B.E.R.W. REPORT

T. & R. Bulletin

THE JOURNAL OF

The Inc. Radio Society of Great Britain

AND THE

British Empire Radio Union

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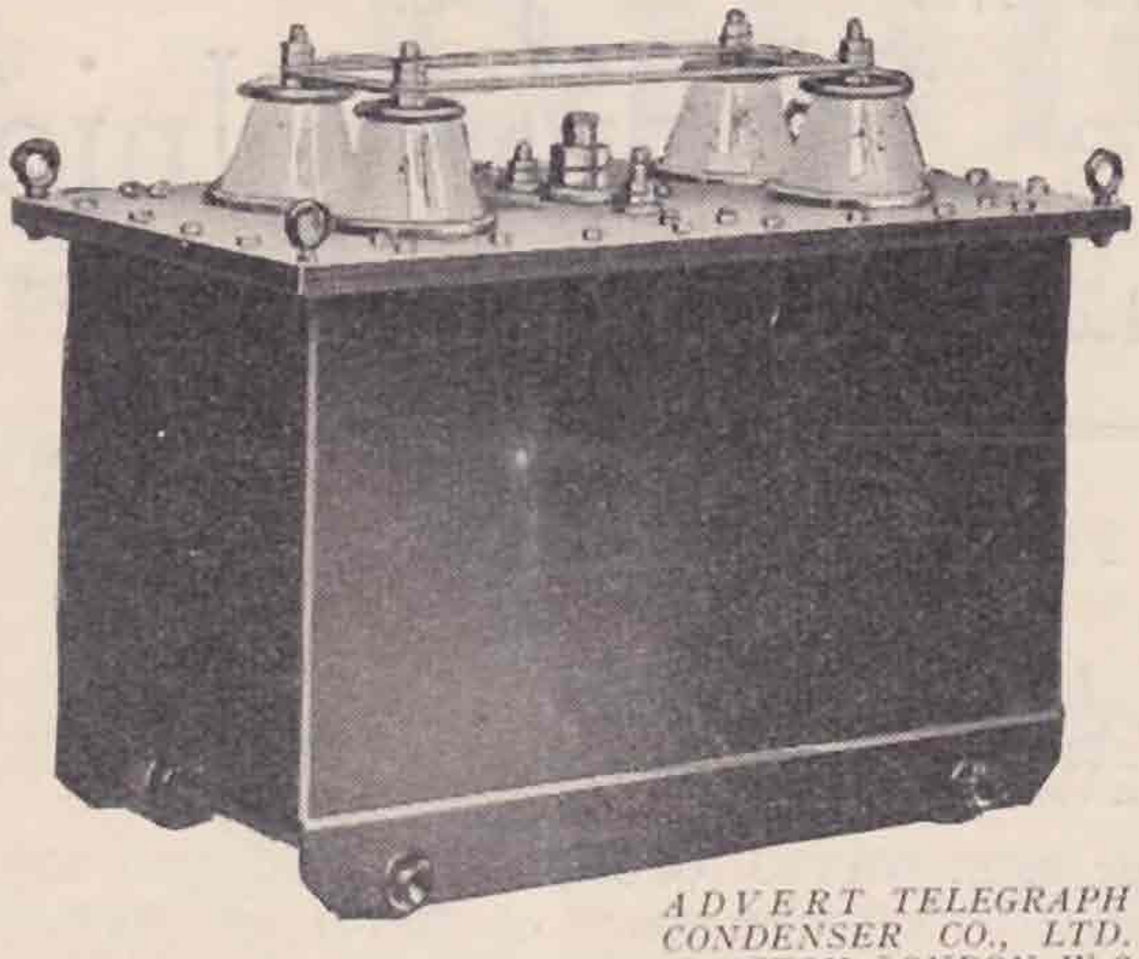

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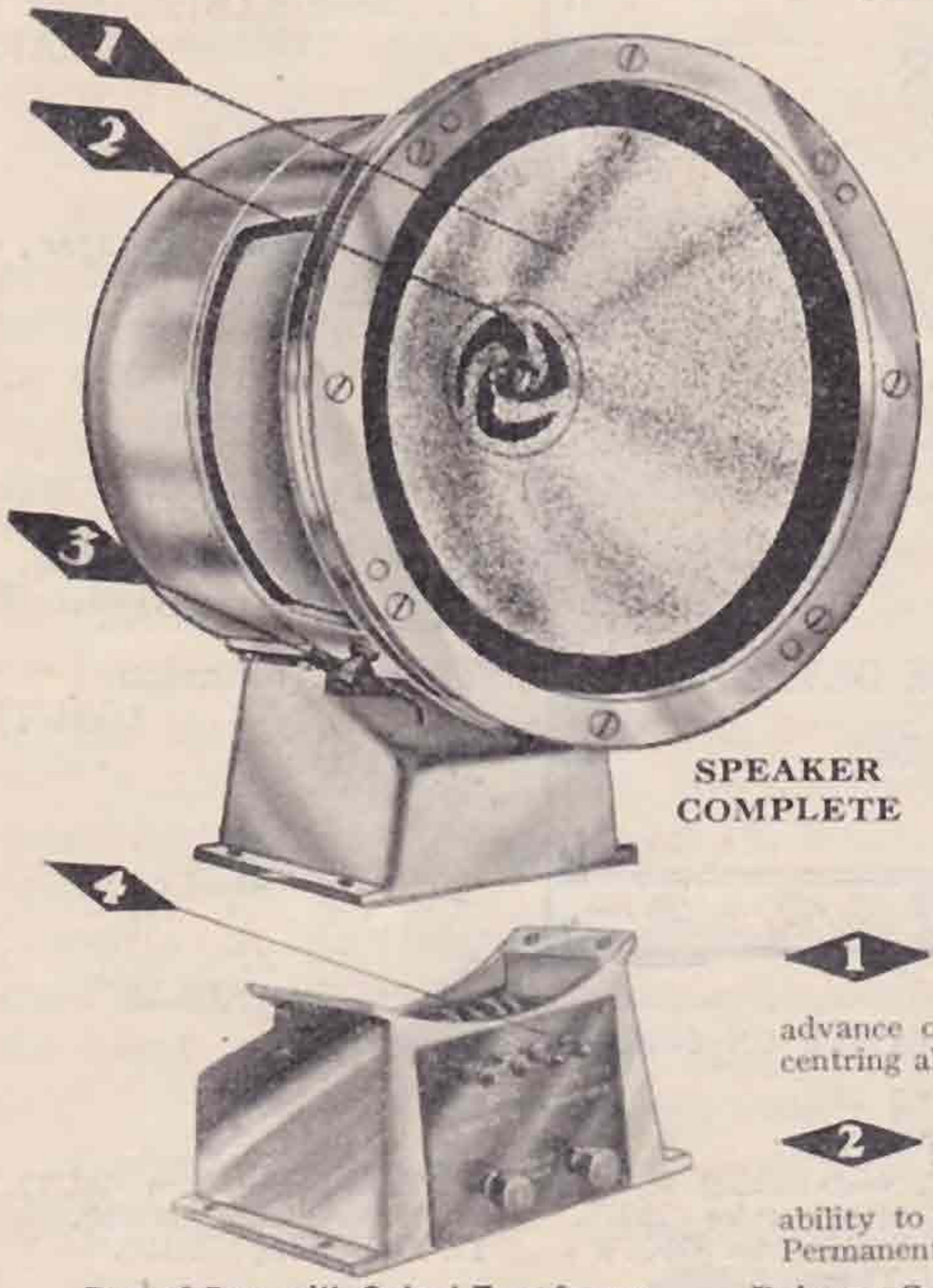

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T&R Bulletin

The only Wireless Journal Published by Amateur Radio Experimenters in Great Britain

JUNE, 1931. Vol. 6. No. 12

What of the Future?

For very definite reasons we have refrained until now from publicly expressing our views concerning the future of amateur radio. During the past year many leading articles and editorials on the subject have appeared within the pages of our contemporaries, all of which have been studied and read with interest by the Council members of our Society. From them we have obtained some idea of the progress made abroad, besides which we have gleaned much useful information which will help us more readily to appreciate the problems which are confronting the amateurs of other countries.

To obtain a more comprehensive appreciation of radio matters as they affect us to-day, we will briefly review the procedure which has been, and will continue, to be adopted by the nations of the world, in their efforts to regularise radio communication.

Until 1927 the majority of countries governed and controlled their radio services on lines primarily designed to suit themselves, but with the rapid increase of such services, commercial, military, naval, experimental, broadcast and amateur, it was apparent to all that steps must be taken to convene an International Conference of radio experts, to examine carefully the needs of all parties and to allocate to the best of their ability definite parts of the frequency spectrum to each class of service.

This first International Conference took place at Washington and was attended by delegates from practically every country.

From the first it was clear that amateur conditions would be subject to very severe and critical review, but, thanks to the untiring energies of Mr. K. B. Warner and his colleagues, we were enabled to emerge from the Conference with well-defined, if not over-large, International frequency bands around 7 and 14 M.C.s, and shared allocations at other points harmonically related to one another. The presence of the A.R.R.L. delegates, and the fact that the American Government has always given its wholehearted support to its radio amateurs, contributed in no small manner towards the concessions which were given the amateurs of the world. We use the word " concessions " advisably, for it was probably in this wise that many of the delegates gave their agreement to the proposals put forward by the amateur representatives.

Unfortunately, even to-day we still find in many quarters this somewhat conciliatory attitude being shown towards us by the controlling influences in countries which shall remain unnamed.

One of our greatest tasks, therefore, is to prevent this feeling gaining ground. By word and deed it is the duty of every radio amateur to prove to those in authority that he is a valuable asset to the community at all times. In war or in peace, in times of distress or in times of emergency, he has shown his aptitude to " get there " efficiently and promptly. Publicity to

(*Continued on page* 351.)

British Empire Radio Week, 1931.

By John Clarricoats (G6CL), Honorary Secretary.

AMATEURS throughout the world will join us in congratulating Mr. Trevor Evans, VK2NS, of Bathurst, New South Wales, on winning the "B.E.R.U. Challenge Trophy" for the year 1931.

Mr. Evans had no less than 64 B.E. contacts to his credit; 55 of which were made with New Zealand stations. It is of interest to record that the winner made full use of the rules which permitted the working of 20 stations in a particular Zone on each amateur band. Mr. Evans worked 20 New Zealand stations on both 3.5 and 7 M.C. and 15 on 14 M.C. His remaining contacts were with Great Britain (3), Iraq (2), Ceylon (2), and Hong Kong (2).

We hope to publish a description of the winning station in an early issue of the Bulletin; meanwhile we must content ourselves with an examination of the photograph here reproduced.

Arrangements are being made for the trophy to be sent direct to the President of the Wireless Institute of Australia, in order that a suitable presentation ceremony may be organised.

It is with very much pleasure that we record the achievements of other well-known Colonial and British amateurs during the week.

Outstanding performances stand to the credit of Mr. Hamblin (YI6HT), Mr. Rahim (VS7AP), and Mr. Miles (G5ML), all of whom made over 40 contacts with many different parts of the Empire.

VK7JK, VK2HC and ZL4AI all made high scores, but the vast majority of their contacts were with their nearest neighbours.

Amongst the Britishers we find our E.L.S. leading all along the line. Harold Old (G2VQ), runner up to Fred Miles for the Zone 1 award, was badly handicapped on one or more occasions through standing by during good DX hours for B.E.R.U. traffic. With more time available G2CJ and G5VM would have gone well into the 40 contact group; their performances were, however, very creditable, as both stations are only licensed for 50 watts. It will be noted from the tabulated lists that G5ML and G5VM effected the majority of the G-VK contacts, whilst G2VQ and G5VM contacted with more zones than other British stations.

As expected, communications with Canada and Newfoundland were the most numerous from G, but when it is realised that a very large number of VE1 and 2 stations are active it seems curious that only 63 British contacts were made with Zone 2. YI6HT, SU1AQ and ZU6W were mainly responsible for the G contacts with Iraq, Egypt and South Africa, proving that reliable contacts may be established with important B.E. centres, providing the stations are there to be worked.

The total of 236 outgoing G QSO's is satisfactory, but will undoubtedly be left far behind in future years.

Turning now to our overseas stations, we find an old friend in VE2CA leading for Zone 2. Mr. Turner, in forwarding his claim, expressed his enjoyment of B.E.R.W. and hoped it would be the forerunner of many more similar contests. He also pointed out that B.E.R.W. coincided with an A.R.R.L. sweepstakes contest which produced severe QRM from W stations partaking in the event. We would mention, in passing, that B.E.R.W. was fixed in September, 1930, and as far as we knew we were clear of all other contests. However, every effort will be made in future to prevent clashing with other events. Mr. Turner also recommends that a system of weighted credits be used in future, as these would put the Empire on a more even footing. This suggestion and all others will be carefully examined before next year, as we realise there were many flaws in our first rules.

One very interesting point arises in connection with Zone 2. It will be noticed that although 63 outgoing G contacts were made, only 18 incoming contacts to G were claimed. We suggest that many of our VE friends were remiss in sending in their logs.

Only one claim was received from the British West Indies, this from VIYB, T. A. Archer, who, unfortunately, only made three contacts (all with G), due to illness. There were 5 British contacts, however, with this Zone, the other two being with NJ2PA and TI3XA, an Englishman in Costa Rica.

The response from South Africa was intensely disappointing in view of the large B.E.R.U. membership. With the exception of Mr. W. Heathcote (ZT6X), no one else made even a partial challenge to Mr. Auret (ZU6W), who walks away with the certificate for Zone 4.

Where were the S.A. stations during B.E.R.W.?

There were 38 British contacts with this Zone and 22 claimed. We were disappointed to find no log from ZS4M, one of our most consistent B.E.R.U. stations. Contacts with VQ2TY (5), ZS2N (3), ZT1T (3) were also made by home stations, but no logs were received. A total of 33 other contacts were made with Zone 4, 11 being effected by VS7AP.

Zone 5 produced only three reports, the award going to Mr. H. W. Cox (VQ4CRF), the majority of his points being scored by contacts with Great Britain and South Africa.

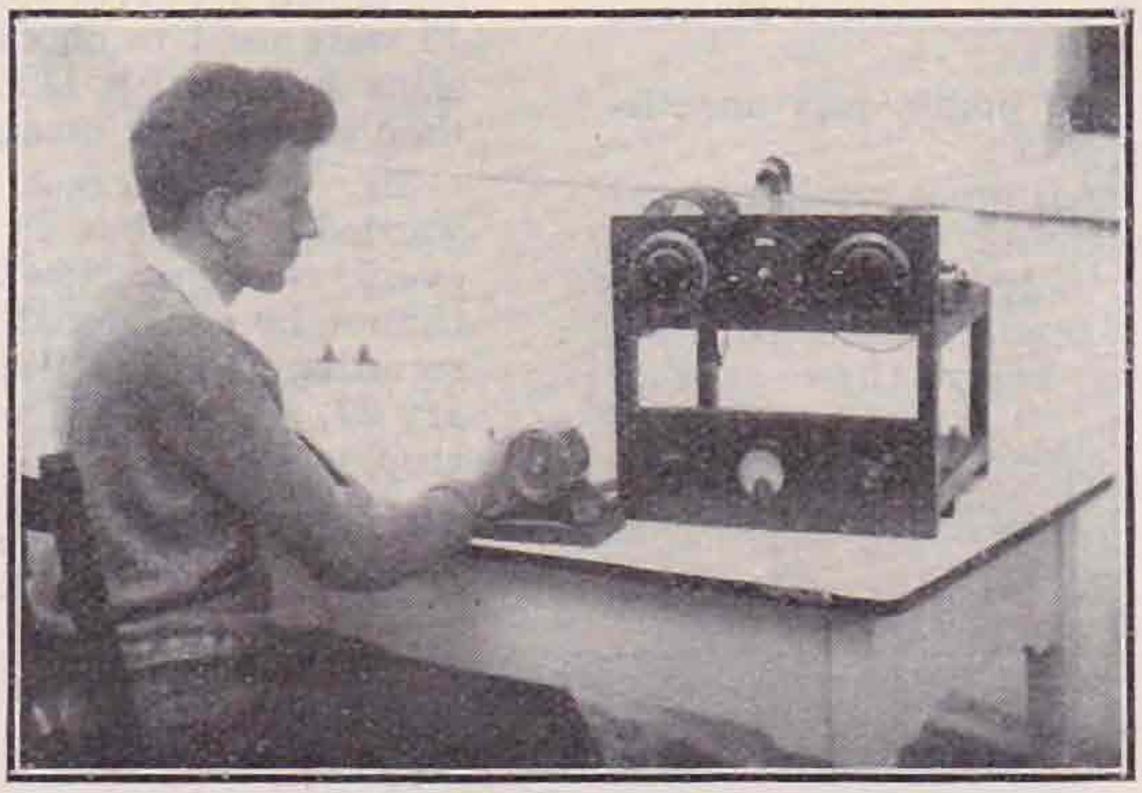
Zone 6 was represented by YI6HT and YI1EJ, who between them totalled 56 points. Mr. Hamblin's excellent effort has already been recognised by the national Press, when on March 1 the London "Daily Mail" gave a brief account of his work

ZONE AWARDS.

No. 1	Fred Miles ...	G5ML
No. 2	Earle Turner	VE2CA
No. 3	T. A. Archer	V1YB
No. 4	N. H. Auret ...	ZU6W
No. 5	H. W. Cox ...	VQ4CRF
No. 6	H. Mohrstadt	SU1AQ
No. 7	H. W. Hamblin	YI6HT
No. 8	A. M. Rahim ...	VS7GJ
No. 9	No claim received.	
No. 10	P. O'Brien ...	VS6AE
No. 11	G. G. Sampson	ZL4AI
No. 12	Trevor Evans	VK2NS

during the week. His 24 contacts with Great Britain eclipsed all others, and we accordingly congratulate him on this particular concentration. Mr. Hamblin also raised 13 ZL stations, proving the all-round efficiency of his station. It is an interesting point, however, to observe that with but three exceptions no B.E. contacts (other than G's) were made with Canada. These were made by VQ3MSM, VQ4CRF and VK3BQ.

Ceylon's two representatives, VS7AP and VS7GJ kept our end up in Zone 8, but why the VU stations completely missed reporting it is difficult to guess, because a fair number of other zones made contact with India. Mr. Rahim produced a most interesting log covering contacts with seven other zones. There were 44 incoming contacts from other B.E. Zones, most of which were with the above-mentioned stations.



VK2NS.
TREVOR EVANS.
First Holder B.E.R.U. Challenge Trophy.

membership could only furnish one report, and that from our representative, Mr. O'Brien (VS6AE). Of his 24 contacts, 14 were with New Zealand and three with Great Britain (G2VQ, G5VM, and G6WT).

Zone 11 (New Zealand) had but three representatives, and of these only ZL4AI put in an effective score. His 41 contacts were with Australia (34) and Great Britain (7).

Lastly we come to Australia ; seven stations turned in logs and between them produced 236 contacts, by a coincidence exactly the same number as claimed by Great Britain. Unfortunately, from one point of view, the majority of their contacts were only comparatively local, 185, or 80 per cent., being with New Zealand. However, we are very glad to record their work and trust that many friendships have been made as a result of B.E.R.W.

There were 21 G contacts claimed by the VK stations, who reported, but no less than 41 outgoing G contacts were claimed by the Home members. Other B.E. Zones (excluding New Zealand) recorded 51 contacts with VK against the 30 claimed by the VK stations reporting.

Zone 9 (Malaya) produced a complete blank, no contact being reported from either Great Britain or the Colonies.

Zone 10 (Hong Kong) with its very active HARTS

BRITISH ISLES.

Call.	Zones Worked. 2	3	4	5	6	7	8	9	10	11	12	Totals
G5ML	12	—	5	—	2	3	1	—	—	7	12	42 *
G2VQ	4	—	4	1	3	2	1	—	1	4	7	27 *
G2CJ	5	1	4	3	4	3	1	—	—	2	1	24 *
G5VM	5	—	1	1	1	2	—	—	1	1	11	23
G2CX	2	1	4	1	2	2	1	—	—	—	—	13 *
G6VP	5	2	2	—	1	—	1	—	—	—	1	12 *
G5BJ	2	1	—	—	1	—	1	—	—	—	6	11 *
G6RB	4	—	2	1	1	—	—	—	—	3	—	11 *
G6WN	2	—	1	—	3	3	—	—	—	—	—	9 *
G2OP	2	—	2	—	2	2	—	—	—	—	—	8 *
G6XQ	3	—	1	—	—	—	—	—	—	1	2	7
G6NF	1	—	3	1	—	1	—	—	—	—	—	6
G5LA	4	—	—	—	1	1	—	—	—	—	—	6
G6DH	1	—	1	—	1	1	—	—	—	1	—	5 *
G6UN	3	—	—	—	—	—	—	—	—	1	—	4
G2OL	1	—	—	—	1	1	—	—	—	—	—	3
G2PA	2	—	1	—	—	—	—	—	—	—	—	3
G5QY	—	—	1	—	1	—	—	—	—	—	—	2
G6FO	—	—	—	—	2	—	—	—	—	—	—	2
G6WY	1	—	1	—	—	—	—	—	—	—	—	2
G6XN	1	—	—	—	1	—	—	—	—	—	—	2
G2MA	—	—	—	—	—	1	—	—	—	—	1	2
G5YG	1	—	1	—	—	—	—	—	—	—	—	2 *
G2BY	—	—	1	—	—	—	1	—	—	—	—	2
G6CL	—	—	—	—	1	—	—	—	—	—	—	1
G6WL	1	—	—	—	—	—	—	—	—	—	—	1
G6HP	—	—	1	—	—	—	—	—	—	—	—	1 *
G2GM	1	—	—	—	—	—	—	—	—	—	—	1
G2DH	—	—	1	—	—	—	—	—	—	—	—	1
G5NJ	—	—	—	—	—	—	1	—	—	—	—	1 *
G6QB	—	—	1	—	—	—	—	—	—	—	—	1
G5RV	—	—	—	—	—	1	—	—	—	—	—	1
Grand Totals ...	63	5	38	8	28	23	8	0	2	20	41	236

* Empire Link Stations.

OVERSEAS.

Zone	Call.	Zones Worked. 1	2	3	4	5	6	7	8	9	10	11	12	Totals
2	VE2CA	11	—	—	—	—	—	—	—	—	—	2	3	16
	VE2AC	3	—	—	—	—	—	—	—	—	—	—	2	5
	VE1BV	2	—	—	—	—	—	—	—	—	—	—	—	2
	VE3RF	2	—	—	—	—	—	—	—	—	—	—	—	2
3	V1YB	3	—	—	—	—	—	—	—	—	—	—	—	3
4	ZU6W	20	—	—	—	2	1	—	3	—	1	—	—	27
	ZT6X	2	—	—	—	—	—	—	5	—	—	—	2	9
5	VQ4CRF	6	1	—	8	—	1	1	2	—	—	—	—	19
	VQ3MSM	2	1	—	2	—	1	—	2	—	—	—	—	8
	VQ5NTA	1	—	—	—	—	—	—	2	—	—	—	—	3
6	SU1AQ	16	—	—	—	1	—	3	1	—	—	—	—	21
7	YI6HT	24	—	—	1	1	2	—	5	—	—	—	13	46
	YI1EJ	4	—	—	—	—	2	—	4	—	—	—	—	10
8	VS7AP	7	—	—	11	3	1	3	—	—	1	—	14	40
	VS7GJ	—	—	—	5	1	—	—	—	—	—	—	3	9
10	VS6AE	3	—	—	4	—	—	—	1	—	—	2	14	24
11	ZL4AI	7	—	—	—	—	—	—	—	—	—	—	34	41
	ZL1AP	1	—	—	—	—	—	—	—	—	—	—	5	6
	ZL3CP	—	—	—	—	—	—	—	—	—	—	—	5	5
12	VK2NS	3	—	—	—	—	—	2	2	—	2	55	—	64
	VK7JK	5	—	—	—	—	—	1	1	—	2	43	—	52
	VK2HC	3	—	—	1	—	1	1	1	—	1	23	—	31
	VK7CH	2	—	—	—	—	—	1	—	—	—	26	—	29
	VK3UK	3	—	—	—	—	—	1	4	—	2	18	—	28
	VK3BQ	5	1	—	—	—	—	1	3	—	1	10	—	21
	VK6MU	—	—	—	—	—	—	—	—	—	1	10	—	11
		135	3	—	32	8	9	14	36	—	11	189	95	532

Summing up the transmitting side of the tests, we are forced to certain conclusions.

(1) B.E.R.W. was not properly supported by many of the best home and colonial stations (including several E.L.S.).
(2) The system of awarding points was unsatisfactory in certain respects.
(3) The test period of a continuous week reacted unfairly on stations whose operating times are restricted to short daily periods.
(4) Many stations failed to report after discovering that their total was lower than another station.
(5) The tests were conducted at a period when conditions were below normal for the time of year.
(6) The under ten watt station was beaten on almost every call by a high power station.

To overcome some of the above difficulties, in future years, steps will be taken to produce rules which will give a more accurate reflection of the work carried out by the participants,

Turning to the reception side of B.E.R.W. With the solitary exception of an excellent receiving log from Mr. Percy Seymour, our correspondent in Arabia, not one other overseas report of value was received. It is impossible to surmise why this state of affairs existed, unless it was due to the fact that our large B.E.R.S. membership did not realise that Rule 12 gave them the same rights of entry as those members possessing call signs.

Mr. Seymour's log was probably the most interesting of all received, for situated as he is in the middle of the world, he was able to log both sides of dozens of B.E. contacts, thus providing an invaluable check on contestants' reports. His log contained details of 58 calls heard, and of this number 40 were used to check contacts. On several occasions he heard a B.E. station calling "CQ" and then logged four or five G stations replying.

Mr. Willard Long, of Frankston, Victoria, forwarded a log, but as this contained in practically every case only New Zealand "CQ" calls heard, it cannot be considered of any real value. His only recorded DX call was at 12.50 G.M.T. on February 27, when G5VM was heard calling VK2NS—the trophy winner.

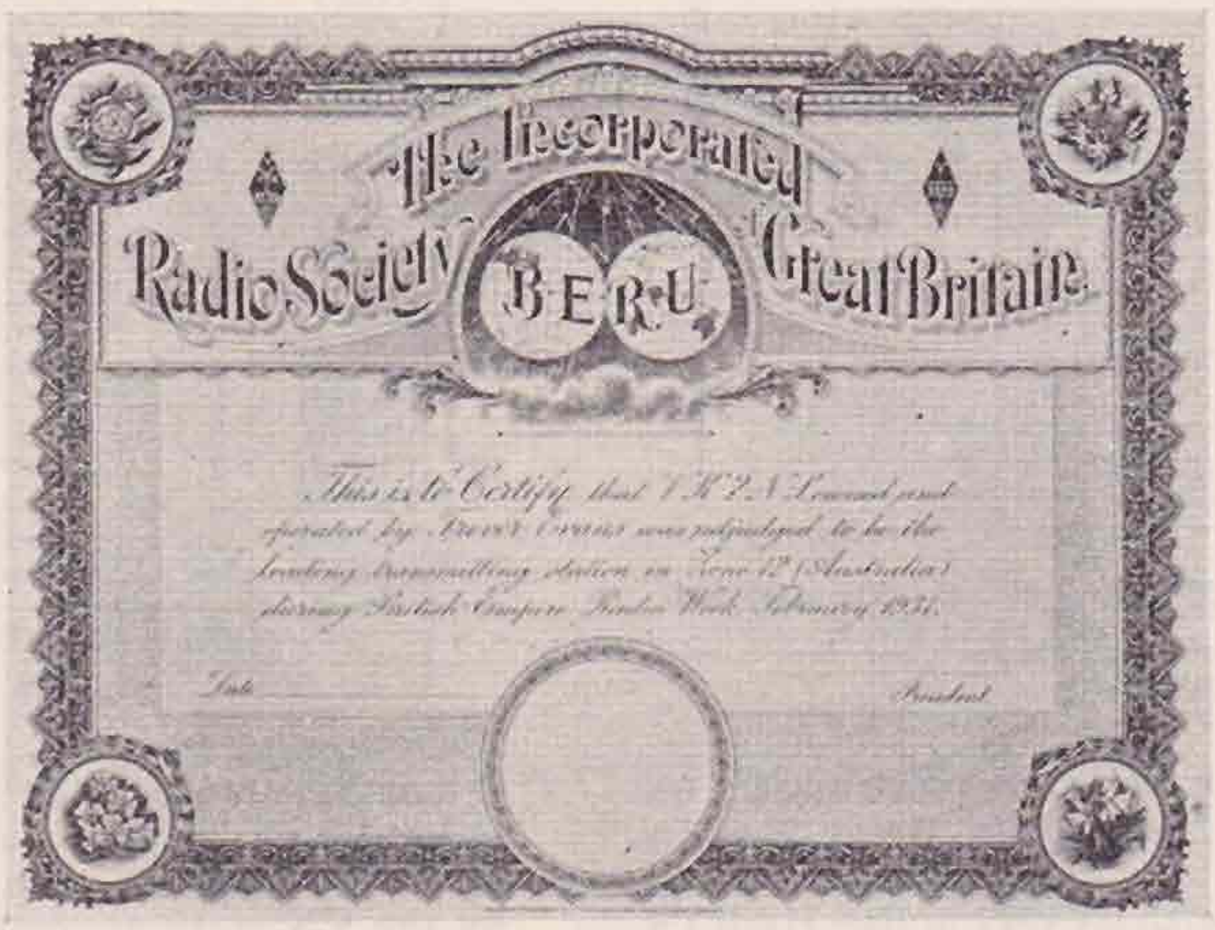
Only one BRS station reported according to rules, Mr. Bellamy, of Mapperley, Nottingham. His 12 calls heard are, however, a very poor total in comparison with the dozens logged by other members who could not report owing to their station being licensed to transmit.

B.E.R.U. Challenge Trophy.

In concluding this report of our first B.E.R.W. we wish to take this opportunity of thanking all who have reported, and all those who have contributed to the handsome trophy which is now on its way to Australia.

Especial thanks are due also to Mr. Handy and the A.R.R.L., who so kindly circulated to 112 newspapers and journals full details of the event.

Finally we thank Mr. Hanky, of the London "Daily Mail," for giving us useful publicity, and in closing down, we express the hope that future British Empire projects will be more fully supported by the members of the Society upon which the sun never sets.



A Journey into the World of Science.

By G. G. Blake, M.I.E.E., F.Inst.P., F.R.S.A.

(A paper read before the R.S.G.B. on April 29, 1931.)

(*Continued from previous issue*).

Relativity.

In order that we may obtain some realisation of what relativity means, let us perform a few mental exercises.

1. Let us imagine ourselves seated in a train in which we are unable to feel any motion either of the train itself or of the air which we move through.

If we glance, say, out of the left-hand window, we see what appears to be a stationary train by the side of us, so we conclude that we are standing still; if we look, however, through the right-hand window we note that we are passing telegraph poles at say, 10 miles per hour.

We glance again to our left and we note that we seem to be going backwards at five miles per hour, yet we know by the telegraph poles (which we know to be fixtures) that the real fact is that we are progressing at 10 miles per hour, and the other train is passing us at 15 miles per hour.

If the telegraph poles were travelling themselves at some unknown speed, everything would be relative, and we should have no fixed point from which we could judge whether we were going backward or whether the other train was moving. This is exactly the difficulty we are up against when we try to take measurements as our earth travels along through space. All the heavenly bodies are moving about in various directions, and we have no fixed and stationary point of reference. According to our measurements we are travelling round the sun at about 17 miles per second, a speed so great that it caused Litchenburg to remark that, as a man raised his hat in the street, he travelled 17 miles bareheaded without catching cold. Although we can repeat our measurements over and over again with the same result, if a being living on Venus or some other planet were to make them his measurements would not agree with ours.

Let us imagine a blind aviator flying along in an infinite sky, or, as he would probably get his machine smashed at the first encounter, I think we had better visualise a blind angel who could bump about without seriously hurting herself.

To this individual the distance between objects would appear as duration experienced in moving from one to another. Imagine that she now encounters a wind; obviously if she flies with it, all the duration distances will be shortened, or if she flies against it they will be lengthened. In other words the duration distances vary according to the condition of the medium in which the measurement takes place. Measurement is relative to the observer. How could we measure the motion of one point in infinite space without a point of reference to gauge that motion. Or again, how could we measure time in flow of duration without instants of reference.

Applying the theory of relativity to the ether of space, Einstein says that Newton was wrong when he said that all bodies exert an attraction upon one another, i.e., that the sun attracts the earth, that the earth attracts the moon and so on. The effect is much the same, but he says that the attractions do not belong to the bodies themselves. Attraction is not an attribute of matter, it is a property of space itself. If there were no matter, space would exhibit no strains. The apparent attractions observed by Newton were the effect of the distortion or bending of space by the presence of matter.

All this would at first sight appear to be very unreal and unnecessary argument, more especially as Einstein, in order to explain gravitation, had to assume fifth dimensional space. However, by careful reasoning on these lines, Einstein predicted that during an eclipse of the sun by the moon a ray of light from Jupiter should be deflected 1.7 degrees from its course. In 1926 this prediction was verified (photographically) by astronomers, and whether we like it or not, this deflection could neither have been predicted or explained by Newtonian laws. Einstein also predicted the displacement of certain lines of the spectrum, and has been able to explain certain observed, but hitherto unexplained, irregularities in the movements of the planet Mercury.

Space-time is Einstein's fourth dimension, and he says that time is not some strange phenomenon that passes us, but it is a dimension of space quite as real as length, breadth and height. I will try to make this more clear.

If I make a dot on a sheet of paper, when I make it, it is a dot in fourth dimensional space, but as time passes I could count seconds and picture it as the end of a straight line—one second, two seconds, three seconds, and so on, so that the dot is really the end section of a line in time and space.

If I now move the paper in any direction I bend or distort the otherwise straight time-space line in the fifth dimension.

What applies to the dot on the paper applies also to ourselves and to everything in existence—we are all at the end of time-space lines. We must discard our habit of thinking of time as passing us, and view the matter the other way round. Relatively, time may be a dimension along which we travel.

Has it ever occurred to you that we only live in the present instant of time, we do not live in the past; we leave it behind us and only remember it; nor do we live in the future. Actually we only live in a flat section which is travelling through time, probably at the speed of light.

(If we could move away from a moving object at the speed of light it would apparently cease to move, or, as it were, it would stand still in time.)

It is a wonderful thought that we ourselves, together with everything that has been, are existing in this momentary section of time and travelling along at the same speed through time and space.

(*Continued on page* 350.)

Smoothing Circuit Design.

By G6OT.

IV.—DESIGN OF CHOKES.

(Continued from April Issue.)

1. The Use of Permeability Curves.

WE saw in the last article that, provided we could find a value for μ^1 (incremental permeability) for the iron in a core, we should be able to calculate the inductance of any winding upon it. Figs. 1 and 2 enable us to do this. At the outset it must be pointed out that the values we shall get from these curves are only approximate. The value of the permeability of any given sample of iron is, unfortunately, dependent upon the mechanical treatment which it receives in the course of being punched. It is still more dependent upon the annealing or other heat treatment such as transformer laminations are generally subjected to after being punched. Figs. 1 and 2 give, however, the permeabilities which may be expected from "Stalloy" given ordinary commercial treatment.

Fig. 1 shows the value of the incremental permeability for various values of A.C. flux. Each line represents a particular D.C. polarising force, and connects the permeability with the A.C. flux for the steady direct current which produces such a polarising flux. The figures for A.C. flux are in lines per cm^2, and are to be taken as the peak values. The figures written against the curves are in ampere-terms per cm. length of iron circuit.

In Fig. 2 each line again refers to a particular direct polarising force, but this time connects the permeability with the alternating magnetising force. The curves of Figs. 1 and 2 are, of course, obtainable from each other, but it is often more convenient to get the required permeability from one of them than the other. For example, if the alternating current through the winding is known, Fig. 2, giving the values of $\frac{iT}{l}$, is obviously the one to use. On the other hand, if the voltage across the choke or transformer is known, we can easily calculate the alternating flux in the iron and then use Fig. 1.

2. Calculation of Inductance without D.C. Polarisation.

Now let us return to the example which we proposed to work out at the end of the last article. Suppose we have a core made of Stalloy stampings known as No. 32. A drawing of the core is shown in Fig. 3. It is assumed that a total thickness of lamination equal to 1 in. is used. Suppose we put on this core a coil containing 1,000 turns. As a start let us calculate the inductance to alternating currents of very low value and with no direct current in the winding. This is the simplest magnetic condition of the iron and the value of permeability obtaining is generally called the "initial" permeability.

1. The nett area of the core must first be calculated (A)

Gross area of centre limb $= 1 \times 1 = 1$ sq. in.
$= 2.54 \times 2.54$
$= 6.46$ cms.^{2}

Assume a "stacking factor" of 0·9.

The nett area $= 0.9 \times 6.46$
$= 5.81$ cms.^{2}

2. The length of iron circuit (l) can be found from the dimensions given in Fig. 3.

$$l = 2\tfrac{3}{4}'' + 1\tfrac{1}{2}'' + 2\tfrac{3}{4}'' + 1\tfrac{1}{2}'' = 8\tfrac{1}{2}''$$
$$= 8\tfrac{1}{2} \times 2.54$$
$$= 21.6 \text{ cms.}$$

3. The permeability (μ^1) we must get from either Fig. 1 or Fig. 2. In this case it is immaterial which curve we use, as both the alternating current through the winding, and hence the volts across it, are to all intents and purposes zero. Also, we are told that the direct current is zero; we thus choose the upper curve of Fig. 1, say, and find the permeability to be 800.

Now, remembering that we have 1,000 turns on the core, and using the formula developed in the April issue, we get:

$$L = \frac{1.256 \times \mu^1 A T^2}{l} \times 10^{-8}$$

Putting in the values for μ^1, A, T and l,

$$L = \frac{1.256 \times 800 \times 5.81 \times 1{,}000 \times 1{,}000 \times 10^{-8}}{21.6}$$
$$= 270 \times 10^6 \times 10^{-8}$$
$$= 2.70 \text{ henries.}$$

Nothing very difficult in that, is there?

3. Calculation of Inductance in Presence of D.C. Polarisation.

Now suppose that the choke is used in a circuit in which a direct current of, say, 20 milliamps is flowing, but the alternating component is still considered as very small. How much is the inductance reduced? First, we have to find the steady magnetisation produced by this current. This is given by

$$\frac{IT}{l}$$

where I = D.C. current in *amperes*
and l = length of iron circuit in cms. as before.
Thus we have

$$\frac{IT}{l} = \frac{20 \times 1000}{1000 \times 21.6}$$
$$= .926.$$

For the moment we may call this equal to unity (had we known the answer we should have assumed a current of 21.6 mas. of course!)

Now looking at the curves in Fig. 2 we see one labelled $\frac{IT}{l} = 1$. Using this, the value of μ^1 is found to be 580 at an alternating magnetising force of zero.

Our inductance, therefore, is now given by

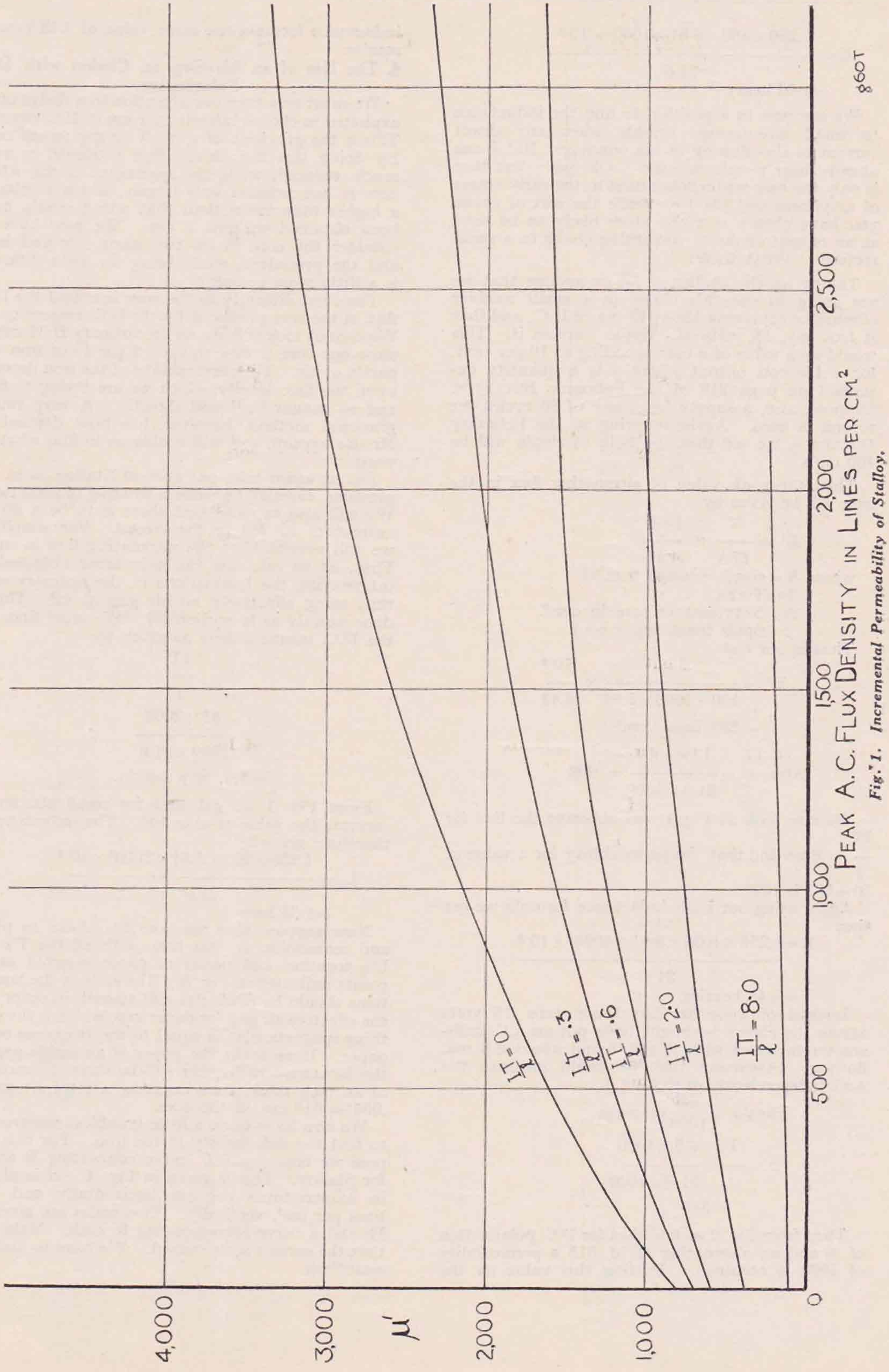


Fig. 1. Incremental Permeability of Stalloy.

$$L = \frac{1.256 \times 580 \times 5.81 \times 1000^2 \times 10^{-8}}{21.6}$$

$$= 1.96 \text{ henry}$$

We are now in a position to find the inductance to small alternating currents when any direct current is also flowing in the winding. But I can already hear people saying: "Oh, yes; but that is only the case with chokes used in the early stages of amplifiers and the like, while the sort of choke you have chosen is much more likely to be used as an output choke or smoothing choke in a small rectifier. What then?"

Taking up the challenge, let us assume that we are going to use this choke in a small receiver eliminator supplying about 13 ma of D.C., and that it has, say, 15 volts of "ripple" across it. This would be a value of a corresponding to 10 per cent. for a 150-volt output where a is a quantity described on page 218 of the February BULLETIN. Suppose, also, a supply frequency of 50 cycles per second is used. Again referring to the February BULLETIN, we see that the bulk of ripple will be 100 c.p.s.

Then the peak value of alternating flux in the iron will be given by

$$B^1 = \frac{V}{fTA} \times \frac{10^{-8}}{4.44}$$

where V = ripple voltage (r.m.s.)
T = Turns.
A = Nett area of core in cms^2.
f = ripple frequency (c.p.s.)

Thus in our case

$$B^1 = \frac{15}{100 \times 1000 \times 5{\cdot}81} \times \frac{10^{-8}}{4.44}$$

$$= 583 \text{ lines /cm}^2$$

$$\text{Also } \frac{IT}{l} = \frac{13 \times 1000}{21.6 \times 1000} = .602$$

We now look at Fig. 1, and choosing the line for $\frac{IT}{l} = .6$ we find that the permeability for a value of $B^1 = 583$ is 1030.

Again using our basic inductance formula we get that

$$L = \frac{1.256 \times 1030 \times 5.81 \times 1000^2 \times 10^{-8}}{21.6}$$

$$= 3.48 \text{ henries.}$$

Instead of knowing that there were 15 volts across the choke we might have put an A.C. milliameter in series with it and found about 6.8 ma. flowing. (Assuming that we could measure the A.C. independently of the D.C.).

$$\text{Thus } i = \frac{6.8}{1000} \text{ amperes}$$

$$\therefore \frac{iT}{l} = \frac{6.8 \times 1000}{21.6 \times 1000}$$

$$= .315$$

Then from Fig. 2 we find that for D.C. polarisation of .6 and an alternating iT of .315 a permeability of 1030 is obtained. Putting this value on the inductance formula the same value of 3.48 henries results.

4. The Use of an Air-Gap in Chokes with D.C. Polarisation.

We must now turn our attention to a dodge often exploited in chokes intended for use in D.C. circuits. This is the provision of a small air gap in the core. By doing this the steady flux produced is very much reduced, while the reluctance of the whole core is not reduced very largely, which results in a higher inductance than that which would have been obtained without a gap. We now have to consider the core in its two parts, air and iron, and the procedure, while being no more difficult, is a little more complex.

The chief difficulty in the way is to find the D.C. flux in the iron produced by the D.C. ampere turns. We cannot look this up on an ordinary B/H curve, since our core is now composed partly of iron and partly of air. The permeability of the iron depends upon the flux density, which we are trying to find, and so cannot be found directly. A very simple graphical method, however, has been devised by Mr. Karapetoff, and will enable us to find what we want.

Let us again take our core of Stalloy as in the previous cases and assume a winding of 2000 turns. We will also suppose that there is to be a direct-current of 85 Ma in the circuit. For simplicity we will assume that the alternating flux is small. First, let us calculate the inductance obtained by interleaving the laminations in the ordinary way, thus using effectively no air gap at all. This is done exactly as in section (3). We must first find the D.C. magnetisation as given by

$$\frac{IT}{l}$$

$$= \frac{85 \times 2000}{1000 \times 21.6}$$

$$= 8.0 \text{ very nearly.}$$

From Fig. 1 we get that for small alternating currents the value of μ^1 is 100. The inductance is, therefore, given by

$$L_1 = \frac{1.256 \times 100 \times 5.81 \times 2000^2 \times 10^{-8}}{21.6}$$

$$= 1.35 \text{ henries}$$

Now suppose that we take the choke to pieces and reassemble it, this time with all the T's and U's together and pieces of paper inserted at the points indicated in Fig. 3. The ends of the laminations should be made flat and smooth in order that the effective air gap (or paper gap, which is the same thing magnetically) is equal to the thickness of the paper. If we make the paper of an inside page of the BULLETIN each piece will be three-thousandths of an inch thick, thus inserting a total air gap of .006" = .015 cm. in the core.

We now have to do a little graphical construction to find the flux density in the iron. For this purpose we require a D.C. curve connecting B and H for Stalloy. This is given in Fig. 4. H is plotted in ampere-turns per cm. horizontally, and B in lines per cm^2, vertically. Two scales are given for H, and a curve corresponding to each. Make sure that the correct scale is used. We have to find two quantities.

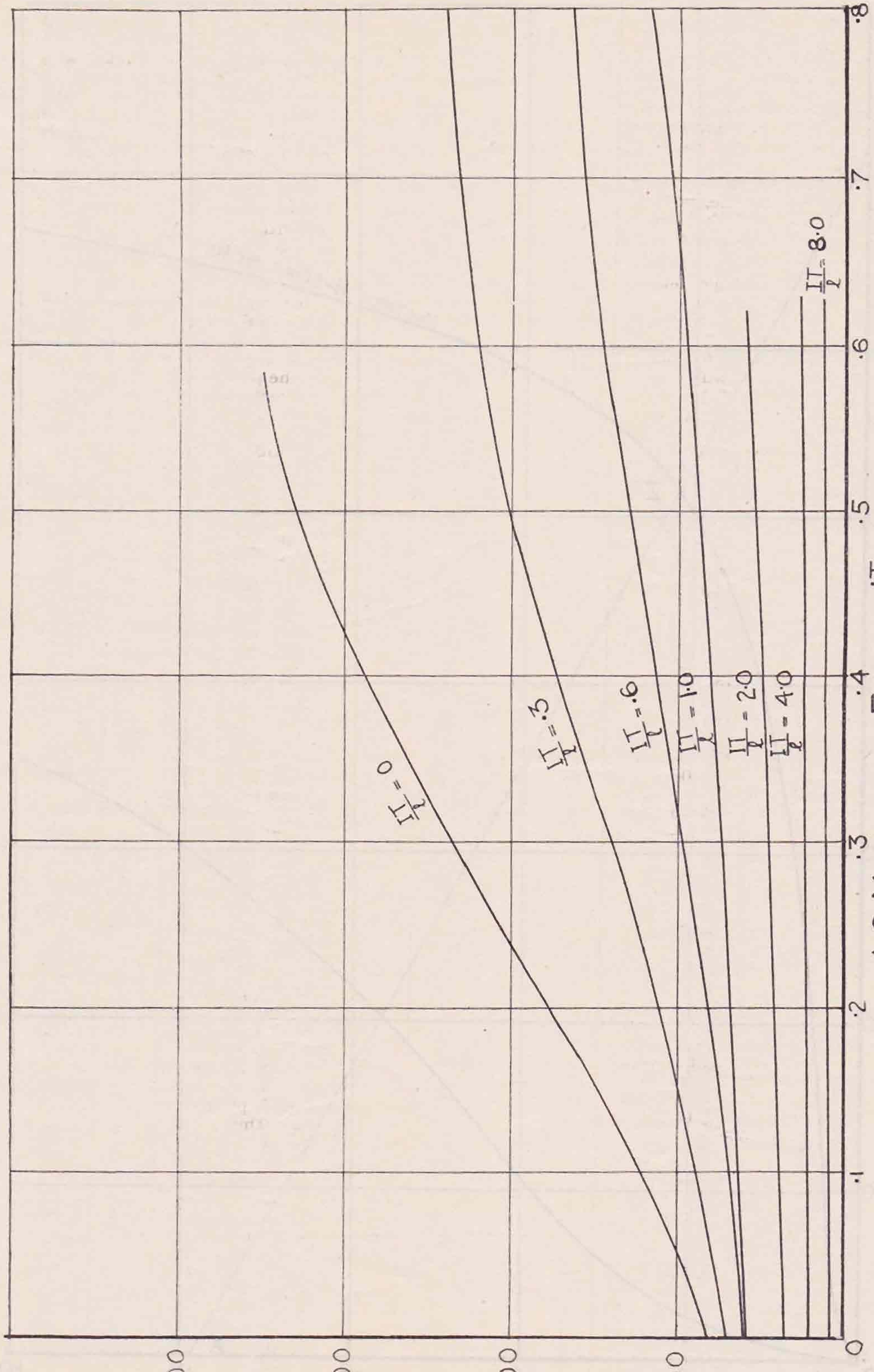


Fig. 2. Incremental Permeability of Stalloy.

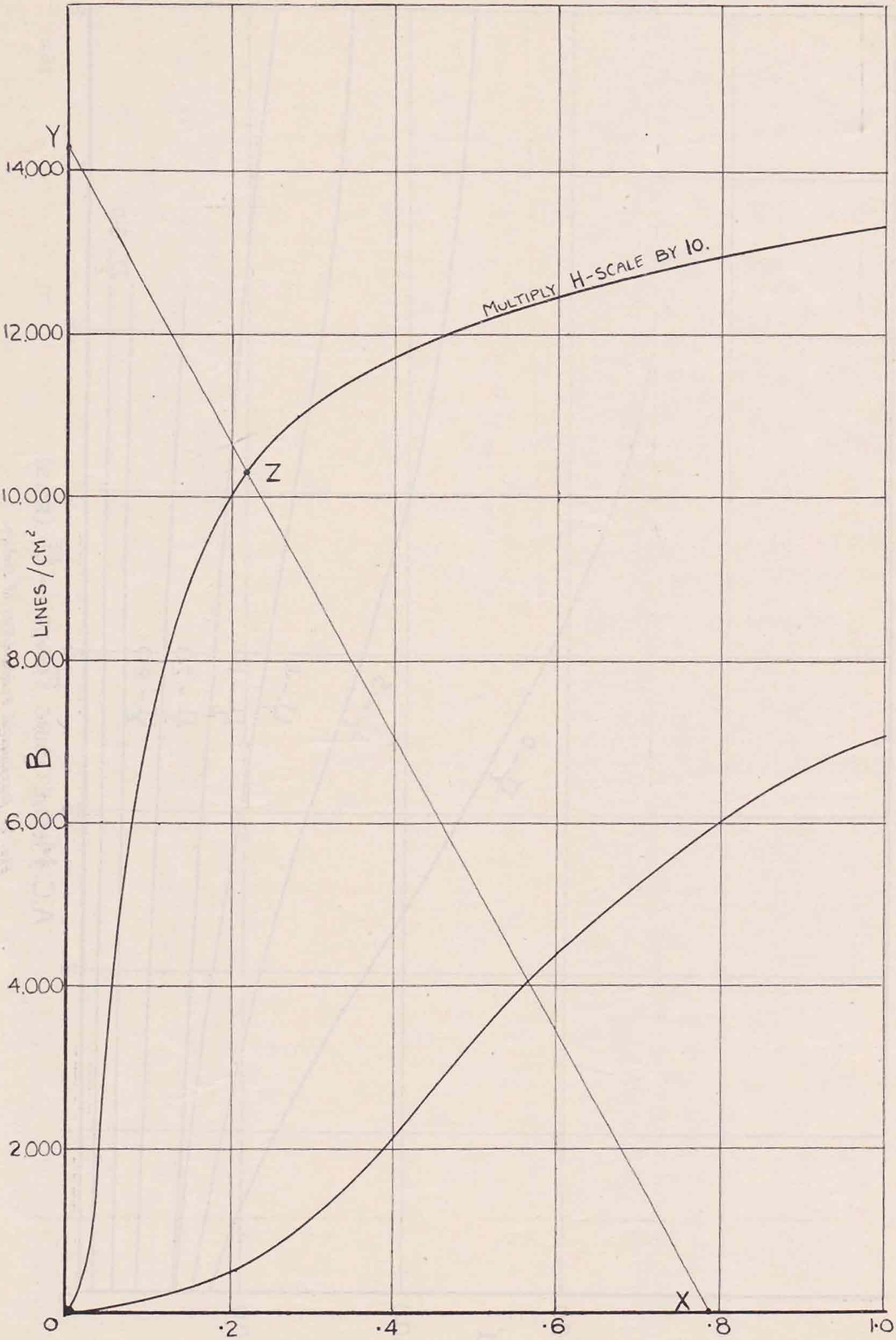


Fig. 4. B/H Curve for Stalloy.

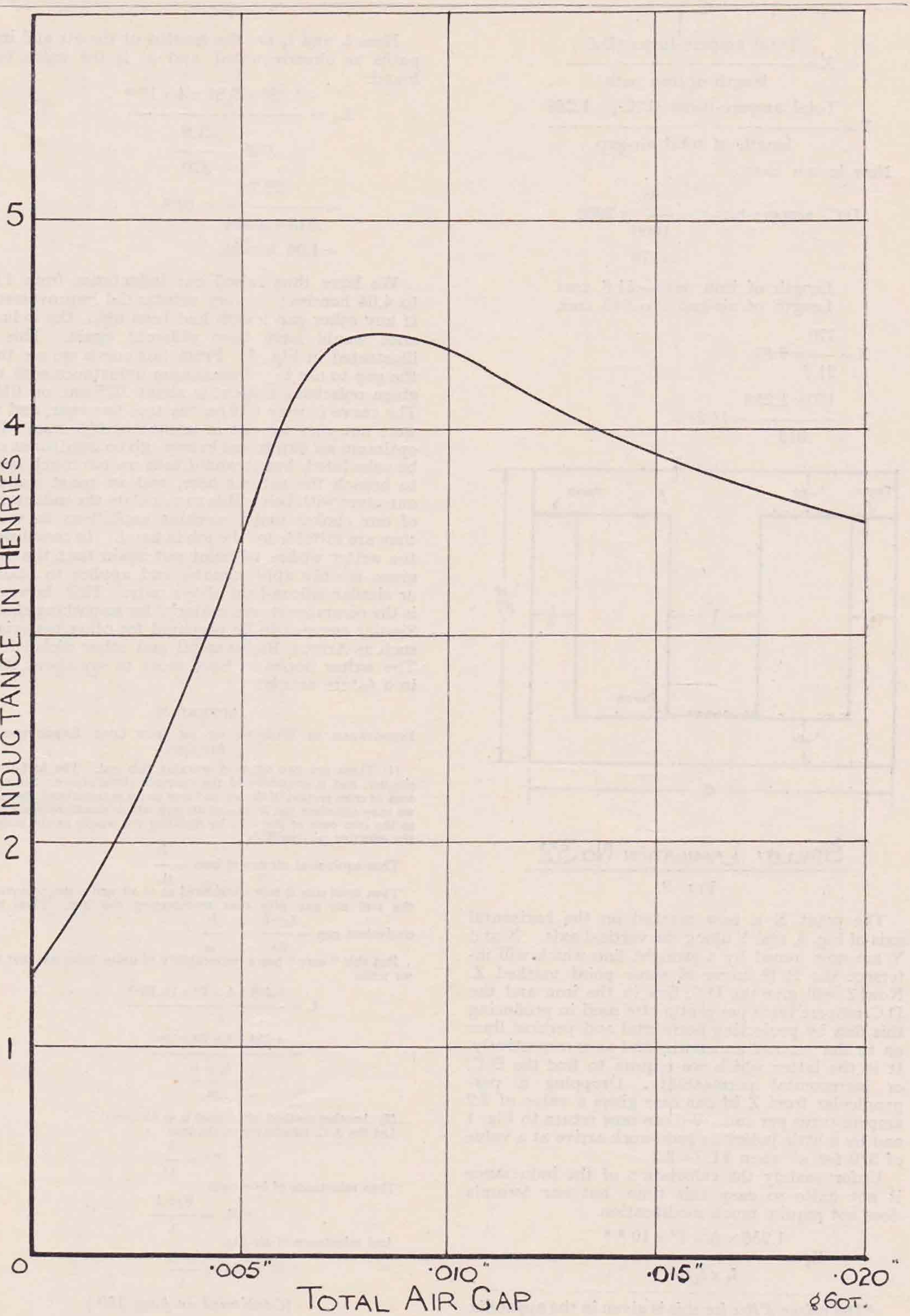


Fig. 5. Variation of Inductance with an Airgap.

$$X = \frac{\text{Total ampere-turns (D.C.)}}{\text{length of iron path.}}$$

$$Y = \frac{\text{Total ampere-turns (D.C.)} \times 1.256}{\text{length of total air-gap}}$$

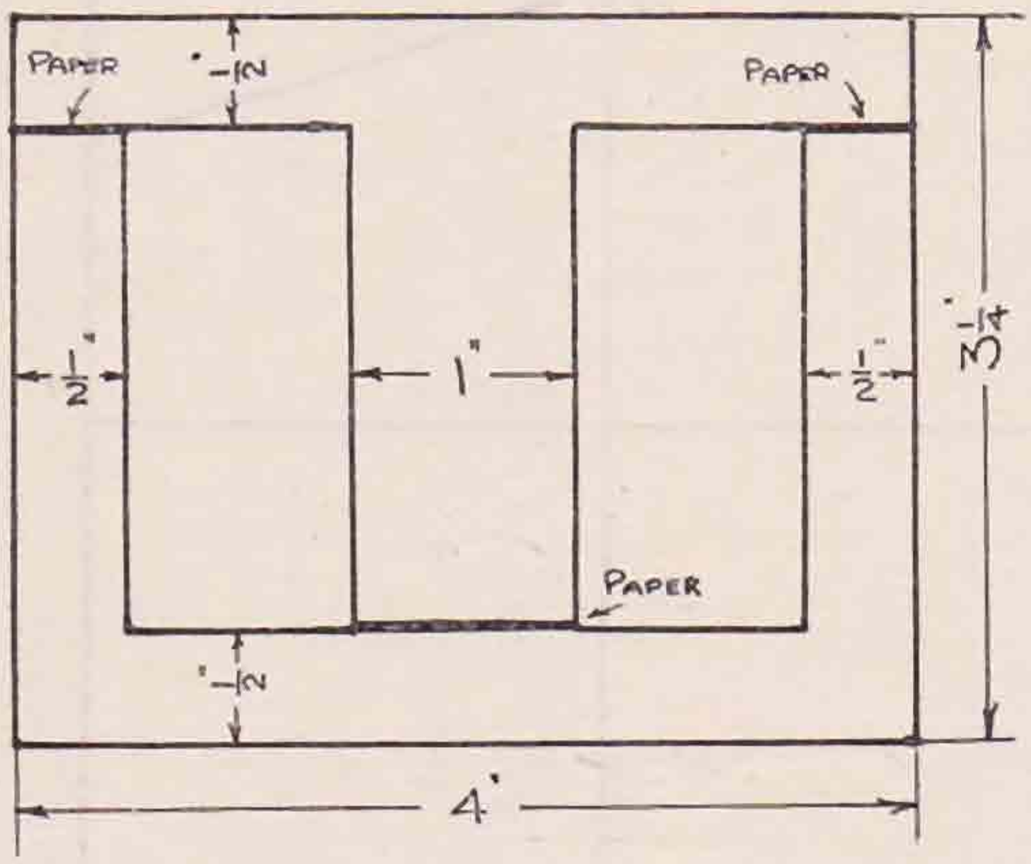
Now in our case

$$\text{D.C. ampere-turns} = \frac{85}{1000} \times 2000$$
$$= 170$$

Length of iron path = 21.6 cms.
Length of air-gap = .015 cms.

$$X = \frac{170}{21.6} = 7.87$$

$$Y = \frac{170 \times 1.256}{.015} = 14.240$$



STALLOY LAMINATION No. 32

FIG. 3.

The point X is now marked on the horizontal axis of Fig. 4, and Y along the vertical axis. X and Y are now joined by a straight line which will intersect the B/H curve in some point marked Z. Now Z will give the D.C. flux in the iron and the D.C. ampere turns per centimetre used in producing this flux by projecting horizontal and vertical lines on to the vertical and horizontal axes respectively. It is the latter which we require to find the D.C. or incremental permeability. Dropping a perpendicular from Z in our case gives a value of 2.2 ampere turns per cm. We can now return to Fig. 1 and by a little judicious guesswork arrive at a value of 370 for μ^1 when $IT/l = 2.2$.

Unfortunately the calculation of the inductance is not quite so easy this time, but our formula does not require much modification.

$$L_2 = \frac{1.256 \times A \times T^2 \times 10^{-8} *}{l_2 \times l_1/\mu^1}$$

Here l_1 and l_2 are the lengths of the air and iron paths as already noted, and μ^1 is the value just found.

$$L_2 = \frac{1.256 \times 5.81 \times 4 \times 10^{-2}}{.015 + \frac{21.6}{370}}$$
$$= \frac{29.2}{.015 + .0574} \times 10^{-2}$$
$$= 4.04 \text{ henries}$$

We have thus raised our inductance from 1.35 to 4.04 henries; a very substantial improvement. If any other gap length had been used, the inductance would have been different again. This is illustrated in Fig. 5. From this curve we see that the gap to use to get maximum inductance with the given polarising current is about .025 cm. or .010". The curve is very flat on the top, however, and we were not very far out in using our .015 cms. The optimum air gap to use in any given conditions can be calculated, but it would take up too much space to broach the subject here, and we must content ourselves with being able to calculate the inductance of our chokes under working conditions to see if they are suitable for the job in hand. In conclusion, the writer wishes to point out again that the data given is only approximate, and applies to Stalloy or similar silicon-iron alloys only. This, however, is the commonest core material for smoothing choke. Similar curves can be prepared for other materials, such as Armco, Radio metal and other nickel iron. The writer hopes to have more to say about these in a future article.

APPENDIX.

INDUCTANCE OF WINDING ON AN IRON CORE EMBODYING AN AIR GAP.

(1) There are two ways of working this out. The first is the simpler, and is employed in the example given above. Since the area of cross section of the air and iron paths is considered the same, we may calculate the length of air gap which would be equivalent to the iron part of the core by dividing the length of the core by the effective permeability.

$$\text{Thus equivalent air gap of iron} = \frac{l_1}{\mu_1}$$

Thus total core is now considered as of air and a length equal to the real air gap plus that representing the iron. Thus total

$$\text{equivalent gap} = \frac{l_2 + l_1}{\mu^1} = \times \frac{l_1}{\mu}$$

But this "core" has a permeability of unity being air, and thus we write

$$L = \frac{1.256 \times A \times T^2 \times 1 \times 10^{-8}}{l_1}$$
$$= \frac{1.256 \times A \times T^2 \times 10^{-8}}{\frac{l_2 + l_1}{\mu_1}}$$

(2) Another method often used is as follows:
Let the A.C. reluctivity of the iron

$$R^1 = \frac{1}{\mu^1}$$

Then reluctance of iron path

$$= R_1 = \frac{R^1 \times l_1}{A}$$

And reluctance of air gap

$$= R_2 = \frac{1 \times l_2}{A}$$

*The *raison d'être* for this is given in the appendix.

(*Continued on page* 350)

Design of a Power Amplifier for High Frequencies.

By F. Charman (G6CJ).

PART II.

(*Continued from previous issue.*)

WHEN considering the valve as a speech amplifier, we are considerably handicapped as regards efficiency owing to the requirement of no distortion. We are limited slightly by the curvature of the valve characteristics at low anode currents, but the chief factor, of course, is that it is not possible to travel further up the load line than zero grid volts, because of the serious distortion that accompanies grid current. The possibility of grid current fixes a limit at 25 per cent., and any curvature of the characteristic further reduces this. For similar reasons we cannot get any greater efficiency from a valve which is being modulated, and this should be borne in mind when designing a transmitter for 'phone or cw.

However, when we are dealing with one frequency and have a tuned circuit as a load in the anode, the distortions produced by grid current and curvature do not worry us much, because the harmonics which represent the distortion do not develop appreciable voltages across the load which is not tuned to them. We can, therefore, increase the efficiency by (*a*) running into grid current, and (*b*) biasing to zero anode volts, or both together.

Considering (*a*), we can choose a position of operations for one valve (Fig. 7). Say, 500 volts 20 m.a., and by taking a line through this point till $E^1B^1 = E^1G$, we find we can get an anode peak voltage EO = 500 volts, and a current peak of 20 m.a., or a H.F. output of 5 watts, $= \frac{1}{2} E^1E \times EO$, which is 50 per cent. efficiency. The load is 25,000 ohms impedance, and the D.C. bias about —70 volts. The drive required is about 120 volts peak, and for all values of drive above 70 volts+, grid current will absorb power from the driving circuit. The amount of this loss is somewhat difficult to estimate, but it is usually sufficient to limit the ratio between the powers of the drive and driven oscillators to about 1 to 8.

In this example, since the valve is taking 10 watts D.C. and handing out 5 watts of A.C., its actual dissipation is only 5 watts as long as the drive is connected and the anode load is in operation. Provided we could guarantee these conditions we could increase the input to nearly 20 watts, * and the only danger to the valve would be the development of, say, 500 volts D.C. + 500 volts peak H.F. anode volts + 120 H.F. grid across the pinch; or, if the extra watts were obtained by increasing the H.T. as well as the feed, as is desirable for efficiency, up to 1,000 volts H.F. across the pinch. But the moment we detuned the load we should have to remove the H.T., or the drive, or the valve would blow up.

Considering now case (*b*), suppose that the valve were biased to zero current (Fig. 8). Then anode current would flow for only the positive half-cycle of the grid swing. As the grid volts rise to maximum, the anode volts drop to zero, but the anode current rises to a maximum which may be set at the maximum emission of the valve. Returning through zero to minimum grid volts, however, the anode volts rise to 2EO, but the anode current remains at zero, so that the current into the load consists of a sinusoidal current with the negative halves cut away (Fig. 8a). Now, mathematically, such a current may be resolved into the following components :—

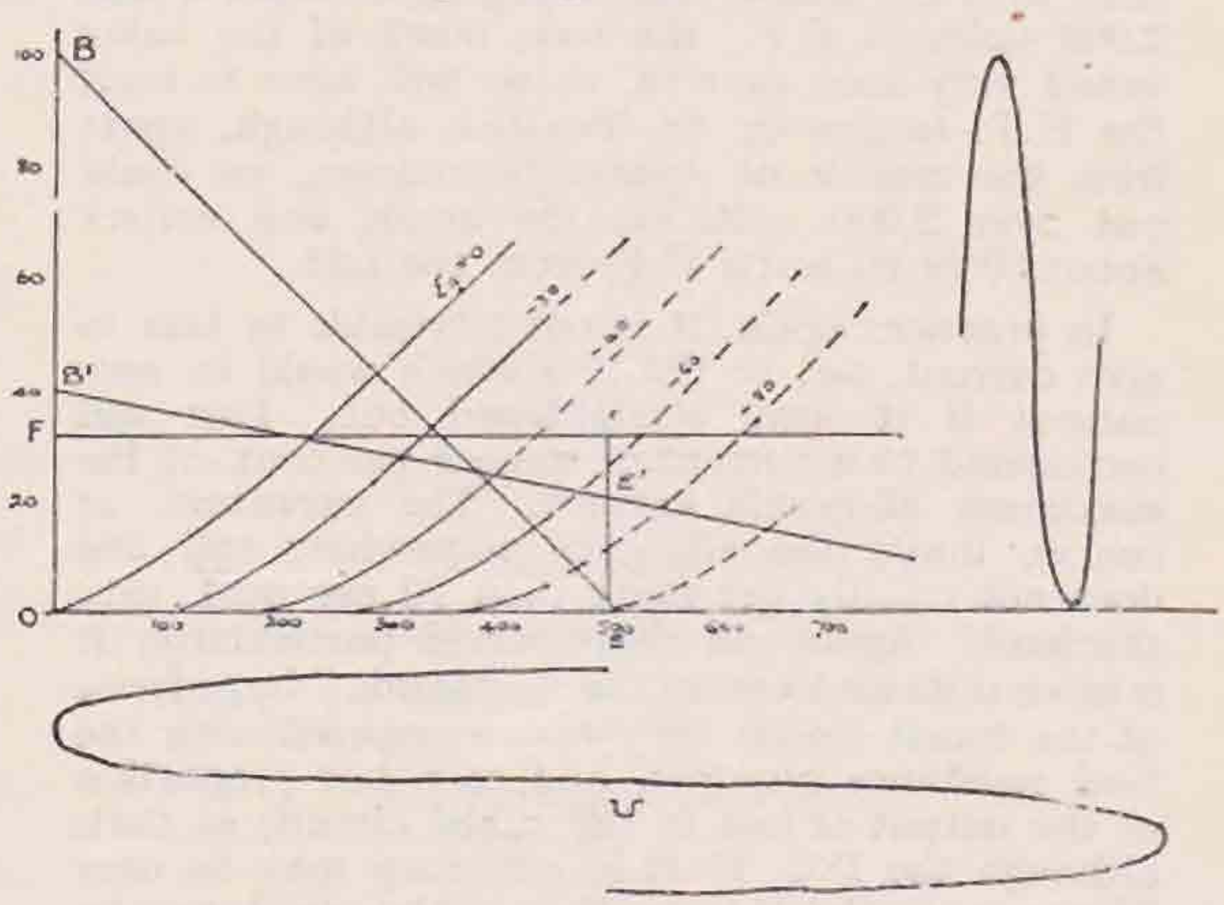


Fig 7.

31.8 per cent. or $\frac{1}{\pi}$ direct current.
50% amplitude fundamental frequency.
21.2% ,, 2nd harmonic
Zero ,, 3rd ,,
4% ,, 4th ,,
+ others in small quantities.

So that, if the maximum peak of the anode current were 100 m.a., the valve would take 31.8 m.a. D.C., and develop 50 m.a. peak H.F. fundamental in the load. This is sketched in Fig. 7. The A.C. power is $\frac{1}{2}$v. $\times$ i (50 per cent. fundamental) $= \frac{1}{2}$.OE $\times \frac{OB}{2} = \frac{1}{4}$ OE.OB, i.e., *half* the area of the triangle OBE. The D.C. input is $\frac{OB}{\pi} \times OE$, i.e., OE $\times$ OF. Dividing the A.C. power by the D.C.

* We can never get the full 50 per cent. efficiency in practice owing to causes to be outlined.

power, we find for the efficiency of the amplifier $\frac{OB.OE}{4}\ \frac{\pi}{OB.OE}\ \frac{\pi}{4}$, or approximately 78 per cent. So that by biasing hard and driving hard we have considerably increased the efficiency. Only 22 per cent. of the power supplied is dissipated by the valve.

Assuming it is safe to drive the LS5 to 100 m.a. peak, the feed will be 32 m.a. With 500 volts H.T. the load line is BE, Fig. 7, the D.C. input $.032 \times 500$, or 16 watts, and these are divided as $.78 \times 16$, or 13.9 watts in the load and $.22 \times 16$, or 2.1 watts in the valve. The D.C. bias required is —100 volts, and the drive 100 plus, say, 100, or 200 peak volts H.F., 400 volts swing. The load is

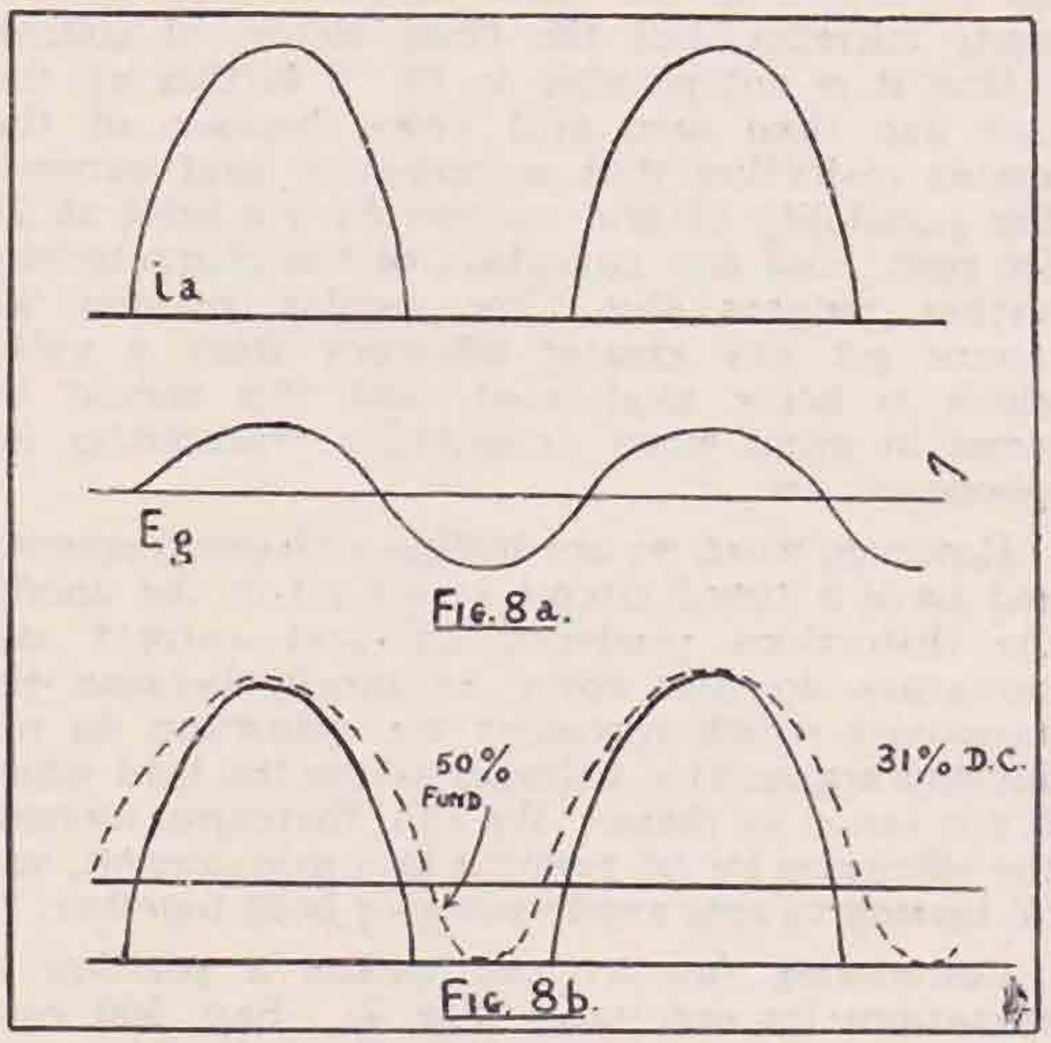
$$\frac{OE_1}{OB} \frac{500v.}{.1\ amp.} = 5{,}000\ ohms.$$

Now the valve would be quite cheerful with such a light dissipation, so let us double it by doubling the H.T. The load resistance is now double, or 10,000 ohms; the bias —200 volts approximately, and the drive about 400 volts peak. The valve would then consume 4.2 watts out of the 32 supplied and produce nearly 28 watts of H.F. energy. However, we know from experience that with the anode lead swinging between 0 and 2,000 volts at H.F., the base pinch of the valve would very soon cave in, so we will have to limit the H.T. to five or six hundred, although, apart from the trouble of voltage breakdown, we could put over 2,000 volts on the anode and collect about 50 or 60 watts H.F. from the LS5.

In practice, again, it is not advisable to bias to zero current, but to the line which would be zero current if it were straightened out. This will correspond to a current of some 5 per cent. of the maximum allowable current. The curvature, of course, limits the efficiency somewhat, and one does not usually get more than 70 per cent. into the load. Again, on short waves particularly, it is often difficult to make the " dynamic " impedance of the tuned circuit very high compared with the load resistance required, and so a fair proportion of the output is lost in the tuned circuit, so that, although the D.C. to H.F. efficiency may be over 70 per cent., the D.C. to H.F.-in-the-aerial may be less than 50 per cent. On 28 M.C., in fact, it is difficult to make the dynamic impedance of the tuned circuit alone sufficient to *equal* the required load, so that the efficiency is often very low indeed.

Before summarising, perhaps it would be as well to elaborate one or two points mentioned. The maximum emission referred to is a somewhat indefinite term. With the older Tungsten filaments, of course, it was not possible to get more than a certain anode current under any conditions without increasing the filament current, as the valve curves flattened out at the top as well as the bottom. With more modern valves, however, there seems to be no reasonable limit to the current available, but, of course, more than a certain current will seriously damage the valve, and the determination of the " max " current at the peaks of the oscillations is not quite so obvious. One must make some assumption as to what " steady " current can be drawn (the point F in Fig. 7) from the filament. This is usually indicated nowadays by the makers in their grid bias table. The " max " current is to be taken as π times, or approximately 3 times, this value.

Again, the estimation of the amount of power required to drive the valve is somewhat difficult, as no useful grid-current curves are published and a complete analysis is rather beyond the scope of this article. However, it will be noticed that the excursion into the " No man's land " of positive grid is decreased as the anode voltage is increased, so that, with a higher anode voltage a greater power can be controlled with the same grid loss. Thus, if we drove successfully with a 8 : 1 power ratio with a certain H.T., it would be possible to increase the ratio to 10 : 1 by increasing the H.T., provided we did not overrun the valve in other ways by doing so.



The power absorbed in the grid circuit is composed of that overcoming the losses in the tuned circuit, which are $\frac{\omega^2 L^2}{r}$, and should be negligibly small, plus the power dissipated in the *apparent* resistance represented by the conduction from filament to grid, when the grid is positive. A rough estimate of this, for small valves, is about 20,000 ohms, and the driving stage should be matched into an impedance of this order, either direct or by transformer, and should be big enough to produce the required grid swing in this load.

One further point. If the valve is to be run at high efficiency, there will be three or four times more power in the whole circuit than the valve alone would dissipate without a catastrophe, and it is essential that this power is not turned loose on the valve. For example, if the drive is on, and the anode is detuned, the feed will rise to a high value, and if the H.T. is high, the valve's anode will get red hot, white hot, or even melt, accompanied by suitable music from the power supply. Fifty watts poured into the digestive organs of an LS5 will seriously undermine its constitution. And quickly. This is the only really dangerous condition, however. With the drive on, anode tuned, but aerial off, high voltages may occur, so that provided one never detunes seriously when the

H.T. is up, one is fairly safe. All preliminary fiddling should, therefore, be done with low H.T., though accurate adjustment cannot be made, because the correct load is a function of the H.T. The various possibilities are :—

1. Full H.T., no drive, or aerial ... ... Safe for all tunings.
2. Full H.T., no drive, aerial on ,, ,, ,,
3. Full H.T., full drive, untuned anode and no aerial ... ... Disastrous.
4. Full H.T., full drive, anode tuned ... ... Comparatively safe, i.e., for short intervals. May develop high voltage or spurious oscillation.
5. Full H.T., full drive, anode tuned, aerial load coupled ... Normal

It is usual to employ a grid leak, as some extra bias may be obtained from the grid current during the + grid swing, and this tends to increase the efficiency somewhat. It also acts in the direction of safety in the dangerous condition (3), or if the circuit goes into self-oscillation.

aerial is assumed to be a transformer, or some electrical arrangement which is equivalent, such as a capacity coupling. The anode load is to consist of the losses in the tuned circuit, plus the resistance, transformed in value by the coupling of the aerial. Now the impedance of the tank circuit is $Z=\frac{\omega^2L^2}{r}$, and the effect of the aerial is to increase r. Or, puting it another way, the anode load is Z in parallel with S^2 times the apparent impedance of the aerial, where S is the step ratio of the transformation. If we can make r very small, then the load is entirely due to the aerial, and a C/F half-wave aerial, which looks like about 100 ohms, would require, to make it a 10,000-ohm load, a ratio $S=\sqrt{\frac{10,000}{100}}$, i.e., 10 : 1.

It is hoped in the future to give some further indications of the methods of design of this part of the circuit.

Summarising, then, the method of design and operation is as follows :—

Draw the V^a/I_a curve and the line F (Fig. 7), which is determined as above. Mark the point $B=3\times OF$. Try various load lines until the

H.T.	Drive to peak.	Z_a	D.C. m.a.	D.C. watts.	Watts output.	Bias.	Overall Grid Swing.	Dissipation.	Step-down ratio for 300ω Zepp feeders.
SW/9	2,000	300	6,700	95	190	150	—150	400	40	5
		200	10,000	64	128	100	—150	350	28	6
		150	13,000	48	96	75	—150	300	21	7
	2,500	300	8,300	95	240	185	—200	450	55	5
		200	12,500	64	160	125	—200	375	35	6.5
		150	16,700	48	120	90	—200	350	30	7.5
		100	25,000	31	80	60	—200	320	20	9
	3,000	300	10,000	95	285	210	—250	500	75	6
		200	15,000	64	195	150	—250	450	45	7
		150	20,000	48	145	110	—250	400	35	8
		100	30,000	31	95	75	—250	375	20	10
DO/40	1,000	100	10,000	32	32	25	—150	350	7	6
		150	6,700	55	55	42	—150	400	13	5
	1,500	75	20,000	24	36	28	—200	450	8	8
		100	15,000	32	48	36	—200	475	12	7
	2,000	50	40,000	16	32	24	—250	550	8	11.5
		75	27,000	24	48	36	—250	575	12	9.5
		100	20,000	32	64	49	—250	600	15	8

Further help can be secured by the use of automatic bias from the H.T. feed, as this will tend to control the transports of the valve to some extent. The value of the resistance is, of course, E/I, or EO÷OF in Fig. 7. In the example given it would be just over 3,000 ohms.

The production of an anode load of a given value is brought about as follows : The coupling to the

rectangle EF is equal in area to about 4½ times the allowable watts dissipation. Work about 10 per cent. to 20 per cent. below this for safety. The H.T. is then the point E, the grid swing is indicated by the interesection of the load line and the valve curves, the D.C. bias such as to carry the static curve approximately to the point E, and the load impedance is OE÷OB ohms, or 1,000 OE÷OB, if

OB is called milliamps. The input is then OE × OF watts, of which theoretically 78 per cent. are delivered to the load, and the rest lost in the valve, though you will be lucky if in practice you do better than 60 per cent.

If desired, the drive stage can be designed in the same way.

In operation, the valve is set up with a low H.T. and the bias is adjusted until the feed is nearly zero. The drive is then switched on, when the feed will rise. Tuning the anode (without aerial) should now reduce the feed to nearly zero again. If it doesn't, make another anode coil bigger in dimension and fatter in S.W.G. until the losses of the circuit are much smaller. Now, with the anode tuning down to low feed, the H.T. and bias can be gradually put up towards the required value. During this process the effect of coupling the aerial can be tried. It should be possible to pull the feed up to the line - - - (Fig. 6). If the correct conditions are not approached in some degree, do not put up the H.T., but remember, once it is up, do not detune the anode load appreciably.

The secret of success is to get, first, plenty of drive, by keeping up the L/C ratio of the grid coil and keeping down its losses, and then to get hold of an efficient anode circuit. On 7 M.C. these should not be difficult, but on 14 M.C. the design of a low-loss tuned circuit needs to be carried out carefully, and on 28 M.C. it is almost impossible to obtain high dynamic impedances. The writer has, on 10 metres, obtained 40,000 ohms by special design, but the average circuit which one encounters very seldom exceeds a few thousand ohms. Here, then, it is advisable to use low impedance valves, which require correspondingly low loads. Unfortunately, such valves require large grid swings, so that it is difficult to obtain a high power ratio between drive and driven circuits.

In conclusion, as further example, the approximate operating conditions are given for two other valves.

A Journey into the World of Science—(*Continued from page* 339.)

To make this thought more clear, the momentary section of time on which we live can be represented by this *sheet of cardboard* travelling upward through time and space.

We cannot see anything above us in the time dimension, and can only realise the presence of things and events when we meet them. If I hold my fountain pen above this sheet it is still in the future, and our first consciousness of its presence would be of a point arriving on the sheet as soon as the sheet comes in contact with the tip of the nib.

We can never see the pen as a whole, we shall merely observe changes of shape, each shape having certain definite durations of time; the point will change into a semi-circle, the latter into a circle. Suddenly this circle will alter in size, and finally, after the circle due to the barrel of the pen has persisted for a comparatively long time, the circles will suddenly become smaller and smaller till they fade away, leaving the pen in the past.

During all this time we have never seen the pen as a whole, only a changing section at a time. Much careful thought would be needed even to partially realise its real significance.

Even our thoughts hang in chains above us in time, and pass through our brains bit by bit; in the actual moment of life we cannot even think one complete thought, no wonder that we find the laws of Nature so difficult to comprehend. Like the fountain pen, we never see anything as a whole in its reality, we live, as it were, in one plane. By endeavouring to think in four and even five dimensions our mathematicians are endeavouring to obtain a true perspective and to find the real shape of the facts which surround us.

In conclusion, I should like to remind you of a verse in the 2nd Chapter of Corinthians (verse 18): "While we look not at the things which are seen but at the things which are not seen, for the things which are seen are temporal; but the things which are not seen are eternal."

* * *

Mr. Blake's lecture was very well illustrated with actual experiments in the lecture hall, and in particular the experiment to demonstrate the effect of the radiation from radium tubes on the molecules of the air of the room, and that illustrated on page 305 of the May issue, were exceptionally interesting.

At the conclusion, Mr. Maurice Child contributed some interesting remarks to the discussion.

The President, Mr. Bevan Swift, warmly thanked Mr. Blake for the very excellent lecture he had delivered, and made reference to the considerable trouble that he (Mr. Blake) and his assistant had gone to in arranging the very considerable quantity of apparatus for the various experiments.

Members and their friends who were present were certainly taken a long way into the "world of science," and only wished they could have tarried longer at certain points.

(*Continued from page* 346.)

$$\therefore R_1 + R_2 = \frac{R^1 l_1 + l_2}{A}$$

Thus the apparent reluctivity of the whole core

$$= Ra = (R_1 + R_2)\left(\frac{A}{l_1 + l_2}\right)$$

$$= \left(\frac{R^1 l_1 + l_2}{A}\right)\left(\frac{A}{l_1 + l_2}\right)$$

$$= \frac{R^1 l_1}{l_1 + l_2} + \frac{l_2}{l_1 + l_2}$$

But generally l_2 is very small compared with l_1. Hence $\frac{l_1}{l_1 + l_2}$ is nearly equal to unity. Similarly $\frac{l_2}{l_1 + l_2}$ very nearly equals $\frac{l_2}{l_1}$

Therefore we may find that

$$Ra = \frac{R^1 + l_2}{l_1}$$

Thus the apparent permeability of the whole core $= \mu a = \frac{}{Ra}$.

$$= \frac{1}{R^1 + \frac{l_2}{l}}$$

(*Continued on page* 353.)

HIC et UBIQUE.

What of the Future ?—(*Continued from page* 335).

us as individuals is of no account, but publicity for the amateur cause is essential. "Talk amateur radio, think amateur radio," is a motto we should do well to adopt.

Reverting back to Washington, most of us are fully conversant with the broad principles which were adopted in so far as they affect us as a "service." Our present bands were fixed and lists of International abbreviations and prefixes allotted. A definite stand was taken to regularise the operation of our stations by insisting upon the use of accurate frequency measuring apparatus, and the abolition of spark and unrectified alternating current transmissions.

The year 1928 brought with it an intensive campaign which was designed to show the ways and means we were to employ, in order that our stations should conform to the requirements demanded of us in the following year.

Our own T. & R. BULLETIN and the A.R.R.L. journal "QST" published numerous articles dealing with the new age and with some pride we can look back now and say that the skilful guidance given us three years ago has resulted in a state of satisfaction which was scarcely considered possible, when we first learnt of the restrictions Washington had laid down.

The amateurs of the world have "toed the line," and by putting into practice methods which their more technical colleagues have suggested, the standard of operating has risen to-day to a very high level. We do not disregard the fact that certain amateurs continue, in spite of friendly warnings, to abuse their licences, but we are happy in the knowledge that these "black sheep" are few and far between.

So much, then, for present day conditions, but what of the future ?

Even as we write the second C.C.I.R. meeting is being held in Copenhagen. "What are these meetings and what is their significance ?" are questions asked on every hand.

To trace the origin and the reason for the existence of the International Radio Consulting Committee we must retrace our steps to Washington once more. It was decided before the Conference concluded that, in order to prepare the way for future conferences (which would be held every five years) a committee of experts should meet regularly about every two years to examine all pertinent questions relating to radio matters. The committee, now known as the "C.C.I.R.," met for the first time at the Hague in 1929. The object of this committee is to make recommendations to the next International Conference ; it cannot by its constitution make changes to existing regulations. We wish to emphasise this point clearly because we believe there are some who visualise changes being made immediately of a nature which will affect us as amateurs.

At the conclusion of the present meeting in Denmark all proposals and recommendations put forward by the delegates will be set out in a volume which will be available to the public towards the end of the present year. On its publication we shall know what proposals are likely to effect our future, as these will form the basis of the discussions next year in Madrid. "The closing scene at Copenhagen will be the opening scene at Madrid," of this we are certain.

Immediately we are acquainted with the gist of the proposals which are to be submitted, it will be our duty to examine them and, if necessary, prepare a statement for submission to our own Government, in which we shall ask for certain modifications or changes to the proposals to be adopted if it is found that they are in any way likely to restrict our future freedom.

Just prior to the opening of the Copenhagen meeting your President and Honorary Secretary, in company with other members of Council, had the pleasure of personal interviews with Mr. K. B. Warner, the Secretary of the I.A.R.U. and A.R.R.L. K.B. went to Copenhagen holding the rank of Major in the U.S. Naval Reserve, and as such was permitted to act as a technical adviser to the American Delegation. His real presence there, however, was as watch-dog for the amateurs of the world. We are confident that, with Warner near at hand, our interests are safe, for no more competent spokesman exists in the amateur ranks, but whilst we have been perforced to leave the job at Copenhagen to him, we have no intention of doing so at Madrid. We were assured, not only by K.B., but by our own Government Delegates, that no *important* amateur matters were to be discussed at Copenhagen ; therefore we feel we were justified in not unduly pressing for individual representation (it is doubtful whether we should have been given permission in any case), but we are firmly convinced that for the good cause of amateur radio representation is essential at the next Conference. Even if our representative is not permitted to take part in the actual discussions, we consider someone should be near at hand with full authority to approach our official Government Delegates, immediately it becomes known that matters of vital importance are to be dealt with by the Conference.

With this thought in mind we will conclude. We have no intention at this stage of outlining our views regarding the future distribution of amateur wavebands, but we have every confidence that in general we shall retain our hold on most, if not all, of the territory we possess at present. By our actions we shall be judged ; see to it that you, as an individual, are operating your station in a manner which will cause no reflection to be cast on the body of good fellows, who ask nothing more than that they shall be regarded as genuine radio amateurs.

J. C.

* * *

English County Representation.

With the rapidly-growing home membership it has been considered desirable to modify the present method of district representation.

Commencing with Convention. 1931, each county will be represented by one member elected by the

members of the county concerned. Nomination forms will be provided in the July BULLETIN. In the event of more than one nomination being received, a ballot form will be published in the August BULLETIN. The announcement of the election of county representatives will appear in the September BULLETIN.

In the event of no nomination being received from a particular county, Council will, at their September meeting, either appoint a representative or will arrange for an adjacent county representative to act for the two counties.

County representatives will be responsible to district managers, who will be appointed by Council in August. Each district manager will have several counties under his control, the exact allocation of counties will be decided upon by Council in consultation with existing district representatives.

It will be the duty of each county representative to forward to his district manager each month a brief report of general interest. The district managers will then prepare reports for the BULLETIN for insertion under the "Notes and News" columns.

The district managers will be represented on Council by the provincial district representative, to whom they will address all matters demanding the attention of Council.

County representatives will arrange regular meetings of the members in their district. At least one such meeting should be held annually.

District representatives are empowered to arrange an annual district conventionette, if considered desirable.

In the case of large counties the elected county representative may appoint such sub-county representatives as may be considered desirable for the members in the county.

* * *

It is hoped that the above scheme will prove entirely satisfactory, and it is suggested that present D.R.s should immediately take steps to see that nominations will be sent in from all counties at present under their control.

Nomination forms will appear next month.

* * *

Affiliation of British Empire Amateur Radio Organisations.

The following memorandum has been sent to all B.E.R.U. representatives and groups :—

In order more firmly to establish the B.E.R.U. it has been decided by the Council now governing the R.S.G.B. and B.E.R.U., to invite all Dominion and Colonial radio societies, associations and groups to affiliate themselves as organisations with the B.E.R.U.

At present the title "B.E.R.U." is used to identify the individual Dominion membership of R.S.G.B., but it is our desire to extend the scope of the Union by affiliating all recognised national and district organisations.

We shall be glad, therefore, if you will place our invitation before your Council at the earliest moment. The affiliation of all Empire organisations will be without any fee or charge. Application, therefore, should be made in writing to the present headquarters in London.

On the assumption that the proposal made herewith will be supported by Empire radio organisations, plans are being made to produce a quarterly Bulletin for distribution amongst the affiliated organisations. To this end your Society is invited to forward immediately information of a general character which may be used in the production of the first Bulletin, publication of which is tentatively planned for September, 1931.

In considering affiliations, we feel these should be confined to those radio organisations whose primary object is to foster amateur radio work in all its phases.

In forwarding your views, we shall be glad to have your opinions regarding the desirability, or otherwise, of retaining headquarters in London. Our aim is to organise the B.E.R.U. on lines to suit the whole Empire, but the wishes of the majority will, at all times, govern future actions.

The B.E.R.U. has for its objects the linking together of the radio amateurs of the British Empire; the advancement of the art of radio; the improvement of the status of amateurs in the British Empire; and the promotion and fostering of Empire friendships. It is in no way competitive with I.A.R.U.

* * *

W.B.E. Certificates.

Certificates have been issued to :—G5LA, A. W. Alliston; G5SY, W. B. Sydenham; GI6YW, T. P. Allen; VK7CH, C. Harrisson.

* * *

The G2DT 5-Metre G-R Wavemeter.

Mr. E. T. Somerset (G2DT) originally presented a 5-metre G-R Wavemeter to be competed for in connection with 56 M.C. work, and as nobody appears to be attempting to win this, Council are pleased to approve the following new conditions attached to the award :—

The wavemeter is to be presented at Convention for the best article for publication in the BULLETIN dealing with aerial systems under the following heads :—

(*a*) Zeppelin.
(*b*) Single transmission line.
(*c*) A.O.G.
(*d*) Beam.

The articles should be both theoretical and practical, and should give full details so that the less learned of our members may profit by them.

The articles will be judged by a small committee appointed by Council.

* * *

Calibration Services.

A Calibration Service will be transmitted from G2NM, Mr. Marcuse's station at Sonning-on Thames, Berkshire, on 3,583.13 K.C., according to the following schedule :—

At 11.00 every Sunday (Telephony).
At 23.00 every Sunday and Thursday (Morse).

Times are G.M.T. or B.S.T., as in force. The frequency has been checked and approved by the Post Office.

QSL Section.

Just a word to remind those who ask from time to time for special treatment of their cards that the work connected with the section is essentially straightforward routine, and whilst we would be delighted to satisfy everybody's particular wants in this direction, it would mean at least a doubling

of the staff at H.Q. to attend to all the exceptions to the general rules; so that, for the present at any rate, we have to give a reluctant refusal to all those hams whom we would like to help by sending off cards to them at given dates, etc.

J. D. C.

QRA Section.

Manager: M. W. Pilpel (G6PP).

New QRA's.

G2CR.—A. L. Crane, 44, Brook Bank Road, London, S.E.13.
G2FY.—H. M. Yells, 93, St. Julian's Farm Road, London, S.E.27.
G2WS.—W. A. Scarr, 4, Ridge Mount, Cliff Road, Hyde Park, Leeds.
G2YA.—J. A. Yeats, 68, Bonaccord Street, Aberdeen.
G5GS.—W. Grieve, "Summerford," Station Road, New Waltham, Grimsby, Lincs.
G5IZ.—W. S. Brook, "Crag View," Mavis Lane, Cookridge, Leeds.
G5LN.—W. Lilburn, 40, Theresa Street, West Stanley, Co. Durham.
G5NI.—W. H. D. Nightingall, 20, Weoley Hill, Selly Oak, Birmingham.
G5WR.—C. Wrigley, 68, Church Road, Urmston Manchester.
G6BA.—J. R. Baker, 133, Trafalgar Street, Gillingham, Kent.
G6UB.—S. W. J. Butters, "Walla-Brook," Guy Road, Beddington, Surrey.
2AHX.—L. E. Crabbe, 13, Luccombe Hill, Redland, Bristol.
2AJC.—Faraday Radio Club (Hon. Secretary, J. H. Payton, 39, Penton Place, London, S.E.17).
2AMC.—R. E. Griffin, 7, Davis Buildings, West Street, Bedminster, Bristol.
2ATR.—F. Keen, 26, Pall Mall, Leigh-on-Sea, Essex.
2BCX.—J. N. Walker, 414, Fishponds Road, Eastville, Bristol.
2BIT.—J. B. Webb, Pitlands, Salcombe Hill, Sidmouth, Devon.

G2GO was erroneously given in the last number of the Bulletin as 2GGO.

The following are cancelled:—2AAA, 2AAY, 2BXU.

QRA's Wanted.

AP6JM, I2AA.

New Members.

Corporates—Great Britain.

A. G. Carr (G2XG), E & W. School, R.A.F., Cranwell, Lincs.
W. S. Brook (G5IZ), "Crag View," Mavis Lane, Cookridge, Leeds.
V. R. Mills (G5QM), 122, Hughenden Road, Hastings, Sussex.
R. C. Cave (2ABQ), Holiday House, Mill Lane, Walton-on-Naze, Essex.
B. W. F. Mainprise (2AFO), 48, Earlsfield Road, Hythe, Kent.
P. Varney (2AHB), Beverley, Upper Hale, Farnham, Surrey.
J. H. Payton (2AJC), 39, Penton Place, S.E.17.
A. A. Wallis (BRS541), Eign Street, Hereford.
H. L. Williams (BRS542), 9, Austral Street, Kennington, S.E.11.
J. H. P. Bell (BRS543), 56, Bridge Crescent, Scotswood-on-Tyne, Northumberland.
H. W. Small (BRS544), "Denecroft," York Avenue, East Cowes, I.W.
F. Wiseman (BRS545), 41, Hollins Street, Buxton, Derbys.
J. E. Mallory (BRS546), 24, Camwal Road, Starbeck, Harrogate.
F. Robinson (BRS547), 109, Londonderry Road, Stockton-on-Tees, Durham.
R. E. James (BRS548), 55, Orston Drive, Wollaton Park, Nottingham.
W. B. J. Hackney (BRS549), 47, Cyprus Road, Nottingham.
F. W. Foster (BRS550), 562, Woodborough Road, Mapperley, Nottingham.
T. A. Maguire (BRS551), "Hillgate," Kerry (near Newtown), Montgomeryshire.
R. S. Stott (BRS552), 64, Northcote Road, Battersea, S.W.11.
C. N. Hulbert (BRS553), 3, Cleveland Square, Hyde Park, W.2.
J. Townshend (BRS554), 14a, Flanders Mansions, Bedford Park, W.4.
J. Tovell (BRS555), 13, Central Square, Brigg, Lincs.
W. J. Pearce (BRS556), c/o 25, Brucefield Avenue, Dunfermline, Fife.
W. H. Cooper (BRS557), 348, Glossop Road, Sheffield.
R. R. Smith (BRS558), "Keston," Woodlands Road, Gillingham, Kent.
W. W. Storer (BRS559), "Sunia," Blanklyn Avenue, Leicester.
A. G. Anderson (BRS560), 83, Broad Green Road, Broad Green, Liverpool.
J. K. Grant (BRS561), 30, Thorntree Street, Leith.

Corporates—Dominion and Foreign.

R. V. N. Sadleir (E14D), 40, Upper Mount Street, Dublin.
E. J. Gleeson (E15D), Tinarana, Killaloe, Co. Clare.
R. M. Huey (VK2HU), 19, Centennial Avenue, Chatswood, N.S.W., Australia.
J. M. Retallick (VK2XO), Mary Street, Bellingen, N.S.W., Australia.
V. E. Marshall (VK3UK), 5, Fordholm Road, Hawthorn, Victoria, Australia.
J. E. DeCure (VK3WL), 35, Higginbotham Street, Coburg N.13, Melbourne.
C. Harrisson (VK7CH), c/o Bank of Asia, P.O. Box 633B, Hobart.
J. F. Heine (VK7JK), c/o Mrs. Paton, Queen Street, Bellerive, Tasmania.
W. F. Buist (ZL2AM), Collins Street, Hawera, New Zealand.
G. Brunyee (ZS1AA), "Cleatham," Bonair Road, Ronsebosch, Cape Town.
J. MacK. Ross (ZT6A), 163, Stanton Street, Kenilworth, Johannesburg.
Poul J. Jensen (OZ7GL), Peder Skramsgade 19, Copenhagen K.
C. F. Stephens (ZC1S), Wireless Section, R.A.F., Amman, Transjordan.
J. Lemaire (F8GX), 77, Rue de Lille Ste Audre (Nord), France (temporary address): c/o 5, Cardigan Road, Headingley, Leeds).
Haldor Bettelsen (OZ2H), Ulfborg St. Denmark.
Willy Blaschek (UO3WB), Bahngasse 29, Klosterneuburg, Austria.

(*Continued from page* 350).

Note.—In all the preceding it has been tacitly assumed that the air gap has the same area as the iron core. Actually this is not so owing to the "fringing" or "leakage" flux. This effect is small for small gaps as considered. For larger gaps the effective gap can be considered to be reduced by a leakage factor (L.F.) which is somewhat variable generally falling between 1.0 and about 1.3. Thus a large gap in the order of ¼ in. or more must be divided by, say, 1.3 to obtain an effective gap length which may be used in calculations.

G5YH, 78, Nightingale Lane, S.W.2, will welcome reports on his 7 M.C. transmissions; power 2 watts.

Stray.

A report has reached us that the call sign G6KJ (belonging to Mr. Krohn) is being used by another transmitter on the 14 M.C. band. G6KJ is not on the air at the present time, and if the person responsible for these unlicensed transmissions sees this, will he please note that should his identity come into our hands we shall lose no time in reporting that matter.

One Watt Week.

By M. W. Pilpel (G6PP).

WHEN the suggestion was made, a few months back, that a week of low power tests should be held, during which the maximum power allowed would be one watt, there was much scepticism in QRO circles; and when the idea materialised, and "One Watt Week" became a reality, the doubts increased considerably.

"What can they hope to do with a solitary watt? Why, they will scarcely be able to get across London on that power."

Remarks of this sort were heard on all sides, but the QRP men sat still and said nothing. They had a good idea of what could be done with "that power," and here was their chance to prove that the use of even 10 watts for QSO's over moderate distances was a pure waste of energy.

They only hoped that conditions might be normal during the test week. The Clerk of the Weather, or whoever it is that presides over radio conditions, being in an amiable mood, their wish was gratified. The prevailing conditions, though by no means ideal, were normal for the time of the year.

But even the optimists among the QRP men can scarcely have hoped for, let alone expected, the splendid performances that were achieved.

Three stations distinguished themselves in particular. They were G2OL, G5FB, and G6XN.

These stations each scored over 100 points in the contest, and have proved beyond all possible doubt that low power work is very much worth while.

Pride of place is taken by G2OL, S. W. Cutler, 15, Queen's Gardens, Ealing, London, W.5, with the remarkable score of 165 points, and to him go our congratulations on winning the prize offered by our late Contact Bureau Manager, G5VL.

Close behind follows G5FB, G. Featherby, of Bishops Stortford, with 152 points, and next on the list come G6XN, L. A. Moxon, another Ealing station, with 129 points.

In general, the tests have shown that communication can be established and maintained with a fair amount of consistency over distances between 500 and 600 miles when using one watt on the 7 M.C. band. This band was used almost exclusively by the participants, the reason being that very few stations could be heard on 14 M.C. after about 23.00 G.M.T., and in any case, they were all situated at distances upwards of 4,000 miles, which is too great for consistent communication on the low power used.

G2OL did actually have one contact with U.S.A. on 14 M.C., the only one recorded, but as it was on schedule with W1WV, he does not score any points for it. This is, however, excellent work, and goes to prove that the Atlantic can be bridged on one watt if QRM is not too bad.

The reports that most stations received were astonishingly good, very few being below R4. Among the most notable performances in this direction, a few may be quoted.

G2OL, R8 at OH1NJ. G2TK, R8 at YL2BV. G6FO, R7 at EAR96. G5FB, R8 at SM3TF. G5VB, R8 at OZ4T. G6XN, R6 (twice) at EU2FV.

It will thus be seen that the contacts were not a matter of "touch and go," but real, 100 per cent. QSO's, in fact G6FO maintains that his contact with EAR96 was one of the best he has ever had on 7 M.C.

Nearly all stations complain of QRM, but that, after all, is only to be expected. When one considers the tremendous amount of interference on 7 M.C. these days, the results seem all the more remarkable, and, on the whole, the general performances compare most favourably with those in the QRP tests of 1926, when, although the Atlantic was bridged by several stations, it must not be forgotten that they were all working on the old 45 metre band, with plenty of room to move about, and no American QRM to contend with. Above all, of course, they were using five times the power allowed in these tests. When all these facts are taken into account, the results achieved in these tests seem to be superior to those of 1926, even allowing for the fact that the hours of working at that time were rather shorter, and, as far as the writer's memory goes, conditions were not particularly good at the time. One thing is certain, the average amateur station to-day is considerably more efficient than it was five years ago.

The participants have been almost unanimous in their requests for another "One Watt Week," and although nothing has yet been arranged, it is hoped that a further test week will be held some time next autumn. If results are again good, the advocates of high power will really have to explain why they do not QRP for working over moderate distances.

Now for the individual reports:—

G2OL (165 points) had 39 contacts. His score was helped along considerably by 10 contacts with Hungary. This is, indeed, consistent work, and is further proof that there is nothing of a freaky nature about low power work over a moderate distance. All but two of his contacts were on 7 M.C. Of the 14 M.C. pair, one, already mentioned, was a sked with W1WV, who did not know at the time that such low power was being used. He reported signals R3. The transmitter used was a C.O.—F.D.—P.A. employing a DET1 or LS6A with 9 m.a. at 108 v. on the plate. G2OL finds that the DET1 gives more output at 1 watt than any other valve he has tried, including a CT25X, LS5, LS6A, DE5B, and DO/20. His aerial is 64 feet long, A.O.G., and has been cut down until it is in resonance at 14,180 K.C. It is 40 feet high, and has a bend almost in the centre. He says that his receiving aerial runs parallel with, and $\frac{1}{4}\lambda$ below the transmitting aerial, and the whole thing may be acting as the "Warner Splatter system of radiation."

G5FB (152 points) had 41 contacts. He used the 7 M.C. band exclusively, and found conditions quite good, apart from QRM and occasional QRN. He was at the key at 5 a.m. each day, but failed to get any QSO's before 6 a.m. His QSO's include seven each with SM, OK, and OZ, and show once more how consistent QRP work can be. The circuit in use was a T.P.T.G. with a Cossor "Stentor Six" valve, and 120 v. 8 m.a. on the anode. His aerial is 66 feet long, and is coupled through a small

variable condenser. G5FB has only been on the air for a very short time, and is to be congratulated on putting up such a good show.

G6XN (129 points) had 34 contacts; 30 of these being on 7 M.C., and the remainder on 14 M.C. The latter were all with Finland. For 7 M.C. he used a "haywire," C.O.-F.D. only, but for 14 M.C. he attached a neutralised P.A., with an LS5B or SP55B in the output stage. His aerial was a $\frac{3}{4}\lambda$ (for 7 M.C.), and was tapped via a loading coil on to the plate coil. He shortened it to $\frac{1}{2}\lambda$ later, but got rather weak reports and eventually found that this was due to nearly half the aerial lying flat on the roof! After this fault was remedied, better reports were obtained. His power varied between 8 m.a. at 125 volts and 6 m.a. at 160 volts, supplied by dry batteries. His best DX was EU3AN of Murmansk, about 1,650 miles.

G2TK (65 points) had 20 contacts, including the only recorded one with the Azores, where he was reported R4. His power was 80 v. 10 m.a. to a P625 valve, and he used the usual A.O.G. aerial. Most of his contacts were in the early hours of the morning, and he says that interference from U.S.A. was very bad after 20.00 G.M.T.

G5VB (37 points) had 16 contacts. His average mileage per contact was about 700, and average reported QRK, R4-5, the best being R8 from OZ and R6 from YL. Twenty-two per cent. of his test calls were answered, and 17½ per cent. of the stations he called came back. All his contacts were made on the 7 M.C. band between the hours of 21.25 and 24.00 G.M.T., when QRM is at its worst.

G2WP (28 points) had 20 contacts. He considers that with an average aerial, the maximum reliable range on 7 M.C. is 500 miles, and this is borne out by reports in general. He states that his aerial is an A.O.G. only 15 feet high, but mentions that its length is 52 feet, which is rather shorter than most. His transmitter was a T.P.T.G., using a B.4 valve with 100 volts and 10 milliamps.

G6FO (25 points) had 17 contacts. He sends in a very detailed and interesting report, and states that he was on the air for 18 hours out of a possible 77. He worked exclusively on 7 M.C. because of (1) the impossibility of obtaining DX on 14 M.C. with 1 watt; (2) the stations on 7 M.C. are always looking for contacts apart from DX; (3) a scarcity of stations on 3.5 M.C., combined with bad QRN and QSB, with an early fade-out of Europeans, 4) only G's are workable on 1.75 M.C., and few are likely when using only 1 watt. His remarks concerning the fade-out on 3.5 M.C. are rather curious, because Europeans seem to come through at almost any time at the writer's station, except during some of the hours of daylight. Fade-out is certainly not so marked on 3.5 M.C. as on 7 M.C. He found that he could only make about one QSO per hour, as compared with three per hour when using 20 watts, and no doubt QRM was to blame for that effect. He did not hear a single G during the tests, although he heard several being called. The transmitter used was a rather unusual type of Hartley, and was evolved from the "Chokeless Hartley" described in the February "BULL." Eight m.a. at 100 v. were used to a P625B valve, and the aerial, which was directly coupled, was a single wire, 66 feet long, with a 22 feet feeder.

G2IO (16 points) had 12 contacts, his best report being R9 from ON4WAL. His transmitter was a C.O.-P.A. using LS5 and LS5B valves, and 10 m.a. at 100 v. In common with all other stations, he says that QRP will work provided there is no heavy QRM. He was surprised at the good reports he received from most stations. On the whole, there was practically no fading reported on his signals, and he found that the best time for QRP work was between 07.00 and 08.00 G.M.T.

G2VV (9 points) had five contacts, his low score being attributed to the fact that he was only operating for 13½ hours. He, too, found 07.00 to 08.00 the best time for QSO's. His transmitter was an Ultraudion with a CT25X valve using 10 m.a. at 100 volts. The aerial was a current-fed Hertz, 66.6 feet long, with the feeders joined to make a voltage-fed arrangement. His QSO's were all on 7 M.C.

G5RV (8 points) had five contacts, but was working under great difficulties owing to wipe-out by G5SW "across the road." His best contact was with SP3CY, to whom he gave a message for the Polish Radio Society, which was copied solid. The transmitter in use was a T.P.T.G. with a 7180 K.C. crystal connected across the grid coil, and the aerial an A.O.G.

G2DC (7 points) had three contacts, the best being CT1AH, who reported him R5. He does not give any details of his equipment or general observations.

G6BU (1 point) had one contact, with D4FEB, during eight hours spent at the key. His transmitter was a T.P.T.G. using a P625 valve and 80 volts H.T.

G5AW was not able to take part in the tests.

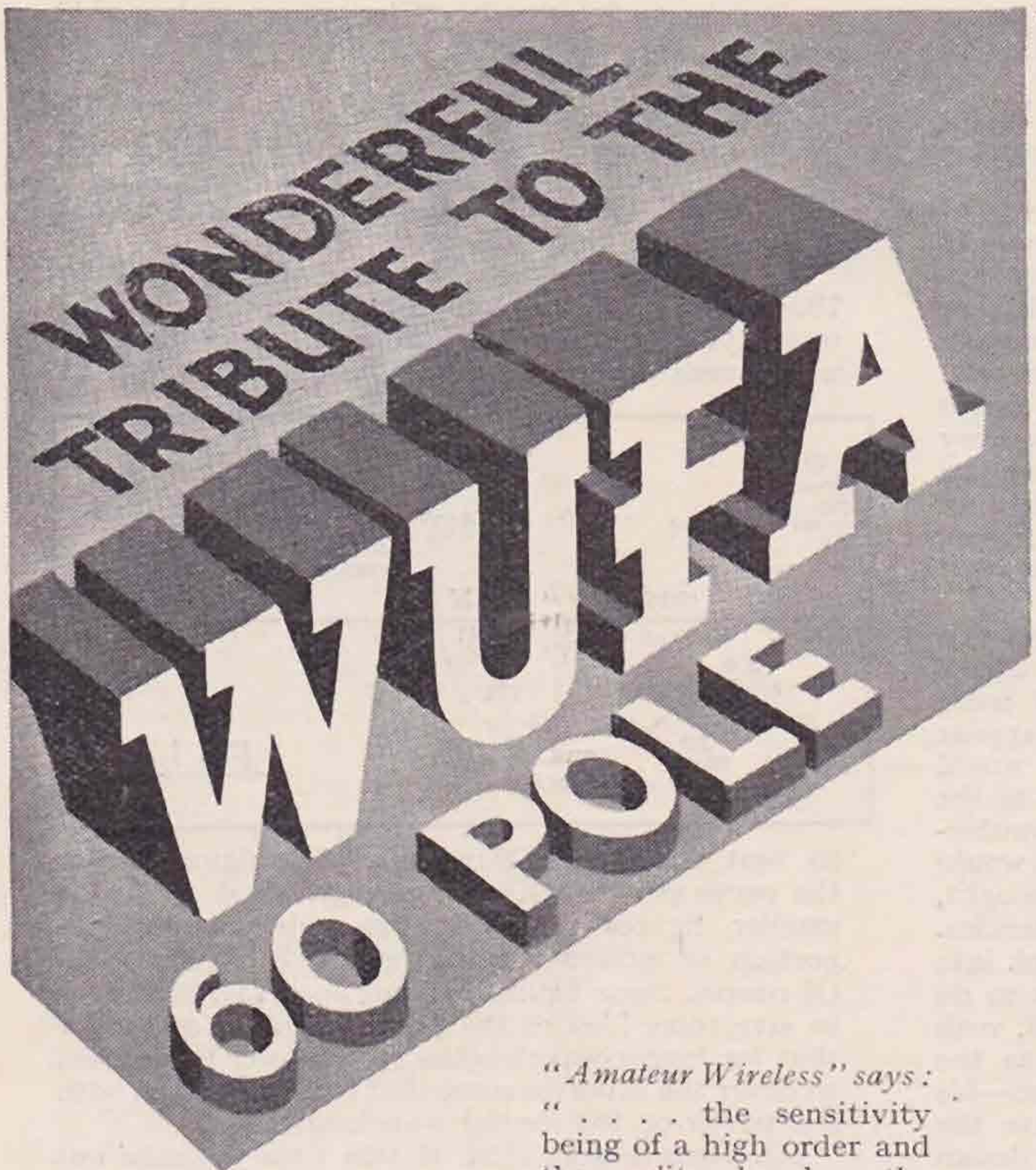
From the above reports it will be seen that most stations favoured the ever-popular T.P.T.G. circuit for transmission, coupled to an A.O.G. aerial of approximately 66 feet. This combination certainly appears to give the best results. It is rather significant that the three leading stations used comparatively high plate voltages, and there seems no doubt that a high ratio of plate voltage to current will give greater efficiency than vice versa. It is the writer's opinion that 5 m.a. at 200 volts should give extremely good results, and it is to be hoped that in the next tests stations will make comparative tests with both high and low voltages.

The following stations entered for the tests, but failed to send in reports: G6WD, G2XB, G6MS, G2ZQ, G5CM, G2IG, G2OC, GI6HI, G6FD, G2WS, G6KP, G5RS, G6PM. Why?

In conclusion, thanks are due to G5VL for offering the prize to the winning station, and also to the members and G.C.'s of the QRP groups of C.B., without whose support and enthusiasm "One Watt Week" would not have passed beyond the "suggestion" stage.

QRP Trophy.

We are advised by Mr. H. C. Page (C.B. Manager) that, owing to an error in checking the QRP group claims against the Trophy Rules, the award was made to 8B instead of 8A. We extend our regrets to XG5RV (G.C. of 8A) and his members, and wish 8B better luck next year.



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"Manchester Evening Chronicle" says :

"The adjustment by means of a double cam . . . enables the best results to be obtained from strong or weak signals . . . ."
"Reproduction is of the very finest quality."

"Wireless Magazine" says :

"Very sensitive unit . . . . Even response . . . . very high notes and all low notes being well handled. Thoroughly recommended; excellent value for money."

"Amateur Wireless" says :

". . . . the sensitivity being of a high order and the quality also above the average."

"Glasgow Weekly Herald" says :

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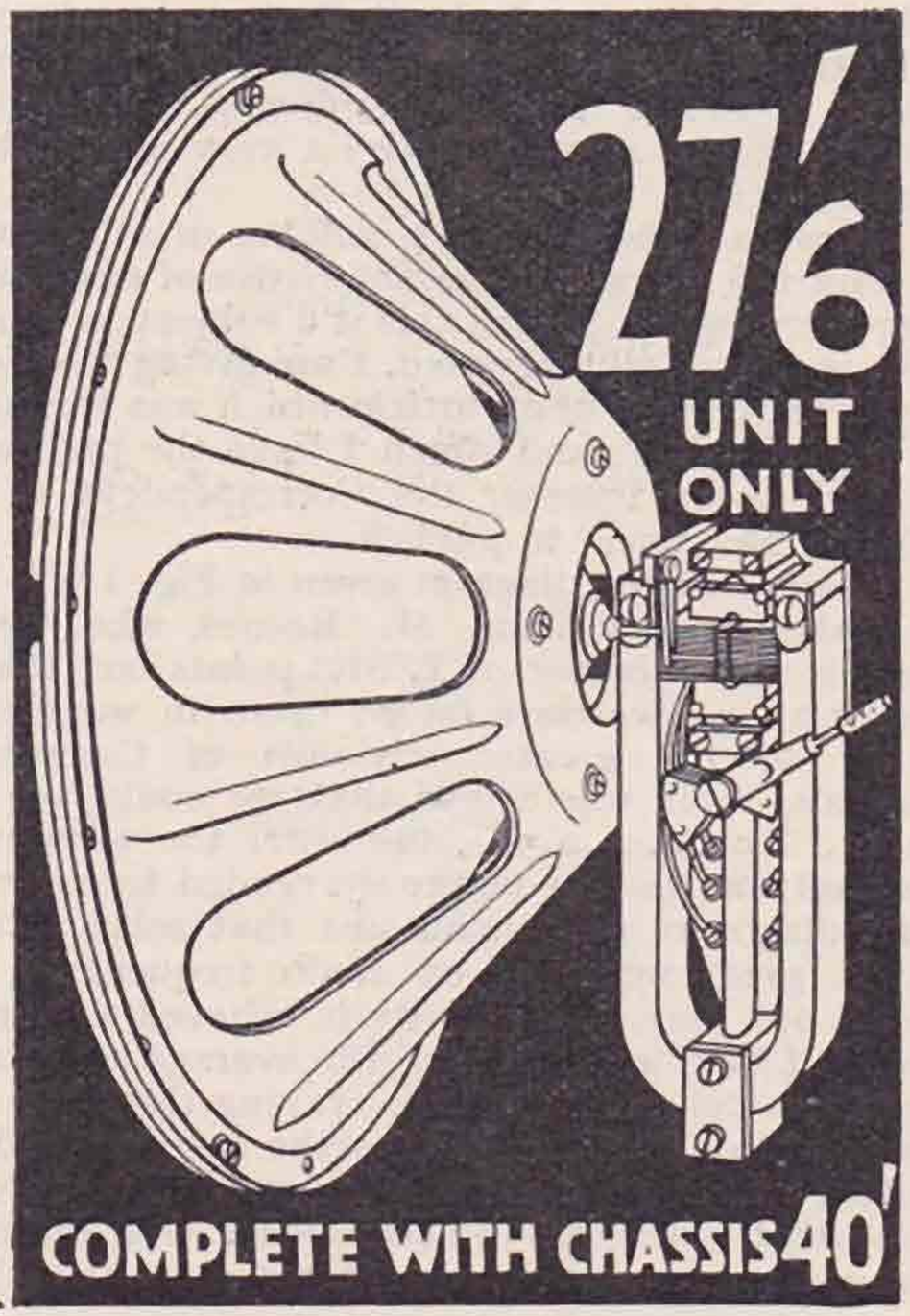


Contact Bureau Notes.

By H. C. Page (G6PA).

THERE seems to be very little news about 28 M.C. work this month, so far as reports from abroad are concerned. I have received none from India, but am not sure whether this is due to any delay in the air mail or merely to the fact that there was nothing worth reporting.

Back to the 28 M.C. tests of January last seems rather a far cry certainly, but as there was so very little reported from the U.S.A. it may interest you to know that BRS327 has had his reception of W9AIC's signals confirmed; BRS327 also logged two other W stations, but so far no confirmation has been received.

Judging from a glance at the section reports this month a great many people are finding that atmospheric disturbance is becoming more and more troublesome. Unfortunately, there does not appear to be any complete remedy for this, and I would like to suggest that more attention be given to the 28 M.C. band. Atmospherics are not very troublesome there, and more attention to that band would be very advantageous, so give it a good thought, some of you, who are tired of the lower frequencies.

I would especially urge the BRS men to look into this matter, as they are in a better position to do really good work on their receivers. After all, with them the receiver is their only care, whereas the transmitter has two things to look after—his receiver and transmitter—and so cannot give the same attention to the question of receiver design that the BRS man can.

G5UM informs me that the 2 M.C. groups are holding a party every Saturday evening. He would be glad of more supporters for this scheme. Our 2 M.C. band has not had nearly as much attention paid to it as it should have. True, atmospherics make it rather unpleasant during the summer months, but surely this offers a very good subject for research.

There have been quite a number of attempts to explain the change in characteristics of our various frequency bands, and as this is a subject in which I take it we are all interested, I am giving you below a short summary of an article which was forwarded to me by G2DT, and which I have the permission of Mr. Oscar Egenes, the Correspondent of the "Natal Mercury," to publish.

A glance at the diagram given in Fig. 1 will help to make matters clear. Mr. Egenes, who, by the way, is the operator of ZT5R, points out that as year by year we were forced down in wavelength owing to the greater demands of Commercial Services, so it was found that we could use less power. In other words, the lower the wavelength we used the less the power we needed to cover the same distances. He maintains that solar activity has a great influence on radio frequencies, and points out that such activity is believed to vary in cycles of from 9 to 12 years, the average cycle being approximately eleven years. Taking this cycle into consideration, he thinks that the success we have had on wavelengths from 100 metres downwards is coincident with such a solar cycle. As, however, the cycle does not become complete until about 1934, we shall have to wait a bit longer to see what the end of the story will be.

Referring once more to the diagram, 1923 to 1934 represents the complete solar cycle. 1923 was a year of minimum solar activity, while 1928 was a maximum, and long distance work was at

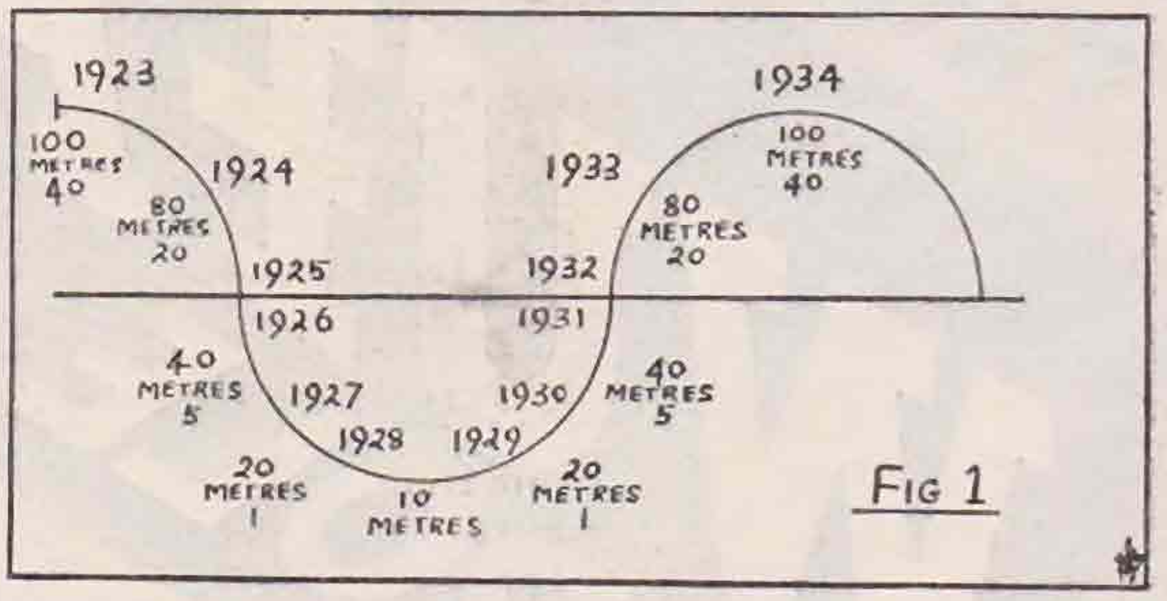


FIG 1

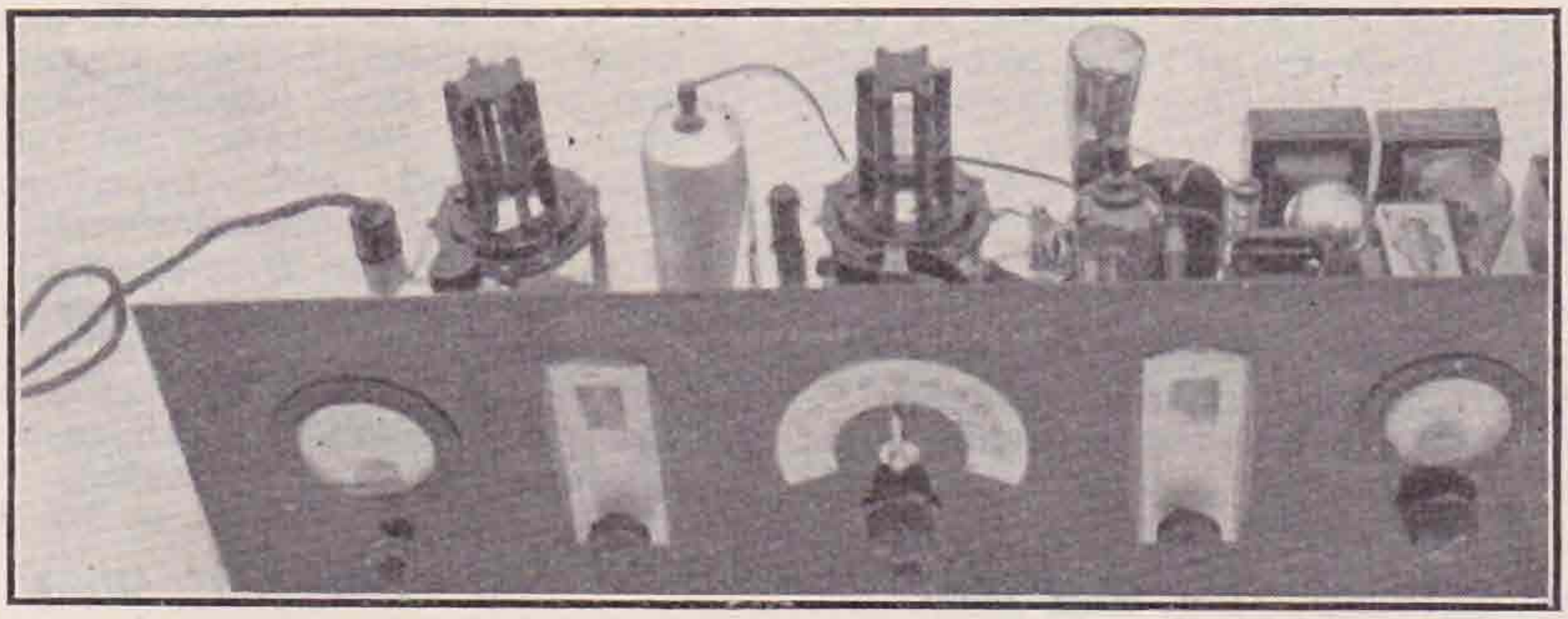
its best on 10 and 20 metres. The figures below the curve represent the wavelength used, while the smaller figures represent the approximate proportion of power required on such wavelengths. Of course, these figures are not accurate, but serve to give some idea of the power required and show that for longer wavelengths more power is required to cover the same distance that can be covered with less power on the shorter wavelengths.

Mr. Egenes says that, if this theory works out to plan, we shall find that the longer wavelengths will best serve our needs, but that we shall require more power for the work.

G2DT has been conducting some very exhaustive work on the subject of using a separate oscillator valve in the receiver. As this is a rather new subject to a good many of us I imagine, I am going to give you his report in full. Here it is :—

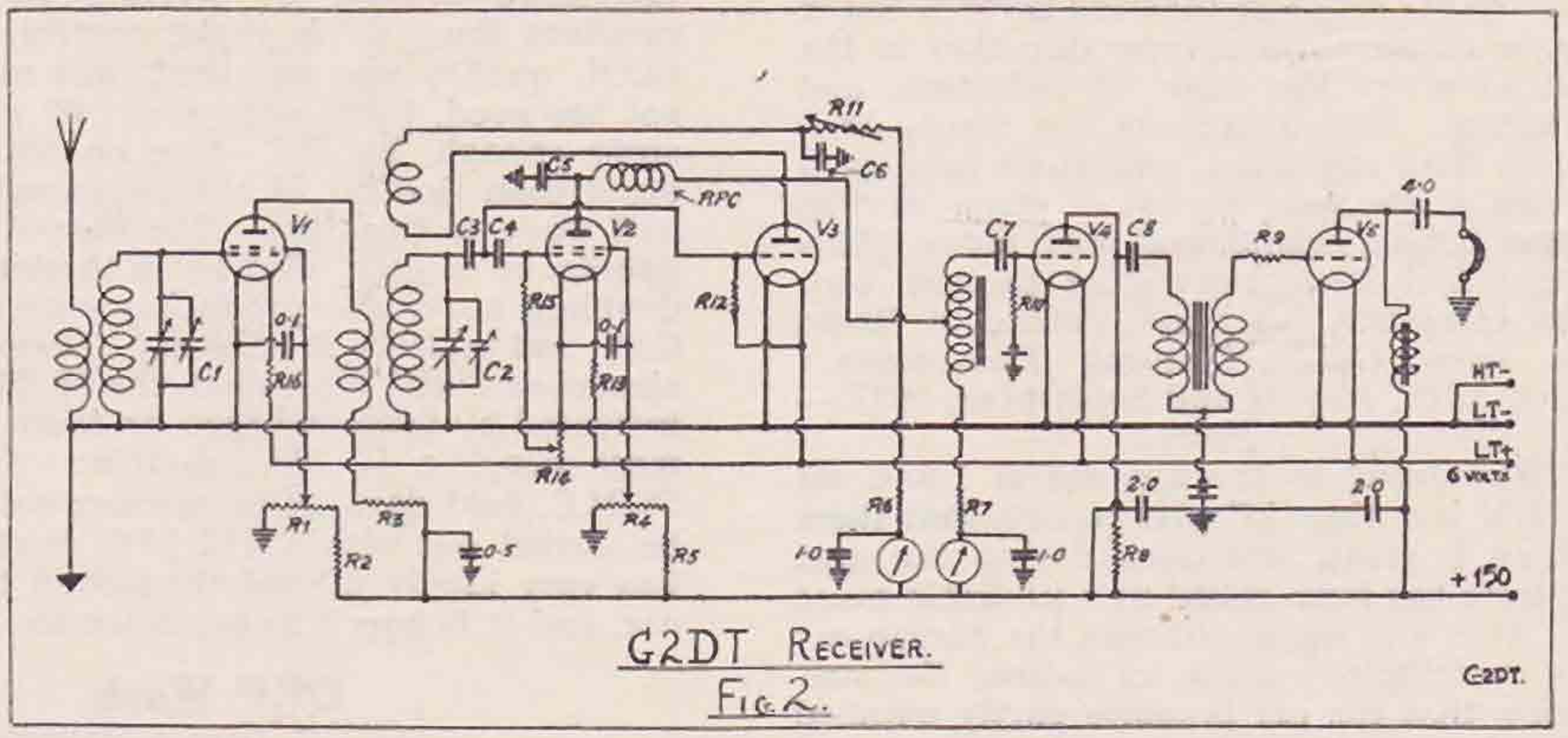
Since publishing details of "A Modern Battery Operated Receiver" in the T. & R. Bulletin for October-November, 1930, numerous kind friends have written to me upon the subject and, in general, there would appear to be a good deal of difficulty experienced in getting satisfactory operation with an autodyne shield-grid detector and some controversy as to the method of coupling the detector. If the autodyne method of detection is employed it seems to the writer that R.C.C. is called for or threshold howl is likely to be experienced, and not very much amplification is likely to result unless about 250 volts are available and the plate load resister can, in consequence, be increased to 500,000 ohms, which, in the case of an Osram S610, will show an applied potential to the plate of 58 volts for optimum results. Greater amplification can be obtained if choke coupling is used, but this usually brings threshold howl in its train, although the writer learns from G5OG that he has not experienced this. However, to be certain of not meeting this contingency and to be able to operate the SG detector at optimum, and at the same time to keep it almost noiseless in action, can be readily achieved by means of a separate oscillator valve, as shown in the sketch. Coupling of the detector

is by means of a Thordarson impedance coupler, which is really a centre-tapped choke. This works admirably and gives increased amplification. Inductances are as specified in the BULLETIN for November, 1930, being wound on 1¾ in. skeleton formers. The writer has adopted the sub-base method of construction of this receiver, using a



sheet of 14 S.W.G. aluminium 28ins. by 12 ins., and this is raised up 1¾ ins., permitting of all bypass condensers, voltage dropping resistors, potentiometers (except R1—the volume control) and low potential wires to be placed under the base plate. Clix ordinary type low-loss valve-holders are used for V1, V2 and V3 and are mounted above the baseplate, but Clix new type sub-base holders are used for the two Audio valves, with a result that all wiring from the output of the impedance coupler goes under the baseplate. The only shielding used in the receiver is a spun aluminium cover for V1 and a 14 S.W.G. aluminium electrostatic screen between the two tank-vernier condensers. In operation the receiver is just the same as the customary autodyne, except that the familiar hiss of the detector has almost vanished and the trials and tribulations of getting the correct radio of screen volts to plate volts correct for the autodyne SG detector has become quite a simple job. No instability whatsoever has been experienced, and this appears to the writer to be due to the " Ferranti plate feed scheme " which has been adopted. Incidentally, this has another advantage in that terminals are dispensed with and a cable connector plug making contact with a receptacle in the baseplate is employed instead.

Although I have stated that windings may be the same as used in the last receiver reviewed I find, upon going further into the matter, that a turn less on the reaction winding will prove to be beneficial. The writer finds that when a separate reactor is used a quite considerable increase in tank capacity is needed as against an autodyne arrangement. As a guide to obtaining efficiency the following readings upon the oscillator and detector meters may be of help : oscillator plate 0.4 to 0.5 m.a. and detector plate 0.8 to 1.1 m.a. I find the Polar tank-vernier in the radio frequency stage well worth while, as this receiver is genuinely sharp in this stage, and it is amazing how a weak signal comes up with a bump upon a slight alteration in capacity of the vernier.



G2DT RECEIVER.

FIG. 2.

C1 C2 Tank-Vernier Condensers. Polar Type A.
C3 100μμf T.C.C. Type " M " Mica.
C4 200μμf T.C.C. Type " M " Mica.
C5 300μμf T.C.C. Type " M " Mica.
C6 1000μμf T.C.C. Type " M " Mica.
C7 0.25μf T.C.C. Type 50.
C8 O.5μf T.C.C. Type 50.
R1 R4 Colverstat 50,000 Ω
R3 ClarOstat 1000 Ω Strip.
R2 R5 Colverstat 30,000 Ω
R6 Colverstat 20,000 Ω
R7 Colverstat 40,000 Ω
R8 Colverstat 5,000 Ω
R9 100,000 Ω Vacuum.
R10 500,000 Ω Vacuum.
R11 200,000 Ω Centralab.
R12 7.0 M Ω Vacuum.
R13 R16 ClarOstat 25 Ω Strip.
R15 4.0 M Ω Vacuum.
R14 ClarOstat 400 Ω
V1 Mazda SG215.
V2 Mazda SG215 Detector.
V3 Mazda HL607 Oscillator.
V4 Mazda HL610.
V5 Mazda 625B.

Group Reports.

28 M.C. Work.

G6VP, Group Manager.

"Nil" reports have been received from Group 1C and 1F. It seems a pity that so few seem to be really interested just now. G6WN, of Group 1C, ran a schedule with FM8BG without success.

From Group centre 1F comes the news that ZL2BG was heard in France on March 30 by F8PQ. This was confirmed the same day. The chief point of interest being the time of reception, viz., 00.12 G.M.T. In view of the reception of VQ3AJ by F8GZ on April 19 at 00.33, it seems as if our daylight theories were none too sound.

It is probable that 28 M.C. tests will be arranged for the early autumn. We shall thus have the opportunity of comparing seasonal conditions.

Let us hope now that conditions are deteriorating on the lower frequencies, 28 M.C. will receive the attention it has lately lacked.

Fading, Blindspotting, and Skip.

G2ZC, Group Manager.

Group 1A have been discussing the question of the nature of the Heaviside layer this month. Several stations have given their ideas on this, but have not stated their reasons for so thinking.

BRS504 thinks the layer is similar to a mirror, which reflects much better when its back is dark. He suggests the surface is generally smooth, but under certain conditions becomes rippled. BRS426 does not agree with this theory, but thinks that the layer is irregular in form, a theory which is shared by G6NK. 2APG suggests that the layer is either stationary, or rotates in a reverse direction to the earth, and so alters the angle of reflection, and produces fading. G6NK favours the theory that there is more than one layer, reflections from each layer arriving at the receiver out of phase, and so causing rapid fading, echoes, and poor notes. (This Group might find some interesting theories concerning the Heaviside layer in "Fading in Radio Compared with Other Natural Phenomena," T. & R. BULLETIN, August and September, 1927.—ED.)

Group 2B.—Owing to the absence of G2ZC on holiday, G2IM is acting G.C. He reports that there has not been a great deal done during the past month. Static has been raised as a probable cause of fading. It is also suggested that the human ear may be a contributory cause of fading, the suggestion being that the ear becomes partly numbed after the crash of an atmospheric in the phones, and takes time to recover, this giving the impression of fading.

3·5 M.C. Work.

G6RB, Group Manager.

Group 4A.—Work on this band appears to have fallen off very considerably with the advent of the summer months, and reports this month are rather scanty. Conditions generally on 3.5 M.C. have deteriorated as anticipated, and atmospherics have now made their appearance, rendering contacts at night practically impossible with any except the strongest signals. G2WP has rebuilt transmitter to T.P. and untuned grid, and finds it more efficient than the Hartley used previously. Reports conditions for G working during the daytime very poor, all signals being weak and fading bad. Things seem to improve after nightfall. G6FO reports very little doing, and apart from a few contacts with G stations on Sunday mornings no work has been done.

G6WY reports very little done on this band apart from the party on April 19. Has made several suggestions regarding the holding of another party, which should make the next one go with a swing. BRS408 has done a good deal of listening and makes some interesting remarks regarding atmospheric disturbance and the relationship of signal strength to it. Experiments with a tone filter in the phones circuit resulted in elimination of a good deal of atmospherics. G6CL has done some very good work with low power and makes some interesting suggestions for holding another party. G6RB has done practically no work during the month, finding the atmospherics a little too much for comfortable working. Will be making a great effort to get WAC on 3.5 M.C. next winter.

56 M.C. Work.

G2OL, Group Manager.

There is absolutely nothing to report this month, for the simple reason that no reports are to hand.

Two recruits are in the act of joining up, and a new group will be formed, consisting of four members, under the group centreship of G6XN. May it have the best of luck. Full details will appear in next month's issue of the BULLETIN. There are still two vacancies in the group, and interested stations, especially those abroad, are asked to join.

Group 7B.—G.C. G2OL. G6XN has again distinguished himself by putting out some really excellent fone, using choke control. As heard at G2OL quality was excellent, but modulation was not too good, being only about 60 per cent. Curiously enough, his C.C. note on 56 M.C. is much purer than that on 14 M.C., although he only uses half wave rectification. The output from the last doubler is so good that he is thinking seriously of doubling again and producing some 112 M.C. C.C., C.W. and possibly fone later. There appears to be almost as much RF round the 56 M.C. doubler as indicated by neon and loop as there normally is on most people's 14 M.C. doubler. In addition to 56 M.C. field days, some outdoor work will shortly be carried out with a 112 M.C. receiver. BRS281 has very kindly offered the Group the loan of his car, and it is hoped to get down to it very shortly.

QRP Work.

G2VV, Group Manager.

Group 8B.—G.C. G2VV has recently put up a new aerial as used by G5CM. Length 33 feet, with any length feeder tapped 11 ins. along. It is very successful on both 7 and 14 M.C. A monthly broadcast to the Group is under consideration. Has noticed that when WX is very wet and stormy radio conditions are at their worst. During April and May fading has spoilt many contacts on both 7 and 14 M.C.

G5CM with new aerial is working U.S.A. consistently, showing that the aerial does matter with DX 14 M.C. work, as many other aerials tried did not bring about a W contact. Also notes fading very bad.

G6SO has been active on 1.75 M.C. mostly and has heard G.C. when he was using 4 watts and a very

small aerial. Notes conditions on all bands improving. Has regular QSO's on 3.5 M.C. band.

G2OA has aerial difficulties and is using a V.F. Hertz over the house and doubled back again to get correct length. With this he is working good DX and says 14 M.C. improving.

2AHB is experimenting with Ultraudion and 2-volt valve. Contemplates using C.C. Is also working on a 2-valve portable using a frame aerial. Will shortly apply for full permit. He, like G.C., definitely notices poor conditions when weather is very bad.

2ANU also using Ultraudion and trying several methods of C.C. Notices improved conditions for DX reception, but says fading is bad.

Group 8D.—G.C. G5MR is working on 7 and 14 M.C. bands. Using .3 of a watt has worked G2TG in Sheffield at R4 QSA4. G2TG was using only .15 of a watt and was received at R4 QSA5. BRS397 is awaiting his " A.A." call. Sends interesting notes on short wave reception and weather effects. On a bright day he reports stations in the North of Scotland, and stations such as CT and EAR in a westernly direction particularly strong, whilst on a wet day he hears South England, Germany and stations in a northernly direction. (Perhaps G2ZN and Co. can help QRP members with these weather effects.—G2VV). G6BU has erected a V.F. Hertz recommended by G2VV. This is 66 feet long and feeder tapped direct on to plate coil. Using this and 5 watts, he has worked XG5SV in Malta. 2AGN finds 14 M.C. best and hears good DX, but says 7 M.C. changeable, whilst 3.5 and 1.75 M.C. are decidedly worse than usual. Considers 28 M.C. band will be the best for low power working when conditions are normal. G5LX is completely rebuilding his station, and details will arrive later. G5QY reports conditions generally improved. Says 14 M.C. excellent, having worked 5 continents with 5 watts.

Group 8C.—G2WS has been busy rebuilding his 14 M.C. transmitter, and is now using a T.P.T.G. circuit. His input is 2 watts, and a half wave Hertz aerial is used. G2AV has also rebuilt his transmitter, but is using push-pull. He is using a Zeppelin fed Hertz aerial, but although he has been able to work Canada he has not yet made contact with the U.S.A. G2TK is using harmonic C.C. He considers the best time for work on 14 M.C. just now is between 1 and 3 a.m.

G5PH has put up a new Hertz aerial with a 66 feet top and 35 feet single feeder, but does not state at what point the feeder is attached to the aerial. He has been grinding crystals, and is now using the Goyder Lock method of control, as he finds this gives louder signals for the same input than the harmonically controlled T.P.T.G.

Group 8A.—G.C. G5RV has been conducting experiments with 7 M.C. fundamental control (quartz) and very low power. Also experiments upon the amplitude of carrier and quantitive relationship of modulation to carrier on 5SW's transmissions. He hopes to make an article for the BULLETIN on this subject later. G5VB is still continuing his very low power fone and CW work. G2ZQ has been observing the percentage of replies to his test calls and to the CQ calls he answers. He finds that the percentage of successful test calls is 54 per cent. and to CQ calls 65 per cent. G5YH reports a somewhat uneventful month, but is busy with a push-pull crystal oscillator for 7 M.C. He agrees with G6MB that low power seems to get out when high power apparently does not, and quotes an instance.

2 M.C. Work.

G5UM, Group Manager.

Groups 10*A* and 10*B* are holding a 2 M.C. party on the first Saturday each month from 23.00 until 02.00 on the following Sunday, and the attention of all R.S.G.B. members is drawn to the fact that if a report or QSO on the 2 M.C. band is required one or more members of these groups will be able to give it during the aforementioned period. The whole of England is covered by the membership of the 2 M.C. groups, from Lancashire and Yorkshire to London and Monmouth. Although C.W. is generally used, some stations can put over telephony if required.

Group 10*A*.—Tests with loose coupled aerial are in progress at G6FO. Hitherto the antenna has been direct coupled and excellent results have been obtained. However, an analysis of the results of other 2 M.C. stations was made, and it was observed that, in general, L/C aerial produced good DX, as is the case on the shorter waves. G6FO has now changed to loose-coupled antenna, using a Hartley oscillator with grid choke and H.T. fed to the nodal point of the oscillator coil.

Work at G5RX during the month has been mainly in connection with aerials. Previously a Marconi type, i.e., aerial and earth, had been used, but a new 66 feet aerial with a 66 feet counterpoise immediately below—that is, a bent Hertz system—has been erected. A resultant increase in aerial current from .3 to .5 amp. was regarded with suspicion, but later the aerial showed that it *was* more efficient by giving greatly increased strength at a distance. During a daylight contact with G5UM (170 miles) on May 10 signals were reported QSA4 R4, and in a further contact after dark, QSA5 R7. An attempt to compare conditions on 7, 14 and 2 M.C. has not been successful owing to lack of signals on the two latter bands at certain periods of the night. Nevertheless G5RX has found May 3 fair, but with some atmospherics, and May 10 very good, with no atmospherics at all.

BRS164 has resumed work after a busy period that kept him away from radio. He supports the theory of G6ZH regarding an improvement in conditions when rain is falling and a westerly wind blowing—more particularly the former. An increase in QRN has been noted, but conditions remain very good. Some particularly interesting work on field strengths has been done by G6ZH in conjunction with G2GG, and though weather has upset the tests it is hoped to prepare some polar curves. Proof of the truth of the maxim, " Do not trust the hot wire ammeter," was forthcoming during these tests, when G6ZH tested two such meters. Each was exactly correct on D.C., but differed by 100 per cent. in their R.F. readings! A report of QSA5 R6 on some telephony tests has been received from BRS499 nearly 350 miles.

G5UM gives a summary of conditions during the past month, as follows :—April 26 : Very good, distant daylight contacts easily made. Little atmospherics or fading. May 3 : Fair, but DX range reduced to 200 miles or so. Some static and fading. May 10 : Extremely good ; reliable daylight contacts up to 200 miles not difficult. No fading or static. May 17 : Moderate, but heavy static spoilt DX.

Television.

G5CV, Group Manager.

Group 11*A*.—G5GJ has had bad luck with his Kerr cell experiments, but is making another start, although he has to make the glass containers himself with a blow lamp as no gas is available. G5GJ intends to obtain the 1,000 to 2,000 volts D.C. necessary for the Kerr cell from a transformer fed from a L.T. battery. The make and break is tuned to approximately 300 cycles, and the output from the secondary is rectified by a chemical rectifier and smoothed in the usual way. He claims to obtain by this method D.C. pure enough to use on the receiver. He is also erecting and building a three-sided 60 ft. mast. G5CV is just completing a receiver run entirely off the D.C. mains with a DET1 in the output stage. The H.T. is obtained from the supply used for the transmitter, 220 volt D.C. mains with 140 volts from accumulators in series.

Antenna Group.

G2OP, Group Manager.

While the antenna I described last time can be erected by anyone owing to its small size, not all of us have the necessary room for the one I am about to describe. This one is due to our old friend G2BI, whose signals are well known to all of us; it appears to work efficiently on all bands. Fig. 3 explains itself.

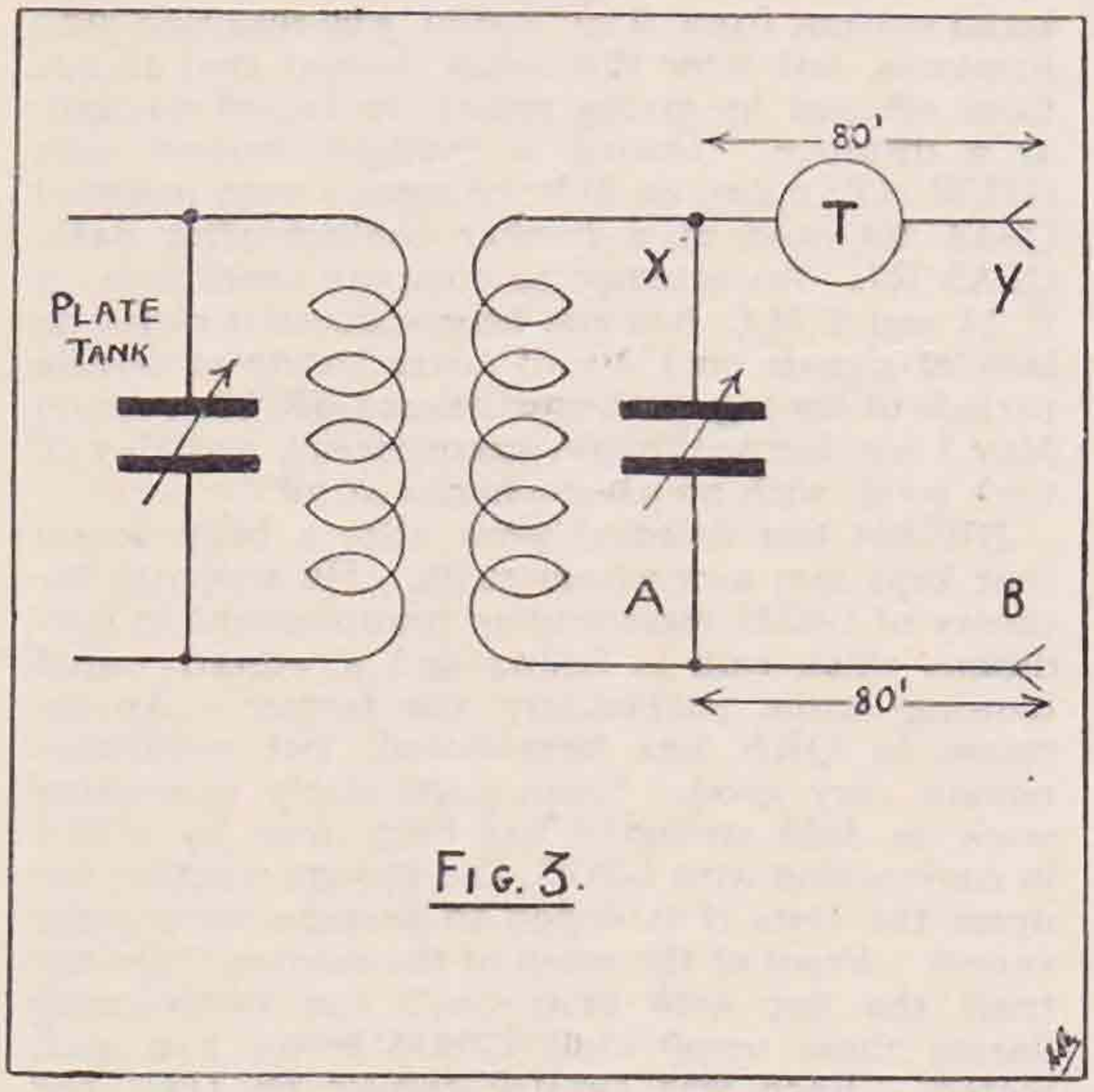


FIG. 3.

At G2BI the transmitter has two P650 valves in push-pull. The aerial coil is split into two halves, one being placed on each side of the plate tank coil. The same coupling coil is used for and 3.5 M.C. and consists of 18 turns of 18 S.W.G. bare copper 4 ins. diameter and spaced one-eighth. For 7 M.C. it is 6 turns of $\frac{1}{4}$ in. copper tube, $3\frac{3}{4}$ in. diameter spaced $\frac{1}{2}$ in., and for 14 M.C. is similar to 7 M.C., but four turns only.

G2BI gives the following figures, but suggests that the adjustments which give these figures are not the best possible :—

Frequency	Plate m.a.	Plate volts	Plate watts	Current at T.
1.75 M.C.	42	220	9.2	0.85 amps.
3.5 ,,	50	220	11	0.75 ,,
7 ,,	70	220	15.4	0.13 ,,
14 ,,	65	220	14.3	0.11 ,,

As a result of last month's notes I have received a number of letters, none of which bear a stamped addressed envelope for reply, and I am asked various questions, such as: Do you tune for max. feed in m.a. or for max. current in thermo couple, etc., etc., etc. It is obviously quite impossible for me to answer all these individually (and pay the postage out of my own pocket), and while I am delighted to receive letters giving the actual results of tests, which are always of value and which I file carefully, I think it is up to the individual to do a little experimenting himself instead of relying on the particular results of others which may be affected by local conditions. Regarding the Wilkinson aerial, let me drop you a tip—it is thought that the particular point where the feeder joins on is the best for DX, but may not be the best for local working as well. It is also suggested that the highest reading in the thermo couple may not give the best results, but that a certain amount of mistuning, if I may call it so, may be better. Now, can anyone find a better point for the feeder for DX, and should one tune, or rather mistune, on the high or low capacity side of the peak value of the thermo couple? These are questions which I want you to answer and tell me, and there are many more which will easily occur to all of us if we think. Try them out OM's and send me your results for tabulating.

The same business about mistuning on the high C or low C side may be tried with G2BI's system, as above, and perhaps someone would like to try a different length, or instead of having aerial and counterpoise one above the other what about trying them in a straight line or at right angles.

You will see that much remains to be done and a solitary test is no use at all as conditions may be unsuitable. Give it or them a fair chance and send on your results for the benefit of others.

While I am dealing with G2BI, may I point out that Col. Palmer mentioned to me the other day that the diagram which appeared in the February, 1931, BULLETIN under C.B. Notes on page 227 is not correct. The grid is shown as connected through the grid leak to the H.T.+; it should, of course, be through the leak to the filament.

I hope to receive many reports on the Wilkinson and this system, and again will you please note that I say REPORTS and *not* questions.

Review of Foreign Magazines.

Again it has been difficult to discover much of novelty in the publications reviewed this month.

In the April "R.E.F.," F8OL describes a MOPA transmitter using a 10 watt pentode in the final stage; his circuit is reproduced herewith (Fig. 4). Separate grid batteries are used for each valve in order that the voltage developed across the battery resistance by the passage of the grid current of the PA may not affect the grid bias of the oscillator. This is important, since the grid current varies with keying.

In a note on the tuning of Zeppelin aerials to resonance with the transmitter, F8RJ remarks that he has regularly observed that, when working on the 14 M.C. band, and radiating a signal which was received at R9 when aerial and transmitter were accurately in resonance, a detuning of 100 K.C.s caused signals to drop to R3.

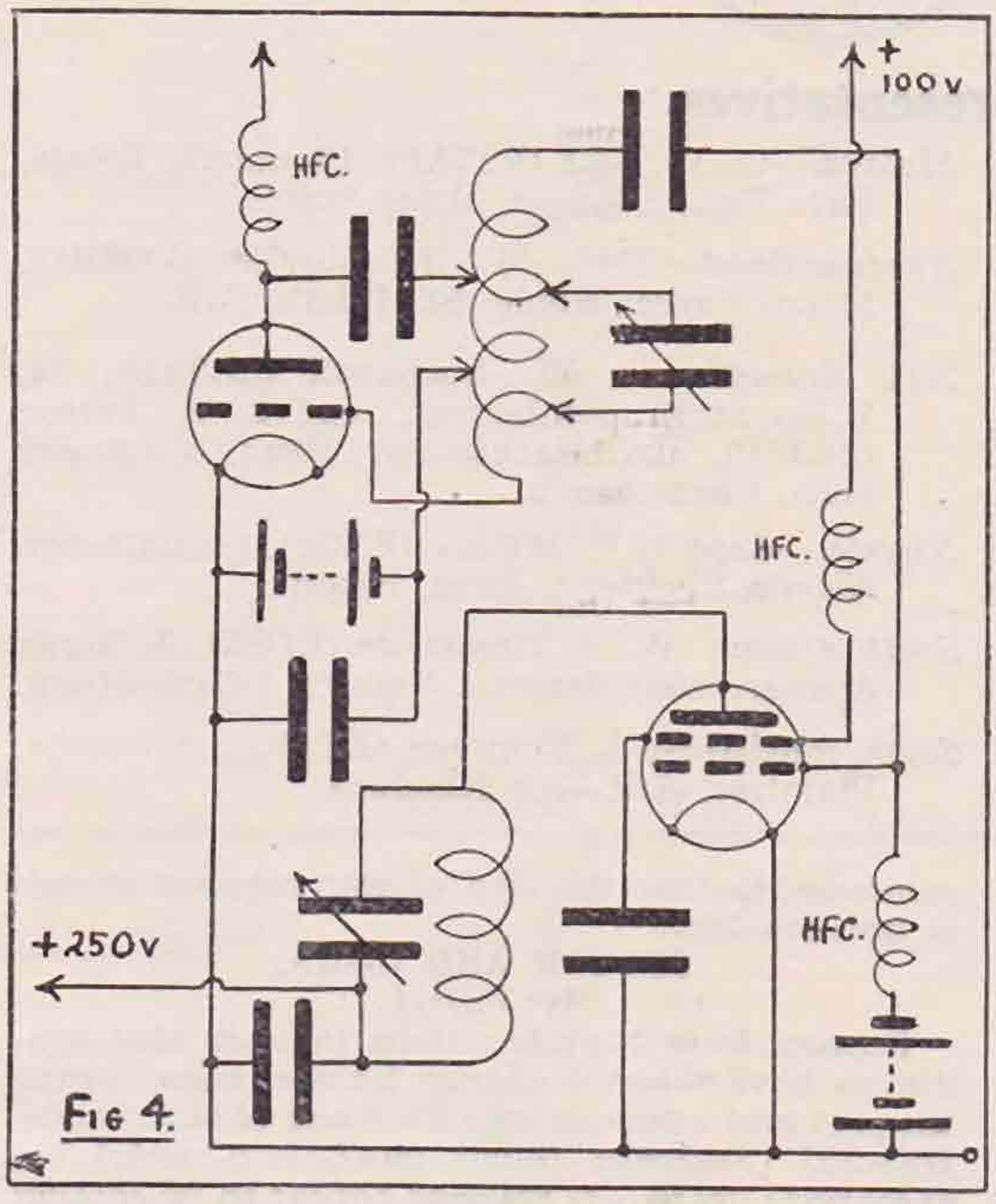


FIG 4.

The same issue of "R.E.F." announces a congress to be held in September in connection with the Colonial Exhibition.

Considerable space is now devoted in German papers to ultra-short wave technique, following the establishment of a number of stations broadcasting on waves of 6 to 8 metres, and it seems that a definite use has been found for these waves, viz., broadcasting over a small area, such as that of a single large town.

Errata.

In Mr. Franks' advertisement on page 317 of last issue the price of the Desk Microphones was erroneously given as 1s. 6d. each; this should have been 17s. 6d. each. Mr. Franks wishes to express his regret at any inconvenience caused through this mistake.

* * *

We regret that owing to an error in the article entitled "The first QSL Card?" in last month's issue, the date of G2UV's QSO with Finnish 2NCA was given as 1927 instead of 1924.

Trade Notices.

Osram Type G.U.1 Rectifying Valve.

WHILST the G.U.1 is not a new valve in the strict sense of the word, it is in the limelight at the present time by reason of a reduction in price from 40s. to 25s. We have recently had an opportunity of testing a pair of these valves and have no hesitation in saying that, in our opinion, they are *the* rectifiers of the future for the medium-power transmitter.

At a maximum anode volts of 1,000 R.M.S. a pair of G.U.1 valves are capable of delivering 1,150 volts at 500 m.a., and at 200 m.a. they deliver 1,350 volts. The voltage drop in the valve itself is constant at 15 volts for any load. The filament consumption is 3 amps. at 4 volts, and when the current taken is more than 60 m.a. per valve (i.e., 120 m.a. full wave), about one minute must be allowed for the filament to heat up before the H.T. is applied. It is also advisable to fit a fuse, such as the *Microfu*, in the H.T. circuit to prevent about ½ K.W. running wild in the filter apparatus in the event of a short.

These valves undoubtedly satisfy a great need of the amateur transmitter who, hitherto, has had to rely on valves of the ordinary type and has found mercury vapour rectifiers difficult to obtain in this country, at any rate at a price which suits his slender purse. The G.E.C. are to be congratulated on producing a rectifier which has proved so efficient and reliable at the low price of 25s.

* * *

The H.L.2 is the latest Osram valve to be added to their list of 2-volt battery-heated valves and is primarily for use as a detector. By very rigidly anchoring the electrodes, and especially the filament, the valve is claimed to be non-microphonic, a characteristic which, we were pleased to note, was evident in the sample we tested. The H.L.2 is excellent as a detector or first L.F. amplifier, and possesses a mutual conductance of 1.5 milliamps (volt impedance 18,000 ohms and amplification factor 27). The anode volts are given as 150 maximum and filament 2 volts at .1 amp; with these characteristics the valve should be found eminently suitable for portable receivers.

The Varley Delayed-action Switch.

Messrs. Varley have produced a delayed-action switch for use with the Osram G.U1 rectifier. This switch is operated by a bi-metal strip which is housed spring-bow fashion in metal brackets. The heater element is wound round the strip and heavily insulated from it. When the strip is sufficiently heated the spring action comes into play, and the contacts are snapped together, thus completing the H.T. circuit. This takes place 60 seconds after switching on the filament as advised by the valve makers. The tension of the strip is adjustable, and the contents are made of special alloy. There are four terminals to the switch, two for L.T. which are fitted in parallel with the filament, and two for H.T. The heater consumes a few watts only, and the whole is fitted in a bakelite moulding which has a removable perforated metal cover. The price is 2s. 6d.

Empire B.E.R.U. News.

B.E.R.U. Representatives.

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

Canada.—C. J. Dawes (VE2BB), Main Street, St. Anne de Bellevue, Quebec.

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

Egypt and Sudan.—H. Mohrstadt (SU1AQ), No. 1 Co. Egypt Signals, Polygon, Cairo.

Hong Kong.—P. J. O'Brien (VS6AE), 12, Kent Road, Kowloon Tong, Hong Kong.

Iraq.—H. W. Hamblin (YI6HT), Wireless Section, R.A.F., Shaibah, Basra, Iraq.

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

Kenya, Uganda and Tanganyika.—G. F. K. Ball (VQ4MSB), The Radio Station, Mombasa, Kenya Colony.

Malaya.—G. W. Salt (VS2AF), Glenmarie Estate, Batu Tiga, Selangor, Malay States.

Newfoundland.—Rev. W. P. Stoyles (VO8MC), Mount Cashel Home, St. John's East.

New Zealand.—D. W. Buchanan (ZL3AR), 74, Willis Street, Ashburton; and C. W. Parton (ZL3CP), 69, Hackthorne Road, Cashmere Hills, Christchurch.

Nigeria.—Capt. G. C. Wilmot (FN2C), 1st Battalion Nigeria Regiment, Zaria, Nigeria.

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

South Rhodesia.—S. Emptage (ZE1JG), Salcombe, Plumtree, Southern Rhodesia.

AUSTRALIA.

By VK2HC.

AFTER the good conditions experienced on 28 M.C. during January and early February there has been a turn to the bad. Inter-State contacts are scarce, the best being between VK5HG and the Eastern stations VK2RC, VK2PK and VK4XN. VK6SA reports ND in VK6 on 28 M.C. this season. The 14 M.C. band has been very erratic, with QSB in evidence, but some good DX was worked during Empire week. The old 7 M.C. band is still excellent for DX with the usual W, KA and Europeans. When QRN slackens on 3.5 M.C., DX and locals are good, and VK2HB reports contact with VE5AW. Several W fone stations have been heard also, and the band proved useful for ZL during Empire week. Membership of W.I.A. is now 741. The VK traffic tests are from April 11 to 25.

BRITISH ARABIA.

By BERS25.

Conditions on the 14 M.C. band during April were very patchy, fading being very marked, and complete wipe-out of signals usually occurring about 20.00 G.M.T. G's and F's were coming through well up to that time, however. This station is trying hard to reach 28 M.C., but difficulty is being experienced in finding one's whereabouts.

CANADA.

By VE2BB.

We are very pleased to report a very marked improvement in DX conditions, especially with regard to Europe. Signals were of good strength and very consistent, allowing many good contacts and a lot of traffic handling.

Canadian hams feel that amateur radio is destined to play a great part in the promotion of world peace, as it serves to break down all national barriers and draws the people of all nationalities so close in comradeship that the idea of war between friends is unthinkable.

CEYLON AND INDIA.

By VS7GJ.

Reports from Northern India indicate that conditions have taken a change for the worse during the past four weeks on both the 7 and 14 M.C. bands. BERS52 (Northern India) forwards a useful list of stations heard. G stations appear to be coming over well. VS7AP (Colombo) reports up to the middle of April conditions on the 14 M.C. band improving slightly, but fading is very bad and daily conditions are irregular. PK4AZ paid VS7AP a visit recently. Mr. J. Nicholson expects to be on the air officially in another week, and I think his call sign is VU2SN and his new QRA is Munnar, Travancore, Southern India. VS7GJ having been away up country nearly all the month, takes no report. QRN in the hills seems to be a great deal more troublesome than at sea-level.

IRISH FREE STATE.

By EI2B.

Conditions during the month have been rather varied on some bands. The 2 M.C. and 3.5 M.C. bands have been fairly normal, but 7 M.C. has varied a good deal. On 14 M.C. conditions were excellent up to May 9, after which there was a great falling off in North American stations, although many South American countries came in well. Since May 10 there have only been one or two occasions on which conditions equalled those of the previous good spell, but TI was worked; this is believed to be the first EI-TI contact. Our newest station, EI7D, has been getting out very well with an input of only 1 watt. We are all proud of the success of EI7C in the 2 M.C. tests. Heartiest congratulations, O.M.

KENYA, TANGANYIKA AND UGANDA.

By VQ4MSB.

There is very little to report regarding conditions

in the area this month, as there is a dearth of information from members concerning their activities on the air. We have had a visit from VQ5NTA on his way back to England, and VQ3MSN also reports a visit from VQ3SKW, who went away thoroughly reinfected with "ham fever" and a determination to get on the air again at once. VQ4MSB has just completed a new power supply, only to find that he is to move on to Kampala in Tanganyika, where there "ain't no power"! He hopes, however, to get going again somehow with a VQ5 call. The following stations are active in the district: VQ3MSN, VQ3SKW, VQ4CRE, VQ4LMA, VQ4MSB.

NIGERIA.

By ZD2A.

Reports indicate that the 14 M.C. band was much better for reception at the beginning of the month, and was quite crowded on some nights. Conditions are very poor at present, with continuous thunderstorms at the commencement of the rains. The new international prefix of ZD has just been allotted to Nigeria in place of FN. FN2C has had his call altered to ZD2A and is now the only amateur transmitter in the country. He is now working phone on 14 M.C., in addition to keeping an ear open for that elusive Asiatic station to complete WAC.

SOUTH AFRICA.

By ZU1D.

The aftermath of conference and early afternoon skip on 7 M.C. is keeping the air singularly free from activity, but much crystal grinding has been going on as a direct result of conference, and the S.A.R.R.L. will soon be able to boast the best signals on the air. All bands have been thrown open for 'phone with the strict reservation that no flattering reports are to be given! This seems to be bearing fruit. Congratulations to ZU6W on winning the H.O.S. trophy.

SUDAN.

By ST2D.

ST2D has been too busy building a new shack and rebuilding gear for C.C. to spend much time on the air. Activity at ST2C unknown. Receiving conditions on 14 M.C. are very good from 16.00 to 20.00 G.M.T., but odd signals seem to get through at all times of the day. QRN is now bad on 7 M.C., but signals are loud after sunset (16.00 G.M.T.). Harmonics of nearby transmitters only are heard on 28 M.C. 3.5 M.C. is being explored, but QRN is deafening.

EMPIRE CALLS HEARD.

Calls Heard Lists will, in future, contain only British Empire calls (including Great Britain) and those of British ships at sea and British Expeditions.

*BRS*497, 24, *Woodside Park Road, N.*12.

7 M.C.: ve3he, vk2zz, vk3ca, vk5hg, vk7ch, vo8mc, zl3aa, zl3cc, zl4am, zl4ao. 14 M.C.: fn2c, ve5aw, vk3ka, vk3pa, vk5pk, vk5dx, vk5hg, vs5ss (QRA?), vs6ae.

W. Griffin, 27, *Park Road, E.*10.
3.5 M.C.: g2gw, g2kb, g5ha. 7 M.C.: g2ii, g5cm, g6cw, g6lm, g6qb, g6rq, g6sr, g6uy, su1ch, 14 M.C.: su1aq, v1yb, ve1bv, ve1cm, ve1dr, ve2aa, ve3bm, vo8ae.

* * *

Mr. "X" (c/o G5XD) heard in Mediterranean Sea. April 15 *to May* 10.
14 M.C.: ei7c, g2ao, g2av, g2by, g2cx, g2dh, g2dm, g2ig, g2kl, g2ol, g2op, g2ow, g2pa, g2qb, g2rv, g2ux, g2vz, g2wv, g2ww, g2yd, g2zq, g5bj, g5cm, g5cn, g5fb, g5fv, g5hj, g5is, g5la, g5lw, g5ml, g5mu, g5nc, g5og, g5pj, g5qf, g5qy, g5sr, g5vb, g5vm, g5vn, g5xd, g5xq, g5yg, g6bb, g6cj, g6cl, g6dh, g6fo, g6fx, g6gd, g6jg, g6lb, g6lf, g6ll, g6nf, g6pm, g6pp, g6qb, g6rb, g6rg, g6rw, g6sc, g6ut, g6vp, g6wn, g6wt, g6wy, g6xj, g6xn, g6xq, g6yk, g6yl, g6yq, su1ch, vs6be, vs7ap, vu2ah, yi6ht, zc1s.

* * *

ST2D, Signals 4, *B. Squadron, R.A.F., Khartoum, Sudan. April*, 1931.
14 M.C.: ap6jm, obsk2, st1t, g2cj, g2lz, g2zp, g6nf, g6vp, g6wn, su1aq, vq4msb, vs7ap, xyi6kr, zc1s, ze1jg.

*BERS*25, *British Arabia.*
14 M.C.: ei2b, ei8c, g2av, g2by, g2cx, g2dh, g2gm, g2ig, g2ma, g2mn, g2nh, g2ol, g2op, g2pa, g2ux, g2wv, g2zp, g5bj, g5cm, g5is, g5kl, g5la, g5lw, g5ml, g5pj, g5qf, g6cl, g6fo, g6gd, g6hp, g6hr, g6jg, g6ly, g6mn, g6nf, g6ot, g6pa, g6pj, g6rg, g6rh, g6ut, g6vp, g6wn, g6wt, g6wy, g6xn, g6xq, g6zr, gi5nj, st2d, su1aa, su1aq, ve1dq, vq2ty, vq4crf, vs6ae, vs7ap, vu2ah, vu2op, vu2pn, yi6ht, ze1jg.

* * *

HB9N, St. Gall, Switzerland (c/o D.A.S.D.).
On 2 M.C., from March 29 to April 13: g2oi, g2qi, g2zc, g5gy, g5jk, g5ug, g5um, g6dr, g6iz, g6jg, g6mn, g6oo, g6uj, g6yq, gi6yw, g6zh, ei7c.

* * *

*BERS*52, *N. India.*
14 M.C.: g2by, g2ig, g2lz, g2ma, g2nh, g2ol, g2ux, g2vq, g5bj, g5dd, g5is, g5lw, g5ml, g5pj, g5yk, g6dh, g6yp, g6wn, g6wy, g6xn, g6xq, vq3msn, vu2bg, vu2kt, vu2pn, vs6ae, zs5u, zu5b. 7 M.C.: g2jp.

* * *

F8LGB (Oise) on 2 *M.C. during R.S.G.B. tests.*
g2qi, g2xs, g5ym, g6zh.

NOTES & NEWS FROM THE BRITISH ISLES.

DISTRICT No. 2.

ON Sunday, July 5, the Liverpool area propose to hold a transmitting field day. The transmitter will be located near Chester, and it is hoped to work on 1.75, 7 and 14 M.C.; the call being XG6RW. Reports will be very much appreciated and should be sent to G2OA, 13, Exeter Road, Wallasey, Cheshire.

The day will finish with a hamfest in Chester, and all Northern hams wishing to attend are asked to communicate with G2OA

DISTRICT No. 7.

By G6GZ.

The Letter Budget is still going strong, although a few of the "old timers" would -be welcomed. Reports suggest a very definite improvement of conditions on 14 M.C. band, whilst quite good work has been accomplished on 7 and 3.5 M.C. The outstanding feature is the number of Japanese stations heard, together with many QSO's. South America, Cuba, Peru and like distances are coming over regularly, and good strength. Most of the 7 M.C. reports are of fone—although a good many seem to be forsaking this wave owing to QRM.

By the time this appears in print, I hope to have the arrangements well in hand for the second Annual Conventionette. Same venue as last year—Tunbridge Wells—and either of the first three Sundays in July.

Further particulars will appear in the Letter Budget. Nevertheless, keep these dates free and endeavour to come along if I report things satisfactory.

The following report active:—BRS432, 2APG, 2ANV, G6QG, G5CM, G2PF, G6WY, G6PZ, 2AHR, G5MR, G5OG, G5UY.

DISTRICT NO. 8.

By G6GZ.

Work throughout the District continues steadily, the approximate number of letters for Budget being a dozen each month. Nothing outstanding has occurred, although I should have thought greater activity would have taken place during the 2 M.C. tests, as this seems a pet wave band in District 8. If any of you fellows can come along to the Annual Conventionette (District No. 7), particulars above, I shall be pleased to pass along further information regarding this upon request. It was a happy event last year when the first of its kind was held, and if everything goes smoothly with arrangements, it will be well worth the effort even if you do have to travel early!

2AHD (Jersey, C.I.) is visiting the mainland in June. He hopes to visit as many "hams" as time will permit. (Welcome, OM.—G6GZ.)

BRS496 is now 2BCS.

The following report active:—G2WK, G2GG, BRS343, BRS157, G2BI, G6BU, 2AHD, G6GZ, 2BCS.

DISTRICT No. 10.

Representative: S. BUCKINGHAM (G5QF), 19, Oakleigh Road, Whetstone, N.20.

The first meeting of the members in No. 10 was held at G6CL on May 23, when a total of eight members, plus G6UT, presented themselves! These included three of our new B.R.S. members, 478, 497, and 536. But where were the other 42 and the odd 30 licensed members of the Society? It was a disappointing effort, but perhaps future meetings will be better supported. Our Letter

Budget is, on the other hand, flourishing, as well as, if not better than, any in the country. If there are any members in North London who are not sharing the Budget, will they please drop a line to me? There have been no outstanding events from the radio point of view recently, except that we should record that G6CL has now worked four continents on telephony, using an input of six watts. His American contact was with W8CRA, when he was reported R5-3. He is using an Adolf microphone. G6CW is experimenting with a 14 M.C. fundamental crystal, but has encountered some difficulties. The following are active:—G2WV, G5QF, G5CD, G2IM, G5SL, G6PP, G6CW, G6CL, G6OT, BRS321, 479, 497, and 536.

DISTRICT No. 12.

Representative: T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4. Telephone: Silverthorn 1557.

The District meeting for April was held at the QRA of G6LL, Clapton, and the May meeting at Chingford, and at the latter meeting XOH5CL was present. By the time these notes appear the District field day on Sunday, June 7, will have taken place. The fixed station is G6HY, at Hoddesdon; the portable station on a car will move around Essex and Herts—the 1.7 M.C. will be used. Reception reports will be welcomed. Next meeting Tuesday, June 23, at Chingford.

DISTRICT No. 13.

Representative: H. V. Wilkins (G6WN), "Hills View," 81, Studland Road, Hanwell, W.7.

The last area meeting proved very successful, so far as numbers were concerned, and we had the pleasure of welcoming ex-SU8WY. He gave us an interesting account of his activities while in Egypt. Wednesday, June 24, will see the next meeting at G5CV, 45, Fairfax Road, Bedford Park, W.4, at 7.30 p.m. Fewer reports have arrived this month and all show a decline in contacts with U.S.A. stations, but found more general DX conditions prevailing. A motor-coach tour, visiting "ham" stations, has been suggested as the summer outing of the area. Will any member who has ideas on the subject drop me a line?

SCOTLAND.

Representative: J. Wyllie (G5YG), 32, Lubnaig Road, Newlands, Glasgow.

The latter part of the April-May period has unfortunately seen a return to the patchy conditions prevalent prior to April. This more particularly with respect to the 14 M.C. band, but the other bands have also suffered, though perhaps to a lesser degree. Heavy QRN has been frequent on 7 and 3.5 M.C., particularly on 3.5 M.C., but of course, that is to be more or less expected at this season.

With reference to the writer's remarks last month in connection with the Macao contact, this is now believed to constitute a first "G" contact, and I shall be obliged if anyone with a prior claim will communicate with me. The particulars are CR9CN, date 18/4/31, 16.03 G.M.T.

I have been asked to comment on the activity of Scottish BRS, particularly with respect to reporting on telephony transmissions. These reports have been much appreciated in the South, and in many cases of QRP telephony have been decidedly helpful. I am very pleased to be able to record

this, as it is such a pleasant relief from the customary "half-brick" which it is usually my lot to deliver.

I am sorry to hear that BRS266 has had a bad time during the winter and hope that the summer will bring him to his accustomed health and strength.

The writer had a welcome visit from D4AFA recently and was pleased to have the opportunity of showing him what Scottish scenery looks like under good conditions.

Here is a point which will be of interest to ALL MEMBERS who have house mains. When a change in supply or frequency is made, it is customary for the supplying company to replace gear rendered obsolete by the change. In the writer's case, a replacement was *not* desired, as a D.C. generator driven via motor from the mains had been in use and after the change it was intended to use the mains entirely for filaments and plate supplies. The matter was put up to the supply company and monetary compensation suggested in lieu of replacements. This was eventually agreed to, the company taking the invoice value of the obsolete gear (which was purchased retail) and deducting 20 per cent., representing the difference between the price at which they could buy the replacements (wholesale) and the price the writer paid (retail). This was decidedly helpful, as had the company insisted in putting in replacements, I should have been faced with the immediate necessity of selling these replacements, probably at a heavy loss.

BRS468 (Mr. McKenzie, of Leith) is now the possessor of 2AUF. Messrs. French, of Edinburgh, and Kollien, of Blackhall, are now G6FN and G5IG respectively, and hope to be "on the air" very shortly. Two new members, in the persons of Messrs. Grant and Mulvay, have to be recorded in "D" District. Enthusiasm runs high in "D" District, where the fortnightly meetings and Morse classes under G6FN have proved a great attraction.

Recently, along with G2MA, I had the pleasure of visiting G6RG and spent a very enjoyable afternoon in the midst of the OZONE from the mercury vapour rectifiers. No summer holidays now necessary. Hi!

G6RG and G5YG have been appointed Empire Link Stations for Nigeria, in addition to the West Indies, but as G5YG will be closed down for some months, G5BJ has agreed to deputise.

Owing to the closing of my house for the summer and various other reasons, "A" District monthly meetings will be cancelled until Wednesday, September 30, when I hope that there will be a good turn-out.

WALES.

Representative: B. F. PHILLIPS (G5PH), 144a, Cwm Road, Brynmaen, Swansea.

We have the pleasure of welcoming G6XB into our area this month, and we hope that he will soon be on the air again after the change of QRA recently. There has been a great deal of activity in this district during the month, especially amongst the three letter men who are swatting for their Morse examinations. Good luck, O.M.'s. The transmitters have been busy on both 14 and 7 M.C., but mainly on the latter, and fone on this band is getting very popular. The following stations report activity: G2AV, 2AIS, 2BPM, G5AS, G5OC, G6XB. G5PH is rebuilding for CC.

Notice to Contributors.

The Editor is pleased to have manuscripts submitted to him for publication, but would remind contributors that, owing to lack of space, a delay often elapses between the receipt of the MS. and the date of its appearance in these pages. All matter intended for publication should be written on one side of the paper only and preferably typewritten (double spaced). Diagrams should always be shown on separate *sheets. Rough sketches can be re-drawn by our draughtsmen. Photographs, if any, should not be smaller than ¼-plate as otherwise the reproduction will be poor.*

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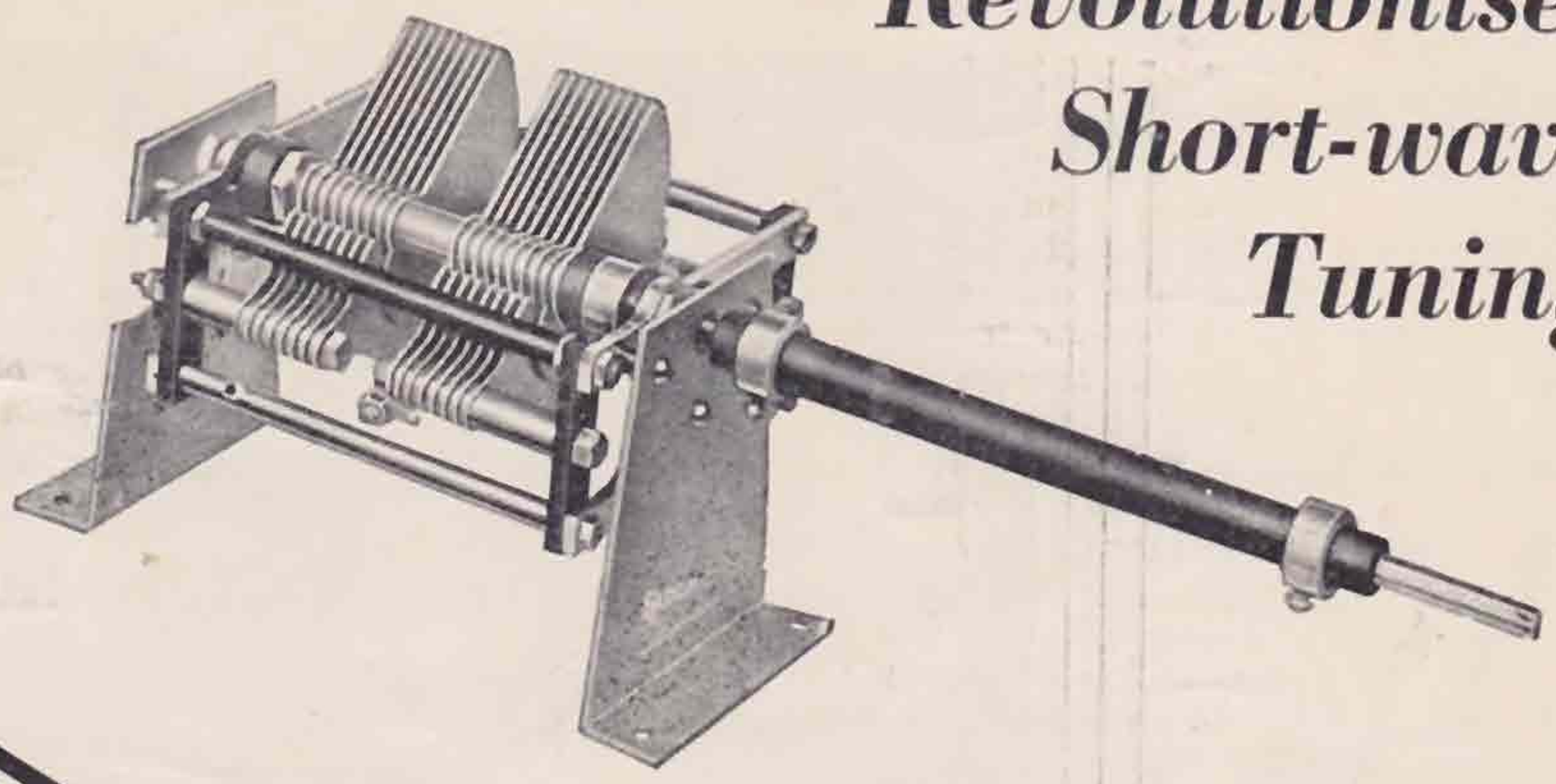

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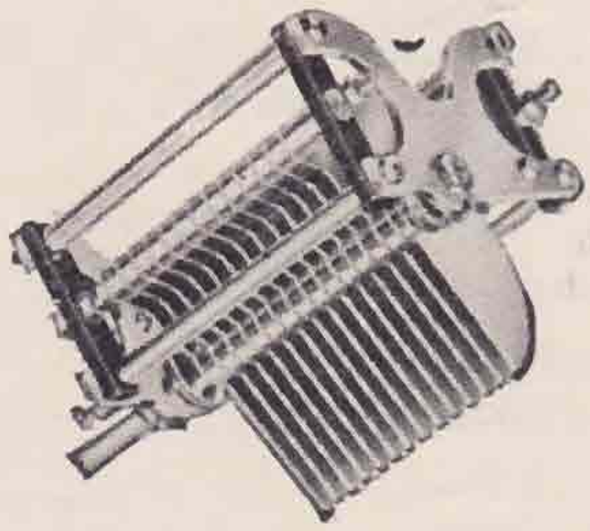

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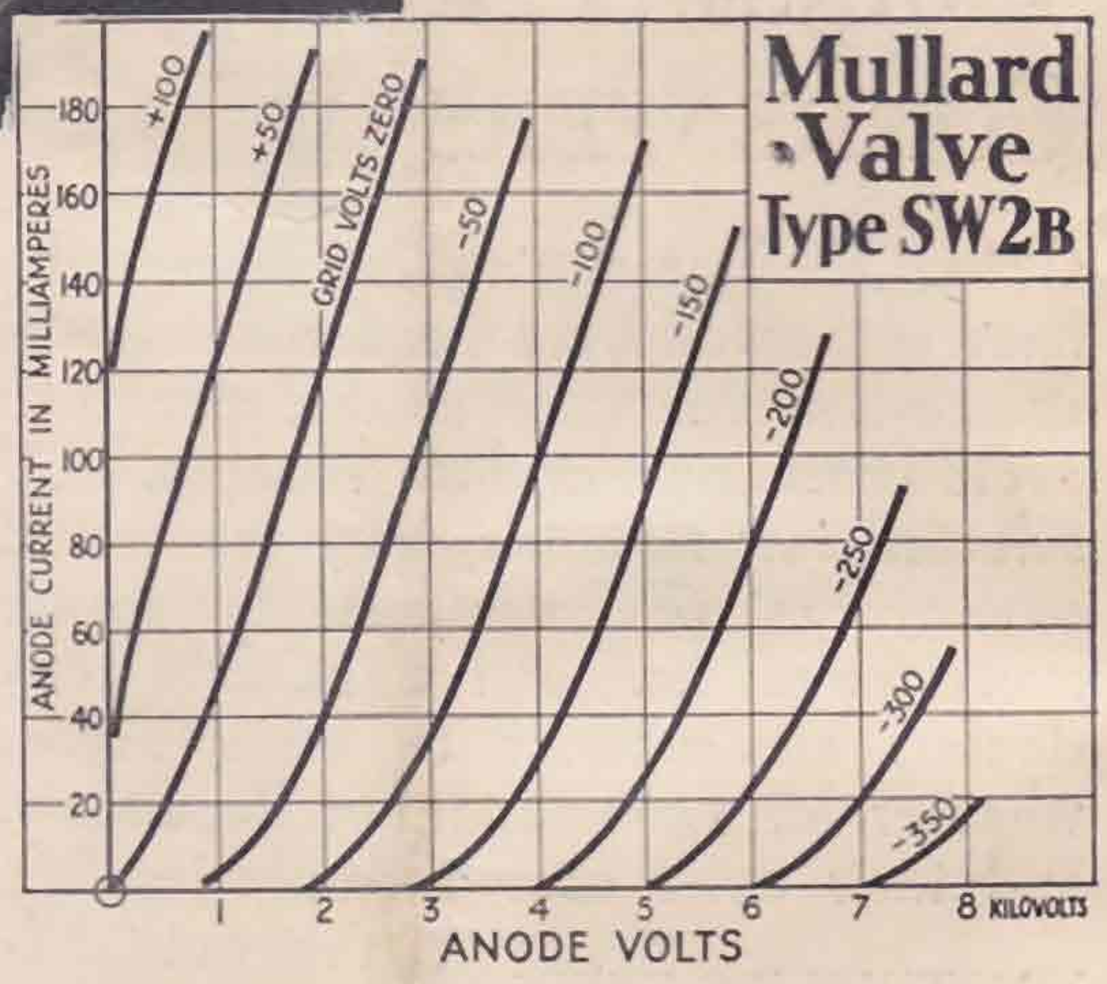

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