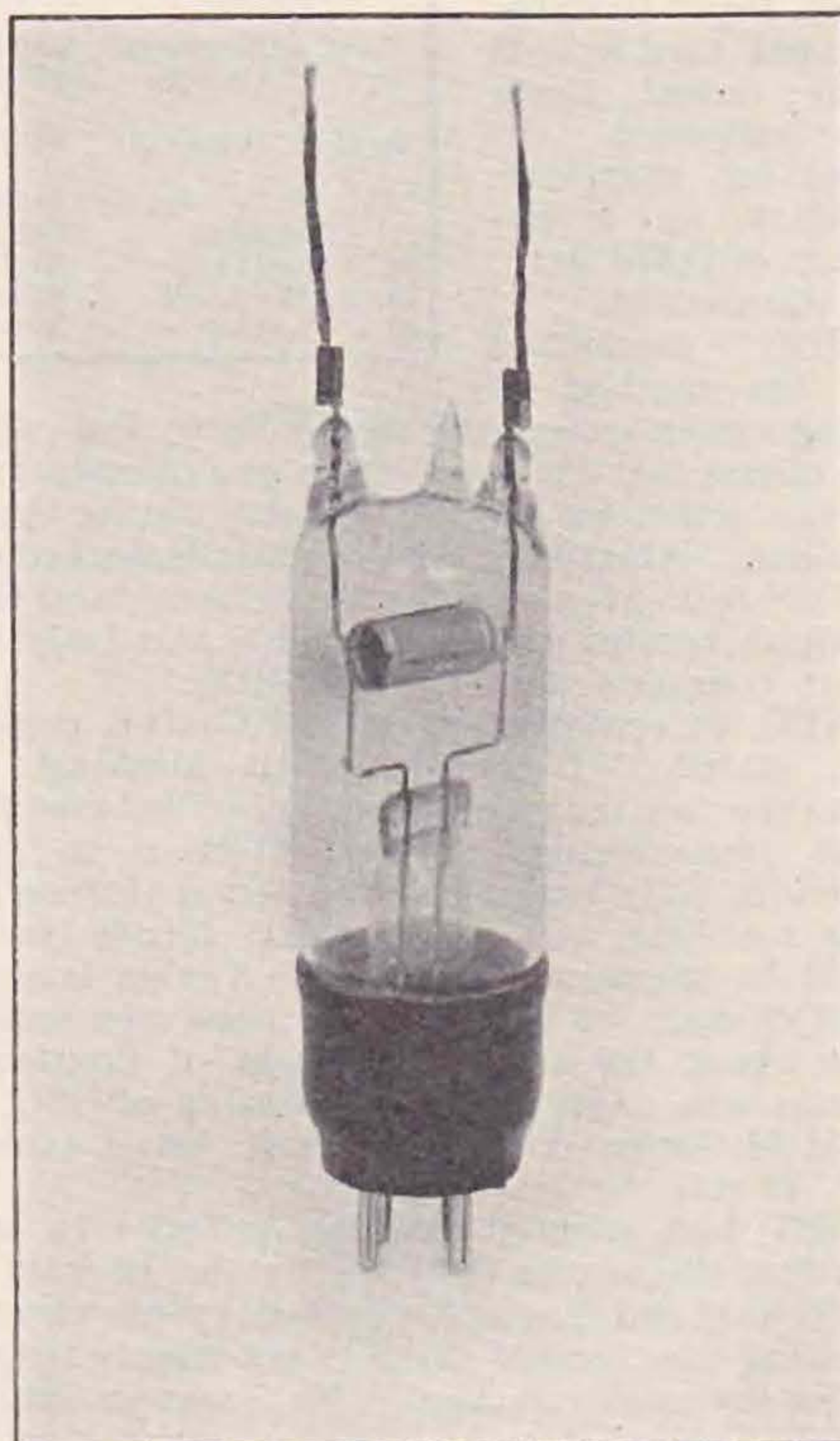


Fig. 1.—Magnetron valve for high frequencies

*Order a copy of the Guide when paying your sub.*



This equation also applies to the split anode magnetron when the two segments of the anode have the same positive potential with respect to the filament. To obtain oscillations the magnetic field strength must be equal to or greater than the critical value.

The circuit diagram of the oscillator is shown in Fig. 5. A tuned circuit is connected between the

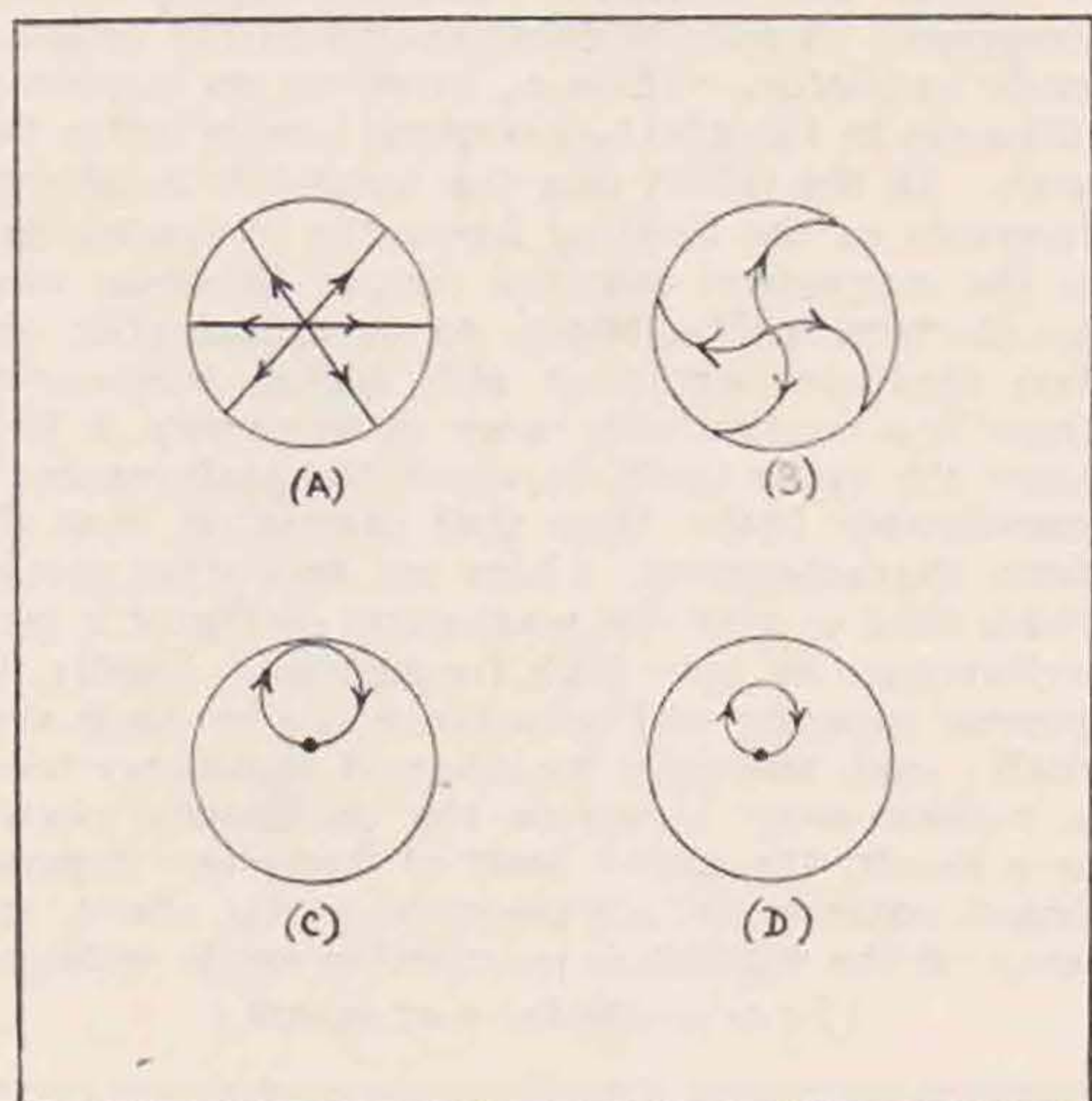


Fig. 3.—Electron paths in a cylindrical diode.

- (a) Without magnetic field.
- (b) With weak magnetic field.
- (c) With critical magnetic field.
- (d) With strong magnetic field.

anode segments. This may consist of a pair of parallel wires with a sliding bridge, as shown in the figure, or, for lower frequencies, of a coil and condenser in parallel. The high tension supply is connected to the centre of the circuit. Owing to the complete symmetry of the arrangement, no radio

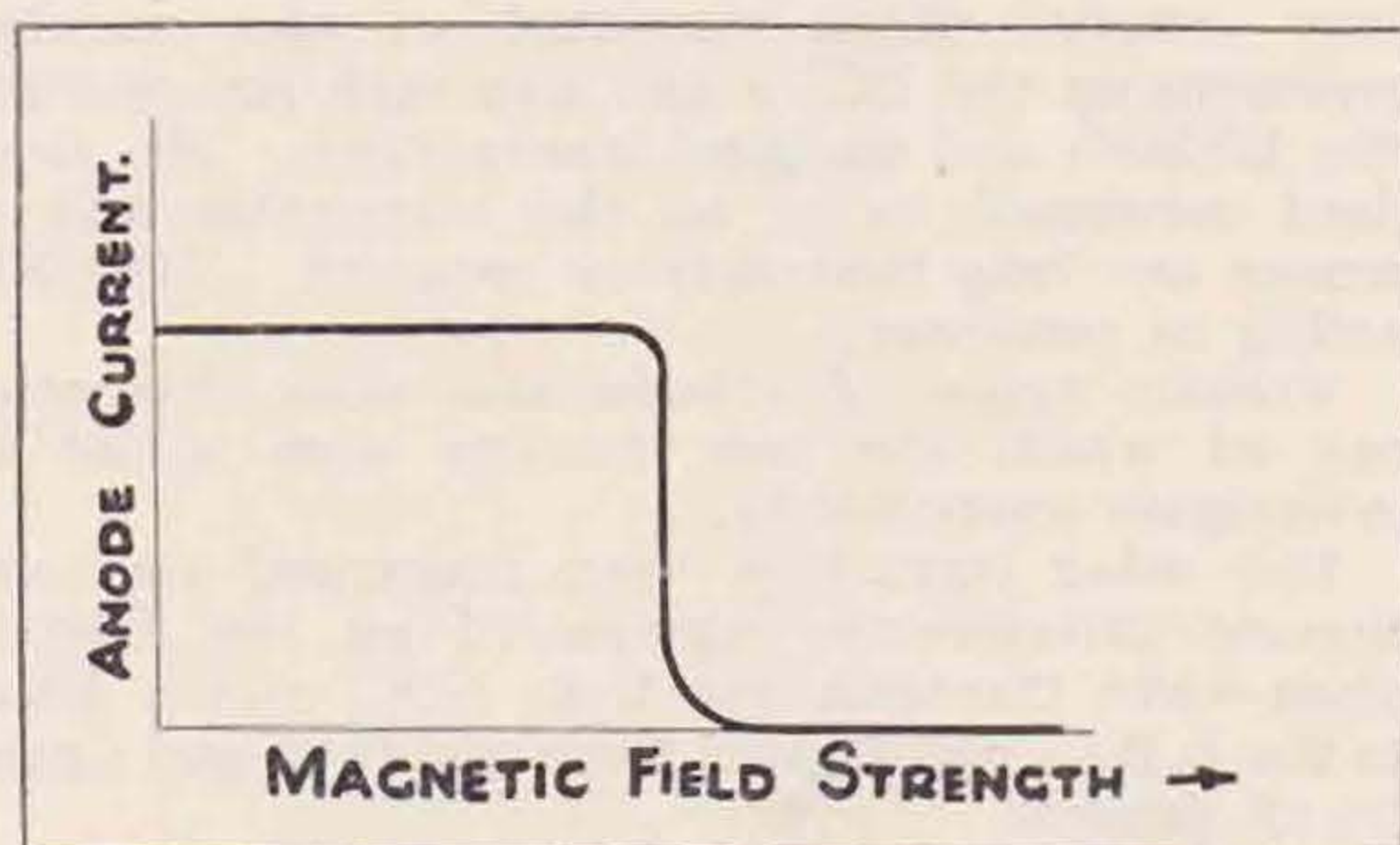


Fig. 4.—Relation between anode current and magnetic field strength with constant anode voltage.

frequency chokes are normally required. This circuit may be operated in two ways, one suitable for the highest frequencies, the other giving a greater output at lower frequencies. These methods of operation will be described later.

When oscillations are set up in the circuit the two anode segments oscillate in opposite phase. As the potential of one segment rises the potential of the other falls. The static characteristics of the

valve are obtained by varying the voltages on the two segments in this way and reading the current flowing to each segment. When the magnetic field strength exceeds the critical value, the segment currents show what may be called symmetrical dynatron characteristics. Within certain limits of segment voltage a decrease of voltage is accompanied by an increase of current. This is illustrated

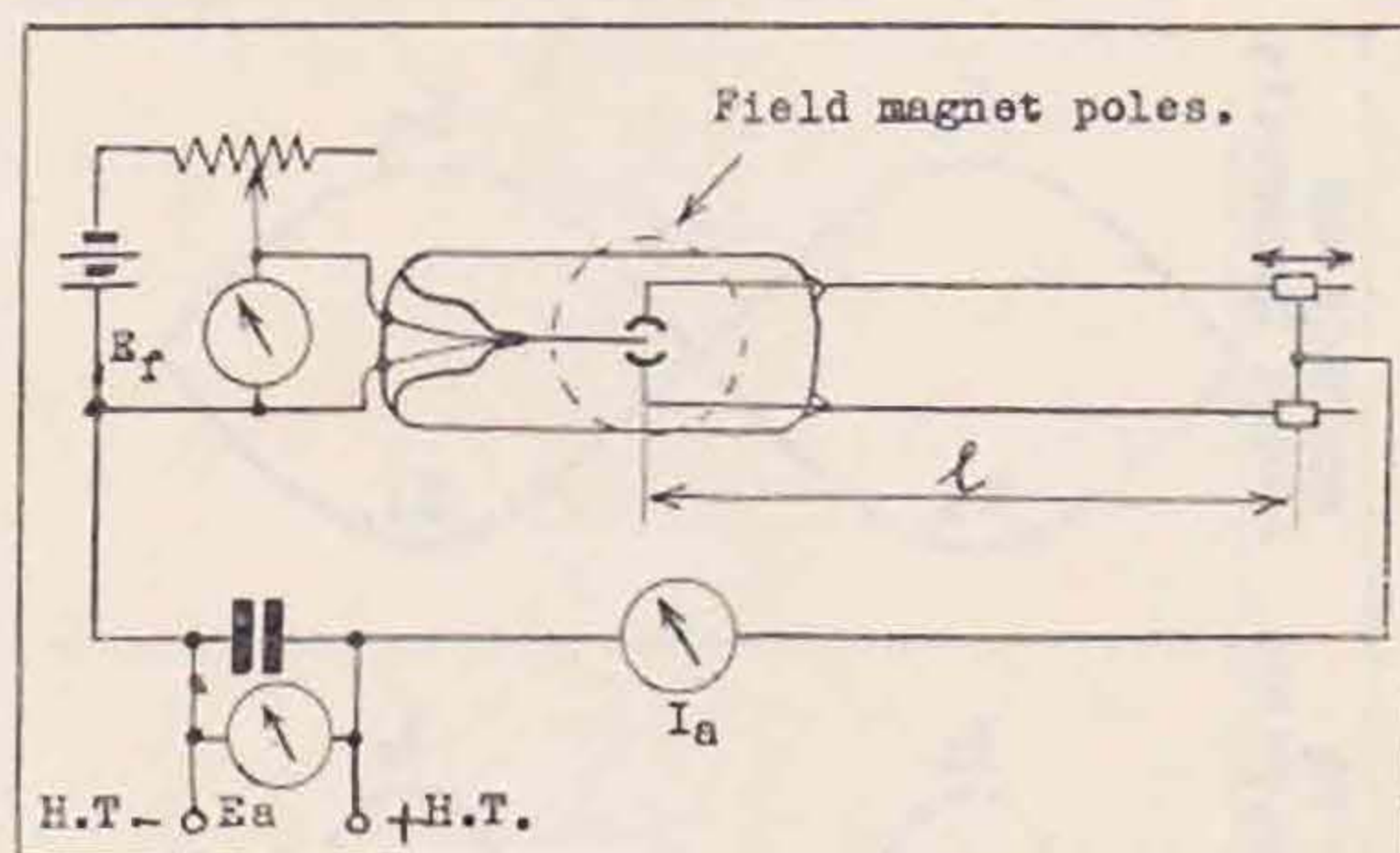


Fig. 5.—Magnetron oscillator circuit for very high frequencies.

in Fig. 6. For clearness the current to only one anode segment is shown. The current to the other segment is the mirror image of the curve shown in Fig. 6. In the figure  $E_a$  represents the working H.T. voltage. As the voltage on one segment ( $E_1$ ) rises from zero to  $2 E_a$  the voltage on the other segment ( $E_2$ ) falls from  $2 E_a$  to zero. The useful voltage range is from about  $0.3 E_a$  to about  $1.7 E_a$  with a suitable value of magnetic field strength. This value is usually between 1.5 and 3.0 times the "critical" field strength for the H.T. voltage  $E_a$ .

These dynatron characteristics, unlike those obtained from screen grid valves, are not produced

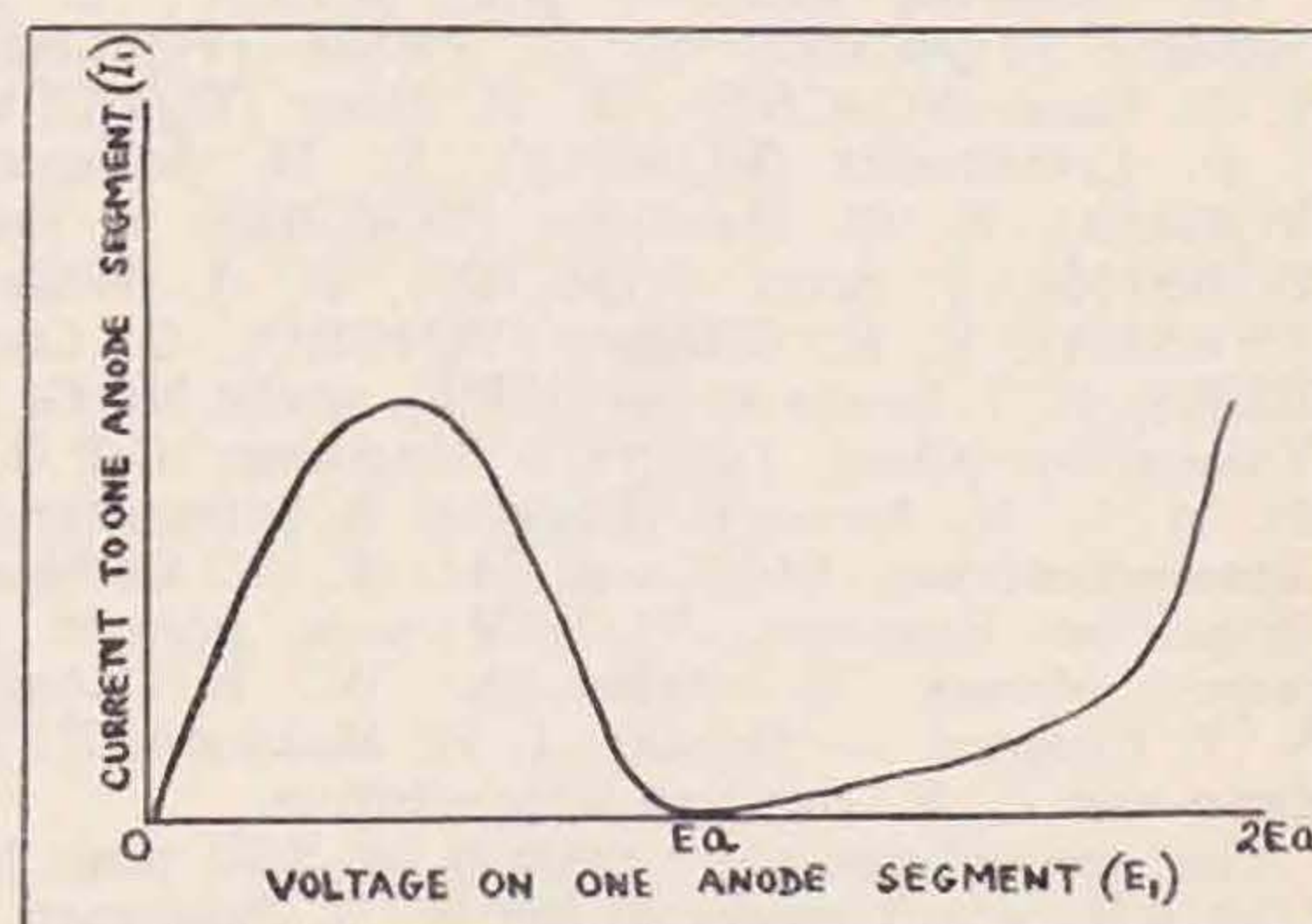


Fig. 6.—Dynatron characteristic of split anode magnetron valve.

by secondary emission. They result from the deflection of the electrons by the magnetic field. The characteristics are consequently free from the uncertainties of secondary emission phenomena.\*

The variation of anode voltage and current during one cycle of an oscillation is shown in Fig. 7.

\* See however *Nature*, vol. 132, p. 854, December 2, 1933, where it is shown that secondary emission from the filament may be of importance.



$E_1$  and  $I_1$  are the voltage and current of one segment, and  $E_2$  and  $I_2$  are the voltage and current of the other. It will be seen that the voltage and current relations in Fig. 7 are much the same as for the anode voltages and currents in a push-pull triode oscillator. The split anode magnetron is in fact a push-pull valve with only three electrodes.

By means of the static characteristics the oscilla-

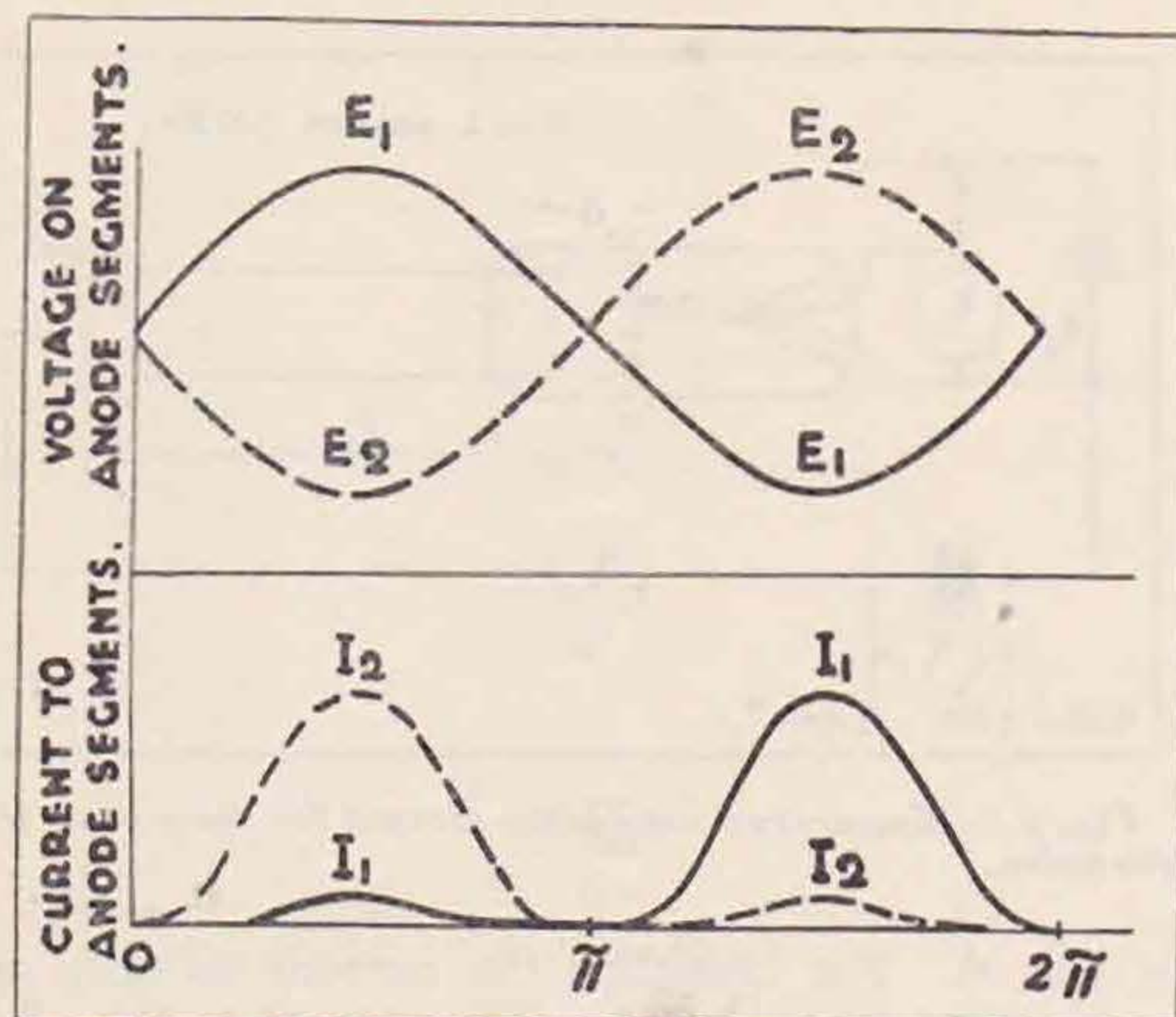


Fig. 7.—Variation of anode voltage and current during one cycle of oscillation.

tion performance of the valve can be calculated for any given magnetic field strength by plotting curves like Fig. 7. The results of such calculations agree with the actual performance so long as the time taken by the electrons to travel from filament to anode is negligible compared with the time period of the oscillation. At very high frequencies this is no longer true, and eventually a frequency is reached at which the negative resistance characteristics disappear. A similar effect occurs in the ordinary triode oscillator. There is, however, an important difference in the effect of electron inertia in the two cases. In the triode case the output falls off continuously as the limiting frequency is approached. In the magnetron case the output *increases* when the electron inertia begins to be appreciable, and then decreases again at still higher frequencies. There is a considerable range of frequency, a little below the upper limit, in which the performance is considerably better than that calculated from the static characteristics. There are two other factors which tend to give the magnetron oscillator a good performance at very high frequencies. Firstly, its internal capacity and inductance can be made very small; and, secondly, its inherent symmetry tends to reduce stray losses in the oscillatory circuit. As a result, the upper limit of frequency depends almost entirely on the electron inertia effect, and hence on the maximum permissible anode voltage.

(To be concluded next month.)

## FIRST EAST AFRICA CONVENTION.

By W. E. LANE (VQ4CRH).

The first Annual Convention of the East African Branch of the British Empire Radio Union was held on Saturday, November 25, 1933, the venue being the New Stanley Hotel, Nairobi, Kenya Colony.

The following members were present: S. A. Pegrum (VQ4CRE), S. G. Fisher (VQ4CRP), W. E. Lane (VQ4CRH), W. H. Hoey (VQ4KTA), J. B. Leibbrandt (VQ4CRK), D. H. Johanson (VQ4NSA), R. O. Davidson (VQ4CRL), F. Cole (BERS175), J. Scott (VQ4CRM), H. J. Walker (BERS191), F. E. Gilfillan (VQ4CRO), G. Cook (BERS), E. T. Somerset (ex G2DT), whilst Mr. G. P. Willoughby (Chief Telegraph Engineer, G.P.O.), Mr. H. L. N. Ascough (Imperial & International Communications, Ltd.) and Mr. T. N. Goddard (Broadcast Engineer, VQ7LO) were present as guests. Messrs. A. Ashworth, W. E. Atwill, W. T. Chappel, — Bryant, J. H. Harrison, R. L. Mann and C. V. Rawlins were visitors.

The proceedings were opened at 2.30 p.m. by VQ4CRH, who introduced Mr. E. T. Somerset.

Opening the Convention, Mr. Somerset touched on the aims and activities of the R.S.G.B. and B.E.R.U. briefly, quoting occasions in which its members have rendered assistance to the organisers of important historical projects. He also read a letter received from headquarters.

Mr. Somerset suggested the formation of a Radio Society of East Africa, and explained to the meeting why such a society should be formed. The Convention was then declared open.

Messages of good wishes received *via* amateur radio from VQ3BAL and G2ZQ were read by VQ4CRH, also letters from J. Clarricoats (G6CL),

Secretary, R.S.G.B., and A. E. Watts (G6UN), Acting Vice-President, R.S.G.B.

The proposal to form a Radio Society of East Africa was discussed after its advantages were briefly outlined by VQ4CRH. The suggestion was put in the form of a proposal by VQ4KTA and seconded by VQ4NSA and carried unanimously. A small committee was set up to arrange the necessary details, which consisted of one member representing the BCL's and one each representing the BERS's and licensed transmitters. Mr. Goddard consented to sit on this committee and to render any help that may be required. VQ4CRH acting as convenor.

Various types of interference were discussed, one of which the new Society were asked to investigate immediately.

The other important type concerned the continuous interference experienced on the Empire short-wave transmissions from GSC, and a letter to the B.B.C. was drafted there and then and signed by all present.

The meeting closed at 3.45, after the guests had been thanked for attending the conference.

At 4.30 p.m. visits were made to Kenya Radio and 7LO stations, by kind permission of Messrs. Imperial & International Communications, Ltd., and to Amateur Stations VQ4CRH and VQ4CRL, which proved of great interest.

At 8 p.m. a party of 28 sat down to dinner, the chief guests being the P.M.G. (Mr. T. Fitzgerald), Mr. G. P. Willoughby, Mr. H. L. N. Ascough and Mr. T. N. Goddard.

(Photograph in page 236.)



# "SOLILOQUIES FROM THE SHACK."

By UNCLE TOM.

*(Breaking out in verse—even more serious than breaking out in spots—is the well-deserved fate of our boy-friend after a surfeit of Christmas fare.)*

**R**ING the welkin, toll the bell, dear me, what is that burning smell? and Christmas, though it may be gone, is something fit to think upon, for many a week, if not a year, I'm sure you've got through too much beer. Forgive me, readers, but I *must* break out in verse, or else I'll bust, it's all that twenty-ninth mince pie that makes me want to heave a sigh and crawl away and quietly die.

Your Uncle's not himself at all—he's not sufficient strength to crawl to his receiver, and to call a "Test," however short and sweet—which only means there'll be a treat in store for listeners in his street, who'll now receive the B.B.C. more wholly and entirely free from "XYZ" and "ABC" than they have done since '23, when Uncle first came on the air, and all the language of despair, and gnashing teeth and tearing hair caused B.C.L.'s to write and swear unto the P.M.G., that their receivers were put out of gear and everything that they could hear was interspersed with bangs and crashes from his infernal dots and dashes.

'Phew!!!! (Prose for a little while, Miss Vamp, please.) Why does Christmas make us all go crazy for awhile? That's not a riddle, but a plain question. I admire the enthusiasm of those hams who can spend the whole holiday on the air; I haven't got it myself! I am far too busy playing with my grandsons' (and nephews') clockwork trains, not to mention plucking the rabbit and skinning the turkey.

Can the ham-spirit be more deeply ingrained in anyone than in the man who sent me a Christmas card (of the snow-and-robin variety) with "Pse QSL" at the bottom thereof? Or is it only an outbreak of formula-madness?

I shouldn't even be surprised to hear of hams arriving downstairs half-an-hour late for The Dinner of the Year (December 25), through finishing a QSO with the usual "Merry Xmas" and other trimmings.

Personally, I try to forget all about ham-radio for a day or so at the festive season, and become a rabid and delighted B.C.L. I really think I should complain if a brother-ham interfered with my reception of London Regional at this time of the year.

Now let's have a look at 1934. What are we all going to do, and how are we going to do it? Some of us will try to branch out in new directions, and to find new interests in radio. Others, alas, will continue their work as automatic QSO-machines; doubtless they get some kind of childish pleasure out of it, but they shouldn't be called "hams."

If you want to make a resolution, I suggest this. Pause for two seconds at the beginning of every QSO and think "Why am I replying to (or calling) this man?" Is it for (a) his QSL-card; (b) because I like to chat with him; (c) because he's good DX and it will be a feather in my cap; or (d)

because I am a ham and it's in the blood? I suggest that (b), (c) and (d) are all legitimate in their way, but that (a) is punk. I should like to think that there was another reason abroad, too: (e) because I have some genuine experimental work to do, and he can help me. Poor old (e)—he's not much in evidence nowadays.

Do, please, let's all try and get some solid, lasting satisfaction out of what might be the finest hobby in the world, if there weren't so many people who just played at it. Ham-radio, properly used, is a Good Thing. Just played with, it is a childish pastime, the thrill of which will inevitably wear off some day and leave the player like a pricked bubble.

Mind you, I haven't a word to say against a man who finds, for instance, that his 14 mc. gear is working rather well, and leaves it alone for a month or so while he just piles up DX contacts. That is one of the joys of ham-radio.

But there are so many who never get any further than that. Rather than alter a single thing in their station, they leave it alone, scared stiff of touching it because they might not be able to work their usual quota of W's the next night. Where would that type of man stand if the P.M.G. knew all about him? How would *he* justify the long list of experiments that he evolved when applying for his licence?

And now for that august body, the R.C.C. The guiding spirits have hit on the excellent idea of circulating a personal questionnaire to all the members, asking them what they are in private or public life. Are they married or single? (And, in brackets, "Glad that I am"; "Thank heaven I'm not"; strike out words not required!) Later on, they ask for an estimate of how one's time on the air is spent—Ragchewing, DX, experimenting, 'phone, ultra-short-waves, and so on. The results will be rather interesting. An early check shows the following: Experimenting, 33 per cent.; Ragchewing, 27 per cent.; DX, 21 per cent.; Ultra-shorts, 7 per cent.; and various, 7 per cent. That seems pretty satisfactory, but, of course, the R.C.C. doesn't include our "spitch" experts who make life miserable for us.

The more personal parts, such as "Are you YL-minded?" will doubtless be made known later, but not, I hope, individually.

This month's tub-thump concerns punk reception-reports. Two or three people have forwarded to me the very worst specimens of the art of the B.R.S., and I can only say that they are no good to man or beast, and that a ham receiving one of them would be perfectly justified in refusing to QSL, however large the type asking him to do so. I don't believe there are many of these sloppy reporters about, but if any of them read these words, I hope they'll take them to heart. The first essential is to get the call-sign right, which

*(Concluded on page 222.)*



# AN A.C. SHORT-WAVE SUPER-HETERODYNE RECEIVER.

By E. J. ARMSTRONG (G2RM).

*For some time we have felt that a description of a short-wave super-heterodyne receiver, constructed on modern lines, would prove of general interest. In this article Mr. Armstrong mentions many components which have been especially designed for such receivers, and we believe that the manufacturers concerned will, no less than our readers, appreciate the opportunity here presented of seeing the results of their labour put to a practical test.*

FOR the past few years the writer has been interested in the construction of short-wave mains operated super-heterodyne receivers, capable of giving reliable reception from all parts of the world, with a particular reference to the British Empire. The initial attempt on these lines took the form of a D.C. model working on the autodyne principle with one stage of intermediate frequency. As this proved successful, an A.C. model was constructed and despatched to Kenya, where Mr. E. T. Somerset carried out an Equatorial test. In reporting upon the results obtained, Mr. Somerset drew attention to the lack of selectivity, a failing not particularly observed in this country, consequently, an endeavour has been made to produce an improved model embodying this and other suggestions. Recent important valve developments and an improvement in the design of short-wave components has contributed in no small measure to the successful results which have now been obtained.

As the performance of the receiver about to be described is influenced to a very large extent by the valves used, a brief description of each seems desirable at this stage.

## Valves.

(1) *Ferranti* Heptode type VHT4. This is a combined oscillator and first detector containing five grids, a cathode and anode. With this class of valve the local oscillations are mixed electronically with the received signals, there being no external coupling between the oscillator and signal circuits. As this valve is of the variable Mu class, full use may be made of automatic volume control (A.V.C.).

(2) *Mullard* Multi - Mu Screened Pentode type VP4. This valve has a very high amplification factor and gives a large stage gain.

(3) *Osram* Double-Diode-Triode type MHD4. This is used as a second detector and also provides for amplified A.V.C. with delayed action. Diode No. 1 is used for half-wave rectification and A.V.C. in conjunction with the triode as amplifier, whilst diode No. 2 provides delayed action.

(4) *Osram* MPT4. This is particularly suitable as an output valve as it is designed to give a high A.C. power output with a very small signal input.

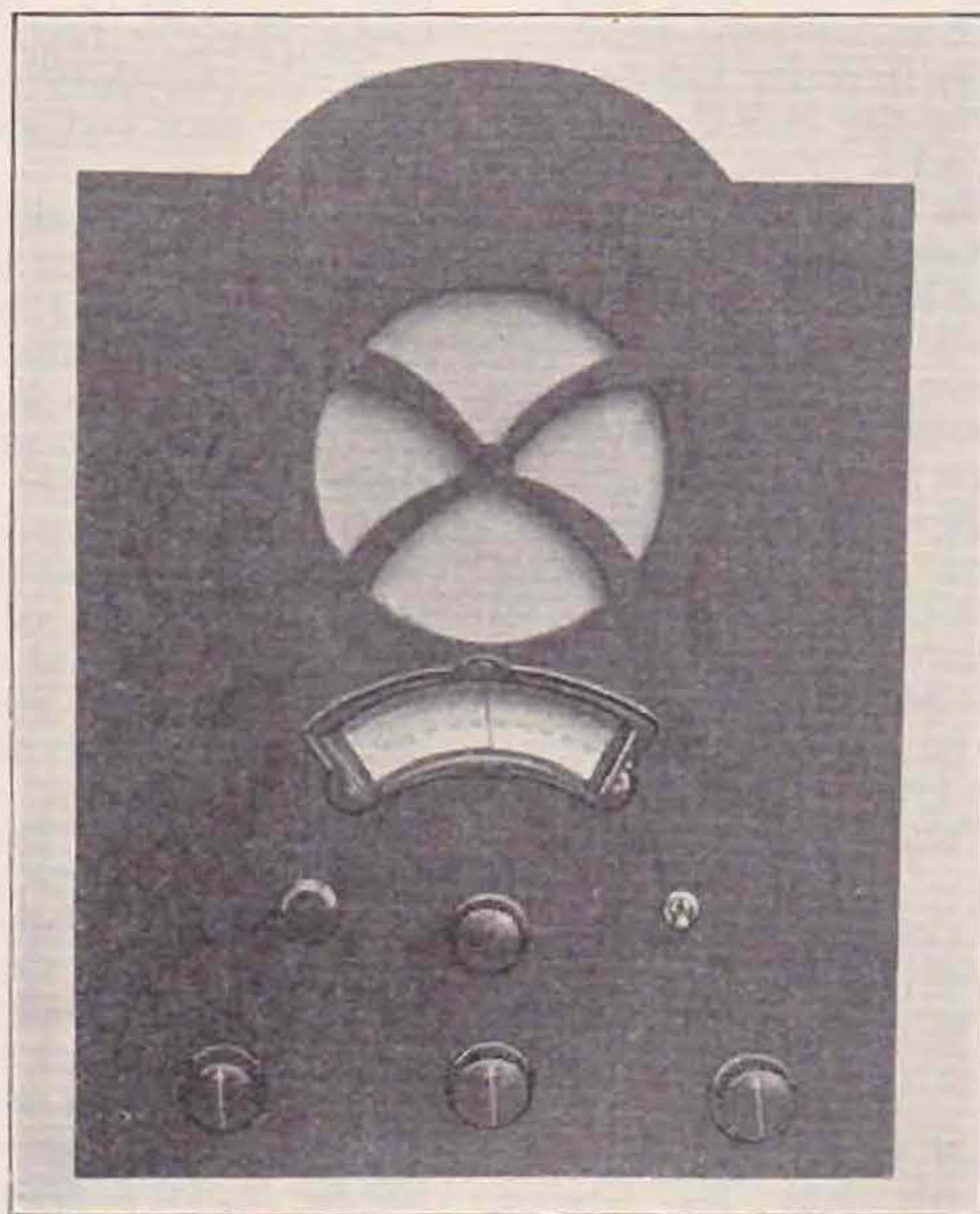
## Constructional Details.

The receiver was constructed on a ply-wood chassis, the ply-max base-board being supplied by Messrs. Peto Scott. In the event of such a receiver being designed for use in tropical climates, a metal chassis would, of course, be necessary.

The dimensions of the chassis are such as to allow plenty of room for components without over-crowding and are 14 ins. x 12 ins. x 3 ins., while the front panel measures 19 ins. x 14 ins.

Referring to Fig. 1 the controls reading from left to right at the top are: Wave change switch, main tuning condenser, on-off switch; below are the dials for the midget variable condenser, reaction condenser, and volume control.

It was considered economical to incorporate a loud-speaker into the design, in order that the field coil could be used for additional smoothing. The instrument used is a *Sonochorde* Junior Model, with a field resistance of 2,500 ohms and capable of handling an undistorted output of 3 watts.



**Fig. 1.**  
**Front view of the Empire Short Wave Super-heterodyne Four. Controls Top: left to right, wave change switch, tuning condenser, on-off switch. Bottom: left to right, aerial tuning condenser, reaction condenser, volume control.**

*Make use of the Standard Frequency Transmissions.*



The two-ganged condenser is a *British Radiophone, Ltd.*, Type 612, especially designed for use in short-wave superheterodynes as aerial and oscillator tuner. This condenser is mounted on a Steatite base and is manufactured entirely of brass, thus avoiding any differences of potential that might arise through contact between dissimilar metals. The end vanes are slotted for matching adjustments; the maximum capacity of each section is .00016 mfd., and the minimum about 14 mmfds.

The mains transformer is a *Claude Lyons B.A.T.* heavy-duty Type 2A, designed to give 350-0-350v., at 120 mas., 2-0-2v. at 2.5 amps, 2-0-2v. at 2 amps. and 2-0-2v. at 4 amps. A *T.C.C.* electrolytic condenser and a *Ferranti B2* smoothing choke complete the components mounted on the baseboard.

#### Circuit Considerations.

At first sight the circuit diagram Fig. 2 may appear a little complicated due to the fact that the Heptode and Double Diode applications are somewhat new to many readers. A few words of ex-

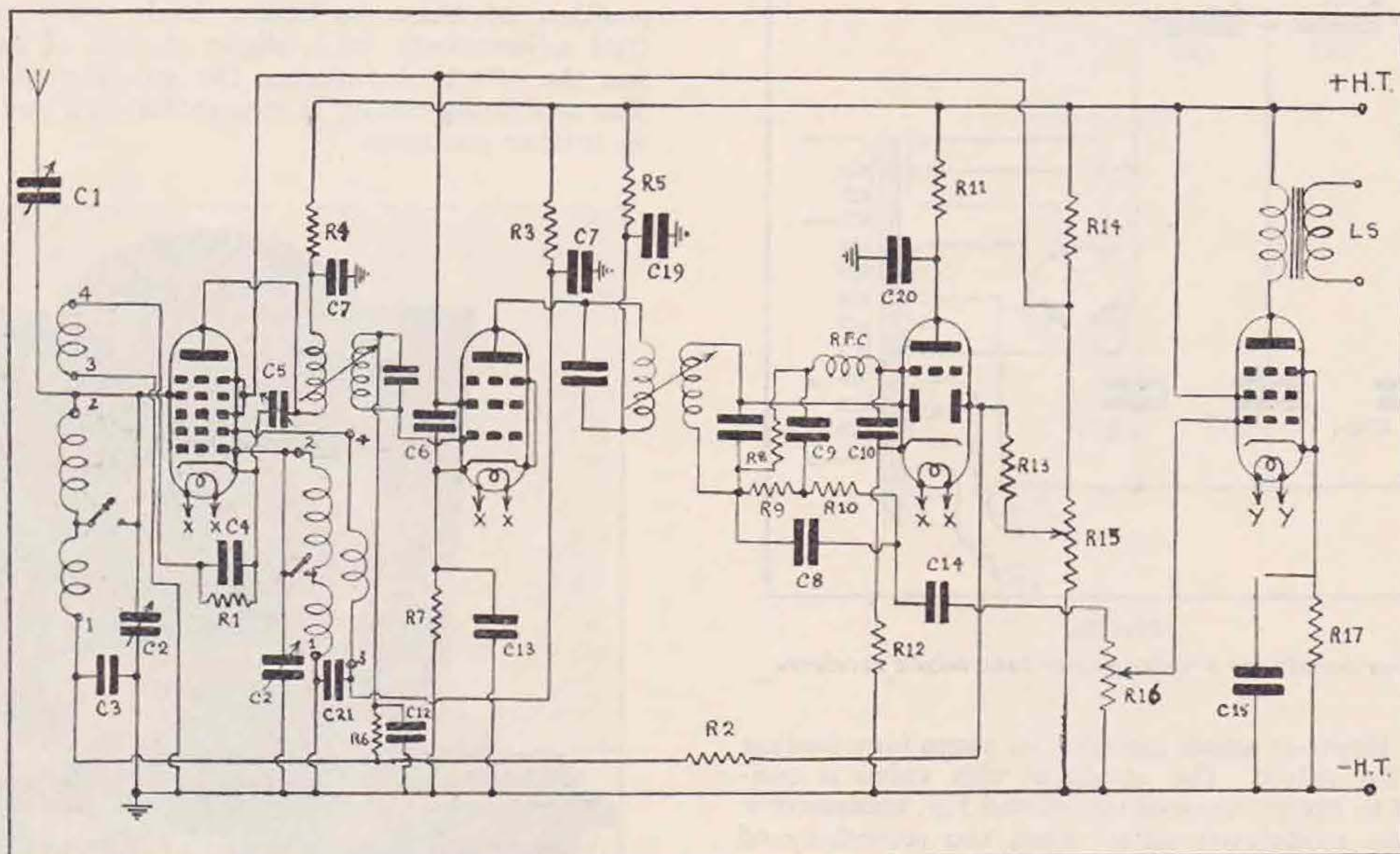


Fig. 2.

#### CIRCUIT DIAGRAM OF THE EMPIRE SHORT WAVE SUPER-HETERODYNE FOUR

##### CLAUDE LYONS B.A.T. RESISTANCES.

R1, 300 ohms, 2 watts.  
R2, R6, R8, 0.5 megohm, 1 watt.  
R3, 50,000 ohms, 1 watt.  
R4, 1,000 ohms, 1 watt.  
R5, R11, 10,000 ohms, 1 watt.  
R7, 200 ohms, 1 watt.  
R9, 100,000 ohms, 1 watt.  
R10, R13, 0.25 megohms, 1 watt.  
R12, 20,000 ohms, 1 watt.  
R14, 15,000 ohms, 2 watts.  
R17, 400 ohms 1 watt.  
R15, 10,000 ohms Clarostat.  
R16, 0.5 megohm Clarostat.  
C1, 40 mmfds. EDDYSTONE.  
C2, 2-gang 0.00016 mfd. RADIPHONE, LTD.  
C5, 0.0001 WINGROVE & ROGERS, Type 4.  
TR, Type 2A CLAUDE LYONS Transformer.  
IF, Ferrocart 150 kc. Type COLVERN. Tuning Coils KSW Type COLVERN. Valve Holders, LECTRO-LINX Airsprung.

##### T.C.C. CONDENSERS.

C3, C9 and C14, 0.05 mfd.  
C4, .02 mfd.  
C6, 1 mfd. (Type T50).  
C7, C11, 0.1 mfd.  
C8, 0.0001 mfd.  
C10, 0.00005 mfd.  
C12, 0.0005 mfd.  
C13, 0.5 mfd.  
C15, 20 mfd.  
C16, 8 mfd. (Type 802).  
C17, 2 mfd.  
C18, 4 mfd. (Type 80).  
C19, C20, 1 mfd.  
C21, 0.01 mfd.  
Valves, FERRANTI VHT 4, MULLARD VP4.  
OSRAM MHD4, and MPT4.  
Rectifier, MULLARD I.W 3.  
CH1, Loud Speaker Field.  
CH2, FERRANTI B2 Choke.  
HFC, McMICHAEL H.F. Choke.  
Base Board, PETO-SCOTT Plymax.  
Disc Drive, WINGROVE-ROGERS Polar-Arcuate.

The screened coils are *Colvern* Type KSW, one being used in the aerial and the other in the oscillator circuit. The Ferrocart I.F. Transformers are manufactured by the same firm, and are peaked to 150 kilocycles. It is possible, however, to adjust these coils to give a peaked separation of about 6 kc. When a receiver of this type is used in hot climates standard I.F. Colverdynes are recommended.

planation will, however, make the operation of the circuit clearer, but before doing this it is desirable to explain the function of the various elements forming the Heptode valve. In this valve grids 1 and 2, together with the cathode form the triode portion and are used as the oscillator section. Grids 3 and 5 comprise the screened grid, whilst grid 4 is the control grid.



Tracing the incoming signal, it will be seen that this passes to the control or modulator grid of the Heptode. Reaction at signal frequency is applied through the cathode and bias resistance R1 to C5, which is a variable .0001 mfd *Polar* condenser Type 4, placed in the primary circuit of the first I.F. transformer. This transformer is included

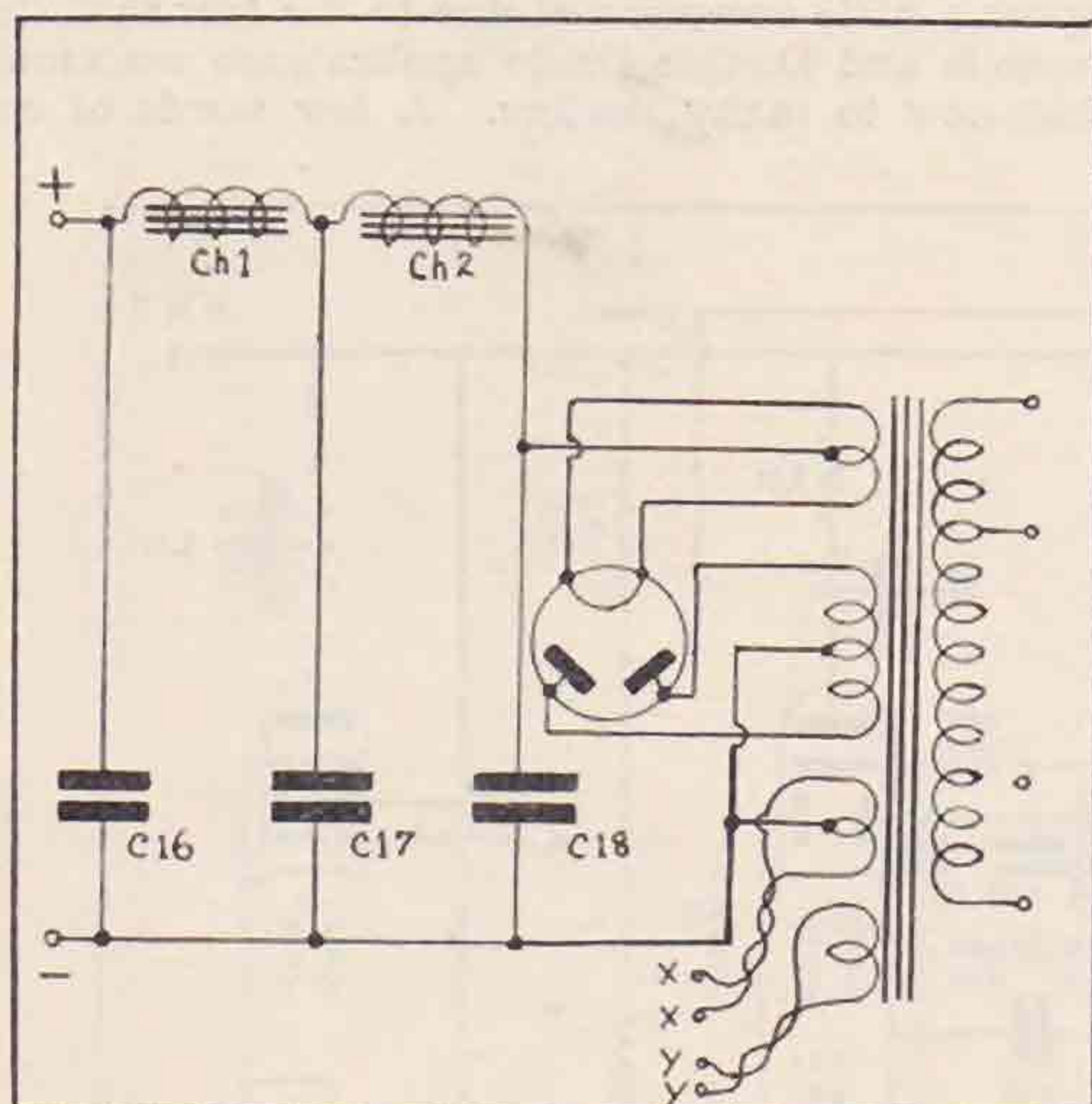


Fig. 2a.

Power supply for 4-valve super-heterodyne receiver.

in the Heptode anode circuits, its secondary feeding the VP4 valve. The anode of this valve is connected to the primary of the second I.F. transformer and the modulated signal from the secondary of this transformer is applied to the double-diode triode between the cathode and diode anode 1. The L.F. rectified signal is developed across R9 and R10 and the L.F. signal voltage transferred to the triode grid through C9. The amplified voltage of audio frequency is now present across the output load resistance R12, and is passed to the grid of the MPT4 through C14. Manual volume control is provided by the potentiometer R16.

To delay the control produced by the A.V.C. a steady negative potential is applied to the second diode through the variable bias resistance R15. The diode is connected through its load resistance to the slider, which is adjusted to give the minimum bias. The potentiometer for this control will be observed at the back of the chassis behind the MHD4 valve in Fig. 3.

Although the field of the moving-coil speaker provides sufficient smoothing for practical purposes, it was considered desirable to incorporate a *Ferranti* B2 choke in order to produce an absolutely silent background. As a precaution against hum being present in the output, a *Claude Lyons* Clarostat Hum Dinger Type HD30 was placed across the filament of the output valve. The centre tap of this device is connected to H.T. negative and the centre tap of the 220v. 2 amp. winding is left open.

It will be seen in Fig. 4, which shows the underside wiring, that all of the decoupling condensers

and resistors have been so arranged as to permit of short connections being employed. The A.V.C. line is run between the decouplers and the left side of the chassis well above the valve holders, while the aerial is brought in through *Clix* plugs and sockets direct to the 40 mmfd. *Eddystone* Midget condenser. In a receiver of this type it is essential that all wiring shall be kept as rigid as possible, and particularly is this necessary in connection with the wiring from the aerial and oscillator coils to the ganged condenser. It was found desirable to make a careful note of the position of these particular leads when making trial adjustments, as a slight change of capacity has the effect of reducing the ganging efficiency. The remaining wiring is straightforward and needs no further comment.

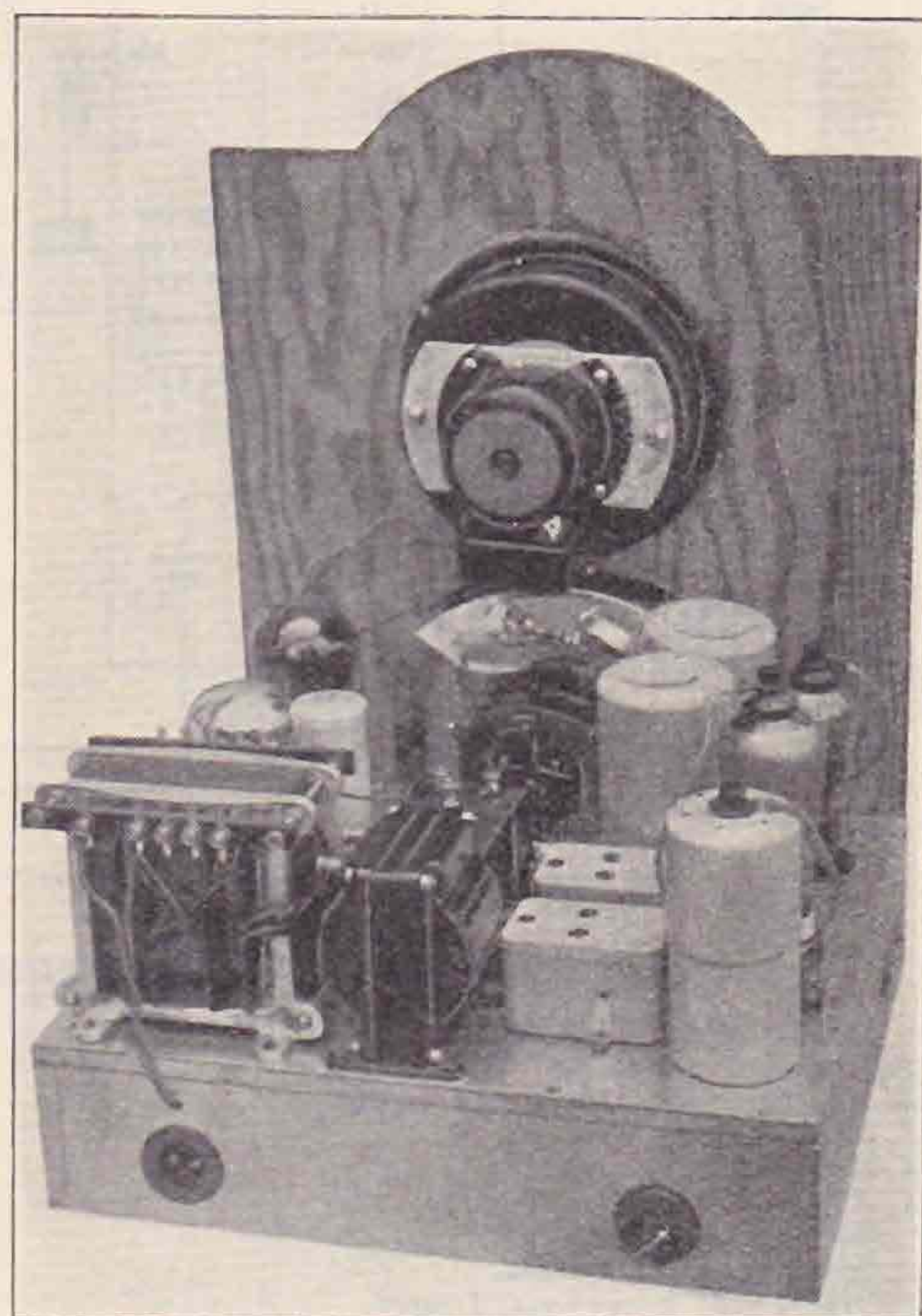


Fig. 3.

Rear view showing assembly and arrangement of components

The disc drive is a *Polar* "Arcuate" ratio 7 to 1 reduction. The two lamp-holders on this drive have been fitted with 4.5 volt 0.3 amp lamps, and a tapping taken from them to the output valve filament leads.

#### Operation.

The tuning of the receiver was found to be exceptionally sharp, in fact, after swinging the pointer across the tuning dial once or twice in order to become accustomed to this condition, it was found possible to separate a high-power c.w. station and the New York-London Telephone Service in only half a degree on the dial. Using the c.w. station as a basis, the filter couplings of the *Ferrocart* I.F. transformers were adjusted to allow for



stray capacities, and after maximum volume had been obtained, a further slight adjustment was made in order to improve the quality of telephony transmissions. After placing reaction at its most sensitive point, and the volume control in the desired position, the variable bias was adjusted to a minimum value. During all tests with this receiver no sign of second channel interference was observed.

The range of the KSW coils appears to be limited from about 15 to about 52 metres, but it is considered that a much wider range could be obtained with greater efficiency if suitable plug-in coils were wound. The writer is not at this stage able to provide particulars of such coils, but he intends to conduct tests, after which the results will be forwarded for publication in this Journal.

It is interesting to mention that when the writer commenced his experiments, doubts were expressed as to the possibility of efficiently ganging a high-frequency receiver, but now that suitable condensers are available, these difficulties appear to have been overcome. It is hoped that the circuit and valves used may suggest other useful applications for short-wave work.

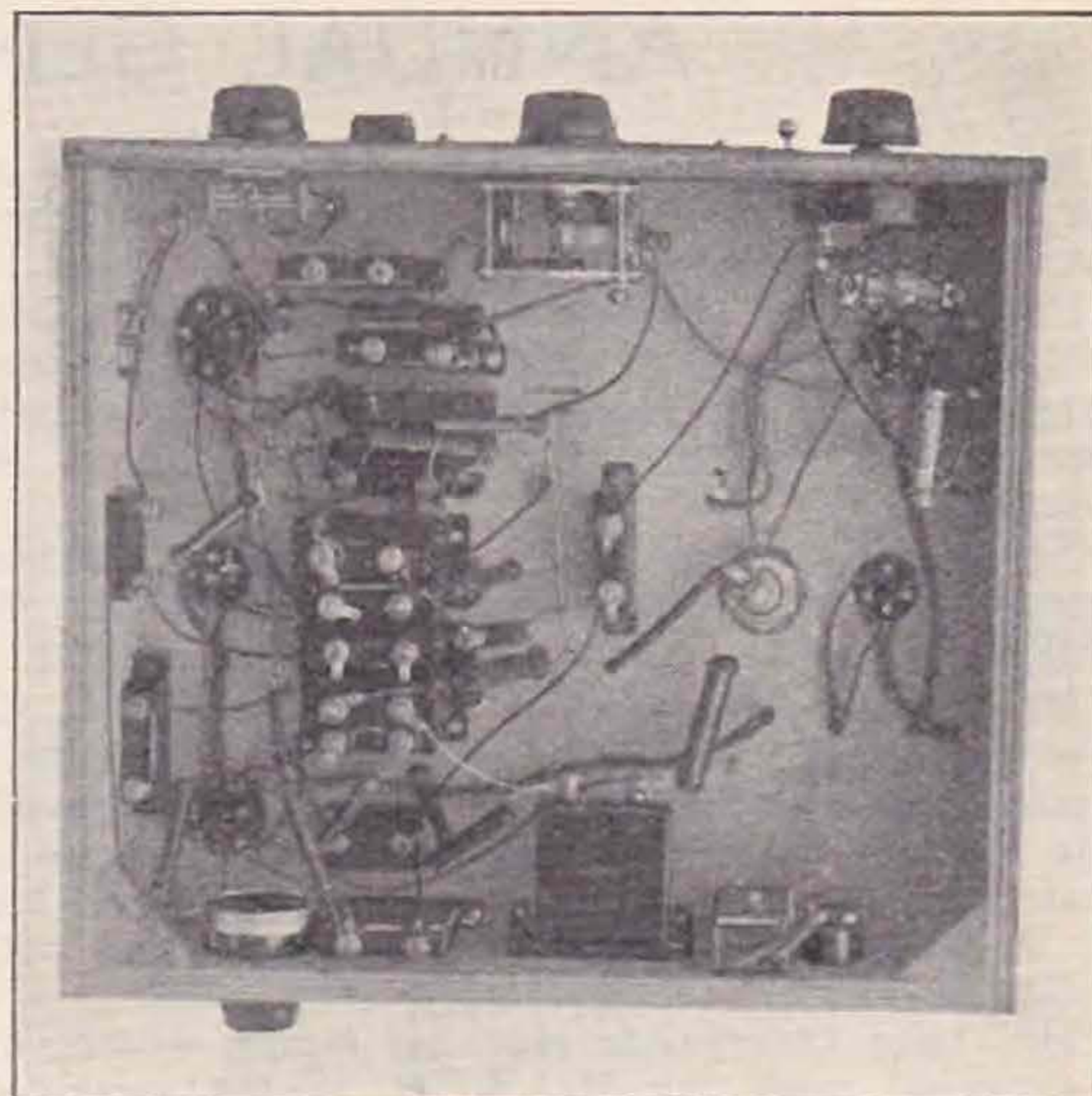


Fig. 4.

Underside of baseboard, showing method of connecting condensers and resistors,

## TRADE NOTICES.

### T.C.C. Interference Suppressor.

In Part 1 of the Interference Elimination article, published in our last issue, certain suggestions were made in connection with the suppression of interference through the mains wiring.

Messrs. T.C.C. have now produced an Anti-Interference Unit which is designed to suppress interference of this type. The unit consists of two non-inductive 2 mfd. condensers joined in series, and with the centre point connected to an earth terminal. The unit is designed for working up to 450v. D.C. or 250v. A.C. and is completely moulded-in with all live parts protected.

For suppressing interference at its source the unit is connected across the mains close to the point at which they are connected to the interfering apparatus, but where this is not possible it can with advantage be fitted at the main switchboard where the mains enter the house.

The unit is a definite stage forward in the campaign being fostered by the I.E.E. and radio manufacturers to overcome the various sources of disturbance which cause criticism to be levelled against radio as an entertainment, whilst the container itself is an excellent example of the progress which has recently been made in the moulding industry.

The price is 10s. 6d.

\* \* \*

### Mullard Rapid Valve Guide.

The third edition of the Mullard Valve Guide is now available, and will be sent free of charge to members mentioning this journal.

This edition has been brought up to date by the inclusion of data and details of their indirectly heated double-diode-triode T.D.D.4 and their two new indirectly heated rectifiers types I.W.2 and I.W.3.

### Clix Continental Valve Holders.

From time to time amateurs require valve sockets for use with continental types of valves. *Lectro Linx, Ltd.*, the well-known makers of Clix terminals, have sent us for examination, a new line of seven-pin sockets especially designed for such valves.

Screened and unscreened types, with or without terminals, are available, selling at 1s. 8d., 1s. 3d., 1s., and 9d. respectively. The screened type is recommended for valves of the Ostar Ganz type.

The quality of these useful components is well up to the usual high standard set by Messrs. *Lectro Linx Ltd.*

\* \* \*

### Polar "E" Type Condensers.

It will be remembered that a Polar "E" type Condenser was specified in the two-valve receiver described in "A Guide to Amateur Radio."

The model used in the original receiver was an advance sample of the finished product. We have now received a finished specimen of this new component and have no hesitation in recommending it to members.

Two types are available, one a single condenser with a capacity of .00015 mfd. and the other a ganged type made up of two .00015 mfd. sections.

The latter is on a single spindle and has an earthed shield between the two halves. The base is made of "Steatite," and the pick up from the rotor is taken through a copper commutator type of brush gear. All plates are soldered solidly to the supports, and the movement is silky in action. The ganged type can be used to advantage for series gap work.

The manufacturers are Messrs. *Wingrove and Rogers, Ltd.*, 188-9, Strand, W.C.2.



## ANNUAL GENERAL MEETING.

Minutes of the Annual General Meeting held at the Institution of Electrical Engineers on Friday, December 29, 1933.

Present: Mr. H. Bevan Swift (President), Mr. Arthur E. Watts (Vice-President), Mr. E. Dawson Ostermeyer (Hon. Treasurer), Mr. John Clarricoats (Secretary), members of Council and about 80 members.

The President moved that the minutes of the last Annual General Meeting held on December 20, 1932, be taken as read. The motion was carried.

Mr. E. D. Ostermeyer proposed, and Mr. J. C. Watts seconded, that the Honorary Treasurer's report and the annual balance sheet be approved. The motion was carried. The President moved that a cordial vote of thanks be accorded to Mr. E. D. Ostermeyer. The motion was carried with acclamation.

Mr. John Clarricoats read his report which, on a proposal made by Mr. A. E. Watts, seconded by Mr. H. V. Wilkins, was adopted. (This report appears in the current issue of the T. & R. BULLETIN.)

The President announced that 438 ballot forms had been received, and reported that Messrs. A. D. Gay, E. A. Dedman, J. C. Watts, J. D. Chisholm, H. C. Page, G. W. Thomas and J. W. Mathews had been elected to serve on Council, together with Mr. A. E. Watts (President), Mr. E. D. Ostermeyer (Vice-President and Hon. Treasurer) and Mr. H. Bevan Swift (Hon. Editor). Messrs. St. Johnston, Milne, Exeter, Wilkins, Whyte, Desmond, Curnow, Alliston and Johnson were unsuccessful candidates for election.

The President, in moving a vote of thanks to the retiring Council, thanked those concerned for their loyal co-operation, and especially expressed his appreciations to Mr. G. W. Thomas for his work as Hon. Editor. He mentioned that the high standard reached by the Society's journal was to a large extent due to Mr. Thomas' efforts, and that it was with regret Council accepted his resignation in June of 1933. The motion was carried with acclamation.

A vote of thanks to the scrutineers, Messrs. L. O. Jones and L. H. Thomas was moved by the President and carried.

Mr. E. D. Ostermeyer proposed, and Mr. J. C. Watts seconded, that Mr. Ockleshaw be invited to act as Hon. Auditor for the coming year. The motion was carried.

A cordial vote of thanks to the President and Council of the I.E.E. for permitting the Society to use their building for meetings was moved by the President and carried.

\* \* \*

At the conclusion of the business meeting, the President presented the N.F.D. award to Mr. H. V. Wilkins, representative for the West London and Middlesex District, first winners of the trophy.

Mr. Arthur E. Watts, on behalf of some 90 personal friends of the retiring President, presented a suitably inscribed electric clock and a cheque to Mr. H. Bevan Swift. Mr. Watts, in making the presentation, said:—

"It is now my privilege, and my very great pleasure, to make a presentation on your behalf to our President, Mr. Bevan Swift.

"Mr. Bevan Swift, who is one of the oldest Amateurs in the country, has served in turn in nearly every executive position in the Society, and has now occupied the Presidential Chair for three years.

"During those three strenuous years our Society has made astonishing progress, which has not been confined to one or two departments, but has embraced practically the whole of our activities. You have just heard from the Secretary what has been done during this year, so I will not take up your time by going into these details.

"There are, however, two things which I should like to mention specially, and which I think may be described properly as land marks in our history; one is the T. & R. BULLETIN, which is the journal of the Society, and the other is our Annual Convention, both of which we owe to Mr. Bevan Swift's foresight.

"Mr. Swift has been the master mind at the back of the work achieved, and we are much indebted to him for his guidance in our deliberations on Council, his unfailing courtesy to all, and his kindly readiness to assist any and everyone who approaches him with no matter what problem or difficulty.

"Mr. Bevan Swift, you are now about to retire from the position of President, and we should like you to know that, in our opinion, you have done a magnificent three years' work.

"We are happy to know that you are continuing as Editor of the T. & R. BULLETIN, and we hope that you will also continue to give us the benefit of your counsel and experience for many years to come.

"In handing you this clock and cheque, which we trust you will accept as a small token of our esteem and affection for you, I also want to convey to you our sincere thanks for all you have done on our behalf, and I am sure that all present will wish me to include Mrs. Bevan Swift in our thanks, for sparing you for so much of your valuable time to work for the progress of Amateur Radio."

A floral tribute was handed to Mrs. Bevan Swift by Mr. Watts.

Mr. Swift, in thanking Mr. Watts and the membership for their generous gifts, assured all concerned that he would continue to serve the Amateur cause to the best of his ability.

---

### "SOLILOQUIES FROM THE SHACK."

(Continued from page 217).

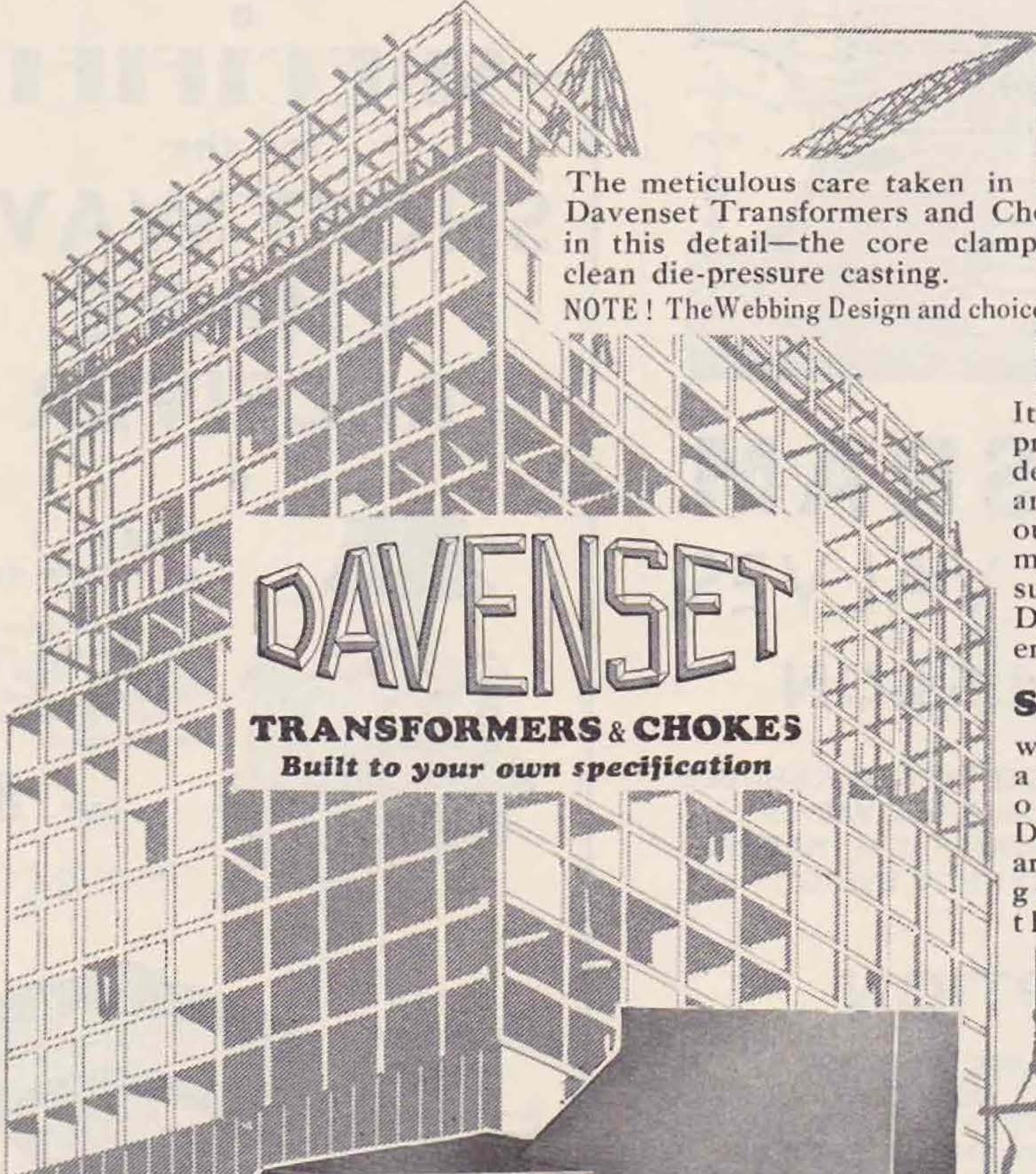
many of them don't! After that, it is insufficient to say, "Heard you very fb last Sunday PLSE QSL." That is mere wall-paper-collecting.

But I hardly like to dwell on this because of the very painstaking B.R.S.'s who send out such full reports. Long may they live. As for the rest, well, I won't say it—it might discourage them. Let them just bear in their minds the fact that it doesn't interest a 50-watt telephony station in London to know that he has been heard "some time or other" in the North of England. Of course he has! But if they can give some interesting dope on his transmission, they'll deserve a card in reply.

AND NOW FOR THE B.E.R.U. CONTEST. WHERE'S THAT SOLDERING-IRON??



# BUILT ON SOUND FOUNDATIONS



The meticulous care taken in the manufacture of Davenset Transformers and Chokes is evident even in this detail—the core clamping frame. It is a clean die-pressure casting.

NOTE! The Webbing Design and choice of two fixing positions.

## DAVENSET

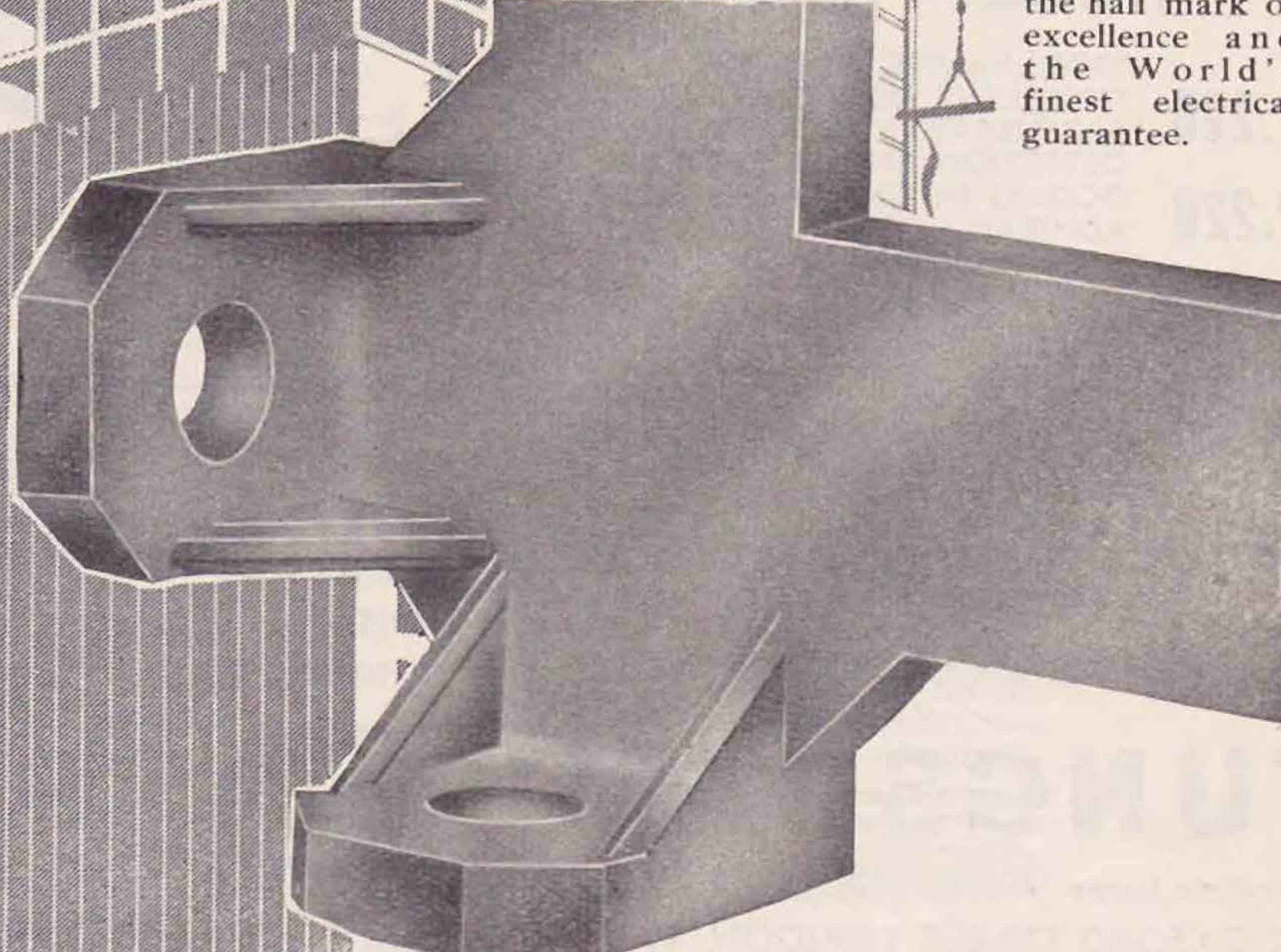
### TRANSFORMERS & CHOKES

*Built to your own specification*

It is the care in the production of small details such as this, and carried throughout every stage of manufacture, that ensures the success of Davenset Transformers and Chokes.

#### SO REMEMBER!

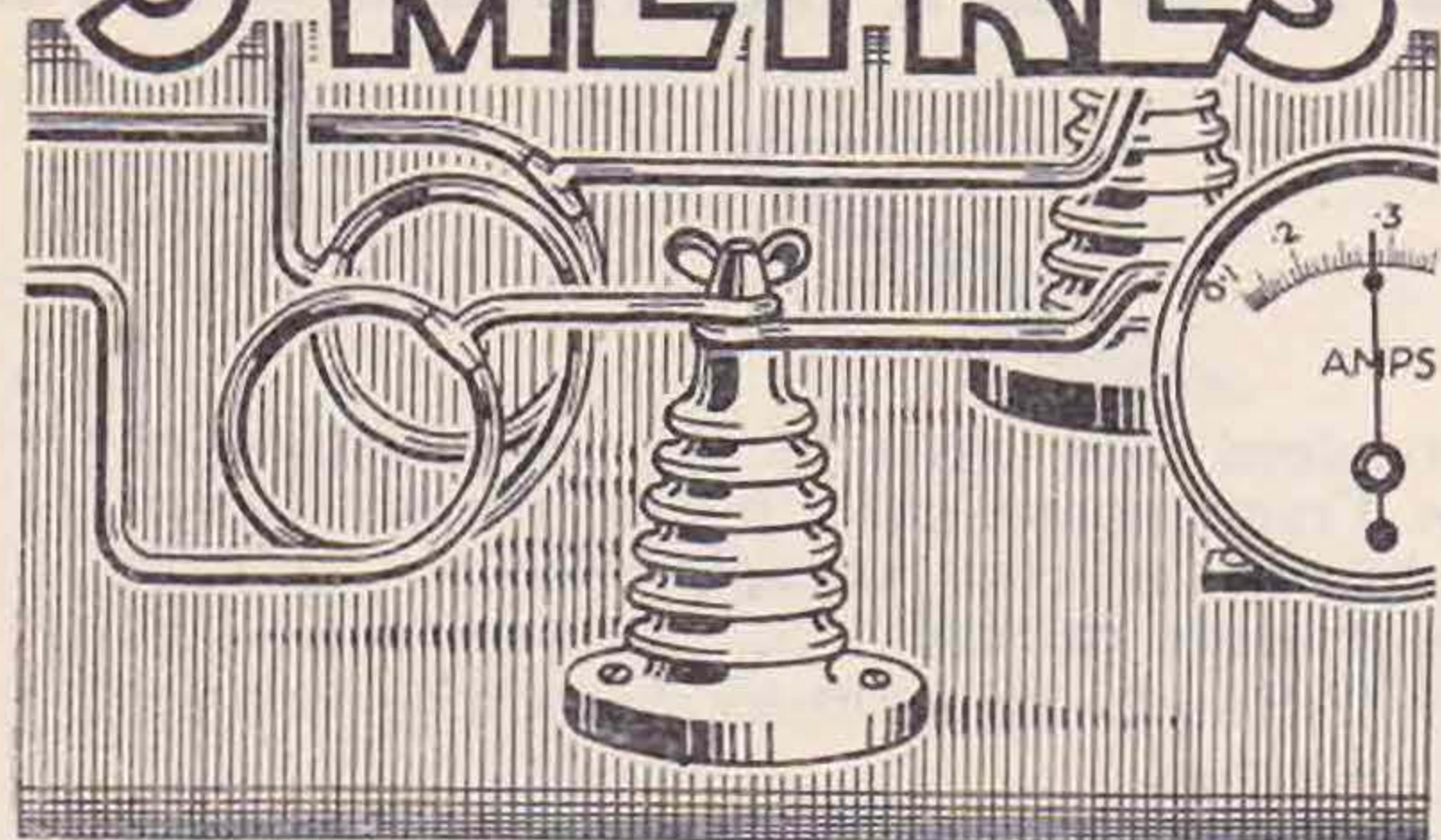
when next you need a reliable Transformer or Choke, that Davenset components are made with the greatest care and thought and are backed by the letters B. S. I.—the hall mark of excellence and the World's finest electrical guarantee.



**PARTRIDGE, WILSON & CO., Davenset Works, LEICESTER**



# 5 METRES



## TUNGSRAM BARIUM VALVES TRANSMISSION

**P.4100**  
**P.430**

FOR THE SELF EXCITED PUSH-PULL OSCILLATOR, THESE VALVES WILL GENERATE THE MAXIMUM HIGH FREQUENCY ENERGY.

## RECEPTION

**L.P.220**

**S.P.220**

THESE VALVES WILL GIVE EXCELLENT RESULTS IN SUPER-REGENERATIVE RECEIVERS WHERE DETECTION AND QUENCHING OCCURS IN ONE VALVE. ALSO ADMIRABLE FOR QUENCHING ONLY.

**P.D.220**

FOR USE AS DETECTOR WHEN SEPARATE QUENCHING VALVE (L.P.220) IS USED.

WRITE FOR FURTHER PARTICULARS AND ADVICE.

(Please mention the "T. & R. Bulletin").

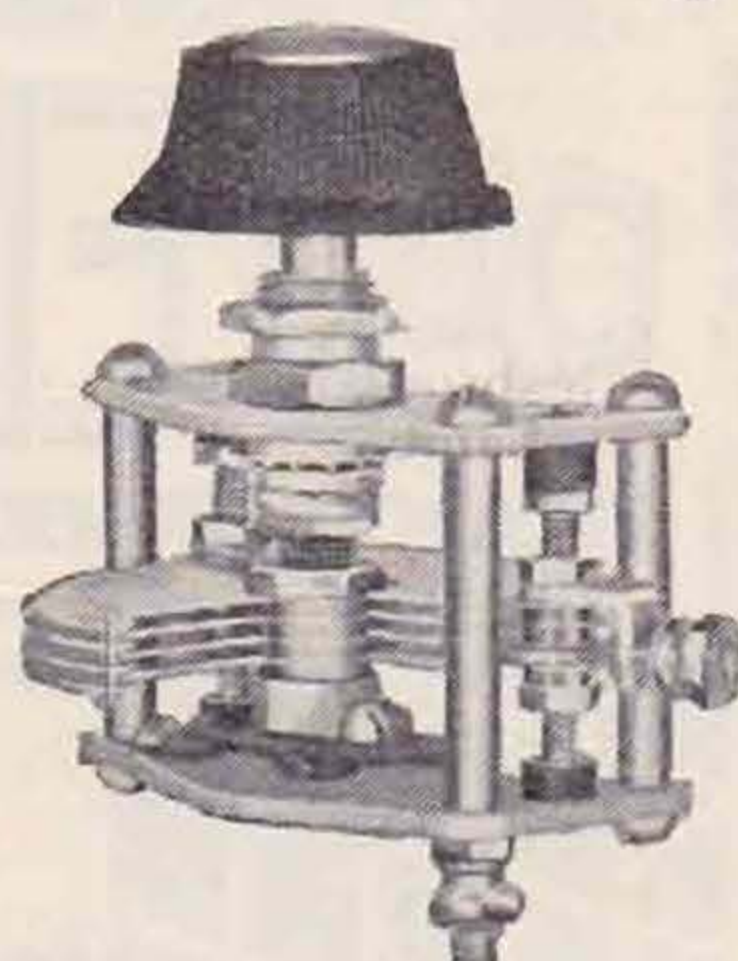
# TUNGSRAM

Electric Lamp Works (Gt. Britain) Ltd.  
72 OXFORD STREET, LONDON, W.1.

# POLAR

## SPECIFIED

for the  
**SHORT WAVE  
EMPIRE  
RECEIVER**



**POLAR  
REACTION No. 4**

A small air dielectric reaction condenser, made in aluminium. Brass Pillars. Ball Bearings. Rotor Vanes bonded. Robust construction throughout.

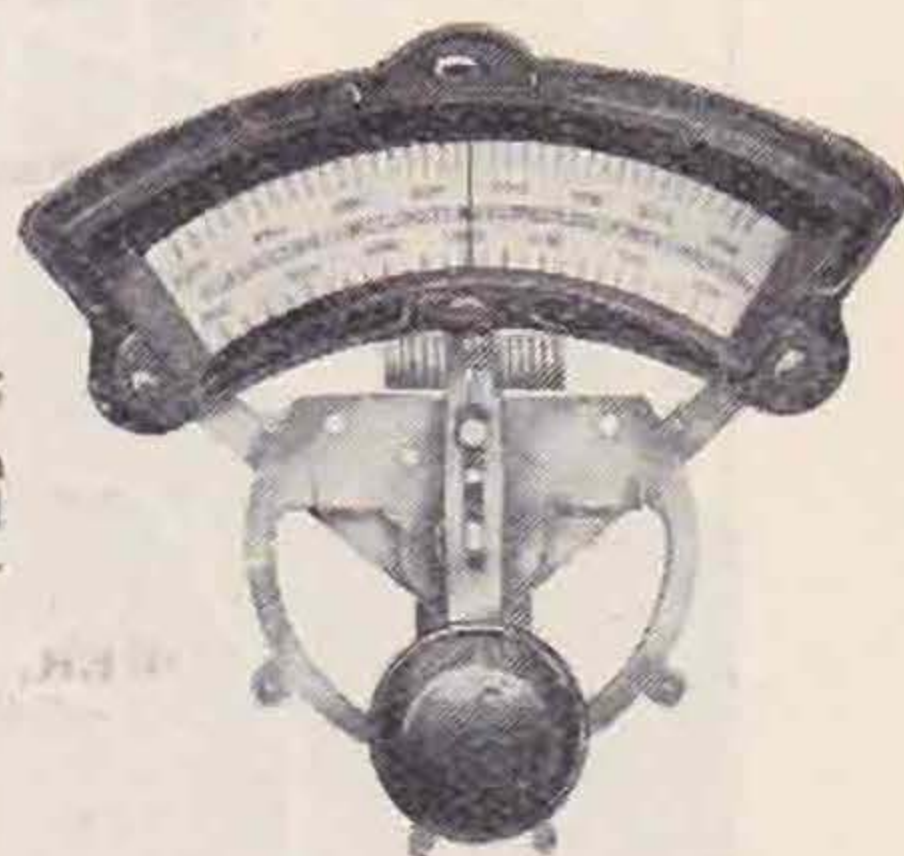
'0001 **3/9**

Also made in '00015, '00025, '00004.

**POLAR  
ARCuate  
DRIVE**

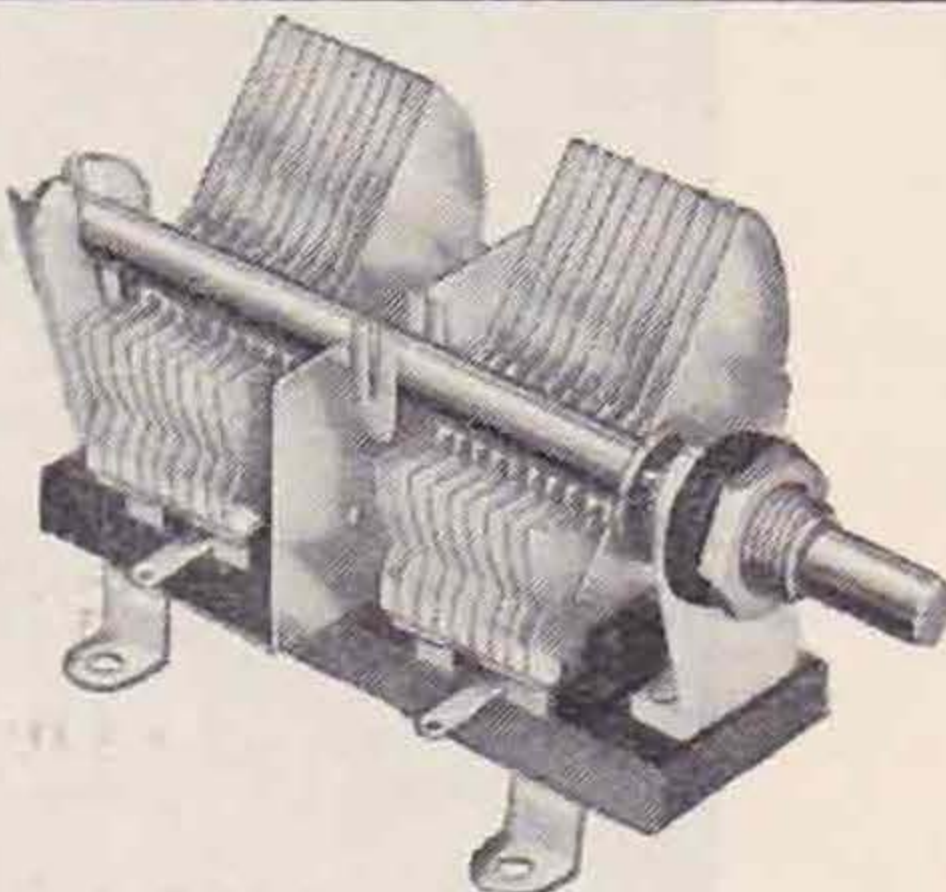
Slow motion drive. Bevelled scale in 0-100° (as specified) or in wavelengths. Moulded escutcheon and Lamp-holder.

**5/9**



Ask for details of the  
**POLAR TYPE 'E'**  
Single and Two Gang  
**SHORT WAVE  
CONDENSERS**

'00015 - - **5/-**  
2X '00015 - **10/6**



SEND FOR THE  
NEW POLAR  
CATALOGUE

**WINGROVE & ROGERS LTD**

188-189, STRAND, LONDON, W.C.2  
WORKS - OLD SWAN, LIVERPOOL  
PHONE - - - - - TEMPLE BAR 2244



# DISTRICT & COUNTY REPRESENTATIVES, 1934

**B**ELOW appears a complete list of the British Districts, with the names and addresses of all Representatives. It is our intention to publish this list quarterly, and in order to make future issues of additional value, Representatives are invited to forward particulars of their telephone numbers (home and/or office).

## District 1.

D.R., Mr. J. NODEN, G6TW, COPPICE ROAD, WILLASTON, Nr. NANTWICH, CHESHIRE.

West Cheshire and West Lancashire :—

Mr. H. W. Stacey, G6CX, 42a, Hampstead Road, Elm Park, Liverpool.

East Cheshire and East Lancashire :—

Mr. W. Lucas, G20I, 64, Worsley Road, Winton, Patricroft, Manchester.

Cumberland and Westmorland :—

Mr. R. H. G. Garside, G2YN, 7, Egremont Road, Hensingham, Whitehaven, Cumberland.

NOTE.—The division between Cheshire and Lancashire, takes place along the line Lancaster, Preston, Wigan, Warrington and Crewe, all five towns being regarded as being the East Cheshire—East Lancashire section.

## District 2.

D.R., Mr. L. W. PARRY, G6PY, 13, HUDDERSFIELD ROAD, BARNSELY.

Northumberland and North Durham :—

Mr. H. C. D. Hornsby, G5QY, 7, Lansdowne Terrace, Gosforth, Newcastle-on-Tyne.

South Durham and Middlesbrough :—

Mr. T. Garrard, G6CV, 50, Lambeth Road, Linthorpe, Middlesbrough.

Yorkshire (West Riding) and that portion of the North Riding lying west of the L.N.E.R. main line :—

Mr. H. Rayner, G5TQ, 32, Grange Road, Cleckheaton.

## District 3.

D.R., Mr. V. M. DESMOND, G5VM, 199, RUSSELL ROAD, MOSELEY, BIRMINGHAM.

Shropshire :—

E. R. Westlake, BRS46, "Ardlui," Wenlock Road, Shrewsbury.

Staffordshire :—

M. A. E. Dyson, G6NJ, "Raggan House," 52, Burton Road, Burton-on-Trent.

Warwickshire :—

Mr. G. Brown, G5BJ, 62, The Ring, South Yardley, Birmingham.

Worcestershire :—

Mr. H. Littley, G2NV, "Radiohm," Bridgnorth Road, Stourton, Stourbridge.

## District 4.

D.R., Mr. W. W. STORER, G6JO, "SUNIA," 28, BLANKLYN AVENUE, LEICESTER.

Derbyshire :—

Mr. R. H. Streete, G2SD, Waverley Lodge, Haven Baulk Lane, Littleover, Derby.

Leicester :—

Mr. P. R. Chapman, G5VH, "Bridgmont," Uppingham Road, Leicester.

Northants :—

Mr. R. J. Pankhurst, G5YF, 9, Shakespeare Road, Kettering.

Nottinghamshire :—

Mr. J. Lees, G2IO, 17, Trevoise Gardens, Sherwood, Nottingham.

## District 5.

D.R., Mr. W. B. WEBER, G6QW, 2 BALMORAL ROAD, ST. ANDREWS, BRISTOL.

Gloucester :—

Mr. J. M. Walker, G5JU, 414, Fishponds Road, Eastville, Bristol.

Oxford :—

Mr. H. J. Long, G5LO, Stanton Harcourt, near Eynsham.

Wiltshire :—

Lt.-Col. W. L. Palmer, G2BI, "Elm Field," Calne.

East Somerset :—

(To be appointed)

## District 6.

D.R., Mr. W. B. SYDENHAM, B.Sc., G5SY "SHERRINGTON," CLEVELAND ROAD, TORQUAY.

Cornwall :—

Mr. J. Tamblyn, G6QH, Barkla Shop, St. Agnes.

Devon :—

Mr. J. J. G. Taylor, G6XD, Willowby, Radford Road, Plymstock, Plymouth.

Dorset and West Somerset :—

Mr. C. H. L. Andrew, G2HF, 16, Mitchell Street, Wellington, Som.

## District 7.

D.R., Mr. E. A. DEDMAN, G2NH, 63a, KINGSTON ROAD, NEW MALDEN, SURREY.

Berkshire and Hampshire :—

Mr. R. C. Neale, G6GZ, Farnboro' Road, Farnborough, Hants.

Surrey :—

Mr. R. J. Denny, G6NK, 32, Waverley Road, Weybridge.

## District 8.

D.R., Mr. G. FEATHERBY, G5FB, 30, LINDSAY ROAD, BISHOP'S STORTFORD, HERTS.

Bedfordshire and Cambridgeshire :—

Mr. B. M. Scudamore, G6BS, 39, Owlstone Road, Newnham, Cambridge.

Buckinghamshire :—

Mr. K. E. Brian Jay, G2HJ, The Quinta, Elm Close, Amersham.

Hertfordshire :—

Mr. H. R. Scobell, 2AZD, "Sherborne," Bucknall's Drive, Watford.

Huntingdonshire :—

Mr. B. Rowell, 2AKA, 14, Market Hill, St. Ives.

## District 9.

D.R., Mr. F. L. STOLLERY, G5QV, BEAUMONT HALL HOTEL, MARINE DRIVE, CLACTON-ON-SEA, ESSEX.

Essex :—

Mr. M. Buckwell, G5UK, 115, Tankerville Drive, Leigh-on-Sea.

Norfolk :—

Mr. H. W. Sadler, G2XS, "Redways," Wootton Road, Gaywood, King's Lynn.

Suffolk :—

Mr. C. A. Jamblin, G6BT, 121, Queen's Road, Bury St. Edmund's.

## District 10.

D.R., Mr. D. LOW, G5WU, "NANTISSA," WESTBOURNE ROAD, PENARTH, GLAM.

Glamorgan :—

Mr. R. W. Hall, 2AHN, Newholme, Llwynmawr, Sketty, Swansea.

Monmouth :—

Mr. F. T. Wilson, G2XX, 85, Risca Road, Newport.

Breconshire :—

Mr. G. R. S. Farnie, G5FI, The Grange, Cefn Coed, nr. Merthyr Tydfil.

## District 11.

D.R., Mr. T. VAUGHAN WILLIAMS, G6IW, "MALINCOURT," GROSVENOR AVE., RHYL, FLINTSHIRE.

## District 12.

D.R., Mr. S. BUCKINGHAM, G5QF, 19, OAKLEIGH ROAD, WHETSTONE, N.20.

North London :—

Mr. E. R. Radford, G2IM, 33, Whitehall Park, N.19.

North-West London :—

Mr. D. N. Corfield, G5CD, 10, Holders Hill Gardens, Hendon, N.W.4.

## District 13.

D.R.,  
(To be appointed)

## District 14.

D.R., Mr. T. A. ST. JOHNSTON, G6UT, 28, DOUGLAS ROAD, CHINGFORD, E.4.



## District 15.

D.R., Mr. H. V. WILKINS, G6WN, 81, STUDLAND ROAD, HANWELL, W.7.

West London :—

Mr. G. A. Exeter, G6YK, 29, Askew Crescent, Shepherds Bush, W.12.

Middlesex :—

Mr. F. Charman, G6CJ, The Cottage, Park Way, Long Lane, Hillingdon.

## District 16.

D.R., Mr. A. O. MILNE, G2MI, "SOUTHCOT," LARKFIELD, KENT.

Kent :—

Mr. G. A. Chapman, G2IC, 109, Cheriton Road, Folkestone.

Sussex :—

Mr. C. W. K. Sands, G5JZ, "Springfield," Heathfield Tower.

## District 17.

D.R., Mr. A. E. LIVESEY, G6LI, STOURTON HALL, HORNCastle, Lincs.

Lincolnshire :—

Mr. W. Grieve, G5GS, Summerford, New Waltham.

Rutland :—

(No representative).

## District 18.

D.R., Mr. T. WOODCOCK, G6OO, "SANTOS," GEORGE STREET, BRIDLINGTON, YORKS.

Yorkshire (East Riding) :—

Mr. W. A. Clarke, G5FV, "Lynton," Hull Road, Keyingham, Hull.

Yorkshire (North Riding) :—

Mr. J. A. Cuthbertson, G5CU, "Dunromyn," Cross Lane, Burniston Road, Scarborough.

NOTE.—The North Riding covered by this District is that portion which lies to the east of the L.N.E.R. main line.

## Scotland.

Manager, Mr. J. Wyllie, G5YG, 31, Lubnaig Road, Newlands, Glasgow.

## Northern Ireland.

Manager, Mr. W. Graham, G15GV, 5, Ratcliffe Street, Donegall Pass, Belfast.

## DISTRICT NOTES

## DISTRICT 1 (North Eastern).

MR. J. DAVIES (G2OA) reports that 23 members were present at the December meeting held in Liverpool. This number included five "heroes" from Manchester; who made the journey in spite of bad fog; and Mr. Chafin (W4AII-4PAW) the winner of last year's A.R.R.L. N. & F.D. Contest.

B.C.L. Interference Elimination will be discussed at the January meeting arranged for the 17th inst., this will be followed in later months by discussions on 56 mc. work, and a debate on the merits of the low and high frequency bands.

G5SF reports active after an absence of many years, while 2AYY advises that he is now G5JG. The C.R. extends New Year greetings to all old and new friends.

## DISTRICT 2 (North-Eastern).

First of all, allow me to wish you all a very Happy and Prosperous 1934.

There is very little of real interest to report this month.

Lieut.-Commander W. S. Mann recently gave an address on R.N.W.A.R. work to the Newcastle Group, and the result was a gain of several members.

Sheffield seems to be pulling together again, and a visit to the North Regional Transmitters has been arranged. The next meeting will be held on January 19.

I intend visiting Newcastle and Middlesbrough during the next few weeks, where I hope to see most of the members in person.

## DISTRICT 4 (West Midlands).

Mr. J. Lees (G2IO), C.R. for Notts and Derby, reports G5YP, 2HD, 5VU, 6KQ, and BRS1155 active. G6MN is assisting the Doncaster Police in radio matters, and G6DS has worked his first ZL. G5YP has run into a spot of bother with local B.C.L.'s. (Have you studied the Interference Elimination article, OM?—Ed.)

Derbyshire, after four years of inactivity, has sprung to life, and a Derby Short Wave Radio Society has come into being with G2SD, 5HT, 2RP, and 2BOW (ex BRS4) all taking an active part. Already the membership exceeds twenty, and

a club-room, with Morse practice facilities, is receiving much patronage.

G2IO recently delivered a talk to the members, during which he explained various phases of Society work. Mr. Streete (G2SD) has been invited to serve as the new Derby C.R., and it is anticipated that the long-awaited revival of interest in that county will become a reality. Mr. Streete is chairman of the local club.

Mr. Storer reports that the Leicester Amateur Radio Society meetings held every fortnight at the Turkey Café, Leicester, are always well attended. On December 19 the members of the Society paid a visit to the works of Messrs. Partridge & Mee, Ltd., where they were given a short talk on sound film reproducers and a demonstration of one of the firm's amplifiers. The party were conducted through the workshops by Mr. S. N. S. Mee, and were shown various types of transformers and amplifiers in the course of construction, including an amplifier giving a speech input of 132 watts! A Cathode Ray Tube demonstration was also given.

The Society has a series of interesting lectures arranged for the spring, and those interested should write to the Hon. Secretary, Mr. W. A. Roberts, "Walco," Sawday Street, Leicester, for details.

## DISTRICT 5 (Western).

Capt. G. C. Price, in bidding farewell to his District, writes as follows: "It has always been my aim to keep these notes as general as possible, according to the rules. My final brief remarks are that the condition of the District is eminently satisfactory. During the seven years I have held office, I have watched the membership grow from a mere handful to dozens of keen and enthusiastic members, and the happy condition I now report is due to the excellent work done by the C.R.'s and the support which they and the membership have given me. I take this opportunity of thanking one and all for their loyalty and help. I hope that 1934 will bring further laurels to the District by renewed successes, and that every member will enjoy a prosperous year."

Mr. W. B. Weber (G6QW) appreciates the honour of his appointment as Representative for District 5



and with his C.R.'s takes this opportunity of wishing all members a happy and prosperous New Year.

It is with a deep sense of appreciation that we put on record our sincere thanks to our retiring D.R., Capt. G. C. Price (G2OP), for the staunch and loyal support that he has given to our District during his term of office. We all thank you, OM.

During December the Bristol section held their usual monthly meeting, which was well attended. These meetings are held on the first Thursday of every month at the Full Moon Hotel, North Street, Bristol, at 7.45, and the D.R. hopes that all members, especially the new ones, will attend.

Many members attended the television lecture and demonstration arranged at the Bristol University, also the Post Office Short Wave Station at Hutton, near Weston-super-Mare, a convoy of eight cars meeting for this occasion.

The Annual County Dinner will be held on Saturday, January 20, at the Full Moon Hotel, Bristol, when Capt. G. C. Price (G2OP) will be the guest of honour, and a welcome is extended to all R.S.G.B. members. Full particulars can be obtained from G6QW.

## DISTRICT CALENDAR January/February, 1934.

**January 20.** Gloucester County Dinner at Full Moon Hotel, Bristol, at 7 p.m.

**January 23.** District 3 and M.A.R.S., at Hope and Anchor Hotel, Edmund Street, Birmingham, at 8 p.m.

**January 23.** District 14. At G6LL, 178, Evering Road, Clapton, at 7.30 p.m.

**January 24.** District 15, at G6WN, 81, Studland Road, Hanwell, at 7.30 p.m. Talk by G6CJ, "Background Noises on Receivers."

**January 27.** District 12 at G2IM, 33, Whitehall Park, Highgate, at 7.30 p.m. Talk by G6CL, "Modern C.C. Transmitters."

**February 1.** District 5, at Full Moon Hotel, Bristol, at 7.30 p.m.

**February 1.** S.L. and D.R.T.S. at West Norwood Brotherhood Hall, at 8 p.m.

**February 4.** District 7, at G6GZ, Farnborough Road, Farnborough, at 2.30 p.m.

**February 13.** District 3 and M.A.R.S., at Hope and Anchor Hotel, Edmund Street, Birmingham.

### DISTRICT 6 (South-Western).

Most of the members in this district seem to be active, and as far as can be ascertained, practically all bands are in use. Unfortunately, another of the District Budgets seems to have gone astray, consequently the D.R. is only able to report on information that has come to his knowledge. It is hoped that by the time these notes appear, the missing volume will have turned up, but in case it has not, will the member who has left it under that pile of old issues of the "BULL." kindly get it out and post it on to me!

The D.R. has been unable to arrange the "tea-rag chews" suggested, but hopes to do so soon. Probably Exeter will be the first venue chosen.

G5GD has worked a ZL on 14 mc. and so qualifies for his W.B.E. and W.A.C. It is believed that G5WY also accomplished this feat a day later, but the D.R. has had no confirmation. ZL's seem to be coming through well in the S.W. between 0830 and 0930 G.M.T., and the D.R. has found contact comparatively easy, having established 60 contacts in 50 days on 14 mc.

On 3.5 mc., G5VL, 6RP and 5SY are active. The D.R. hopes to make wider use of this band, as a means of keeping in closer touch with the members of the District, and asks all who can to listen for his telephony transmissions each Sunday at 1030 G.M.T. He hopes to contact all active No. 6 stations, and in this way it should be possible to bind more closely together the members of a rather widely scattered area. Your support is requested, OM.

By the time these notes appear, the appointment of C.R.'s will have been confirmed, and it is hoped that all members will loyally support those who have expressed willingness to give of their time in the interests of the members in their counties. The D.R. would like to thank the prospective C.R.'s for agreeing to accept office, for by so doing the District is, for the first time, to be properly represented.

In conclusion, the D.R. wishes all members happiness and prosperity in the New Year, with plenty of DX.

### DISTRICT 7 (Southern).

The attendance at the December District Meeting, held at G5WP, was well up to standard, and the usual interesting discussions ensued. The D.R. takes this opportunity of thanking all who helped by providing facilities for holding monthly district meetings during the last year.

The district meeting is now a well-established feature of our activities, and provides opportunities for help to the younger members of the Society that are almost unobtainable in any other way.

The February meeting will be held at Farnborough on Sunday, February 4, 1934, meeting at G6GZ, to be followed by tea and discussion at the Tumble Down Dick Hotel, adjoining.

Activity on all bands has been much as usual during the last month, but there is a noticeable falling off of good conditions for DX work on the higher frequency bands.

Congratulations to G5LC and Mrs. LC on the arrival of a junior op.

### DISTRICT 8 (Home Counties).

Signs are not lacking that this district is rapidly assuming an air of healthy activity. For instance, a very acceptable Christmas present arrived for the D.R. in the form of the first edition of the new letter budget. It is a splendid effort and great credit is due to G2HJ as manager in getting off the mark so briskly and so efficiently. One very interesting point brought to light therein is the fact that BRS1132 uses an aerial hung down a well, whereby he receives signals that would otherwise be drowned by qrm from motors at a local factory. This seems to offer immense possibilities—as a change from the Crystal Palace, how about some 56 mc. tests from the Blackwall Tunnel?



Cambridge seems to be suffering from the rebuilding epidemic, G2XV for dx 'fone, 5JO à la B.B.C., and 6BS for B.E.R.U. contest, G2OR (ex BRS895) is on the air with a nice note on 7 and 14 mc., also G5PI and 6YP are active. G5YK is to be congratulated on his re-election to Council, incidentally he probably does more serious experimenting during his week-ends at Cambridge than most members do in their full time.

There are several A.A. men in the district who are looking forward to full tickets early in the New Year, and it is hoped that when proficient they will be applying for 3.5 mc. permits. The D.R. wishes to encourage the use of this band for district and inter-district contacts which are all too infrequent at present.

Preliminary details for N.F.D. are now being discussed, any suggestions or offers of gear will be welcomed. After his excellent score last year, it is natural we should look to G6BS for this year's 80-metre outfit. This he has agreed to do.

The following are active in the district: G5VT, 6BS, 5JO, 2XV, 2OR, 5PI, 6YP, 5YK, 2HJ, 2RL, 2QX, 5FB, 2AZD, 2ACX, 2BQK, BRS1132.

#### DISTRICT 9 (Eastern).

No reports are to hand from the three counties, although most stations are active. The D.R. takes this opportunity of wishing all members a bright and happy New Year. Please send something along for the February notes, if only a card to your C.R.

#### DISTRICT 10 (South Wales and Monmouth).

It was pleasing to observe that activity was maintained throughout the Christmas holidays, and with the New Year ahead, it is hoped that all members will take full advantage of their licence facilities and use the bands allocated to them.

Your D.R. regrets that owing to business pressure he was unable to attend the December meeting, but G2XX reports that G6YJ, 2PA, 5KK, 5BI, 2JL, 2XX, and 2BPG were present, and that the meeting was extremely interesting.

All members in Monmouth continue to maintain activity except G2PA, who is inactive for a short period. Both G5KK and 6YJ are rebuilding, and anticipate better results in the New Year.

Mr. Mudford, Secretary of the Blackwood Radio Society, reports considerable interest with regular meetings being held on Mondays. Members of No. 10 are welcome at these meetings, and it is noted that G5BI, 6PF, and 6GW have taken advantage of this opportunity to co-operate with this active society.

G6PF, Abertillery, is working fone on 1.75 and 3.5 mc., and obtaining very good reports; G5WU, BRS727, 1128, and 1131 are also active in the Cardiff area.

The Swansea Radio Society did not have the usual attendance at their last meeting, but keenness still predominates in this area. 2AHN, now G2SN, is on the air, the best of luck, OM. Members will be sorry to hear that 2AWN has been seriously ill, but we are pleased to hear that he is making an excellent recovery. I feel sure that all members join with me in wishing him good health and strength, with a complete recovery in the near future.

Your D.R. and C.R.'s would like to take this opportunity of wishing all members the best of luck and prosperity in the coming year.

#### DISTRICT 11 (North Wales).

I am sorry to have to grumble again, but with the exception of G2II and the Prestatyn Group I never hear from anybody. Will you please let me know what you are doing?

It is proposed to hold a meeting in January so that we can discuss plans for 1934; will all interested members send me a card giving alternative dates and venues, as well as items they wish inserted on the agenda?

There is not much news this month. The active stations are G2II and the Prestatyn BRS men, BRS1060, 1156, 1211, 1303. A Happy New Year to all.

#### DISTRICT 12 (London North).

Twenty-one members were present at the December meeting held at G6FI. A distinguished and very welcome visitor in the person of Mr. George Merriman (VS6AH and G6GM) was present to give a few interesting comments on modern receiver design.

### Forthcoming Contests

February 3, 4, 10 and 11.

Senior B.E.R.U.

February 17, 18, 24, and 25.

Junior B.E.R.U.

March 3, 4, 10 and 11.

Low Power.

The event of the evening was the Junk Sale, as a result of which 15s. was forwarded to the *Daily Sketch* Christmas Hamper Fund.

The January meeting will take place on the 27th, at 33, Whitehall Park, Highgate, N.19, when Mr. E. R. Radford, G2IM, will act as host. A discussion on modern C.C. stations will be opened by G6CL. A report from the N.F.D. committee will be tendered at that meeting.

The December letter budget was poorly supported, but the letters from those who contributed showed that much useful work is being achieved.

Remember, all reports to the D.R. or C.R.'s before February 1, please.

#### DISTRICT 13 (London South).

A Happy New Year to all District 13 members, and may 1934 prove a successful year for S. London. It is high time the B.E.R.U. trophy came to this part of the world, and we hope that every member in the district will do his utmost to secure the cup for No. 13. Although there is plenty of talent in the district we seem to just fall short of the top class, and therefore it is with added pleasure that we congratulate BRS250 on his success in the 3.5 mc. contest and hope that this will be the first of a series of "bags" for S. London.

As regards individual activities, we have very little information, and any news of interest will be

*Let your DR hear from you.*



welcomed. Pending the appointment of the new DR. this should be sent to HQ.

G6NF is putting out some excellent telephony on the 3.5 mc. band, and is very busy with the Calibration Section work. As a result of Mr. Weston's lecture last month he is making experiments with a Cathode Ray Oscillograph, and some interesting developments should result.

We are sorry to hear of G2GF's long illness, and trust that he will soon be fully active again.

G5IS is believed to be contemplating QRO with the remains of a dismantled battleship!

The January meeting of the S.L.D.R.T.S. was held at Bush House, where there was a lecture and demonstration by G5SA on Sound Films. The February meeting will be held at the W. Norwood Brotherhood Hall as usual at 8 p.m.

#### DISTRICT 14 (London East).

Amongst the subjects discussed at the last District meeting were N.F.D. matters, and B.C.L. interference.

BRS1175 is now 2BVH, and is building a CO/PA. G6QK was recently visited by XOH7NH and XOH3NG, and he in turn visited their respective ships, SS. *Carolus* and S.S. *Greta Thorden*, while they were lying in the Surrey Docks. XOH7NH has been worked recently by G6QK, and the D.R. on 7 mc. The Finnish operators hope to attend a District meeting soon. The next District meeting will be held at the QRA of G6LL on Tuesday, January 23, 1934—178, Evering Road, Clapton, E.5.

#### DISTRICT 15 (London West and Middlesex).

Owing, it is presumed, to a very cold night, the December meeting was the most poorly attended for some months past. For particulars of the January meeting, see District Calendar. More offers are wanted for the months following February for QRA's for meetings. Will all those willing to help please drop me a line as soon as possible?

By the time these notes appear in print, Miss Rita Smith (of G6VP) will have changed her name to that of Mrs. Price (of G6HP). May I take this opportunity, on behalf of the area, of congratulating them and offering our best wishes for their future happiness?

G6LJ has started up again after being off the air since 1926, and we offer him a welcome. G6RS sends his usual lengthy letter for the budget, which contains an extensive report of countries heard. G6VP has, like G6WN, little to report, while BRS642 has been busy with studies, and not found too much time for radio.

#### DISTRICT 16 (South-Eastern).

Members in the district will, I am sure, join with the new D.R. in thanking G6WY and G2IG for their past work in the District, and we wish them all the best of luck on their retirement from office. It is to be hoped that members will rally to the support of the new district officers and help to put No. 16 more definitely on the map; there are over 80 of you in Kent alone. Nuff said! G2IC reports that activity in Kent has been great during the past month, and all bands are well supported. G2IC is trying to keep a sked with VU2FY on 7 mc. with 10 watts. G6XB is busy neutralising a T6ID. 2ASC has finished a 7 and 14 mc. rig using an MPT4 as combined oscillator and doubler. 2BAX

hopes to finish his CO-PA soon, whilst 2BOO is also busy designing his transmitter. G2IC proposes a series of short lectures on "Artificial Aerials," their design and construction!

The Folkestone members of the Society have constituted themselves as the "Folkestone Radio Amateurs." Meetings of the club are held at Folkestone every Monday evening, when visitors are assured of a hearty welcome. They are advised to drop G2IC a line and ask for QRA of the next meeting.

The Medway Amateurs also continue to thrive; G2IG, 5FN, 5MM, 6XB, 6NU, and 6VV all report active. A 56-mc. Kent-Essex field day was held on Boxing Day, but no details are to hand. G5MM is building for television. G2IG and 2MI have been working break-in with great success on several bands. G2IG is building a single sideband super and also continues excellent DX contacts. G2MI is keeping a regular nightly sked with VK2NR.

G5OQ appears to be the sole survivor of the Tunbridge Wells group, and is active on 1.7, 3.5 and 7 mc. Lengthy QSO's with G2MI using break-in have been made. G2JH has left the district.

G2JN, 2GD, 2KL, 5FJ, 5MP, 6AI, 6FV, 6IY, 6PA and many others are heard regularly; a report of their activities to their C.R. is earnestly requested.

There is no report from Sussex, probably due to the short notice of the change of DR. G2AO, 2KV and 5JZ are all heard active, and no doubt we shall hear more of them next month.

#### DISTRICT 17 (Mid.-Eastern).

It is proposed to hold a meeting of the Lincolnshire membership on January 21, at Cranwell Aerodrome for a visit to the Radio Equipment, followed by tea and discussions at Sleaford in the evening. All members will be circulated.

G6RN is the new call sign of ex-2AFY, whom we are pleased to welcome on the air. We also extend greeting to a new member, Mr. Hodgson, of Mareham-le-Fen (BRS1311).

The following stations are active and have reported this month: G2QH, 5BD, 5CY, 5GS, 5LQ, 5XL, 6AK, 6RN, 2BCM, 2BIH, BRS426, 1044, 1145, 1021.

G6UO is again with us at Gainsborough, although inactive, G5LQ is happily no longer out of employment, G5XL is bagging new members in Lincoln City. G6LI established telephone communication with Sierra Leone on 7 mc. during Christmas.

I have had requests for the re-establishment of the BRS letter budget. I will re-start this if SIX members will write to me requesting a new circulation.

#### DISTRICT 18 (East-Yorkshire).

The new D.R. bids welcome to all members in No. 18 District, and hopes to meet everyone personally during the coming year.

G5FV (C.R. for the East Riding) reports that a local club is being formed in Hull. Monthly meetings will be held.

Permanent headquarters for the North Riding Group operating under G5CU have been found at the Belvedere Hotel, Scarborough, where regular meetings take place on alternate Monday evenings. It is expected that application will be made for a transmitting licence for use by the club.



Bridlington will become the centre of the new District, an arrangement which should suit members living to the North and the South.

Reports should in future be sent to either G5FV or G5CU to reach them not later than the 25th of each month.

### SCOTLAND.

In pursuance of the policy indicated last month, the following notes are the first from the pen of G5ZX, the latest and first addition to the staff of Scottish headquarters. The rapid growth of our membership has made this step imperative, and I trust that by so doing the general efficiency of our organisation will be improved.—G5YG.

\* \* \*

A further addition to Scottish transmitters this month is Mr. Inglis, of Edinburgh, who now relinquishes 2APL for G6IN.

In "D" District, G6KZ has been appointed District Officer for 1934 in succession to G6FN, and it is hoped that members will continue to give their support to the new D.O. and to report each month.

No more suitable occasion than this can be found for a brief appreciation of the services rendered to "D" District by the retiring officer. Mr. French has been very energetic in the Society's interests, and a most popular official with the members. Our best thanks are therefore due to him.

While on the subject of "D" District, it is reported that there is a "pirate" at large, and that he is causing considerable trouble in his locality by means of telephony transmissions. Steps are being taken to locate the offender, and as the police say, "An early arrest is expected."

G2AZ, of Edinburgh, is returning to Malta, where he hopes to take part in the B.E.R.U. organisation. While regretting his departure, it is felt that he will give valuable service to the amateur cause in Malta.

Mr. Hamilton, "C" District Officer, complains that members will not volunteer any reports on their activities, although several are known to be active. Owing to the difficulty of getting members to attend a meeting, the district officer proposes to have a ballot "by post" in order to elect his successor for 1934.

No news is to hand as to the activities or otherwise of "B" District, but it is pleasing to note that "A" District shows considerable life. On 56 mc., G6ZX, 6YG and 6ZV are carrying out transmissions every Sunday morning between 11.00 and 12.00 G.M.T., primarily for the benefit of A.A. and B.R.S. members interested in this band who possess receivers only. So far, no reports have been received from these members, and if no interest is shown in these regular transmissions, they will be discontinued as such. The transmitting amateurs themselves, however, have had quite a "kick" out of the fact that an unknown station was heard to call G6YG and 6ZX on December 10 and 17. This transmission was too weak to identify, but any information regarding it would be of interest.

It was observed between 11.45 and 12.30 G.M.T.

G6IB and 6ZX are reported to be using 'phone on 7 mc., and thereby adding their quota to the 7 mc. cacophony.

G2MA is having trouble with the P.O. telephone lines, there being somewhat serious induction effects.

In conclusion, Scottish headquarters extend to all best wishes for a Happy and Prosperous New Year, and thanks for numerous good wishes received.

### Northern Ireland.

To one and all, a very happy and prosperous New Year!

Looking back at 1933 we think it can be truly said that GI has been more active than for some years past. The outstanding event, of course, was N.F.D., and some of us have memories of that hectic time which will not fade for many moons to come. However, we are still undaunted and intend to make a sturdy effort to arrive much nearer the top of the score card. This will be impossible without *united* effort, and all who desire to co-operate in the next episode are asked to communicate with the D.R. as soon as possible, when arrangements will be made to hold a meeting to discuss plans.

GI6YW has been unfortunate enough to have his 1,000-0-1,000 v. transformer go up in flames, and as a result is at present off the air. Rumour was wrong—Mr. Spoule's (ex-2ANV) call sign is GI2SP, and not as reported in last notes. He reports a number of European contacts including 15 EAR and CT QSO's. GI6TK, as reported elsewhere, has received a B.O.C. certificate; he reports a new contact with K4. GI5QX is using 30 watts to a locked TPTG, and reports contacts with W5 and ZU; he heard several VK's on 14 mc. during the last earthquake, but was unable to contact. GI5UR reports a goodly number of contacts during the month.

Conditions on 7 and 14 mc. have been very poor, no DX being heard except for a few bright spots on 14 mc. at about 13.00/14.00 G.M.T.

GI stations are asked to watch for VE3BW, who is anxious to effect a GI QSO. 2ABT has obtained a radiating licence subject to passing the usual Morse test.

All envelopes for GI QSL cards should be sent to GI5HV, 45, Bawnmore Road, Belfast, the official QSL agent for Northern Ireland.

### Strays.

Mr. B. Groom (G6RG) has recently received a batch of QSL's, which he is most anxious to pass on to the person who admires his call so much that he feels constrained to use it!

\* \* \*

Mr. H. O. Crisp (BRS207) has received confirmation from Mr. P. Wandelt (W2AU), 168, W. 53 Street, Bayonne, N.J., regarding his reception of Mr. Wandelt's 3.5 mc. telephony transmission on November 22 last. This is the first American station received at loud-speaker strength this winter by Mr. Crisp on 3.5 mc., who asks other BRS's to look out for W2AU.

\* \* \*

Mr. A. W. Hartley, Hon. Secretary, Radio Section, Tenth Finchley Scout Group, advises us that the section has been issued with the call 2BTZ. They have now relinquished B.S.R.S.2.



# CONTACT BUREAU NOTES.

By H. C. PAGE (G6PA).

**T**HERE is very little of interest to report this month, as the seasonal activities undoubtedly interfered with radio work.

The A.A. Group has not yet been formed owing to lack of support, but it is proposed to make a start shortly. The response has been very disappointing, but not unexpected.

## 28 M.C. Groups (No. 1).

G6VP (Manager).

Whether any reports are still in the post or not, the fact remains that only two have come to hand so far, and as they are both negative, it is feared that the appalling conditions are responsible for the hiatus.

G5SY reports that he is still busy both with the transmitter and receiver, but awaits better times.

G6BC kept the VK2HC and G6WY schedules without result. He is experimenting with pentodes as crystal oscillators and hopes to control his 28 mc. output from a 7 mc. crystal without any other intermediate stage.

I am informed by the courtesy of G6YL and F8GQ that W2JN is again on 28 mc. every Sunday until the end of January or (perhaps later) from 14.00-16.00 G.M.T. After 16.00 G.M.T. he will QSY to 14 mc. for reports.

G6VP has only listened at intervals; when conditions on 14 mc. seemed to indicate a possibility, but without any results other than local harmonics.

If it is not too late, a Happy New Year to all.

## Atmosphere and Fading Groups (No. 2).

G2GD (Manager).

The work of the Group has been steadily progressing during the last month, and although reports do not convey much idea of activity, routine work has been quietly carried out.

The Group is running a G.C.'s letter budget, consisting of all the monthly report from G.C.'s with their comments added in continuous rotation. It is expected that this will produce much closer co-operation between the groups within the "Twos." As a first step towards closer co-operation between other groups, G5AM is resigning G.C. of 2F, and instead is to act as "Liaison Officer" between Groups 2 and 3, in which capacity he will furnish the "Twos" with theoretical investigation of their material, in return for which the "Twos" will carry out observations on behalf of the "Threes."

*Group 2A (G6MB).*—This group is continuing routine observations and at the moment no conclusions have been arrived at.

*Group 2C (G5JH).*—Reorganisation is now complete, and attention has been focused on sunspots. The time lag between sunspots and reception conditions has again been noted and commented on. A suggestion is made, based on records of sunspots and aurora for the years 1916-1918, that only certain meridians of the sun have any apparent effect on the earth.

*Group 2E (2BCM).*—Routine reports have been sent in by G5OQ, BRS1151 and the G.C. The conclusion so far reached is that on no occasion

was DX good when AP was not uniform. The converse, however, does not necessarily hold.

*Group 2F (G5AM).*—A report received from G2IC is in favour of the Isobar theory.

The G.C. contributed a short summary from a paper by Colmell and Myers (Proc. American Phys. Soc.). During the autumn of 1932 simultaneous observations were made on W8XK, 6,140 kc., and KDKA, 980 kc. Fading curves were plotted on maps supplied by the Weather Bureau. It was seen at once that signal strength of longer waves varies after nightfall according to change in barometric pressure. Short waves, however, have some characteristic curve regardless of the weather. It is inferred from this that the E layer is connected with varying pressure while the F layer is unaffected.

The G.C. feels this to be rather vague and unconvincing.

## Theory Groups (No. 3).

BRS865 (Manager).

*Group 3A* during the last two months has been discussing the method of reporting signal strengths at present in use. We concede that the method of estimating the QRK by sound intensity in the headphones *may* be capable of reasonable accuracy over a fairly wide range, despite the fact that audibility follows a logarithmic law. However, we fail to see how a serious experimenter can benefit from an R3 report from "Uncle Tom" on his one-valve wonder in one street and an R8 report from someone else on his seven-valve super in the next! The reports are meaningless and convey nothing to the operator except that he is being picked up satisfactorily. Even supposing the receivers used are mentioned (and they seldom are) he knows nothing more than that his aerial has not suddenly developed marked directional properties.

Bearing these points in mind, we have attempted to put signal strength, or more correctly "field strength" on a basis which is not arbitrarily fixed by the receiver in use. Those methods we know are designed to give laboratory accuracy and seem to show a supreme indifference to cost. We hope to modify one of these methods so that a larger part of the accuracy will be retained while the cost will be greatly lowered. It is hoped that a suitable piece of apparatus will be the subject of an article for the BULLETIN at a not-too-distant date.

As the electron-coupled oscillator now seems to be attracting some attention in this country, we should like to draw the attention of members to some recent experiments carried out by J. C. Drabble and R. A. Yeo with a pentode oscillator. They point out that, using a screen-grid valve, secondary emission and feed-back through the anode to screen capacity are liable to cause trouble. Both these defects are obviously absent if a pentode is used. Frequency stability and overall efficiency of the single pentode appears to be comparable to that of an M.O.P.A. delivering the same output. A further important advantage is that 100 per cent. distortionless modulation of the output can be obtained by varying the bias of the suppressor grid (*i.e.*, that normally connected to the cathode) over comparatively small range. The experimenters



found that a very small valve of the receiving type gave a sufficient voltage swing to modulate fully a 4 kw. pentode! Those interested should refer to the December issue of the *Wireless Engineer and Experimental Wireless*.

*Group 3B* welcomes a new member, BRS914, whilst BRS1095, who for some months past has disappeared from the ken of man into the hidden depths of the East London College, has at last reappeared and has disgorged two or three letter budgets which we feared were lost forever! The Group is not confining itself to one particular subject, but is discussing various points that members bring up. The budget is kept in continuous circulation, contributions being withdrawn as soon as the subject dealt with has been sufficiently torn to pieces. The subjects for this month are three-phase R.F. A.C., and certain aspects of L.F. chokes.

[We shall welcome contributions from this Group.—Ed.]

### Receiver Design Group (No. 5).

BRS981 (Manager).

Mr. Scudder, the Manager of this group, forwarded a very comprehensive report of recent experiments carried out with different types of receiving circuits. Unfortunately time did not permit us to have blocks made of the several diagrams submitted, therefore his contribution by mutual consent is being held over until our next issue, when a complete account will be published.—Ed.

### 1.75 M.C. Groups (No. 10).

G5VT (Manager).

In taking over the control of the 1.75 mc. Groups, G5VT wishes to pay a tribute to G5UM and G6FO, the late G.M.'s, and looks to the members for their support in carrying on the work.

Activity on 1.75 mc. seems to be on the decrease, partly due to two causes: longer B.B.C. hours and the growing number of commercial stations using the wave-band.

It is understood that a number of B.R.S. members were at one time attached to the Groups; but no records are available. Will interested B.R.S. kindly communicate?

*Group 10A.*—At present there is no G.C., but it is expected that an appointment will have been made by the time these notes appear. G5RX has been rebuilding and has given special attention to a key-thump filter which enables him now to work during broadcasting. [Let us have details for the BULLETIN.—G.M.] G2YI has had to limit his activities for business reasons. G6GC has joined the Group and has been observing the influence of the moon on 1.75 mc. signals.

*Group 10B.*—G6OO is carrying on as G.C. and reports signs of renewed activity. G2CI has been experimenting with some unconventional radiating systems, but is handicapped by having to transport his apparatus between his two stations six times a year. He would be glad to arrange regular schedules with those who would keep them! G6FJ has transferred from 10C to 10B.

*Group 10C.*—This Group is flourishing and runs a letter budget which is well supported. 2AQW, the G.C., derives the material for his reports from that, saving members the trouble of reporting to him monthly (*verb. sap.*). Microphone experiments are engaging the attention of several members. 2AQW has constructed a Reisz type microphone which has been used successfully for public address work. G5JV describes a moving-coil microphone which he has built from a midget Celestion speaker. He has also been using a ribbon-type and declares that it is impossible to avoid A.C. pick-up "unless the power pack is half a mile away"; G5VY does not agree. G2XP has recently joined 10C.

## HIC ET UBIQUE.

### District Representatives.

Council at their December meeting accepted with regret the resignation of Capt. G. Courtenay Price (G2OP) from his office as representative of No. 5 District. Capt. Price has been our Western District representative since 1926, during which period his advice has been of the utmost assistance to Council. His resignation at this stage has been brought about in no small measure through his desire to devote more time and thought to the work of the R.N.W.A.R., to which body he is attached as District Commander.

On behalf of Council and his numerous friends at home and abroad, we take this opportunity of thanking him for his past services and wish him good luck in his future radio activities.

Mr. W. B. Weber (G6QW) has been appointed the new District 5 representative.

At this same meeting, Mr. A. O. Milne (G2MI), of Larkfield, Kent, was appointed to succeed Mr. H. A. M. Whyte (G6WY), who has resigned for personal reasons.

Mr. W. W. Storer (G6JQ), of Leicester, has been appointed representative for No. 4 District, whilst

Mr. T. Woodcock (G6OO), of Bridlington, takes charge of a new district (No. 18) which has been formed from parts of Nos. 2 and 17.

Numerous new C.R.s were also appointed and their names, together with those of all D.R.'s and C.R.'s appear on page 225.

### Appreciations.

The Secretary, on behalf of Headquarters Staff, wishes to thank all members at home and abroad who forwarded Christmas and New Year greetings. These were much appreciated.

### Calibration Section.

Manager: A. D. GAY (G6NF).

This opportunity is taken of thanking all members who forwarded reports on the November and December calibration signals. Reports will always be much appreciated, as will be suggestions for the improvement of the service.

So far no reports have been received from Scotland and the North, and the writer is anxious



to know whether the service is being used in these parts of the country.

An improvement in the triode frequency meter described in the December, 1932, BULLETIN, consists of the incorporation of a 300 mmf. grid condenser and leak of 25,000 ohms. The resultant reduction of grid current through the inductance renders the circuit practically independent of changes up to 20 per cent. in supply voltages. The leak and condenser should be of high quality and a type 577 condenser and a non-inductive wire-wound resistance should be chosen.

## QSL Section.

Manager: J. D. CHISHOLM (G2CX).

There is reason to believe that the QSL Bureau of Estonia is no longer functioning, and if any member is able to supply the address of a possible successor the Section will be very grateful for the information.

We have recently been receiving a number of cards from non-members of the Society, and we therefore take this opportunity of drawing attention to the fact that although we will forward cards to British non R.S.G.B. members we cannot, in fairness to those who pay for the maintenance of the service, accept cards for distribution from them.

As you will see from the Secretary's report elsewhere in this issue, we have handled an even greater number of cards during 1933, and are looking forward to a still heavier year in 1934. The best wishes of all connected with the Bureau are extended to members and all co-operating societies abroad during 1934, and it is our hope to be able to give a better service still during the coming year.

If I may be permitted to speak personally for a moment, I should like to thank those at H.Q. who have to bear the brunt of the work, and in particular Miss Spence, whose duties are mainly concerned with the Bureau. My thanks are also due to the QSL sub-committee who have been extremely helpful during a year in which they have been called upon to make important recommendations concerning policy.

## R.S.G.B Reception Tests.

Details of the next series of reception tests are given below. New participants are referred to the September issue of the BULLETIN for full particulars. Logs are particularly requested from Northern Ireland and Wales, either from transmitting or B.R.S. members. During a recent period on 56 mc. an interesting log was turned in by BRS565, proving that on this band there is much activity, but, strange to say, very few contacts were being made! All logs in this series should reach Mr. T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4, by February 21, after which the budget will be circulated.

### SERIES 24.

Test Letter.	Date. 1934.	Period. G.M.T.	Band. mc.
A	Sun., Jan. 21	00.00—01.00	7
B	" " 21	10.00—11.00	56
C	" " 21	16.00—17.00	14
D	Wed. " 24	20.30—21.30	3.5
E	Thur. " 25	20.30—21.30	28

Test Letter.	Date. 1934.	Period. G.M.T.	Band. mc.
F	Sun. Jan. 28	09.00—10.00	1.7
G	" " 28	11.00—12.00	56
H	" " 28	19.00—20.00	28
I	Thur. Feb. 1	20.30—21.30	7
J	Sun. " 4	08.00—09.00	14
K	" " 4	10.00—11.00	3.5
L	" " 4	11.30—12.30	1.7
M	Thur. " 8	20.00—21.00	14
N	Sun. " 11	07.00—08.00	7
O	" " 11	09.30—10.30	3.5
P	" " 11	11.30—12.30	28
Q	" " 11	22.30—23.30	1.7
R	Thur. " 15	20.00—21.00	56

## World Contact Association.

In an early issue we hope to give full details of this new association which has been formed by a group of R.S.G.B. members in California.

Mr. Howard Voss (W6DE), the secretary of the W.C.A., became our first American Sixth District member when he joined us in March of last year; since then, thanks to his efforts, many other well known W6s have been added to our overseas list, including W6EAK, W6EXQ and W6FAL.

Most of these members hold our W.B.E. certificate, but, as Mr. Voss points out, Empire QSO's with Africa and Asia are rarities. He asks us to mention that all R.S.G.B. W6 members will be active during the coming B.E.R.U. Contest, when they hope to make short Empire QSO's with old and new friends.

They will also send to headquarters a complete log of all B.E.R.U. stations heard. This list should prove of great interest, and we take this opportunity of thanking Mr. Voss and his colleagues for their spontaneous offer of assistance.

## The December 8 Celebrations.

Poor conditions were responsible for the fact that our message to Mr. Hiram Maxim (President, A.R.R.L.) was only received in Hartford through one channel.

The stations responsible were G5NF, VPU2, and W2ADQ. Efforts were made by several other British stations to effect a direct relay, but without success.

The following reciprocal message from Mr. H. Maxim (President, A.R.R.L.) was handed in by Mr. C. H. Chorley (G5YH), on December 27, 1933:—

"Bevan Swift (G2TI), President R.S.G.B., London, England. Delighted to receive your tenth anniversary message, which reached me via G6CW, G5NF, VPU2, W2ADQ. On behalf of the members of the American Radio Relay League, I thank you. We reciprocate, with assurance of continuation of this feeling of good fellowship, made possible by two-way communication between our respective countries. Heartiest season's greetings.—Hiram Percy Maxim, President, A.R.R.L."

We wish to thank all members who assisted in this historical celebration.

Q.R.A. Section and New Members List will be published next month.



# Empire



# News.

## B.E.R.U. REPRESENTATIVES.

*Australia.*—H. R. Carter (VK2HC), Yarraman North Station, via Quirindi, N.S.W.

*Bahamas, Bermuda and the Eastern Part of the West Indies.*—P. H. B. Trasler, (VP4TA) No. 2 Mess, Pointe à Pierre, Trinidad, B.W.I.

*Burma.*—W. G. F. Wedderspoon (VU2JB), Government High School, Akyab, Burma.

*Canada.*—C. S. Taylor (VE1BV), Stewiacke, Nova Scotia; R. Prissick (VE2CX), 27, Bellevue Avenue, Westmount, Montreal, P.Q.; S. B. Trainer (VE3GT), 4, Shorncliffe Ave., Toronto, 5, Ont.; A. E. Howard (VE4CJ), 2401, 25th St. West, Calgary, Alberta; and A. L. Cusden, (VE5HJ), 1465, 17th Avenue, New Westminster, British Columbia.

*Ceylon and South India.*—G. H. Jolliffe (VS7GJ), Frocester, Govinna, Ceylon.

*Channel Islands.*—H. J. Ahier (G5OU), 4, Roseville Street, St. Helier, Jersey, C.I.

*Egypt, Sudan and Transjordan.*—Lt. E. S. Cole (SU1EC), Haking House, Abbassia, Cairo, Egypt.

*Hong Kong.*—A. P. Rosario (VS6AN), P.O. Box 391, Hong Kong.

*Iraq.*—M. Goodinson (YI5KM), "A" Bungalow, 203 Squadron, R.A.F., Basra.

*Irish Free State.*—Col. M. J. C. Dennis (EI2B), Fortgranite, Baltinglass, Co. Wicklow.

*Jamaica, British Honduras, Turks Island and Cayman Island.*—C. M. Lyons, (VP5MK), P.O. Box 36, 12, Port Royal Street, Kingston.

*Kenya, Uganda and Tanganyika.*—W. E. Lane (VQ4CRH), Box 570, Nairobi, Kenya Colony.

*Malaya.*—T. G. Laver (VS3AC), Government Electrical Power Station, Johore Bharu, Johore.

*Malta.*—H. G. Cunningham (BERS.161), H.M.S. "Royal Sovereign," c/o G.P.O., London.

*Newfoundland.*—E. S. Holden (VO8H), Box 650, St. John's, Newfoundland.

*New Zealand.*—C. W. Parton (ZL3CP), 69, Hackthorne Road, Cashmere Hills, Christchurch.

*Nigeria.*—Capt. G. C. Wilmot (ZD2A), Depot Nigeria Regt., Zaria, Nigeria.

*North and South Rhodesia.*—J. W. Mavis (ZE1JE), P.O. Box 160, Umtali, South Rhodesia.

*North India.*—2nd Lt. T. H. Beaumont (VU2FP), 1st Batt. Beds & Herts Regt. Jhansi, India.

*South Africa.*—W. H. Heathcote (ZT6X), 3, North Avenue, Bezuidenhout Valley, Johannesburg.

## Australia.

By VK2HC, via VK3RJ, ZL4AO and G5YH.

**A**CTIVITY continues on 28 and 56 mc. and some interesting contacts have recently been established. Conditions on 14 mc. have been poor.

Most parts of VK report that DX could be worked during December on 7 mc., but 3.5 mc. operation has been spoilt by violent QRN.

The W.I.A. Convention is to be held from January 26 to 29. It is hoped to give a report of the relay contest in our next notes. VK3 have hopes of winning this contest.

## Egypt.

By SU1EC, via G6WY.

December was a variable month, with some very bad and some very excellent patches on both 7 and 14 mc. On 7 mc. the more definite changes were observed, and the hours from 04.30 to 06.30 G.M.T. were used mostly. From the 1st to the 5th U.S.A. stations came in well; from then until the 12th, W4 stations were in the majority, but after the 12th only South Americans could be heard, with a very occasional W4. From 14.00 to 17.30 G.M.T. was the best evening period, when VK and W6 stations were heard at excellent strength. British stations came in well and several very QRP G's were heard at surprising and quite con-

sistent volume. QSB at times was bad, a steady R6 signal dropping to R1 within 30 seconds and staying down at that level. This applied mostly to SU/G contacts and occurred many times on both bands. The 14 mc. band had some excellent spots, but for the most part was poor, although VK's could be worked most afternoons. All VK's and ZL's contacted seemed as "keen as mustard" on the coming B.E.R.U. Contest.

SU6HL has returned from the West African flight; SU1CH has paid a visit to SU1EC in Cairo, and is moving his QRA from Alexandria to Cairo in February, as he has employment in the building of the new official Egyptian Broadcast Station. This station will not be of interest to G listeners, for although it is QRO, 70 per cent. of the programmes will consist of Arabic music!!

SU1CH hopes to be active in Cairo using 200 watts MOPA and an FB.X/7 receiver; SU1AA has rebuilt his set and has been carrying out 3.5 mc. tests; SU1AA, 1SG, 1EC, 1AQ, 2GA and 1TM are all active.

## Jamaica.

By VP5MK, via VP5PZ, ZL4AI, and G5YH.

Conditions during December were again bad, although isolated DX was worked. VP4AA on 7 mcs. worked his first VK; VP5CC and 5LF are also active on this band. VP5PZ is working many DX QSO's and has W.A.C. on 7 mc. Seasonal greetings to all members from Jamaica. (NOTE.—



This message completely circled the globe, as G5YH heard it being transmitted to ZL4AI by VP5PZ.—Ed.)

## Kenya, Uganda and Tanganyika.

By VQ4CRH.

Conditions on 7 mc. were very good during November, but 14 mc. was as erratic as ever!

Great activity prevailed during the Davidson contest, and the result should prove very interesting. The winner will undoubtedly be found in VQ4, with VQ4CRL, VQ4KTA and VQ4CRH well in the running.

The first Annual Convention held at Nairobi on November 25 was a great success, practically all the local members turning up with one or two visitors.

The question of forming a Radio Society of East Africa received unanimous support, with the result that the following week a general meeting was held, officers elected with an energetic committee to get down to business. Hon. Secretary is Mr. R. J. Fittall, whose address is c/o *East African Standard*, Nairobi.

Individual station reports are lacking this month, no doubt everyone is busy rebuilding ready for the 1934 Contests.

[A full report of the East African Convention appears on page 216.—Ed.]

## Malta.

By BERS161.

The authorities have at last made a move with regard to the issue of licences, and it is hoped that Malta stations will be officially licensed by the time this is published.

We extend a hearty welcome to Mr. S. A. Rance (ex-B.E.R.U. Representative for Iraq, YI2DS), who has recently joined us from that country.

## New Zealand.

Via G6VP and G5YH.

N.Z.A.R.T. Headquarters for 1934 are Box 288, Auckland.

The following are the members of the 1934 Executive: Hon. Treasurer, ZL1AB; Editor, ZL1CK; Technical Editor, 1AC; Secretary, 1FW; Distributor, 1AA; Advertising Manager, 1AR; Traffic Manager, 1GC.

The retiring Executive on behalf of their Association wish the Council and members of the R.S.G.B. a Prosperous New Year.

ZL4AO and ZS1H recently established a record by making the first ZL4-ZS QSO on 14 mc. This is only the second time South Africa has been worked from ZL4, the previous occasion being by ZL4AA way back in 1927 on 32 metres. Congratulations are extended to ZL4AI and ZS1H.

## Northern and Southern Rhodesia.

By ZE1JE.

Climatic conditions are still extremely bad in this part of the Empire, thunderstorms visit us almost daily, and, in consequence, QRN in its worst possible form is continually present. All bands appear to be similarly affected. One or two G stations and a few Europeans still push their way through on the 7 mc. band, but are difficult to copy.

ZE1JE observed the following remarkable phenomenon on December 5. Whilst searching through the 7 mc. band at 19.00 G.M.T. the terrific QRN which was present suddenly began to die down and eventually became practically non-existent. Immediately DX signals began to come in, and the following countries were logged (signal strength ranging from R3 to R7): G, CT, EAR, OK, PA, VK, VQ3 and W2. Contact was made with G5WQ, whose signals were QSA3 R3, and a short QSO resulted. At 21.30 G.M.T. the terrific QRN came on again as suddenly as it went, and put a stop to further operations. It would be interesting to know the cause of this sudden variance.

ZE1JH, who is attached to the Government Meteorological Department, Bulawayo, reports recent activities confined to official daily skeds with ZE1JN, Salisbury, and ZE1JC, Gokwe, the latter station being "out in the blue" about 100 miles from the nearest lines of communication, collecting and consolidating weather information, work in which amateur radio is proving absolutely invaluable. The 3.5 mc. band is being used at present, this band being most suitable for day work from the point of view of skip, QSB and QRN. ZE1JH was QSO W6QD, phone and C.W., on 7 mc. band during September, thus qualifying for W.A.C. His C.W. was reported QSA5 R7 and phone QSA 3/4 on L.S. input 50 watts to push-pull TPFQ transmitter, aerial full-wave zepp. During the recent flight of the South African Air Force Squadron to Rhodesia he was commissioned to keep in touch with the radio-equipped plane, which he successfully accomplished mostly on two-way phone on 7 mc. band. On the return flight to Pretoria a four-station, network half-hourly schedule was kept up, the operating stations being ZE1JH, ZU6H, Pretoria, ZEDA, Defence Force Station, Salisbury, and the plane WAPI. The stunt proved very successful, so much so that the local press gave it some publicity of their own accord, which is all to the good for amateur radio.

ZE1JF reports exceptionally bad conditions during November on the 7 and 14 mc. bands, and, in consequence, has been inactive. He is overhauling and rebuilding, and will be QRO in time for the 1934 B.E.R.U. Contest. ZE1JD, Plumtree, is at present in Northern Rhodesia on business.

ZE1JB, Bulawayo, one of our leading amateurs and an ex-member of the B.E.R.U., at present on leave, has promised to rejoin on his return. ZE1JJ and VQ2XD have not reported.

## Notes from Europe.

Mr. Paul Heinemann, OZ4H, the new President of E.D.R., advises us that as from January his Society will not accept QSL cards for unlicensed Danish amateurs. All such cards will be returned to the senders.

The following are the new senior officials of E.D.R.:—Vice-President, E. Eliason, OZ2E; Secretary, Fr. Flensburg, OZ1D; Editor, H. Fogedgaard, OZ7F; Treasurer, O. Eriksen, OZ3FL.

\* \* \*

We have pleasure in announcing that the U.R.E. have arranged an International Contest for three week-ends commencing March 24 and 25. This contest would, as originally arranged, have clashed



with our B.E.R.U. Contest, but thanks to the kind co-operation of Mr. Uriarte, President, U.R.E., the above dates have been chosen.

Diplomas and medals will be presented to the leading foreign stations, and we trust that all members at home and abroad will look out for Spanish stations during this event. Code words will be exchanged in a similar manner to that of previous years.

Further details can be obtained direct from Box 262, Madrid.

## New French Morocco Society.

We are advised by M. Daussy, CN8MD, that the amateurs in French Morocco, have now formed a national society known as "Reseau des Emetteurs du Maroc" (R.E.M.). Application is being made for affiliation with the I.A.R.U.

We extend our sincerest good wishes to this latest recruit to the ranks of organised National Societies.



FIRST ANNUAL CONVENTION GROUP, NOVEMBER 25, 1933.  
EAST AFRICA.

Front row, left to right: G. Cook (BERS), R. O. Davidson (VQ4CRL), T. N. Goddard (7LO), G. P. Willoughby (GPO), E. T. Somerset (ex G2DT), H. L. N. Ascough (I & I.C., Ltd.), W. E. Lane (VQ4CRH), S. A. Pegrum (VQ4CRE), S. G. Fisher (VQ4CRP), J. B. Leibbrandt (VQ4CRK) is between VQ4CRL and Mr. Goddard. Back Row, left to right: J. Scott (VQ4CRM), F. Cole (BERS175), F. E. Gilfillan (VQ4CRO), H. J. Walker (BERS191) and W. H. Hoey (VQ4KTA) are immediately behind VQ4CRH. D. H. Johanson (VQ4NSA) seated on extreme right.

## CORRESPONDENCE.

*The Editor does not hold himself responsible for opinions expressed by correspondents. All correspondence must be accompanied by the writer's name and address, though not necessarily for publication.*

### LETTER BUDGET FOR SECRETARIES OF AFFILIATED SOCIETIES.

To the Editor of THE T. & R. BULLETIN.

DEAR SIR,—I consider it would be a good plan if some system of co-operation between the Secretaries of local Affiliated Societies could be evolved. These men are dependent largely upon their own resources when it comes to arranging lectures and developing their Society, and therefore, however limited it may be, each Secretary has some knowledge which might be of use to his colleagues holding similar positions.

It is suggested that a Letter Budget be instituted which could be circulated to interested Secretaries. By this means ideas and information would be pooled to mutual advantage.

The writer would be willing to initiate such a budget.

Yours faithfully,

W. A. ROBERTS,

Secretary,

Leicester Amateur Radio Society.

"Walco," Sawday Street,  
Leicester.

### NEW ABBREVIATIONS.

To the Editor of THE T. & R. BULLETIN.

DEAR SIR,—May I suggest two useful additions to our list of recognised abbreviations?

74.—"r, r, ok, ok, om, om, ge, ge, dr, dr, ob, ob, vy, vy, psd, psd, fr, fr, ur, ur, fb, fb, cl, cl, es, es, vy, vy, psd, psd, dr, dr, ob, ob, to, to, qso, qso, u, u, dr, dr, dr, dr, ob, ob . . . blab . . . blab."

*Introduce the Guide to Your Friends.*



75.—Much about the same as "74," but used when station is signing off.

" tks, dr, ob, fr, fb, qso, dr, ob, hpe, cuagn sn dr ob es qsk agn sn dr ob va va gn gn dr om pse pse qsk qsl es foto foto fr foto, foto, gn, gn, va, va, 73, 73, va."

A typical qso could then be worked somehow like this: "XXIX de ZZIZ ge om 74, ur T1 sigs W1 R1 . . . chat chat chat 75.XXIX de ZZIZ."

The amount of superfluous "chatter" that is daily perpetuated over the air has prompted this letter. Maybe it will force home to some the uselessness of formula qso's.

E. S. COLE (SU1EC).

## HIGH ANGLE RADIATION.

To the Editor of THE T. & R. BULLETIN.

DEAR SIR,—I read Mr. Wheeler's (VK5HW) letter on "High Angle Radiation" with interest; there are, however, one or two points I should like to raise. I must, however, confess that I am better acquainted with the more purely physical aspects of the ionosphere than with practical explanations of actual radio conditions; further, I have not been able to obtain the copies of *QST* mentioned.

I think it should be pointed out that in order for a ray to be bent round towards the earth, the ion density of the atmosphere must *increase* as height above the earth increases. Considering a ray which is entering the low "E" region, admittedly it is progressively bent away from the normal (*i.e.*, towards the earth) until it has reached the region of maximum density of ionisation of the E-layer. At this point, with increase in height above the earth, ion density will *decrease*, for since there are certainly two distinct ionised layers in the upper atmosphere, they must be separated by a distinct minimum of ionisation. Consequently, for this part of their path rays will be bent *towards* the normal (*i.e.*, away from the earth).

It would be expected, then, that if a ray passes completely through the lower layer, the resultant bending would be small; this applies equally well to the effect of the probable "intermediate" layers between "E" and "F," providing their ion density does not rise above "E"—this is, in fact, the case.

Whilst we know that the ion density of "F" is definitely greater than that of "E," I suggest that the actual angle at which a ray strikes it, cannot differ much from that with which it meets the lower layer.

Precisely the same argument applies, of course, to the downcoming ray as to the upgoing ray just considered.

Also, is the statement about *two critical angles* correct? It is easy to see that, as the height of angle of radiation is increased, there will be a certain angle at which any further increase will result in complete penetration of the layer and, therefore, absolute cessation of a reflected ray—this corresponding, of course, to the "skip-distance" ray. If the lower layer is being considered, once it has been penetrated, the ray may, of course, be reflected from the F-layer above it, but surely this ray will return to earth at a considerably greater distance from the transmitter than the skip-distance ray just mentioned, and as height of the angle is further increased, the ray reflected from the upper layer will return to earth progressively nearer the transmitter (not *further*, as VK5HW states) in

precisely the same way as for the first lower layer, until the second critical angle is reached at which layer F is also penetrated. It is very doubtful whether the lower layer, E, is of any importance below 80 m., and perhaps, therefore, only the one critical angle need be considered.

I do not quite understand VK5HW's statement that "with ordinary waves . . . the range of rays lying between the skip distance and the tangent always return at a reasonable distance, and those higher rays probably come down somewhere in between and don't matter much." Does the "somewhere in between" refer to places in between the skip distance and transmitter, or where? It surely cannot mean the former, for the very essential of the "skip-distance" is that it is a region in which no waves reflected from the ionosphere are received.

I would be very glad if VK5HW would give his opinion on the points raised in this letter.

Yours faithfully,

A. T. MATHEWS (G5AM).

## Empire Calls Heard.

E. W. Trebilcock (BERS195), 784, Hare Ter., Moonta, South Australia June to November on 7mc. (receiver o-v-1):—

ei4f, 5f, 7f, 9d, g2ao, 2as, 2az, 2bm, 2di, 2dl, 2gc, 2hq, 2if, 2ig, 2ii, 2in, 2lu, 2lz, 2mi, 2oa, 2ov, 2qo, 2rn, 2sm, 2wq, 2xs, 2zq, 5bd, 5bj, 5cu, 5cv, 5dm, 5fb, 5fn, 5fv, 5gs, 5hb, 5jz, 5kk, 5la, 5lw, 5mp, 5nf, 5np, 5oj, 5pl, 5rx, 5sz, 5ui, 5vb, 5vn, 5vo, 5wq, 5xa, 5xh, 5yh, 5yv, 5yy, 5zf, 5zg, 6ba, 6bs, 6cj, 6ct, 6cw, 6dh, 6gl, 6gy, 6hp, 6if, 6ih, 6iy, 6jc, 6jl, 6jx, 6ku, 6lf, 6li, 6ll, 6nj, 6nn, 6nu, 6of, 6oy, 6qx, 6rb, 6rq, 6tz, 6uj, 6us, 6vp, 6vv, 6wy, 6xm, 6xx, 6yk, 6zv, Gi5nj, 5qx, sulaq, lec, lsg, 6hl, ve2ca, 2dr, 2fe, 2fg, 2gh, 3db, 3eu, 3ja, 3nl, 3si, 4bt, 4dj, 4dk, 4ft, 4js, 5az, 5bi, 5bm, 5by, 5cb, 5ch, 5cp, 5cw, 5dd, 5dx, 5ed, 5eh, 5eu, 5fe, 5ff, 5fy, 5gf, 5gi, 5gk, 5gl, 5hc, 5hs, 5hu, 5hz, 5id, 5ig, 5ik, 5jc, vplak, lal, lam, lff, lfr, vqlaj, 4crf, 4crh, 4crl, 4kta, vslad, 3ac, 3ae, 6ae, 6af, 6ag, 6an, 6aq, 7gj, 7gt, 7ra, vu2df, 2dx, 2fp, 2fy, 2jb, 2kt, 2lz, 3sm, yi7rk, zc6kr, zeljb, lje, ljf (Fone and C.W.), ljn, ztlt, zs2a, 2d, 2f, 2n, zt2e, 2l, zs3d, 4m, 5x, zt5v, 5w, zu5b, 5h, 5n, 5y, zt5ap, zs6ah, 6b, 6c, 6m, 6v, zt6d, 6x, zu6m, 6w.

On 3.5 mc.: ve4bb, 4js, 5dk.

On 14 mc.: g2gi, 5bj, 5vl, 6us, 6xq, 6vp, ve2ch, 3zb, 4jc, 5dv, 5id, 5hi, vu2bm.

E. F. Baker (G5OQ.), "Hilldene," Wilman Road, Tunbridge Wells, November 30, 1933:—

7 mc.: vk2ah, 2mg, 2ng, 2ou, 2px, 2zh, 3dm, 3kr, 3kx, 3wl, 3zb, 3zl, 5pk, 5wp, 7jb, 7nc, 7rc, zeljb, zs2a, zt1r, zu6e, zl1cc, lcd, lgq, lgx, lft, 2ab, 2bz, 2ci, 2fa, 2fi, 2fr, 2gn, 2go, 2kv, 2lx, 2nt, 2ow, 3af, 3aj, 3az, 3bj, 3dc, 3fl, 3gm, 3hk, 3jb, 4ak, 4ai, 4ao, 4bt, 4fo, 4fw.

G6YL Felton, Northumberland. — November, 1933. 14 mc. band.—Ve 2 ab, bg, bt, ca, ch, cu, dm, ee, ew, fi, fr, 3gt, hf, jz, lt, wa, wv, vk, 2hx, mc, nr, xu, 3av, cr, cw, hx, wl, 4rv, 5fm, gw, jh, mu, 6mn, vp, 2nb, vs, 6ja, vu, 2bn, zd2c, zslh, 4m, 4u, 5a, zt, lf, lt, vpu2, xzn2b, xzn2c.

December, 1933.—7 mc. band: Vk3ml, vq3bal, 4cro, yi7rk, zc6ff, zd2a, 2c, zl2fi, mn3bj, zs6c, zt1r, 2e, 5r, 6d, 6n, zu5n, 6e, 6p, vpu2, xzn2b, xzn2c.



14 mc. band: Veldq, eg, fn, 2ec, 3hf, vk2ah, hw, hy, zw, 3bw, kv, ow, 5gr, wj, xk, 6mn, vu2bm, dx, ja, yi7rk, zc6cn, zd2c, zslh, vpu2, xzn2b, xzn2c.

By Kenneth T. Harvey (G5KT), 33, Howard Road, Westbury Park, Bristol, 6. October to December.—7 mc.: Velde, ea, 2ar, az, ee, hk, 3bl, jz, pl, vk2ah, ka, vs, px, xq, 3dm, fj, gq, hq, kx, ml, uh, 4rv, 5gw, md, 7ca, ck, jb, jd, vo8w, z, vq4crh, crl, crm, cro, vs6aq, vu2bn, zl2fl, fr, 3ax, aj, ar, 2kn, 3fg, ir, 4bq, cz, zs2a, zs2f, ztlr, 6f, 6b. 14 mc.: Su2np, velex, 2ee, 3wa, jz, vp4cf, zd2c.

## EXCHANGE AND MART.

### RATES.

Private members' advertisements 1d. per word, minimum 1s. 6d. Trade advertisements 2d. per word, minimum 3s., cash with order. First line, if desired, will be printed in capitals. Copy to reach 53, Victoria Street, or the Advertising Manager, Parrs, 121, Kingsway, W.C.2. not later than the 1st of the month preceding date of publication.

DO YOU WANT ANY BACK NUMBERS of the "BULLETIN"? Try BRS1, Quaintance, Hedgerows, East Horsley, Surrey.

G6VP.—'PHONES, TRANSFORMERS REWOUND; Brown's "A" a speciality; any resistance; 24-hour service. Lowest terms in the trade.

G6DS. For neat and snappy QSL Cards, Log Books and Pads. Send for samples. QRA. "Inglenook," Orlando Drive, Carlton, Nottingham.

GUARANTEED CRYSTALS, 1.7 and 3.5 mc. bands only, 7s. 6d. Plug-in dustproof Holders, 3s. 6d.—WEBB, 10, Aberdour Road, Goodmayes.

MULLARD SW9 practically unused £3/5/0, listed £7/10/0. Autoplex Bug Keys 10/6.—Marshall, (G2MA) 8, Boclair Gardens, Hillfoot, Bearsden, Glasgow.

TELEVISION. — Members experimenting, send for list of components supplied by JOHN SALTER, 13, Featherstone Buildings, High Holborn, W.C. Pioneer maker since 1927 of Television Apparatus.

## Patents and Trade Marks.

GEE & CO. (H. T. P. Gee, Patent Agent for Gt. Britain, U.S.A., Canada, etc., Members R.S.G.B., A.M.I.Rad.E.), 51-52, Chancery Lane, London, W.C.2 (2 doors from Govt. Patent Office). Phone: Holborn 1525. Handbook free.

A. MATHISEN, B.Sc., Registered Patent Agent. Specialist: Television and Radio Engineering Invention Patents.—FIRST AVENUE HOUSE, High Holborn, London, W.C.1. Holborn 8950.

## ELECTRADIX HEAVY CURRENT ACCUMULATORS

S. H. Edison and Nife Steel Cells, for Lab. and Experimental Work, Emergency Lighting, Yachts and Boats. Reliable and stand shorts and overloads.

(Write for List "T.R." of special low prices.)

## LESDIX SERVICE CHARGERS

### A.C.—D.C.

We have 25 models to offer and our prices are low for special requirements. Three popular sizes are the AC109A for 00 cells; the AC106 for 108 cells, and the Lesdix Super Six for 200 cells.



## DYNAMOS, MOTORS, ETC.

At low prices. From a 6v. 3a. and 600v. (100 m/a) D.C. machine at 22/6 to a 50 H.P. motor

Send for Latest Sale List "T.R."

## ELECTRADIX RADIOS,

218, UPPER THAMES ST., LONDON, E.C.4.  
Telephone: Central 4611.

## "T. & R. Bulletin." ADVERTISEMENT RATES.

Per insertion.		Per insertion.	
Full Page	£6 0 0	Half Page	£3 0 0
Quarter Page	1 10 0	Eighth Page	0 15 0

Series Discounts—5% for 6 or 10% for 12 consecutive insertions. Full-page type area 7½" x 5½". Advertisements specified for *Covers and Facing Matter Positions* are not subject to series discounts. The T. & R. BULLETIN is published on the 14th of each month. Orders, Copy and Blocks should reach us by the 30th of each month for the following month's issue. All applications for space or specimen copies should, please, be sent to Advertisement Manager,

PARR'S ADVERTISING LTD.,  
Craven House, Kingsway, W.C.2.

Telephone: Holborn 2494.

## HARMONY HOUSE

(Prop. Walter Johnson. G.2.I.N.)

I give the best prices on old components in part exchange for new equipment.

Transmitting Valves in good condition taken in part exchange for new Marconi, Osram, or Mullard valves. ALL MAKES TRANSMITTING AND RECEIVING EQUIPMENT SUPPLIED.

Largest stock of secondhand transformers, condensers, mains transformers, chokes, coils, etc. at most reasonable prices.

Write stating your requirements, and I will send you a quotation by return.

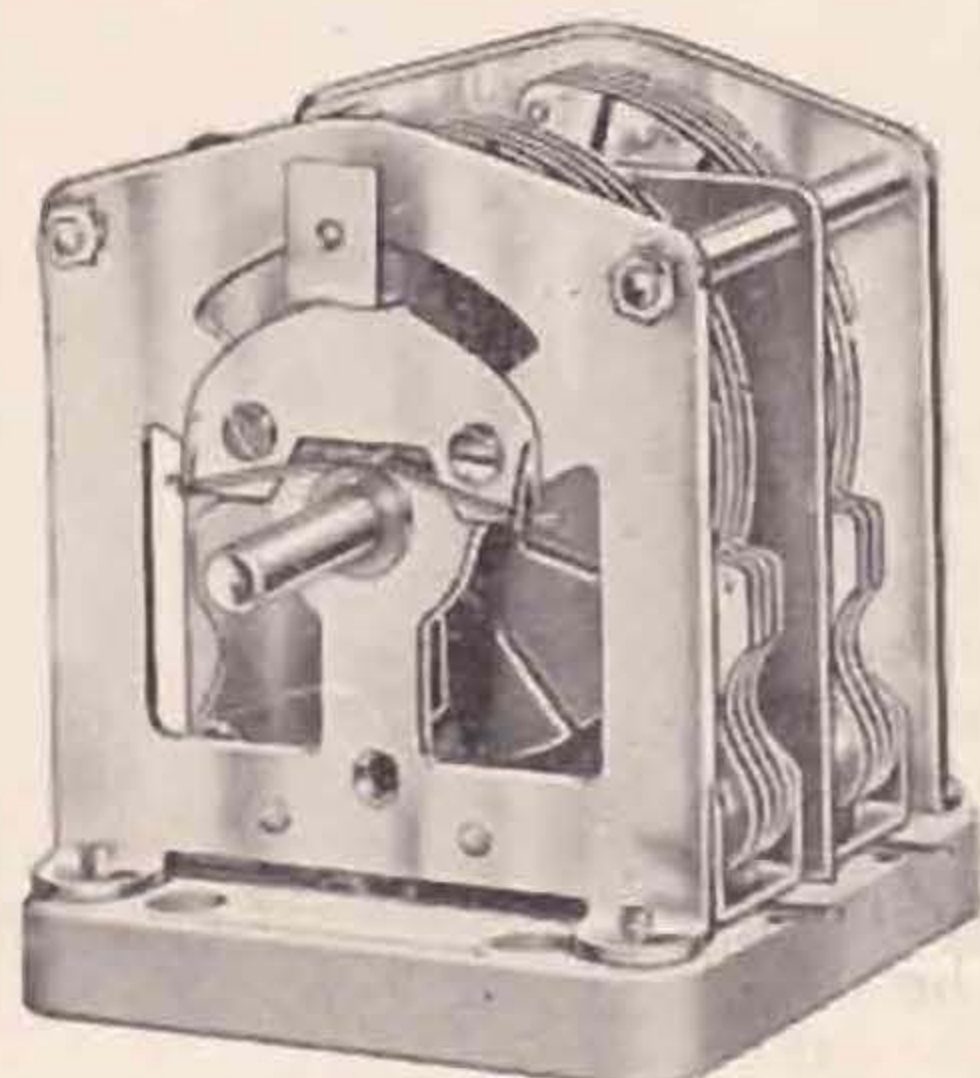
116, CAMBRIDGE ROAD, SOUTHPORT

Tele: 8621

If you are in the trade, write for a supply of Guides. Special terms.



# RADIOPHONE SHORT WAVE CONDENSER



British Radiophone Ganged Condensers are everywhere recognised as the best that money can buy. They have been specified exclusively for nearly all the important sets designed during 1933 and have never failed to give the highest satisfaction in use.

2-gang Condenser, as illustrated.

Type 612 **17/6**

Complete with slow motion dial.

Type 676 **27/6**

## RADIOPHONE SHORT WAVE CONDENSERS HAVE MANY UNIQUE FEATURES

- 1 A "Faraday" pigtail connection to the rotor vanes (i.e. a non-inductive screened flex ensuring constant potential for its whole length, thus preventing "crackle").
- 2 Brass is employed throughout to avoid "different contact potentials" due to dissimilar metals.
- 3 A "Steatite" insulation base ensures freedom from leakage losses.
- 4 The 2-gang model is fitted with slotted-end vanes giving a matching accuracy of  $\frac{1}{2}$  of 1% over the whole scale.
- 5 Heavy gauge frames and spring anchored spindles guarantee absolute rigidity and freedom from mechanical distortion.

Write for details of other British Radiophone products:

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

## COLVERN

*Specified and essential for the*

### 'EMPIRE RECEIVER'

*described in this issue.*

**DUAL RANGE**  
short wave coil.  
Totally screened.

Type K.S.W. **9/6** each

**FERROCART I.F. TRANSFORMER**  
with universal  
mounting bracket.

Type F.C. 150 **12/6**

Send for List No. 12, it gives details  
of the full range of Ferrocart Coils.

**COLVERN LIMITED,**  
MAWNEY'S ROAD, ROMFORD, ESSEX.

## Q.C.C. Quartz Crystals.

1.75 mc., 3.5 mc. & 7 mc. Bands.

**STANDARD TYPE** **POWER TYPE**  
(For use with up to 300v. anode voltage). (For use with up to 500v. anode voltage).

**15/-** **£1**

**100 Kc. QUARTZ BARS £1.**



### Q.C.C. CRYSTAL HOLDERS

**Type B.**—A totally enclosed dust-proof holder of the plug-in type. The body consists of a 2½" Dia. Keramot moulding, the connections to the crystal plates being made internally to two banana type pins, that fit in to two sockets in the base, the holders being instantly interchangeable. Both electrodes are ground dead true by hand.

Price  
**10/-**  
(With  
Base.)

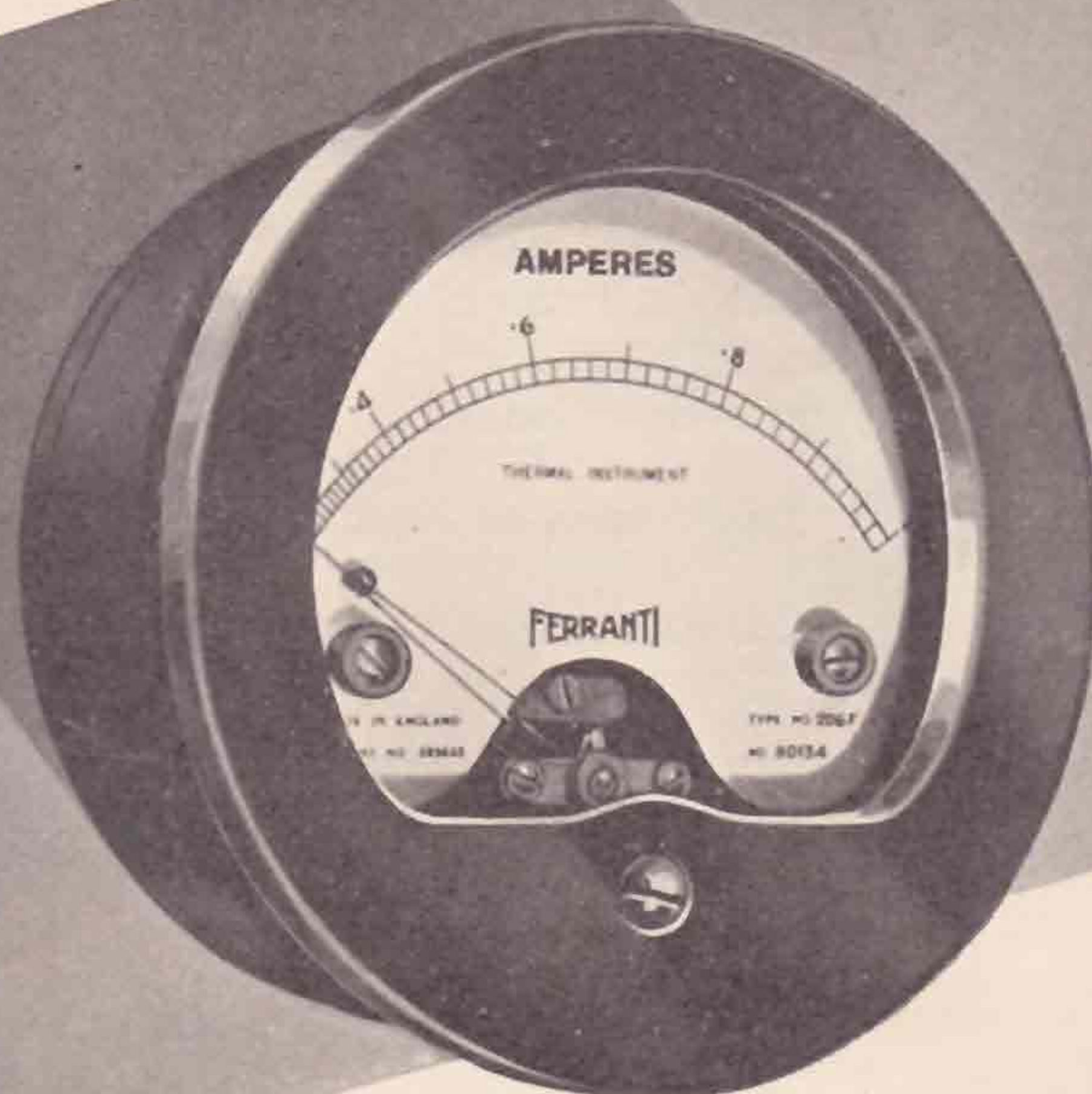
**Type A.**—An open type holder, with heavy brass bottom electrode mounted on a Keramot base. The top electrode is of the correct weight for all types of Q.C.C. Crystals. Both electrodes are ground dead true by hand.

Price  
**4/6**

All goods sent **POST FREE** to  
all parts of the World.

**THE QUARTZ CRYSTAL CO. (G2NH & G5MA),**  
Kingston Rd., New Malden, SURREY, England.  
Telephone: Malden 0671.





# Thermal RADIO METERS

Ferranti Thermal Radio Meters are of the Thermo-e.m.f. type; the movement, which is similar to that of the ordinary D.C. Meters, is connected to two thermo-couples placed near to, but insulated from, the heater wire.

This construction enables the instrument to be calibrated and used on D.C. with no reversal error; and when used on radio frequency circuits, the electrical separation of the two circuits avoids trouble due to the capacitance between the instrument and the earth. These meters are quite independent of wave form, and are suitable for any frequency up to 14 megacycles.

Ferranti wide open scale,  $110^{\circ}$ — $2\frac{1}{2}^{\circ}$ . Meters below 0—1 ampere are subdivided as millimeters, so that they are of particular help when the current in the aerial is small.

## RANGES & PRICES

(Flush or Projecting type)

0—.1 ...	List No. 203 ...	£3 10 0
0—.25 ...	" " 204 ...	£3 10 0
0—.5 ...	" " 205 ...	£3 10 0
0—.75 ...	" " 221 ...	£3 10 0
0—1. ...	" " 206 ...	£2 15 0
0—1.5 ...	" " 207 ...	£2 15 0
0—2.5 ...	" " 208 ...	£2 15 0
0—5. ...	" " 209 ...	£2 15 0

Portable type 2/6 extra.

Write for list Wh 526

FERRANTI LTD.  
Dept. T.R.  
HOLLINWOOD, LANCs.

# FERRANTI

## RADIO METERS