THE T&R

BULLETIN

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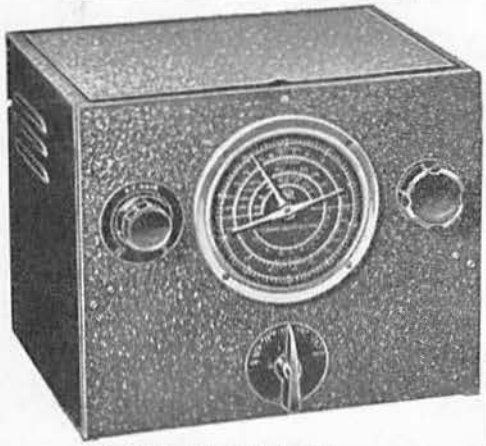

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53, VICTORIA STREET,
LONDON, S.W.1.

THE T. & R. BULLETIN

VOL. 14. No. 11.

THE T. & R. Bulletin is published on or about the 15th day in each month, and a copy is despatched free of charge to each member. Changes of address should be communicated promptly to the Headquarters of the Society.

THE Secretary-Editor will be pleased to consider for publication, articles of technical or general interest. Intending contributors are requested to indicate in advance the scope to be covered by the article under consideration.

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THE T. & R. BULLETIN

OFFICIAL JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

DEVOTED TO THE SCIENCE AND ADVANCEMENT OF AMATEUR RADIO

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Vol. XIV. No. 11. MAY, 1939

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STOCKHOLM, 1940

MOST of our members are aware that Technical Conferences, described as Comité Consultatif International des Radiocommunications Meetings, take place between the Quinquennial International Telecommunications Conferences. For the past few years the R.S.G.B. has been privileged to co-operate in the preparatory work preceding C.C.I.R. meetings, whilst the International Amateur Radio Union (of which the R.S.G.B. is a Member Society) has been officially represented at the Conferences themselves.

Since the last Technical meeting held in Bucharest two years ago, the Cairo Conference has taken place with results already well known.

The next C.C.I.R. Meeting is to be held in Stockholm during 1940 and in preparation thereof a Committee has been set up by the British Post Office to study the various technical problems left over for discussion from the Bucharest meeting.

Once again the R.S.G.B. has been invited to send representatives to serve on this important Committee—further proof if such is necessary that the Society is held in esteem in official circles.

It may, perhaps, be helpful if we explain that at each C.C.I.R. meeting arrangements are made for various administrations to act as Centralising Bureaux for the collection of data relating to specific questions, whilst other administrations agree to collaborate with the centralising administrations on other questions.

For the Stockholm meeting the British Administration is acting as the Centralising Bureau for three important questions and is collaborating in connection with several others.

Among the three questions for which Great Britain is responsible is one entitled " Study of the Propagation of Radio-electric Waves." A pretty wide subject, we must agree, but it is the *one* question which, in our opinion, provides the amateur with an opportunity of making a practical contribution to the next C.C.I.R. Conference.

It is the wish of the Sub-Committee, appointed by the G.P.O. to study this question, that the contribution made by Great Britain should be extended to include data relating to horizontally polarised waves, and in this connection we understand that *information covering amateur observations on all frequencies above* 28 *Mc. will be appreciated.* In particular, practical data dealing with work conducted on frequencies around 60, 120 and 240 Mc. is urgently required.

In preparation for the Bucharest meeting the R.S.G.B. submitted a contribution on the behaviour of ultra-short waves, compiled from work done by its Research and Experimental

Section, and it is confidently hoped that once again we shall be able to make a worth-while contribution.

No time can, however, be lost in preparing the R.S.G.B. contribution ; therefore we would urge not only our Experimental Section members but all members to co-operate immediately in this practical method of justifying our experimental status.

Council, appreciative of its responsibilities, has set up a Technical Sub-Committee for the purpose of correlating the information submitted by members. This information should, we suggest, be put forward under the following general headings :—

(*a*) A study of the effects of horizontally polarised waves on frequencies around 28, 56, 112 and 224 Mc.
(*b*) Types of transmitting apparatus employed.
(*c*) Types of receiving apparatus employed.
(*d*) Types of aerial systems employed.
(*e*) Long-period observations on stations situated at varying distances from the observer.
(*f*) Observations on harmonic reception.
(*g*) Critical frequency data over extended periods.
(*h*) Effects of soil.
(*i*) Barometric and temperature effects.
(*j*) Seasonal and diurnal variations.
(*k*) Observations on the effects of the use of low and high power for transmitting purposes.

It is accepted that most of our members are not in a position to provide data on more than one or two of the subjects enumerated, but providing sufficient all-round response is given we can be certain that the Society's contribution will prove of immense value.

All data submitted by members will be carefully analysed by the Technical Committee, who will make such extracts as they consider will allow the Society to put forward a generalised statement on each specific aspect of the C.C.I.R. question.

Members of the Experimental Section are requested to forward their contributions direct to the Propagation Group Manager, whilst other members should contribute direct to Headquarters.

The task before us is no light one but we feel certain that within the 2,500 ham shacks of Great Britain lies hidden much material that would prove of inestimable value to our own and other Governments.

The Council has taken the initiative ; it is now the duty of the membership as a whole to see that their decision to co-operate has been justified.

BROADCASTING IN THE 7 Mc. BAND

We would inform members that the Society has registered a protest with the G.P.O. regarding the unjustified and illegal operation of a French broadcasting station on 7,280 kc. It is desirable to point out that whilst our colleagues in North America must feel keenly annoyed at the unwarranted intrusion, they have the complete right to operate each and every one of their 40,000 amateur stations (with their 40,000 kilowatts !) on a frequency of 7,280 kc.

We feel that it may serve some useful purpose if we quote our own bi-annual 7 Mc. Band Occupancy Check figures for the past four years.

1935	478	716
1936	759	907
1937	1,035	1,141
1938	1,326	1,263

Maybe someone who studies them will decide that the importance to the community of 1,300 individual amateur stations is as great as that provided by a couple of 7 Mc. broadcast stations with a very limited *clientele !*

J. C.

Insulating Materials for the Higher Frequencies*

By G. F. Bloomfield, Ph.D., D.I.C.

THE importance of utilising low-loss materials for insulation and dielectric purposes at the higher frequencies cannot be over-emphasised. In recent years some excellent low-loss materials have become available in the ceramics, frequentite, steatite, etc., and these have already largely replaced the older materials, such as ebonite or bakelite, for high-frequency equipment. Unfortunately, these ceramic materials suffer from the inherent disadvantage that they cannot be readily manipulated in the workshop, so that the experimenter is restricted to a limited number of standardised parts which lend themselves readily to mass production.

During the past twelve months a new material, Polystyrene, has become available to the radio amateur and to the trade under the names of Trolitul, Victron, Styron, Resoglaz, Rhodolene and Distrene, and, as certain grades of this material are every bit as good as, or in some cases even better than, quartz, mica and the ceramics, while at the same time the new material (available in bulk as sheet, rod, tube or film) can be sawn, drilled and manipulated generally as readily as ebonite, some notes on its properties and manipulation may not be without interest.

Some theoretical considerations of dielectric loss are here put forward to indicate in what circumstances power loss in an insulating material may be expected, and to show how the properties of a material can to some extent be predicted from a knowledge of its molecular structure and chemical composition.

Nature of Dielectric Loss

The criterion of a low-loss material is essentially that it shall have medium or low dielectric constant and a low power factor. The dielectric constant of an insulating medium may be considered as a measure of electrical displacement for a given electric force; it is in the nature of a movement of electricity which reaches a defined value when the electric force is applied. Matter consists of positive and negative charges bound together by the forces of attraction between them and when an electric field is applied there is a tendency for the charges to move in opposite directions against these restoring forces of attraction. In the case of a molecule in which charges tend to become concentrated at opposite ends of the molecule, *e.g.*, water $\overset{+}{H}—\overset{-}{OH}$ there is also a tendency for the molecule as a whole to rotate and set itself in the direction of the field. Such a molecule is termed a "polar molecule": it can be considered as a tiny magnet which tries to set itself in the direction of the field at any instant. The charged portions of the molecule do not necessarily separate, such would be termed ionisation; the molecule only tends to rotate as a whole and the extent to which it does rotate is dependent upon the magnitude of the charges, the size of the molecule, viscosity of the medium, temperature, etc. Highly polar molecules have high dielectric constants, *e.g.*, water 80, non-polar molecules, low dielectric constants, *e.g.*, petroleum 2. In many insulating materials, and notably in synthetic resins, the structure of the molecule is that of a chain of small units linked together end to end or crosswise as in a lattice. The small unit of the chain or lattice may be termed a "repeater unit" which can be either polar or non-polar.

In an alternating field the movement of charged ions or the rotation of the polar molecule or repeater unit has to follow the alternations of frequency and since the molecular and ionic movements are opposed by the forces of attraction between molecules and viscosity influences within the medium, there is in general a lag behind the alternations of the electric field, that is a power loss in the material. A measure of the power loss is obviously the power factor, usually expressed as the tangent of the angle of lag, *i.e.*, tan δ. As frequency increases from zero the greater is the loss factor up to a point at which the frequency becomes so high that the particles cease to respond, and their contribution to the loss factor and to the dielectric constant becomes zero; in other words, the power factor decreases again. In the intermediate region the loss factor passes through a maximum, termed a region of dielectric absorption. If the internal friction is low the absorption takes place at high frequency; if it is high as in glasses and many crystalline solids, the absorption occurs at low frequency. Yager, in a recent paper (1) has studied changes in dielectric constant and loss factor with frequency, and his results illustrate this effect quite strikingly. A typical curve is shown in Fig. 1.

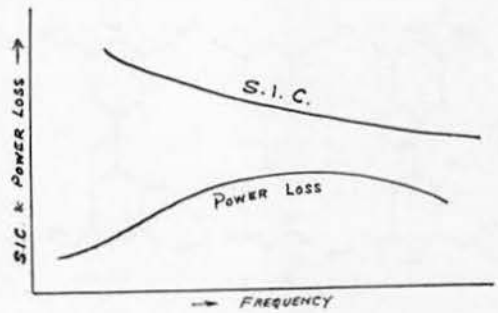


Fig. 1.

Application to Insulating Materials

The type of molecules and electrical displacements in common insulating materials must next be considered. In substances like glass, mica, porcelain, and many resins, the charges are largely ionic and frequently arise from traces of soluble

*A lecture delivered to the London membership at the I.E.E. on February 24, 1939.

impurities dissolved in molecules of water, bound within the structure of the material or absorbed on to its surface ; in such materials leakage current is largely ionic and increases with rise of temperature which further increases the ionisation—such an effect is cumulative and a point is ultimately reached at which breakdown occurs. If this effect is concentrated in a surface layer of absorbed moisture, the familiar phenomenon of " tracking " occurs.

Water has already been quoted as an example of a highly polar molecule, represented H—OH ; it is disadvantageous in an insulating material not only because of its polarity but also because it can ionise substances dissolved in it, leading to ionic charges. Thus, although bakelite resin, for example, contains only 3 per cent. or less of water, its power factor has been observed to fall by 30 per cent. on drying (2). Hydrocarbons—that is, compounds of carbon and hydrogen, are non-polar : if a hydrocarbon radical—i.e., a group of carbon and hydrogen atoms—is introduced into the water molecule there is a marked drop in dielectric constant :—

Water		HOH	...	...	80
Methyl	alcohol	CH_3OH	...	...	35.4
Ethyl	,,	C_2H_5OH	...	...	26.8
Propyl	,,	C_3H_7OH	...	...	21.8
Butyl	,,	C_4H_9OH	...	...	17.8
Amyl	,,	$C_5H_{11}OH$	...	...	16.0

and so on.—OH is a highly polar group—it confers polar properties on any compound into which it is introduced. Conversely, a hydrocarbon group reduces the polar properties of a compound into which it is introduced.

Perhaps the least polar substance which it is possible to imagine is benzene, since its molecular structure is that of a symmetrical hexagon : its dielectric constant is 2.29. If we introduce the polar—OH group into the benzene molecule we have phenol : its dielectric constant is 15. If, on the other hand, we introduce a hydrocarbon, the dielectric constant is not greatly increased ; thus, ethyl benzene has a dielectric constant 2.47. Referring again to phenol, this can be treated with formaldehyde to obtain the well-known insulating material bakelite, the structure of which is possibly of the form shown in Fig. 2.

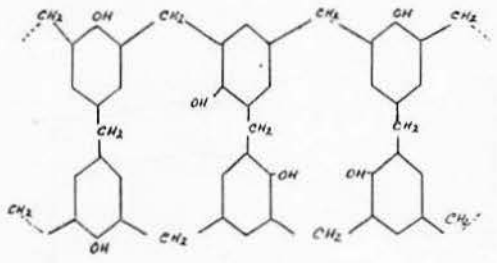


Fig. 2.

In this network the polar phenol is not so free to suffer displacement as in the free state, consequently the dielectric constant is much lower, namely, 4.0 in the pure resin. It has been shown that by the introduction of further hydrocarbon groups into this network, both dielectric constant and power factor are reduced (2), as would be expected from the foregoing theoretical considerations.

In the course of the chemical reactions producing bakelite considerable water is formed, and in a thick specimen this water is removed only with extreme difficulty. In a network structure of the type just indicated there are plenty of open spaces in which molecules of water can be retained ; moreover, a polar molecule has the further property of attracting other polar molecules, *e.g.*, water, to it. Consequently, bakelite generally contains several per cent. of water which has its own effect in increasing dielectric constant and power loss.

In the manufacture of laminated bakelised sheet such as Paxolin, paper is impregnated with bakelite in a premature stage of formation, and is subsequently consolidated under the influence of heat and pressure, the heat causing the " premature " bakelite to form the familiar hard resin. Dry paper has quite a low power factor (.0025) and low dielectric constant, but, unfortunately, bakelite resin is itself somewhat pervious to moisture, so that although every care is taken to minimise the water content by impregnating with resin from which most of the water formed by the chemical reaction has already been eliminated, laminated materials suffer many of the disadvantages of bakelite. The chief advantage of the laminated materials is of course in their very much greater mechanical strength.

Rubber has a non-polar hydrocarbon structure, its dielectric constant is 2.34 and its power factor .002. It is, however, more familiar in the vulcanised state, either partially vulcanised as in flex or fully vulcanised as in ebonite. Vulcanisation consists of a linking-up of rubber molecules with introduction of sulphur, which confers some polarity upon the molecule, and the dielectric constant is raised to 2.5 to 3.0, and the power factor to 3 to 5, times that quoted above, or to an even higher figure if the rubber contains a mineral filler (see table 2). The drawback of ebonite is that exposure to air or light causes oxidation giving rise to surface acidity resulting in a lowered surface resistivity.

Celluloid and cellulose acetate have highly polar structures—the power factors and dielectric constants are accordingly high.

Polystyrene has a purely non-polar hydrocarbon structure and its power factor is extraordinarily low. Other similar hydrocarbon resins which will probably very shortly be available are polyindene and polyethylene.

Since factors contributing to power loss and dielectric constants are—

1. displacement of ionic charges,
2. rotation of polar molecules as a whole,
3. rotation of polar groups within polar molecules,
4. rotation of the repeater unit,

the curve relating power loss and frequency does not in general show any one well-defined maximum as would be expected if one factor alone were responsible for loss. Usually the maximum is broad and ill defined, frequently there is more than one maximum. The laminated bakelites, for example show a maximum just above 10 Mc. when quite dry, but when moist a low-frequency maximum also appears, attributed to ionisation in the absorbed water (Fig. 3).

The maximum at 10 Mc. appears to be common to all bakelites containing a cellulose filler, whether paper, wood-flour or fabric, and urea resins show

the same effect. It is postulated that this absorption is a function of the cellulose; it largely disappears when the cellulose filler is replaced by a mineral such as mica or talc, and the introduction of such a filler has the added advantage of rendering the material less sensitive to moisture pick-up, thus reducing the low-frequency absorption. This forms the basis of many of the low-loss materials now on the market.

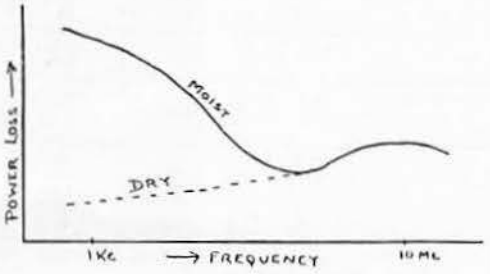


Fig. 3.

In polystyrene the dielectric constant has been found to be independent of frequency up to at least 35 Mc. (1) and the loss factor is also independent of frequency—it behaves, therefore, as the almost perfect dielectric. Further, there is no variation of dielectric loss with temperature at high or low frequencies. (3) The water absorption of polystyrene is nil—prolonged immersion in water does not affect its excellent electrical properties and it is therefore well suited for outdoor work.

A number of properties of practically all of the common insulating materials are shown in Tables 1 and 2. Comparative power-loss figures have been calculated from the product of dielectric constant and power factor and these are shown in Table 3. It is apparent from these figures that Trolitul is definitely better than the ceramics, while Styron is slightly superior even to quartz and mica.

Practical Test

The relative efficiency of insulating materials can be readily tested by inserting a thin sheet between the plates of a small parallel plate condenser of a few micro-microfarads capacity connected in parallel with the tank condenser of an oscillator or driven circuit. It is necessary to re-tune the tank condenser to resonance or to the original frequency in the case of an oscillator, a small reduction in this capacity being required to compensate for the slight increase in capacity of the parallel plate condenser on inserting the dielectric. If there is no loss at all in the dielectric there will be no change in the plate current of the valve when the dielectric is inserted; loss is indicated by a rise in plate current. If samples of several materials are available of comparable thickness, they may be compared one with another. Results obtained by this method are shown in Table 4: there is considerable increase in plate current with practically all materials tested other than the polystyrenes. Differences in the order of the materials at the two test frequencies are due to the variation of loss factor with frequency as has already been explained.

[The demonstration given by the lecturer proved conclusively that polystyrene materials were vastly superior to other insulating materials.—ED.]

TABLE 1

SOME PROPERTIES OF MINERAL INSULATORS

Material	*S.I.C.**	*Power Factor at*		
		1 *Mc.**	10 *Mc.†*	60 *Mc.†*
Quartz.... ...	3	.001	.00011	.00011
Mica	6.5	.003	.00016	.00016
Frequentite ...	5.9		.0007	.0006
Steatite ...	6.5		.0017	.0015
Mycalex ...	6.1	.002		
Porcelain ...	5	.008		

* T. & R. BULLETIN, Sept., 1936, p. 106.
† From a German source.

Polystyrenes

A note on the method of manufacture of polystyrene and details of its mechanical and electrical properties have already been published in THE T. & R. BULLETIN. (4) The name polystyrene means "many styrenes," and indicates its chain-like structure of styrene units linked end to end.

As far back as 1911 polystyrene was proposed as an insulating covering for electrical work but the price at that time was prohibitive (it was actually discovered over a century ago). Only in the last few years has progress in its manufacture enabled it to be placed on the market at a price comparable with other insulating materials. The raw materials are quite cheap but great care is necessary in making the solid polystyrene from the liquid styrene, since traces of chemical impurities can have a serious influence on the power factor; similarly, the use of solvents in manufacture is undesirable.

The power factor of commercial Trolitul has been determined at quite high frequency and shows a slight rise from .0003 at 3 Mc. to .001 at 13 Mc. This rise is contrary to the observations of Yager, (1) working with Styron, and is probably accounted for by traces of impurity in the German material. Unfortunately, no precise information about the British material Distrene is yet available, but tests by the author indicate that it has about the same properties as Trolitul. It is, however, believed that more recent supplies may have a power factor as low as .0002 at 40 Mc.

Polystyrene comes on to the market in the form of a coarse whitish powder not unlike soda. When heated above 70° C. it becomes rubberlike and plastic and can be moulded under heat and pressure into the more familiar sheet, rod and tube; the best conditions for moulding are 140 to 160° C. and 500 lbs. per sq. in. Sheet is made by moulding in a shallow tray, rod and tube by forcing the hot material through a nozzle. If the hot rod, as it comes from the nozzle is wound upon a mandril a spiral results, suitable for use in a coaxial cable for television. The hot rod can be drawn into thread of remarkable toughness and flexibility. Similarly, tough and flexible film is also available. Sheet is available from $\frac{1}{16}$ of an inch thickness upwards, rod and tube of almost any diameter and wall thickness. Thread can be drawn down to the fineness of hair, film is made from .01 mm. upwards (approximately $\frac{1}{2}$ mil.). Small articles of standardised dimensions are most conveniently made by a process known as "injection moulding," in which the hot material is forced into a closed mould, as soon as the material

TABLE 2

PROPERTIES OF PLASTICS FOR ELECTRICAL INSULATION

Material	Specific Gravity	Tensile Strength 1,000 lbs./in.²	Water Absorption % in 24 hrs.	S.I.C.	Power Factor	Frequency
Raw Rubber	0.93			2.5	.002	1 kc.
Ebonite, Pure	1.2	4.3	.02	3.27 3.18 3.15 3.13	.0035 .0084 .0080 .0072	1 kc. 1 Mc. 10 Mc. 35 Mc.
Ebonite, Filled				3-4.5	.012 .03	1 kc. 1 Mc.
Bakelite, Cast	1.3	5-12	.01-.05	5-10 5-7	.025-.2 .005-08 .01-.045	60 ∽ 1 kc. 1 Mc.
Bakelite, ... Wood-flour Filler	1.3-1.5	6-11	.2-.6	5-12 4-9 4.5-8 5.8 5.6	.04-.3 .04-.18 .035-.10 .073 .079	60 ∽ 1 kc. 1 Mc. 10 Mc. 35 Mc.
Bakelite, Paper-laminated	1.3-1.5	6-13	.02-.05	4-6	.02-.05	1 Mc.
Bakelite, ... Mica Filler	3.0	10		6.4 5.6 5.4 5.3	.056 .050 .050 .049	1 kc. 1 Mc. 10 Mc. 35 Mc.
Shellac	1.1-2.7	1-2	1.5	15.0 6.0	.2 .07	60 ∽ 1 Mc.
Urea Resin, ... Wood-flour Filler	1.5	8-13	1-2	6.6 6.3 5.7 5.5 5.3	.034 .022 .030 .038 .042	60 ∽ 1 kc. 1 Mc. 10 Mc. 35 Mc.
Celluloid	1.4	5-9	1-3	7 6.2	.06-.14 .05-.10	60 ∽ 1 Mc.
Cellulose Acetate	1.3	4-10	1.4-3	5-7.5 4-6 4-5	.025-.07 .03 .06	60 ∽ 1 kc. 1 Mc.
Perspex ... ... (Diakon)...	1.18	7-9	0.3	4-6 3.4 3.0 2.9 2.8	.06-.08 .05 .02 .018 .017	60 ∽ 1 kc. 1 Mc 10 Mc. 35 Mc.
Polystyrenes :— ... ... Styron	1.05-1.07	5.5-7.5	Nil	2.6 2.64	.0003 .0001	60 ∽ 1 kc.-35 Mc.
Trolitul				2.5 2.6	.0001 .0002 .0003 .00058 .00125 .0007	800 ∽ 750 kc. 3 Mc. 6.5 Mc. 13.6 Mc. 60 Mc.
Polyindene				3	.0004	1 Mc.

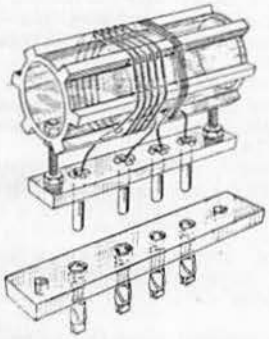
has sufficiently cooled the mould being opened and the article ejected, the process then being repeated. Such machines run quite automatically, powdered material is fed in at one end and finished articles come out at the other, requiring only the attention of one operator to fill the hopper and to pick up and trim the finished articles if necessary.

Owing to the excellent moulding properties of polystyrene, it is rapidly finding its way into the luxury trade, especially in view of its excellent clarity, high polish and brilliance and high refractive index. In this connection a word of warning. In order to obtain even better moulding properties, oils, etc., are incorporated in certain grades of polystyrene not intended for high-frequency work, and these may adversely affect the power factor. For high frequency work, therefore, only the highest grade of glass-clear colourless quality is permissible : in this respect material obtained from a reputable manufacturer can be used with confidence.

Manipulation of Polystyrene

The property of softening at rather low temperatures, upon which depends the moulding properties of polystyrene, is, of course, disadvantageous in the finished article, and up to the present this drawback has not been overcome. In amateur requirements, softening through heat is only likely to occur in isolated instances, such as in a valve base, and here the difficulty can be overcome, as it is really only necessary to have the bottom carrying the pins made in polystyrene—the supporting walls being made in another material more

resistant to heat. Great care, of course, is necessary in soldering on to metal in contact with polystyrene as the metal can easily be made hot enough to melt the material. The most satisfactory precaution is to wrap blotting paper around the base of the metal and adjacent polystyrene, and to keep this thoroughly wet with cold water. In drilling, the drill is preferably withdrawn once or twice and allowed to cool; water is a good lubricant. In sawing, the material should be clamped securely



Receiving Coil and Base made from Polystyrene.

between boards so that the sheet is gripped along the whole length to be cut, in close proximity to the line of cutting; the work should be kept well flooded

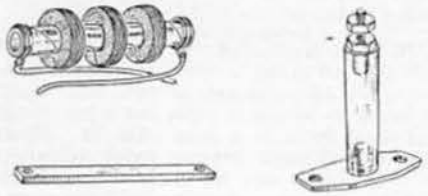
TABLE 3

RELATIVE POWER LOSSES

Material	*Frequency, Cycles*				
	60 cycles	*1 kc.*	*1 Mc.*	*10 Mc.*	*35 Mc.*
"Styron"	1	1	1	1	1
"Trolitul" ...		2	4	10	13 [9]
Polyindene... ...			6		
Quartz			15	2.6	[2.6]
Mica			35	5.6	[5.6]
Mycalex			60		
Frequentite ...				21	[18]
Steatite				55	[50]
Ebonite		58	135	125	115
Porcelain			200		
"Perspex" (Diakon)	475	850	325	250	235
Filled Ebonite ...		200	600		
Urea-Formaldehyde	265	700	850	1050	1100
Cellulose Acetate ...	120- 600	600- 900	1200		
Bakelite, Cast ...	120-2500	150-2500	300-1500		
,, Wood-flour	250-4500	800-8000	750-4000	2100	2200
,, Mica ...		1800	1400	1350	1300
Shellac	3750		2100		
Celluloid	450-1200		1500-3000		
Vinylite		385	250	190	145
Koroseal		6100	1900	900	500

[ ] at 60 Mc.

with water. A newly cut edge can be cleaned beautifully by scraping with a knife. For polishing, sawdust and oil, or whiting and oil, or simply an oily cloth are recommended.



A Group of Polystyrene Components.

Polystyrene is highly resistant to acids, alkalies, oils, and alcohol, but dissolves in certain solvents such as benzene or amyl-acetate, and pieces can be stuck together by means of a solution of scraps of dissolved polystyrene, preferably in benzene, since this has no polar characteristics. Such a solution is also most useful for securing wire in coils, chokes, etc. If a file should become clogged, it can be cleared by soaking in benzene.

TABLE 4

PRACTICAL TESTS AT RADIO FREQUENCY

AT 1.75 MC.: C.O. TEST CIRCUIT: CAPACITY OF PLATES 3μμF. AT 35 MC.: ULTRAUDION TEST CIRCUIT: CAPACITY OF PLATES 5μμF. TEST SAMPLES $\frac{1}{4}$ INCH THICKNESS.

Dielectric	*1.75 Mc. Test*		*35 Mc. Test*	
	Plate current mA.	*Increment*	*Plate current mA.*	*Increment*
Air	2.66	—	5.3	—
Styron ...	2.66	0.00	5.3	0.0
Trolitul ...	2.66	0.00	5.4	.1
Coloured Trolitul	2.70	.04	5.5	.2
Distrene ...	2.70	.04	5.4	.1
Perspex ...	2.84	.18	7.0	1.7
Mipolam ...	2.86	.20	6.9	1.6
Ebonite ...	2.86	.20	6.9	1.6
Urea Resin ...	3.24	.58	7.6	2.3
Cellulose Acetate	3.32	.66	8.1	2.8
Celluloid ...	3.44	.78	8.2	2.9
Bakelite ...	3.84	1.18	8.1	2.8

Recognition of Polystyrene

Polystyrene is recognisable by a very characteristic odour when worked, and a test can easily be applied by rubbing with a file; it is also characterised by a metallic sound when struck or dropped. It exhibits a characteristic fluorescence in ultra-violet light. Its low specific gravity provides a useful confirmatory test.

The illustrations show a variety of polystyrene components (mainly Trolitul) obtainable from *Denco*, 234, Burrs Road, Clacton-on-Sea, Essex, from whom sheet, rod, and tube can also be obtained.

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(3) J. Tech. Phys. (U.S.S.R.), 1933, 3 831.
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Appendix

Since the above article was contributed a most interesting and informative article on polystyrene has been published in the March issue of *Industrial and Engineering Chemistry* (Industrial Edition). Figures for a commercial polystyrene show power factor .0002 to .0003 and dielectric constant 2.55 to 2.60 over the range 60 cycles to 20 Mc., while at ultra-high frequency the power factor is given as 0.0004 in the wavelength range of 60-150 cm. It is stated that polystyrene has proved a useful low-loss material at 1 to 2 cm. wavelength, and it has even been used for windows transparent to infra-red radiation at 0.005 cm. wavelength!

It is also pointed out that at visible light frequency the "dielectric constant" corresponds to the square of the refractive index, i.e., 2.5 in the case of polystyrene, which is practically the same as in the radio frequencies. This provides strong evidence of the absence of any marked region of dielectric absorption through the entire range of radio frequencies, and even into the region of visible light!

G. F. B.

A D.C. Mains Receiver

INCORPORATING a NOISE LIMITER and a REGENERATIVE R.F. STAGE

By R. G. Drewery (G6OY)

THE usual receiver with a tuned or untuned R.F. stage, triode detector, and one or two L.F. stages has very serious shortcomings. These are mainly inadequate stability for C.W. reception, lack of selectivity for telephony reception, and poor sensitivity for telephony on the higher frequencies. These points are easily covered by a good superheterodyne receiver, but unfortunately the high cost of such an instrument limits its popularity, and its complexity deters many who prefer to build their own equipment as far as possible.

The set to be described does at least present some advance towards solving the problems without departing from the popular and relatively inexpensive autodyne. It is designed particularly for operation from D.C. mains. Operation from D.C. mains presents problems which are not encountered by designers of equipment for operation from A.C. mains, and it is hoped that this article will help out of their difficulties some of those who are supplied with D.C. at their homes.

sufficiently high powered electric lamp to be used in the desk without extra resisters being incorporated in the circuit. In the .3 amp. types the choice was small, but it was decided that these should be used as valves of suitable characteristics were available for all stages, and in case of difficulty the American 6.3 volts range (most of which take .3 amps. heater current) could be drawn from. It may be mentioned here that a 75 watts bulb in series with the valves gives the correct voltage within the usual tolerances across each heater. V1 is a Ferranti VPTS, a variable-mu pentode; V2 is a 6K7 which probably needs no introduction; and V3 is an Osram H30, a high-mu triode with an impedance of 14,500 ohms. This L.F. valve is not intended as an output valve, but nevertheless it gives sufficient power output to work a loud speaker on the louder telephony stations, and is an excellent power amplifier when small output only is required.

As will have been gathered from the foregoing the receiver, in the first place, was built solely for

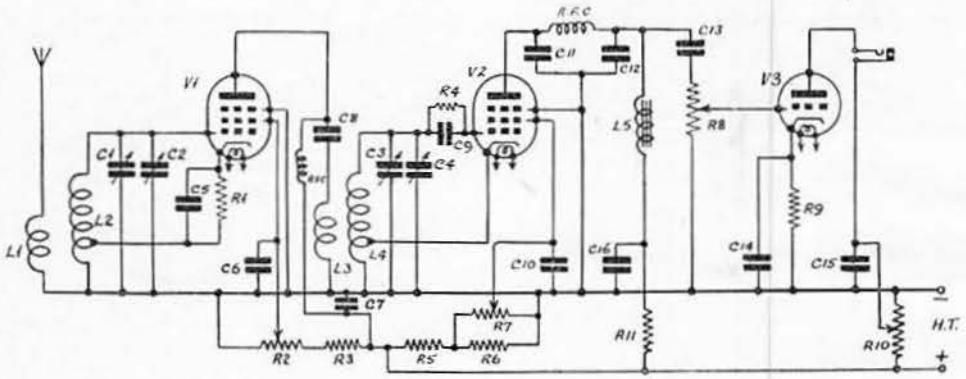


Fig. 1.—Circuit of D.C. mains receiver.

C1, C3. .0001 μF.
C2, C4. 20 μμF.
C5, C6, C7. .01 μF non-inductive.
C8. .0001 μF.
C9. .0001 μF.
C10. 10 μF. 150 V. electrolytic.
C11, C12. .0001 μF.
C13. .01 μF.
C14. 1 μF.
C15. 1 μF. 250 V.
C16. 2 μF. 250 V.

R1. 350 ohms (depending on valve used)—½ watt.
R2. 50,000 ohms variable—Erie.
R3. 25,000 ohms 1-watt Dubilier.
R4. 2 megohms.
R5. 20,000 ohms 1 watt Dubilier.
R6. 10,000 ohms 1 watt.
R7. 50,000 ohms variable—Erie.
R8. 1 megohm variable.
R9. 500 ohms (depending on valve used)—½ watt.
R10. 100,000 ohms variable.
R11. 20,000 ohms 1 watt.

The Circuit

The circuit diagram is given in Fig. 1. It will be seen that a regenerative R.F. stage, a pentode detector, and one L.F. stage are used.

The necessity for a high power voltage dropping resistance for supplying the heaters of the valves is a nuisance, and it was decided that the most convenient and economical method would be to run the heaters in series with a lamp which could be used for desk illumination.

Now in British makes there are available two ranges of universal valves, the .2 amp. and the .3 amp. heater current types. The former type were ruled out as their use would not allow a headphones use. Loud speaker operation is accomplished by the use of a separate one-valve amplifier built into the loud-speaker cabinet.

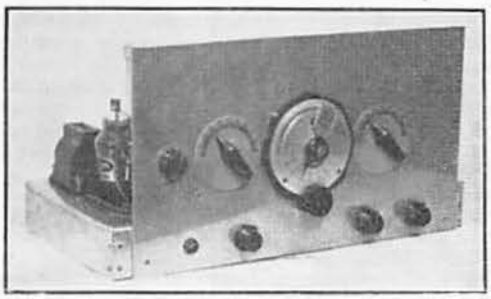
Constructional Details

With the exception of the panel, which is ⅛-in. aluminium, all metal in the chassis and screening boxes is No. 18 gauge aluminium. This metal has been found to be rather light and a heavier gauge would probably make a more solid job. However, by the use of angle bracing strips underneath a very firm chassis can be made with this gauge. It has, however, the advantage of being very easy to work.

The chassis is a tray, 18 in. by 9 in. by 2 in.

It is larger than necessary, for the receiver can very easily be accommodated on a chassis 16 in. by 9 in. to fit a standard sized cabinet, but it was so built to fit an existing cabinet. Two inches is sufficiently deep for normal requirements, but it may be found an advantage to make the chassis ½ in. deeper. The screening is formed by three-sided boxes which are bolted to the chassis and the panel, thus completing two boxes 4 in. wide by 6 in. by 6 in. high. The spacing between the boxes is 2½ in. Screening is completed by a 3 in. by 6 in. piece of aluminium bolted across the opening at the back of the two boxes, and by a lid approximately 10½ in. by 6 in., which covers the top of the two boxes. As will be seen in the photograph a sub-panel to accommodate the radio frequency stage band spread condenser is built across the space between the two boxes.

This method of constructing the chassis seems to be the best way of ensuring two shields between the important sections of the two tuned circuits, and yet allowing ganged band-spread with separate band set condensers to be accommodated on the panel. It is most important with the two high gain stages working on radio frequencies that the screening between the two stages should be as



Front View of D.C. Mains Receiver.

complete as possible, and it seems that the double screening between the stages is necessary.

Some slow motion dials need a good deal of width at the back of the panel and for some of these the 2½ in. between the R.F. stage and detector stage boxes may be insufficient. This point should be borne in mind before the construction of the chassis is commenced.

The R.F. Stage

Most straight short-wave receivers rely almost entirely upon the detector stage for providing the necessary selectivity and sensitivity, and the R.F. stage may be little more than a passenger with regard to these requirements. By introducing reaction into the R.F. amplifying circuit a great improvement in the performance of that stage can be brought about.

Reaction is applied by means of the cathode-tap circuit and is controlled by variation of the screen-grid voltage as is usual in detector stages using this circuit. The stage may be operated with a higher screen-grid voltage than can be used in a similar detector circuit and in practice it has been found to work very well with 100 volts. R3 is a suitable value of resistance to drop the H.T. voltage, so that the maximum available for the screen-grid is about 110 volts; hence by means of R2 the screen grid voltage can be varied from 0 to 110 volts. When it is correctly adjusted the operation of the stage is similar to that of a self-oscillating detector, but, of course, it has not the job of detection to do and is always used in the non-oscillating condition. The shortcomings of a self-oscillating detector which is coupled direct to the aerial can be avoided. Oscillation of the R.F. stage should commence when R2 is almost full in, that is, when the voltage on the screen-grid of the valve is near the maximum. Operation is most efficient just before oscillation commences, hence it should be arranged that oscillation commences near the optimum screen-grid voltage with the valve used, i.e., 100 volts. If oscillation cannot be obtained on a given coil range or if it occurs at too low a setting of R2, the cathode tap on the coil may be adjusted. However, the position for the tap as given in the coil table should be satisfactory. It should be noted also that the coupling of the aerial affects the oscillation of the R.F. stage in the same way as it would an oscillating detector if coupled direct, but adjustment is not nearly so critical as it is never essential that the stage should be operated just on the verge of oscillation. The aerial coupling coils are in each case much smaller than are usually recommended, for loose coupling tends to improve selectivity and makes for greater stability on the part of the stage. However, the effect of the aerial on the oscillation of the R.F. stage is not a disadvantage when the coils have been properly adjusted.

The amplification by the stage is so great that if care in construction is not taken, stray coupling between it and the detector will cause trouble. For example, it is found to be essential to screen the lead from the plate of the R.F. valve to C8, which is under the chassis near the holder of the 6K7. Even faulty earthing of this screening results in erratic behaviour of the receiver, and threshold howl will be found. Further details regarding the use of the stage are given later.

The possibility of varying the screen-grid voltage of the R.F. valve to provide a volume control seems to have been generally overlooked. Whether with or without regeneration of the R.F. stage it is a most effective control needing no preliminary adjustment. In the writer's experience the method of varying the bias of the valve is difficult to adjust in the first place, for either the cut-off is too sharp on weak signals or is inadequate on loud signals. On the other hand, the variable screen-grid voltage method gives a smooth variation from maximum to minimum signal strength on all signals.

The Detector

From consideration of the R.F. stage it is natural to pass on to the Detector. Here we have a circuit very similar to that of the preceding stage; actually it is orthodox.

Care needs to be taken in the choice of detector valve, and the 6K7 has proved to be very good. The valve originally used was very sensitive to changes of screen voltage and small fluctuations in the mains voltage caused a frequency flutter on C.W. reception. This frequency flutter or wobble was constantly present, and gave a great deal of trouble before its cause was traced. Replacement of the valve by a 6K7 solved the problem. The com-

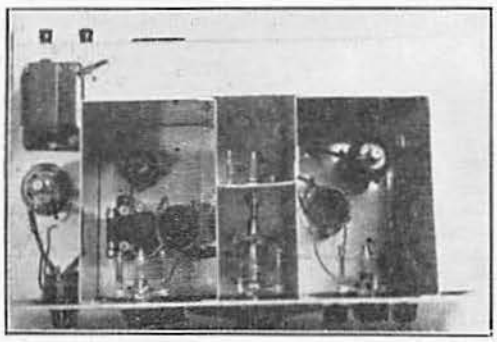
parison has been most useful, for it has shown that the 6K7 (being of comparatively low impedance) handles a louder signal before blocking occurs than did the valve previously used (a high impedance valve). This is a most important point, for blocking of the detector by loud signals is probably the greatest disadvantage of the straight receiver.

The stability of the detector is also governed by the comparative values of inductance and capacitance in the tuned-circuit of the detector. There is little or nothing to be gained by using an extremely small capacity tuning condenser and a correspondingly large inductance coil, yet the use of these causes a distinct loss of stability on the part of the detector. Tests carried out, gradually reducing the inductance of the coil in use for reception on a given waveband, show a marked improvement in the ability of the detector to receive loud signals without blocking, and also in the purity of beat note received. Any possible loss of sensitivity to weak signals which may result from a lower L.C. ratio can be ignored as long as the reduction is not too great. In this receiver the R.F. amplification is so great that the detector never need have the task of rectifying a really weak signal.

The coupling coils from the R.F. stage plate circuit to the detector grid circuit are smaller than are usually recommended. This has been done for the following reasons :—

1. Stray coupling between the two tuned circuits can be very troublesome, and its effect is minimised if the interstage coupling is very loose.
2. Tight coupling reflects an unwanted capacitance across the detector tuned circuit.
3. Loose coupling tends to improve the selectivity of the receiver.
4. It is necessary for coupling to be loose in order that the voltage impressed on the detector grid shall not be too great.

C10 is unusually high. A condenser of this value gives extra smoothing in the screen-grid circuit (a very important point), and ensures that there will be no noise from R7 if that resister is in reasonably good order. However, a condenser of 1 or 2 μF will be sufficient in many cases. L5 can be any good transformer with the primary and secondary used in series, or a special high inductance L.F. choke. A high value resistance of, say, 200,000 ohms in this position is not nearly so satisfactory.



Plan View of D.C. Mains Receiver.

The best screen-grid operating voltage seems to be about 40 volts. A voltage higher than this will cause threshold howl, and a voltage much lower will result in a loss of sensitivity, and, incidentally, a loss of the power to receive loud C.W. signals without blocking. The resistances are arranged to give a maximum voltage of about 60 volts, and oscillation should then commence with the reaction control two-thirds advanced.

The circuit used, together with a R.F. pentode, provides a simple reaction control which is at zero R.F. potential; and for sensitivity, stability and smoothness of reaction this circuit is, in the author's opinion, far superior to the usual circuit using a triode valve.

Noise Limiter

The L.F. stage itself is normal, but in its output circuit there is a resistance R10 and a condenser C15, which together make a very useful noise control.

Most amateurs are troubled by ignition noise and are continually seeking devices to alleviate this exasperating form of interference. It has frequently been pointed out that the interference takes the form of impulses of extremely short duration, and that if it is of sufficient intensity to cause severe interference to a given signal, it is of considerably greater intensity than that signal. Advantage is taken of this fact by arranging that the L.F. amplifying valve is operating so that it cannot respond properly to impulses of greater intensity than the wanted signal. If the voltage on the anode of the valve is low, weak signals will be amplified more than loud ones; and hence a better signal to noise ratio may be obtained when the noise is of greater amplitude than the desired signal. This device is more effective on telegraphy than telephony, but nevertheless on the latter a definite advantage is to be gained, the actual degree of improvement depending on the amount of distortion allowable. As an example, for C.W. reception at the author's station an S6 signal is frequently unreadable with the noise limiter not operating, but when the latter is brought into action the signal may be brought up to R3 or R4.

It should be understood, however, that the device serves only to limit noise and not to remove it.

A further advantage has been noted in that it may be used to provide a measure of A.V.C. The effect is most noticeable when conditions are poor and fading is very rapid. To obtain the A.V.C. effect the regeneration of both R.F. and detector stages should be advanced as close as possible to oscillation point, the receiver carefully tuned and then the voltage on the anode of the L.F. stage reduced as low as possible without cutting out the signal. The output will then be found to be more constant than otherwise. Of course, quality suffers to some extent when the receiver is operated under these conditions, but not enough to make speech unintelligible. On the other hand, a badly fading signal which is barely readable may be made fully readable.

The diagram of an alternative circuit of the noise limiter is shown in Fig. 2. This operates as a combined L.F. volume control and noise limiter. It is not as effective as the other circuit, but proved its worth until it was replaced by the more efficient arrangement. Its use results in a saving as compared with the first circuit by displacing C15

and enabling a fixed resistance to be used instead of R8. There is therefore one panel control less.

Power Supply

The power supply is housed separately and consists of one L.F. choke, and condensers to the capacity of 6 μF. This amount of smoothing is not sufficient on its own, but extra is provided in the receiver, to the detector plate circuit by means of R11 and C16, and to the screen-grid of the detector by means of C10 in conjunction with the voltage dividing network R5, R6 and R7. In the case of difficulty, a double section filter circuit will provide additional smoothing, and may be found necessary in some cases.

The heater supply would seem to be almost fool-proof, yet actually it gave a great deal of trouble. The lamp, or other voltage dropping resistance which may be used, should be placed in the positive lead of the heater circuit so that the negative lead may be connected to the chassis. This applies whether the positive or negative side of the mains is earthed.

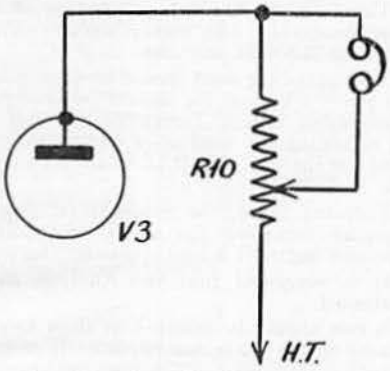


Fig. 2.—An alternative noise limiter circuit described in the text.

It is most important that the heater circuit should be connected direct to the chassis or instability will result. In the first place the author took the supply for the heater from a separate point and kept the circuit entirely separate from that of the high tension supply. It can be left to the imagination to realise how difficult it was to trace to this source the instability which was present.

Contrary to expectations it was necessary to provide smoothing in the heater circuit. Fortunately this requirement was easily satisfied for a single electrolytic condenser (25 μF., 50 volts) connected across the three heaters did the job. Without this component in use a hum made itself unduly obtrusive. With a heater circuit such as is used with this receiver, it is important that it should be realised and remembered that a valve must not be pulled out of its socket with the heater power on or the mains voltage will be thrown across the electrolytic condenser. Further, the polarity of the voltage applied to the receiver must not be reversed accidentally or the condenser will suffer.

Operation

A few words on the operation of the receiver will probably be helpful to users as the number of controls which affect volume is rather large, and the best results can be obtained only when the effects of each is fully understood and appreciated.

For a start, R10, the noise limiter control, should be set at maximum voltage position, so that it is out of action. The detector reaction control behaves normally, and should give no trouble. Set R8 at about half-way position in order to obtain reasonable output from the receiver. The R.F. regeneration control R2 should also be set at about half-way position. With the aerial on the receiver bring into resonance the band spread condensers at any reasonable frequency. Under the subheading " R.F. Stage " details regarding preliminary adjustments of that stage are given. When these adjustments have been completed as explained, variation of the control R2 from zero voltage setting to the oscillation point should produce a regular increase in signal strength and a great increase in selectivity of the R.F. stage. The most effective setting of R2 is not necessarily that at which the selectivity of the R.F. stage is maximum as at this point the amplification by the stage is so great that the detector may be seriously overloaded. For the reception of telephony bad quality may be caused by this overloading, an effect the author had not previously encountered on a straight short-wave receiver. The remedy here, of course, is the reduction of the amplification by the R.F. stage and the restoring of volume output by bringing up the L.F. volume control.

The noise limiter R10 has the effect of attenuating the signals as it is brought into action, but the attenuation of the noise is greater than that of the signal. In practice the desired signal strength is obtained by a combination of the settings of R8 and R10 after R2 has been set for best operation at the particular time and frequency.

Performance

The points mentioned in the first paragraph may now be referred to again. Stability for C.W. reception has been improved by care in design of the tuned circuits, by choice of detector valve and circuit, by the use of unusually loose coupling in the detector grid circuit, and by general care in construction. Selectivity for telephony reception has been improved by the addition of a really selective R.F. stage and by the use of loose coupling of the inputs to the tuned circuits. Sensitivity for reception of telephony has been greatly improved by the incorporation of regeneration in the R.F. stage.

It is an experience to be able to set the receiver controls and to be able to receive telephony stations over the whole width of the 14 Mc. band without touching any control other than the main tuning dial. On 28 Mc. very good reception of telephony is obtained, which is contrary to the experience of many readers who have found telephony reception on this band to be unsatisfactory with a straight receiver.

Tests have been carried out comparing signal strengths with and without regeneration on the R.F. stage, and it was found that incorporation of the regeneration effects an improvement in strength of the signals equivalent to about three S points.

Conclusion

The danger of using D.C. mains when the positive main is earthed must not be overlooked. Whilst

this would not make any difference to the circuit, care must be taken in construction that no shorting of metal parts to earth can take place. An uninsulated panel should not be used.

The H.T. current consumption of the receiver is, at the maximum, 25 milliamperes, including the current taken by the three potential dividers. When the various controls are set for normal operation the total current is about 17 milliamperes.

A final note regarding coil formers may be of interest to readers. Comparison of two coils, both designed for the 14 Mc. band, one wound on a good quality commercial former and the other on a valve base, showed no noticeable difference whatsoever in their performance.

Coil Data

Frequency range	Tap L1	Tap L2	Tap L2	Tap L3	Tap L4	Tap L4	Approx. Wave range Metres
No. 1 3.5 Mc.	6	27	½	6	27	1	—
2 7 ,,	3	11	⅓	3	11	½	29—60
3 14 ,,	2½	6	⅛	2½	6	⅕	14—26
4 28 ,,	1½	2½	¼	1	2½	⅓	8—15

The tap in each case is given from the earth end of the coil. All coils are wound with No. 34 gauge D.S.C. wire. L1 and L3 close wound, and L2 and L4 space wound, excepting the 3.5 Mc. coil, which is close wound. All coils use valve bases as formers Four-pin bases only are needed. The circuit used has the advantage of keeping all coils at chassis potential with regard to D.C. voltages.

* * *

Since the above article was prepared it has been noticed that the *Ferranti* VPTS valve is no longer quoted in Valve Lists. A type 6K7 has been tested in the R.F. stage and this has proved to be satisfactory. No circuit alterations are necessary except that R1 may be reduced in value to 250 ohms. It may also be found advantageous to adjust the position of the tap on L1 to provide a little more reaction.

R.G.D.

B.E.R.U. Contests

Whilst the 1939 B.E.R.U. Contests were fresh in mind a group of London and Home Counties members met informally to discuss ways and means for improving future events. Their deliberations also took into account many of the views which had been put forward by entrants for this year's Contests.

The Council, realising that many members at home and abroad would appreciate the opportunity of considering these views, has decided to authorise their publication.

It should be clearly understood that the views are unofficial and were only drawn up for the guidance of the Tests Committee.

Members at home and abroad are cordially invited to send their comments to Mr. W. H. Allen (G2UJ), 32, Earls Road, Tunbridge Wells, Kent, Hon. Secretary to the Tests Committee.

The list of views follows :—

1. To encourage the use of other frequency bands, the scoring scheme at present in force should be extended to allow 15 contacts on 7, 14 and 28 Mc. before unity is reached.

Thus the first contact on 7 Mc. would register 15 points, the second 14 points, and so on, down to the fifteenth contact, which with all subsequent 7 Mc. contacts would register one point. A similar arrangement should apply to operation on 14 and 28 Mc.

2. The Contests should be confined to operation on 7, 14 and 28 Mc.

3. The Senior Contest should run for 48 hours over one week-end with a time limit per competitor of 24 hours.

The Junior Contest should run for a similar period, and with the same time limit, the following week-end.

The Receiving Contest should embody the Senior and Junior periods with a 24-hour operating limit over each.

4. The Contests should be opened to all British Empire amateurs. The trophy winners should, as hitherto, be R.S.G.B. members.

5. The special log sheet should be dispensed with. In its place a typical log should be illustrated in the November T. & R. BULLETIN, and full details given regarding the method of compilation. It is pointed out that the A.R.R.L. do not issue a special log for their DX Contests.

6. Entrants should be required to give fuller information regarding the aerials and gear used. The present log sheet is inadequate for this purpose.

7. It is suggested that the Analysis sheet be discontinued.

8. A rule should be inserted to allow Council to disqualify entrants who use consistently poor notes.

9. It is recommended that no points be disallowed provided the time, and call sign, of the station worked is logged correctly.

10. The following list of Prefix Zones should be substituted for the present list :—

EI, G, GI, GM, GW	VO	VS7
ST	VP1, 5, 7, 9	VS8
VE1	VP2, 3, 4, 6	VU2, 7
VE2	VP8	XZ
VE3	VQ2, ZE	ZB
VE4	VQ3, 4, 5	ZC
VE5	VQ8	ZD
VK2, 3, 7	VR, VK, ZM	ZL
VK4, 8, 9	VS1, 2, 3, 4	ZS1, 2, 3
VK5, 6	VS6	ZS4, 5, 6

If the new list is adopted it should be pointed out that the regrouping of several Prefix Zones has been made in order to allow certificates of merit to be issued. At present sole entrants from, say, VP2, 4 and 6 are unable to qualify for a Zone Award.

There appears to be no good reason for allowing EI to count as a separate Zone, neither is it felt that any useful purpose is served by treating ZI. in any way other than as a single Zone.

To encourage Canadian participation, it is suggested that five VE Zones be created.

11. The scoring scheme for the Receiving Contest should be based on that recommended for the Transmitting Contests.

The Eddystone E.C.R. Communication Receiver

ONE of the newest and, we can say unreservedly, one of the best communication receivers available to the amateur is the type known as the " E.C.R.," intended for operation from A.C. mains and now in production by *Messrs. Stratton & Co., Ltd.*, of Birmingham.

Tests made during the past few weeks on a model drawn from stock have confirmed all that the manufacturers claim for it. Almost every conceivable refinement is included in the design and it has been proved that these are not merely " passengers " but, intelligently used, they make a definite difference to the results.

One of the most important factors in a communication receiver is the signal-to-noise ratio, and this has been specially borne in mind during the development of the instrument by its designers. Of course, with full R.F. and L.F. gain, and taking into account that nine valves (excluding the rectifier) are employed, some noise in the output is inevitable, but this fact is no criterion of the signal-to-noise ratio, since by making judicious use of the various special controls provided, the background noise can be reduced to a low level and signals, either C.W. or telephony, made easily readable. In this direction, an interesting test is to ascertain the strength (as indicated on the " S " meter) of the weakest telephony signal which is readable through the background noise. With a good outdoor aerial, but one not having any special directional characteristics or resonances, an S3 signal was found to be almost fully intelligible on the E.C.R. receiver, providing the carrier was fairly well modulated. One evening, within a short space of time, telephony from parts as distant as the Philippine Islands, India and the Federated Malay States, was received at good strength and with excellent clarity, in addition to C.W. signals from all parts of the world.

The Circuit

A single R.F. amplifying stage, fully tuned and very effective on all bands, is transformer coupled to a frequency-changing valve of the most modern type, having a high conversion conductance and giving a definite gain throughout the whole range of frequencies. A separate oscillator, employing an electron coupled circuit and possessing a high degree of stability, gives freedom from the troubles often associated with a combined mixer/oscillator valve. Two I.F. amplifying valves, operating on 465 kc., follow, there being seven tuned I.F. stages in all. In the grid circuit of the first I.F. valve is placed the crystal with its associated phasing and filtering circuits.

A double-diode valve, with separate cathodes, gives signal rectification, automatic volume control and, by the inclusion of a special circuit, noise limitation. This valve, incidentally, is the only one called upon to fulfil more than one function.

A small triode L.F. amplifying stage follows, with provision in its anode circuit for the use of telephones (of 2,000 ohms resistance), which, when plugged in, automatically mute the output stage. No direct current flows through the telephone windings. A separate electron-coupled Beat Frequency Oscillator valve can be switched in at will when it is desired to receive C.W. signals.

The final pentode valve is capable of delivering three watts undistorted output to the special energised speaker, which housed in a black crystalline cabinet to match the receiver, handles this amount of power with ease.

A full wave rectifier completes the valve complement. Since a smoothing choke, additional to the speaker field, is provided, the smoothing is very complete and no trace of hum is audible either on speaker or telephones.

General Details

One is first attracted by the handsome appearance of the receiver, which is housed in a black crystalline metal cabinet. The large fluted tuning knobs come readily to hand, the band-set on the left and the band-spread on the right. The " flywheel " effect enables one to search rapidly over the whole range covered in any one wave band, whilst, on the other hand, the most exacting adjustment can be made with ease. In conformity with modern practice, clockwise rotation of the knobs increases the frequency.

Band-spreading is effected electrically by means of 10 $\mu\mu$F condensers (ganged) placed in parallel with the main tuning condensers. Twelve degrees on the band-spread dial is approximately equivalent to one degree on the band-set scale.

It would be difficult to design a dial more easily read than the one incorporated in the E.C.R. receiver. Along the centre of the dial is a finely engraved scale calibrated in kilocycles ; above this is the band-spread and below the band-set scales, both the latter (0 to 100 degrees) being engraved in half degrees. Due to the length of the dial, readings can be taken to better than a quarter of a degree. The accuracy of the calibration proved to be excellent. All the amateur bands are clearly marked, as also are the short-wave broadcast bands.

Four wave bands are available through the medium of switched coils, the dial rotating to indicate which set of coils are in circuit. The ranges included are as follows :—

		Frequency in Mc.	Wavelength in Metres.
Range 1	...	32.0 —14.7	9.37—20.4
Range 2	...	15.5 — 7.13	19.7 —42.2
Range 3	...	7.44— 3.39	40.0 —88.5
Range 4	...	3.5 — 1.6	85.8 —187

Coils for the medium broadcast frequencies are not included as the receiver has been designed especially for amateur communication work. The inclusion of such coils would probably detract from the performance on the higher frequencies, as a compromise in the value of many of the circuit constants would become necessary.

The remaining control knobs are large in size and smooth and noiseless in action. Those applicable to the crystal filter, R.F. and L.F. gain carry

suitably engraved scales, whilst the B.F.O. control is calibrated in kilocycles.

Construction

The construction is of a most sturdy character throughout. The chassis, coil unit, crystal unit and screens are die-cast in one piece, thus giving most effective screening. Great care has been exercised in the layout of the valves and components, all leads are short and rigid, and even the small parts are securely attached to the chassis. The receiver is obviously intended for hard use in any climate. The valves are of the International Octal Base type, and replacements, when these become necessary, should be easy to obtain in any part of the world.

Performance

The excellence of the overall performance is due as much to the attention given to small details as to major ones. The complete screening enables each and every valve to work at maximum efficiency and only high quality components are incorporated. Every single variable condenser, whether for actual tuning or trimming, is of the air-dielectric type, whilst ceramic condensers, noted for their low losses and constancy of capacity under varying conditions, are employed in many of the important positions.

To these two latter factors can be attributed the complete absence of image interference, at least on 14 Mc. and lower frequencies. Special attention was given to this point and a deliberate search was made for image interference, with negative results. It will be appreciated that the inclusion of air-dielectric trimmers confers many advantages, these including great accuracy of initial adjustment, subsequent maintenance of such adjustments, and low losses, the latter enabling the "Q" of the coils to be maintained at a high figure.

Unfortunately, the 28 Mc. band has been dead during periods at which listening tests could be made but there is every reason to believe that the performance on this frequency is well maintained. The receiver was free from image interference on the 13 metre broadcast band and no trouble from this source should arise on the 28 Mc. amateur band.

With the crystal out of circuit, the band width is 8 kilocycles, making possible the reception of broadcast stations at high quality when conditions permit. The selectivity can be progressively increased until, at maximum, the effective band width is only 150 cycles, thus permitting the reception of C.W. signals through severe interference.

The receiver is truly of the single signal type. By suitable adjustment of the crystal phasing control, one side band can be peaked and the other almost completely eliminated.

At the rear of the receiver is a switch which brings into action the noise-limiting device. This has been found to be very effective, signal strength being unaffected whilst peaks of noise from atmospherics, cars or other forms of "man-made" static are rendered unobtrusive.

Provision is made for the use of any type of aerial system in common use.

A manual giving comprehensive operating instructions accompanies the receiver which, complete with the heavy energised speaker, is priced at £45. At first sight, this figure appears to be rather high but it must be remembered that a receiver of this type cannot be mass produced. To appreciate the work which has been put into it, it is necessary to remove the outer cabinet. The die-cast chassis by itself is obviously an expensive item, but there is no doubt that its inclusion is fully justified in view of the difference it makes to the performance as a whole and to the mechanical rigidity.

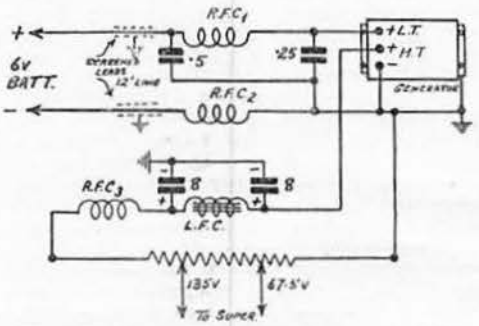
J. N. W.

Noise Filters for Receiver H.T. Supply using a Motor Generator

The following information is sent by Mr. R. N. Fox (AC4YN), in the hope that it will be of assistance to some of the participants in N.F.D.

AC4YN is situated at Lhasa, Thibet, consequently the problem of power supply is a weighty one, especially when a super-het receiver is to be used.

The receiver employed is a R.C.A. 7-valve super with a B.F.O. and regenerative R.F. amplifier added. The sole means of power supply is from L.T. accumulators and it is therefore necessary to use a rotary convertor to supply the receiver. After exhaustive tests, the circuit reproduced here has been evolved to eliminate the last trace of generator noise. Sensitivity is excellent and "background" is negligible with the telephones between either side of the R.C.A.19 grids (B output) and earth.



Noise Filter for Receiver H.T. supply using Motor Generator.

RFC. 1 & 2.—20 turns No. 12 D.C.C.
RFC. 3.—Hammalund CH100.
LFC.—Jefferson 466-430.

The 9 valves obtain their H.T. supply from a 250-volt 50 mA. motor generator which is driven by a 6-v. 120 A.H.C. battery. At the present time battery bias is still in use in order to use up the stock of batteries, but it is intended to make provision for a potential divider later. The .25μF. condenser is not critical, and almost any value above .1μF clears the trouble.

If it is intended to use a 2-volt tap on the accumulator to run the filaments, a suggested filter is a series choke, similar to RFC1, with a .5μF. condenser from the battery side and a .25μF condenser from the set side to earth.

A. O. M.

Stray

Mr. R. W. Ascombe (G4DO), of "Fir Croft," Cavendish Avenue, Dore, Sheffield, will be pleased to hear from any member who has constructed and is using *The Wireless World* High Quality Communications Receiver.

Remote Control of Transmitter by Voice-Operated Relay.

By J. C. EGERTON (G8MU)

IF necessity is the mother of invention, then laziness is the grandmother of invention!

The design to be described was originated by necessity—the family objected to noise on the first floor, particularly late at night, and the result is the lazy man's ideal—the transmitter and receiver, after once being tuned to the desired station, can be operated with the hands in the pockets! Switching on the transmitter is merely carried out by speaking.

The transmitter at the writer's station is located on the first floor of the house on the west side, while the receiver is placed on the ground floor in a room on the far east side, with a separate receiving aerial. One pair of wires only was in existence connecting the two rooms, for the purpose of supplying an extension loudspeaker from the B.C.L. set upstairs. The problem was to convey the speech currents from the microphone to the transmitter, and also to switch the transmitter "on" and "off," using only these two wires.

It was also thought necessary to arrange switching so that broadcasts from the main B.C.L. receiver upstairs could be received downstairs when required. Two switches, a double-pole upstairs and a quadruple pole downstairs (see Fig. 3) were used to connect the line alternatively to the input of the modulator or to the output of the B.C.L. receiver upstairs, and downstairs to connect the line either to the loudspeaker or to the microphone; also to connect the loudspeaker to the *Ultra Skyrider*.

It was found necessary as a precaution to connect a fuse bulb directly in the loudspeaker speech coil circuit in case the microphone was switched on when the loudspeaker was connected to the line. To prevent R.F. feedback into the modulator a 2μF condenser was connected from each side of the primary of the microphone transformer to earth. This was found to be essential when the line was connected, but no feedback was experienced without these condensers when the microphone was used upstairs and without the line connected. As the leads from the microphone to the modulator are between the microphone and the microphone transformer primary, the losses can be neglected. It must, however, be mentioned that a pre-amplifier and step-down line transformer would be required with a crystal or other high-impedance type of microphone.

Operation

Referring to Fig. 1, speech potentials are tapped off the modulation transformer through the blocking condensers C1 and C2 by means of the potentiometer R1, and applied to the control grid of a 42 (connected as triode). The output from the 42 is passed, *via* the condenser C5, to the grid and plate, connected together, of one-half of a 6A6, and the resulting rectified negative bias is applied through the resistance R5 (found to be essential for smooth operation) to the grid of the second half of the 6A6, in parallel with which is a .1 μF condenser C6 shunted by a 3-megohm variable gridleak R6 for controlling the delay. The relay is connected in the anode circuit of this valve. This relay is particularly sensitive, and can be adjusted to operate with a current of only 1 mA. In this case it is set to operate at about 2.5 mA. Without modulation a current of about 10 mA. flows through the relay, holding the contacts A and B together, and applying 120 volts negative bias (see Fig. 2) to the grid of the crystal oscillator, thus stopping it from oscillating. Directly speech occurs, negative bias is applied to the grid of the second half of the 6A6, the anode current drops to zero, and the contacts A and B

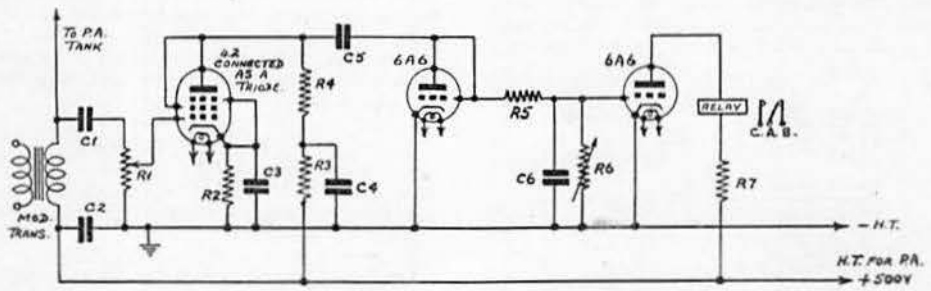


Fig. 1.

Layout for operating voice controlled relay for remote switching of transmitter.

C1, 2, 5. 1 μF.
C3, 6. 0.1 μF.
C4. 8μF.
R1. 50,000 ohms.
R2. 1,000 ohms.
R3. 25,000 ohms.
R4. 5. 100,000 ohms.
R6. 0-3 megohms variable
R7. 25,000 ohms, 2 watts.

The relay is an ex G.P.O. double contact moving iron type.

open, removing the 120 volts negative bias from the C.O. and allowing it to oscillate. When speech ceases the negative charge in the condenser C6 leaks away through the resistor R6, and when the anode current reaches 2.5 mA., through the relay, the contacts close, and 120 volts negative bias is applied to the C.O. which switches off the transmitter. The transmitter must, of course, be designed so that there is sufficient negative bias applied to the grids of all the valves to prevent excessive anode current when there is no excitation. The delay period between cessation of speech and switching off the transmitter can be adjusted by means of varying the value of R6, over a fairly wide range and is set at approximately 4 seconds at the writer's station. H.T. for the controller is taken from the supply to the final power amplifier, which is separate from the supply to the C.O. and the doublers.

Relay Adjustment

Adjustments to the relay should be carried out by means of a battery, rheostat and milliammeter

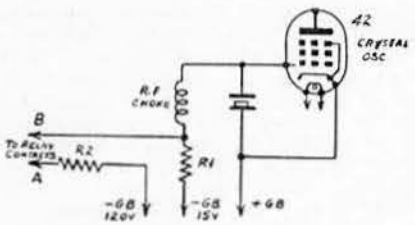


Fig. 2.

Grid circuit of voice controlled crystal oscillator. R1, 100,000 ohms. R2, 10,000 ohms. To prevent the accidental short circuiting of the grid bias battery, R1 and R2 are connected directly to wander plugs.

connected in series with the relay outer terminals. (There are three terminals connected to the windings at one end of the base and three terminals at the other and connected to the relay contacts.) The contacts should be adjusted so that there is side-play of approximately $\frac{1}{32}$-in., then the contact plate should be moved, by means of the threaded adjustment screw provided, until the moving contact just throws over with a current of 2.5 mA. When the current is reduced to about 1.5 mA. the relay should

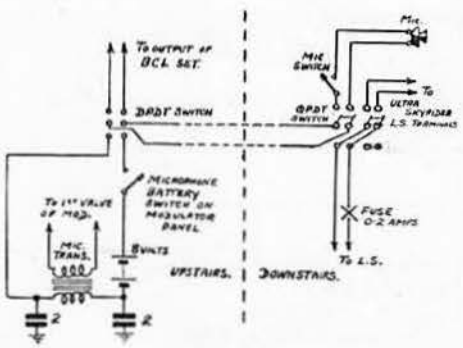


Fig. 3.

The arrangements adopted by the author for line switching.

return to its original position. The exact adjustment requires patience, and final adjustment should be carried out under working conditions. (These instructions apply to the relay mentioned in Fig. 1, which is an ex-G.P.O. double-contact type obtainable from *Galpins*, of Lewisham, price 7s. 6d.) If a milliammeter is placed in series with the relay, between the relay and R7 it will facilitate final adjustment. The exact position of the tapping on the potentiometer R1 is fairly critical. If the tapping is too high the surge through the modulation transformer when the P.A. plate current ceases is sufficient to operate the relay and cause a symptom like " motor-boating." If the tapping is too low the relay does not operate. No difficulty has been experienced in finding the right position, but these effects are mentioned in case they should be a source of perplexity.

As certain parts of the apparatus are at high potential, the whole has been mounted on a base-board and placed in a full-sized square-type biscuit tin. The potentiometer R1 and the variable resistance R6 are fixed to one side of the tin with the knobs projecting.

This controller was constructed from " scrap " parts in the writer's possession, and no finality of design or of the values of components is claimed. However, as described, it works, and works well, which is what really matters! It may be thought that 100,000 ohms is too high a value for a C.O. gridleak, but many other values have been tried with no difference in performance. It is desirable to keep this resistance as high as possible, as it will be observed from reference to Fig. 2 that the two grid resistances R1 and R2 are in series with one another across 105 volts of grid bias. The original battery after six months is still showing full voltage.

Duplex Operation

This method is particularly suitable for duplex working. In fairness to other amateurs, it is obviously undesirable to radiate a carrier when listening to the station with which one is in contact, and this controller provides the solution to the problem of repeatedly switching the carrier " on " and " off." It also prevents forgetfulness which may easily occur during a duplex QSO, however well-intentioned the operator may be. The four seconds delay seems just right in order to allow the speaker to get his breath between sentences. It is almost essential to use headphones for " duplex," as the sound from the loudspeaker is apt to switch on the transmitter when not required, and sometimes even to cause a howl.

Learning Morse

From the offices of *The Wireless World*, Dorset House, Stamford Street, London, S.E.1, there has just been published a timely little booklet entitled " Learning Morse."

Written in easy to follow style, the tyro is given helpful advice on mastering the code, special emphasis being placed on accurate timing and on the correct method of holding the key.

A description is given of a Morse Practice set employing a single valve oscillator.

The Morse Code occupies the centre pages, whilst the Q Code, Signal Report Codes and a list of International Prefixes round off a very helpful little pocket compendium.

The price is 6d. from any bookseller.

Workshop Practice

By "SHACK"

PART V

THERE are many types of screw threads in use to-day, but the only one most likely to be needed for radio work is the British Association (B.A.) thread. This thread is numbered from 0 to 10, the largest (No. 0 B.A.) being slightly under $\frac{1}{4}$ in. in diameter, whilst the smallest in common use (No. 10 B.A.) is .067 in. in diameter. Smaller sizes are seldom used, and can be ignored in this discussion. For most radio work Nos. 2, 4 and 6 are quite sufficient, but some component manufacturers use the odd sizes, particularly No. 5 B.A. The table gives a list of the B.A. sizes from 0 to 10 B.A. with the clearing and tapping drills. In certain cases two drills are specified for the tapping size and the choice depends upon the material to be tapped.

Metal Screws

Metal screws are of two types, rolled thread and cut thread. Rolled threads are much cheaper to produce, but whilst they are fairly satisfactory for light work their appearance cannot be compared with a good cut thread screw. Rolled thread screws are never found in first-class radio or electrical instruments and should be avoided. As their name implies, cut thread screws are turned out of the solid bar in an automatic machine. The threads are clean and sharp, giving a better grip to the nut, whilst the head looks more attractive.

B.A. Sizes and Drills

B.A. No.	Clearing Drill.	Tapping Drill.
0	$\frac{1}{4}$ in.	9 or 10
1	2 or 3	18 or 19
2	10 or 11	25 or 26
3	18 or 19	30 or 31
4	26 or 27	33 or 34
5	29 or 30	39 or 40
6	32 or 33	44
7	38 or 39	48
8	42 or 43	51
9	46 or 47	53
10	49 or 50	55

Metal screw heads are of various types, such as cheese head, countersunk head, round head and raised head. Each has its own particular use, and nothing looks worse than to see a wrong type of screw used on a job. The hole for the head of a countersunk screw must be countersunk, yet how often do we see screw heads sticking up above a panel, when a few minutes' work with a countersinking drill would have imparted a finish to the job.

Where countersinking is impracticable, a cheese headed screw looks more workmanlike than a round head. Round-headed screws should be used very sparingly; in fact, they can nearly always be replaced with advantage by the cheese-headed variety. Round-headed screws are rarely used in engineering work for the reason that they have a weak head and the saw cut is very liable to be damaged by the screwdriver slipping when tightening.

Needless to say brass (plain or plated) is the only permissible material for radio screws and nuts. Steel screws are stronger, but suffer from the serious disadvantage that they rust. When rustless steel screws become a commercial proposition and are available for amateur use at reasonable prices, then the brass types will become a thing of the past. Nickel, or preferably chromium-plated, screws look better than brass on an aluminium panel, but where no plated screws are available brass screws with their heads thinly tinned make a very good substitute.

Nuts

Nuts are also of two types, those stamped from a sheet of metal, usually brass, and those turned from solid hexagon bar. Stamped nuts should be avoided like the plague. Nuts are made in two thicknesses, described in the trade as half nuts and full nuts. In engineering practice half nuts are used to lock a full nut where vibration is anticipated and the half nut is always run on first. In radio practice half nuts are sometimes used alone, usually when there is insufficient room for a full nut.

There is a right and a wrong way to put on a full nut. One side of the nut has the tops of the edges turned off, and this side is always the outside. Again, following engineering practice, a washer should be placed under the nut to prevent the edges from biting into and marking the article being gripped. B.A. spanners, both box type and double-ended flat steel, are very cheap, and there is no excuse for tightening nuts with a pair of pliers. Pliers are not intended for tightening nuts and only cause damage, thereby making a job look unsightly. Where nuts are liable to work loose or are subject to vibration, spring washers, either of the helical or serrated tooth type, should be used instead of plain washers. Do not use both spring and plain washers, as the latter will defeat the whole object of the former.

Soldering Tags

When it is desired to make a connection to a screw passing through ebonite or a similar insulator it is not advisable to place a soldering tag between the nut and the ebonite. Put a washer and half nut on first, follow with the soldering tag, and finally use a full nut to grip the soldering tag. If the soldering tag is gripped between the nut and ebonite, there is always the risk of the ebonite shrinking, thus allowing the soldering tag to work loose.

Wood Screws

It would take many pages to describe all the various types of wood screws which are manufactured, but for our purpose only steel and brass screws with either countersunk, round or raised heads need be considered. Wood screw diameters are denoted by numbers starting with No. 1 (which has a diameter of $\frac{1}{16}$ in.), advancing by $\frac{1}{64}$ in. The length increases by $\frac{1}{8}$ in. in the smaller sizes and $\frac{1}{4}$ in. or $\frac{1}{2}$ in. in the layer lengths. Countersunk

screws are measured overall, whilst round-head screws are measured from under the head. Chromium, nickel-plated and japanned screws are easily obtained in all the usual sizes. Screws are made in smaller sizes than No. 1, but these are very seldom used in amateur radio work.

Rivets

Although in commercial radio practice nuts and screws are giving place to rivets, they are almost unknown in amateur circles. Rivets are strong, easy to use, very cheap, and they impart a workmanlike appearance to any set. Small rivets ($\frac{1}{16}$ in., $\frac{3}{32}$ in. or $\frac{1}{8}$ in. diameter) can be purchased from most model-makers in steel, copper and aluminium with round or countersunk heads. Naturally the material used for the rivet should be the same as that of the materials to be joined. The two plates should be clamped together and the holes drilled and countersunk on the outer sides. The rivets should then be inserted one at a time and the surplus lengths cut off with a pair of end-cutters, leaving sufficient of the rivet projecting above the panel to fill the countersink hole. Commence riveting with the ball of a light ball-peen hammer and finishing off with the flat face, taking great care never to strike the sheet itself. When using steel rivets it is not advisable to countersink the sheets to make the finished rivets lie flush; steel rivets are best left with a round head on each side. The most successful use for rivets is in building chassis and metal cases, whilst screws and nuts are to be preferred for fixing components.

Mounting Stand-Off Insulators

It is an unfortunate but true fact that all electrical insulators have poor mechanical properties when compared with the metals, the small porcelain ceramic stand-off insulators being no exception, as all who have used them will agree. The fixing flanges have a most disconcerting habit of breaking, often some considerable time after fixing. An examination of the base will reveal very slight irregularities which prevent the insulator from lying flat on the chassis. Fortunately carborundum will cut most of the ceramics with ease, and it is a simple matter to rub the base of the insulator along a coarse *flat* carborundum stone till the base is smooth. As a further, but very necessary, precaution a washer of thin sheet rubber should be fitted between the chassis and insulator. A good rubber for this washer is a piece cut from $\frac{1}{16}$ in. or $\frac{3}{32}$ in. rubber-covered canvas, which is sometimes used for hospital and similar work. The outline of the insulator can be marked with a pencil or scriber and then cut out with a pair of sharp scissors, whilst the two holes for the fixing screws can be punched out with a hollow punch. Besides largely preventing damage to the insulator, this rubber washer acts as a very efficient spring washer. Should an insulator suffer damage, it can be repaired with a smear of " Durofix " following the directions of the makers.

The grinding of the base and the fitting of a rubber washer are advisable if the insulator is to be mounted on a metal or hard wood base, but the process may be omitted if the base is soft wood.

Hot Wire Ammeters

There must be literally hundreds of burnt-out hot wire ammeters lying discarded in scrap boxes, yet it is a very simple matter to repair them, given a little patience. The movement comprises a thin resistance wire soldered between the two terminals with a thin unspun silk thread connected between the centre of this wire and a light spring and passing once round the pointer spindle. When current is passed through the wire it generates heat which causes the wire to expand. This permits the silk thread to be pulled by the spring, thus causing the spindle to rotate slightly, moving the pointer.

The principal faults are broken wires and perished silk threads. In a new instrument the operating wire is a special alloy, but for all practical purposes a length of No. 40 S.W.G. Eureka wire answers the case quite well. When tested on D.C., a meter re-wired with No. 40 Eureka should show a full scale reading of about 0.6 amps. instead of 0.5 amps. Eureka is not difficult to solder, but it may be necessary to use a paste flux instead of resin. Tin the wire before soldering, in order to obviate any chance of a dry joint. Unspun silk is not always easy to obtain, although it can be purchased from most scientific instrument dealers, but a fairly good substitute is a single strand of embroidery silk. It is hopeless to try to use the twisted silk, as it has a toothed effect on the very small diameter spindle, thereby causing the pointer to move in jumps. At the junction of the wire and the silk there is either a small glass bead or loop of thin wire to prevent the heat in the wire from burning the silk.

In opening up a hot wire meter (of the ex-army type) either remove the three small fixing screws round the case or unscrew the front half of the case. Pull off the pointer with a pair of strong forceps or small pliers, taking care not to bend the spindle extension on which the pointer fits. Under no circumstances should an attempt be made to prise off the pointer, or the spindle extension will become bent. Removing the dial will reveal the extent of the damage.

Fitting a new resistance wire is not difficult, but making knots in the silk thread demands some care and patience. A spot of Chatterton's Compound can be used at the spring end, but the silk must have a knot at the bead. Two pairs of fine pointed forceps are the only tools required, together with a 4 B.A. nut to edge the spring away from the case whilst the silk is being fixed. Before soldering the resistance wire, tighten up the adjusting screw almost to its limit and solder the wire fairly taut between the two terminals. Common sense will dictate how tight the wire should be made; if it is too tight, or if the adjusting screw is loosed off too much, it will break. If the wire is too slack the meter readings will be much lower than they should be. Finally, take care that the silk is the correct way round the spindle, otherwise the meter will read backwards!

A Modern Selective Receiver Featuring Mullard Red E Valves

Part III.—Various Points of Interest

By J. N. WALKER (G5JU)

FURTHER experience in the use of the receiver described last month proves beyond doubt that it is most efficient in every respect. Signals, both C.W. and telephony, have been received from all parts of the world on the higher frequencies whilst on the lower frequencies stations never previously audible have been logged. Once the user has become accustomed to the controls, the receiver is very easy to handle.

Due no doubt to the low wattage rating of the heaters of the "E" valves and to the fact that the heat produced is evenly radiated, there is not the slightest trace of creep, either in the receiver proper or in the monitor. A signal, once tuned in, "stays put" indefinitely and no re-tuning has been found necessary after operation of the send-receive switch.

As one would expect, hand-capacity is entirely absent, providing, of course, the metal cabinet is well earthed.

In general, the noise level of a super-heterodyne receiver is in proportion to the degree of R.F. amplification being employed and is therefore dependent to some extent, and with any given signal, on the efficiency of the aerial. A signal may be receivable with only a short length of wire, but the background noise will be high, whilst, on attaching a good aerial, the signal will come up and background noise will be reduced, either by the action of A.V.C. or by manual control of the R.F. gain. With the present receiver, the low noise level is substantially independent of the degree of amplification and changing the aerial has but little effect on it. The overall gain is so high that perfectly satisfactory results may be secured with a small aerial, although, as always, a good outdoor aerial is advised for optimum performance.

As would be expected from the superior qualities of the valves, the performance on 28 Mc. is outstandingly good. Most superhets on this frequency have a high level of background noise when operated at maximum sensitivity but, on the present straight receiver, the weakest of signals can be heard and read against a comparatively quiet background.

Further Points Regarding Operation

It will be appropriate at this point to discuss in some detail the use of the various controls. First of all, the reader may wonder at the omission of an audio-frequency gain control. What is the usual purpose of an L.F. gain control when other methods of controlling signal strength are included in any particular communication type receiver? To cut down, to a reasonable value, the high level of background noise which results when the R.F. gain is turned up to its full value. In the present instance, the level of background noise is low even at full R.F. gain, and the strength of signals can be controlled almost entirely by means of the R.F. gain control, which occupies a position often assigned to a L.F. control. The degree of R.F. amplification is so high that care becomes necessary to avoid overloading the detector valve.

It will be found difficult to receive any signals at all unless the R.F. and detector tuned circuits are in line. This, of course, is as it should be and shows that the incoming signals are following their proper paths. The R.F. stage peaks strongly, and this factor is one of the reasons why no attempt has been made to gang the R.F. tuning condenser to the detector band-set condenser. If this were done, the adjustment of the coil windings would have to be carried out to an exceedingly accurate degree, if the two circuits were to hold resonance over the full sweep of the condensers. Should the circuits fall out of resonance even slightly, the performance of the receiver would be seriously impaired.

No band spread condenser is associated with the R.F. stage, because the 100 to 1 ratio of the *J.B.* Airplane dial, controlled by a 2-in. knob, enables an exact adjustment to be made, even on the highest frequency range. Incidentally, the makers of the dials advise that they can be fitted with the larger knobs at no increase in price.

Using R.F. Regeneration

Although the tuned R.F. circuit has very low inherent losses, it is damped to some extent by the input grid impedance of the associated valve and this deleterious effect increases with frequency. The EF8 valve possesses a higher input impedance than older type valves and the tuning is fairly sharp without the application of regeneration. The latter will, however, make a difference both to signal strength and selectivity, especially on the 28 and 14 Mc. bands.

The regeneration control (lower left-hand knob on the panel) is placed in a position such that the leads to the associated valve are short, this being essential in view of the fact that two leads to the potentiometer carry R.F., and interaction with other circuits must be avoided. It has not been found necessary to screen the leads in question.

When first bringing the two circuits into line, the regeneration control should be in the "off" position, *i.e.* turned to the extreme left. Afterwards, regeneration can be gradually applied, the tuning becoming sharper and sharper, until the point is reached at which the circuit breaks into oscillation.

Control of the Detector Stage

The control of the detector stage is perfectly straightforward and calls for little comment. It has been found desirable to reduce the capacity of the band-spread condenser by the removal of one of the fixed plates, an operation which can be quite easily effected. In consequence of the alteration, the actual band-spread obtained is as follows:—120 degrees on 28 Mc., 80 degrees on 14 Mc., 125 degrees on 7 Mc., and the whole 180 degrees on 3.5 Mc. The band-set condenser is employed for tuning on 1.7 Mc. and, due to its

relatively low value compared to the frequency, no difficulty has been experienced in this respect. At the same time, a somewhat larger dial would be an asset and the constructor is recommended to order an *Eddystone* dial type 1077 in place of the one originally specified. The band-spread condenser is available as a vernier control on this frequency.

Band	Radio Frequency Stage	Detector Stage
28 Mc.	60 degrees	22 degrees
14 Mc.	70	35
7 Mc.	150	62
3.5 Mc.	110	45
1.7 Mc.	120/170	50/90

The above table indicates approximate dial settings for the different amateur bands

For the guidance of constructors, a table is appended showing the main dial settings for the different amateur bands when the coils are wound to the schedule given in Part II. Some small discrepancies may occur, but the figures will prove useful in locating the amateur bands when first putting the receiver into operation.

The EF6 valve is such a ready oscillator that small individual alterations to the reaction coil windings are desirable in order that the control of reaction is effected over the central portion of the potentiometer and not at either end. The single turn specified for the 7 Mc. coil must, of necessity, be placed very close to the tuned winding, otherwise it will be necessary to increase it by an additional quarter turn. The single turn on the 14 Mc. coil is rather too large and it can well be reduced to three-quarters of a turn. In the case of the 28 Mc. coil, the single turn is definitely too large, even when it is well spaced from the main winding. It is therefore advisable to reduce it to half a turn.

Taking into consideration the way in which the mutual conductance is maintained at high frequencies, the low input capacity of the valve and the great ease with which oscillation is obtained, it is considered probable that the receiver can be made to function efficiently on the television band and possibly even on the 56 Mc. amateur band. Experiments in this direction are being conducted and details will be published later if they prove successful.

Without doubt, one of the reasons why oscillation is maintained so easily and with absolute smoothness of control right up to the highest frequency is because of the very short electron transit time which forms one of the features of the " E " series of valves.

The Monitor/Frequency Meter

The first operation called for by the monitor is calibration. With the coil and condenser values specified, the working frequency is certain to fall somewhere near the 3.5 Mc. amateur band, providing the trimmer condenser is set at its maximum capacity. The receiver portion proper should be set oscillating at a frequency within the band, whereupon, with the monitor running simultaneously, the detector grid will be almost " blocked " when the monitor is tuned to resonance.

Next, spot frequencies should be located at each end of the band and at as many intermediate positions as possible. This operation can conveniently be carried out with the aid of calibrated crystals, although known frequencies of stations heard over the air will also help. A graph can then be drawn and the resulting line should be perfectly straight. When employed for monitoring purposes, it is only necessary to switch off the receiver portion and switch on the monitor, which will be tuned to the harmonic or overtone of the transmitter frequency. This can be carried out in one operation if a double-pole double-throw pattern is used for the send-receive switch, the additional section being wired in parallel with the existing monitor switch, which should be retained.

When it is desired to ascertain the frequency of a received signal, the frequency meter and the receiver are allowed to function simultaneously. The tuning of the receiver is adjusted to zero beat on the signal and the F.M. dial rotated until the heterodyne note is heard, this again being brought to zero beat. The F.M. dial reading is then read off against the calibration curve and to facilitate this operation it would be well to prepare a separate graph for each band.

It must be admitted that with the particular 100-degree dial fitted, the accuracy, although sufficiently good for normal requirements, is not as high as it could be made. In actual fact the stability of the circuit is so good that it would pay to fit a better dial, such as the *Eddystone* type 1077, thus also improving the appearance of the receiver as a whole. Especially is this greater accuracy called for when a transmitter employing any form of drive other than crystal is in use, in order to make quite sure that, when operating near the edge of a band, the actual frequency is not outside the prescribed limits.

The final use of the frequency meter is to reduce severe interference. This feature is only possible when the signals are C.W., since a telephony signal must, in any case, be tuned-in dead on frequency. It will be found, however, that tuning the F.M. to zero beat on the received carrier will slightly increase the intelligibility of a very weak telephony signal.

When severe C.W. interference is experienced, the receiver reaction control should be backed-off just below the point of oscillation and the dial of the F.M. adjusted to heterodyne the signals, similar to the manner of a beat frequency oscillator in a superheterodyne receiver. Slight rotation of the receiver and F.M. tuning condensers will enable a position to be found such that the interfering signal is attenuated or, at worst, beat notes widely differing in tone result, thus enabling the desired signal to be read with less difficulty.

The Input Network

We will now turn to some particular features incorporated in the design of the receiver. The first is the input network to the first R.F. valve consisting of C1, R1 and RFC1 in Fig. 1, page 577, of the April BULLETIN.

If the resistance R1 were to be omitted, the radio-frequency choke would be permitted to develop to the full any natural resonances it possessed—there is bound to be at least one such resonance, and in all probability there will be minor ones, although these are not likely to fall within any amateur band. One result would be the well-known effect of reception of commercial harmonics, whilst broadcast break-through would also occur in the vicinity of powerful stations. The addition of R1 removes these defects and the valve amplifies evenly, the whole range of applied frequencies.

R1 further prevents any tendency to low-frequency self-oscillation, this otherwise being possible through T.P.T.G. action of the radio-frequency chokes in the grid and anode circuits of the valve.

The condenser C1, being small in value, acts as a high impedance to signals of low-frequency and further serves to prevent the valve amplifying low frequencies to the possible detriment to the amplification of high frequencies. For normal reception the vanes will be fully meshed, but when a long aerial is employed or when a powerful station is transmitting nearby, the capacity should be reduced to avoid the first valve being overloaded.

The aerial input is of the high impedance type and, in general, an end-on aerial is necessary. Doublet aerial or low impedance feeders have not been catered for, chiefly because such systems, whilst very effective on the particular band for which they are designed, do not give good all-round results over such a wide range of frequencies as is covered by the receiver. Low-impedance feeders can be accommodated by carrying out certain modifications, these consisting in the main of the provision of suitable coils. In the grid circuit of the first valve, it will be necessary to provide a semi-aperiodic coil for each band, winding a coupling coil of two or more turns at its " earthy " end. It will be obvious that a further set of plug-in coils will be called for unless a switched arrangement, requiring greater space than is available, were to be substituted.

The System of Regeneration

There are three basic methods of obtaining regeneration in a valve, the first of which, that of arranging coupling between the grid coil and one in the anode circuit is very well known and will not be considered here. The other methods are shown in Fig. 1 (*a*) and (*b*).

In Fig. 1 (*a*) the coil L represents an inductive impedance which, by virtue of its position in the cathode lead, is common to both anode grid and circuits, thus giving rise to regeneration. R1 and C1 are the bias resistance and by-pass condenser respectively and do not affect the action. Regeneration is controlled by C3—the greater its value the less the tendency of the valve to oscillate. This circuit is seldom used on high frequencies because it does not readily lend itself to smooth and convenient control. It is effective when, for instance, it is desired to make an I.F. stage regenerative without tampering with the I.F. transformer. Simply by the addition of the components shown, both the sensitivity and selectivity may be increased, whilst, by making the I.F. valve actually oscillate, C.W. signals can be received without a separate beat oscillator.

The third and, for the present purpose, the most common method of securing regeneration is by tapping the cathode on to the grid coil, as illustrated in Fig. 1 (*b*) and the other diagrams. Here, in effect, the first three electrodes, *i.e.*, the cathode, the control grid and the screen grid, form a triode which can be made to oscillate independently of the other electrodes. Oscillation is very easily provoked with modern valves and, in all cases, the cathode tap is placed very close to the " earthy " end of the coil—less than a single turn is often sufficient.

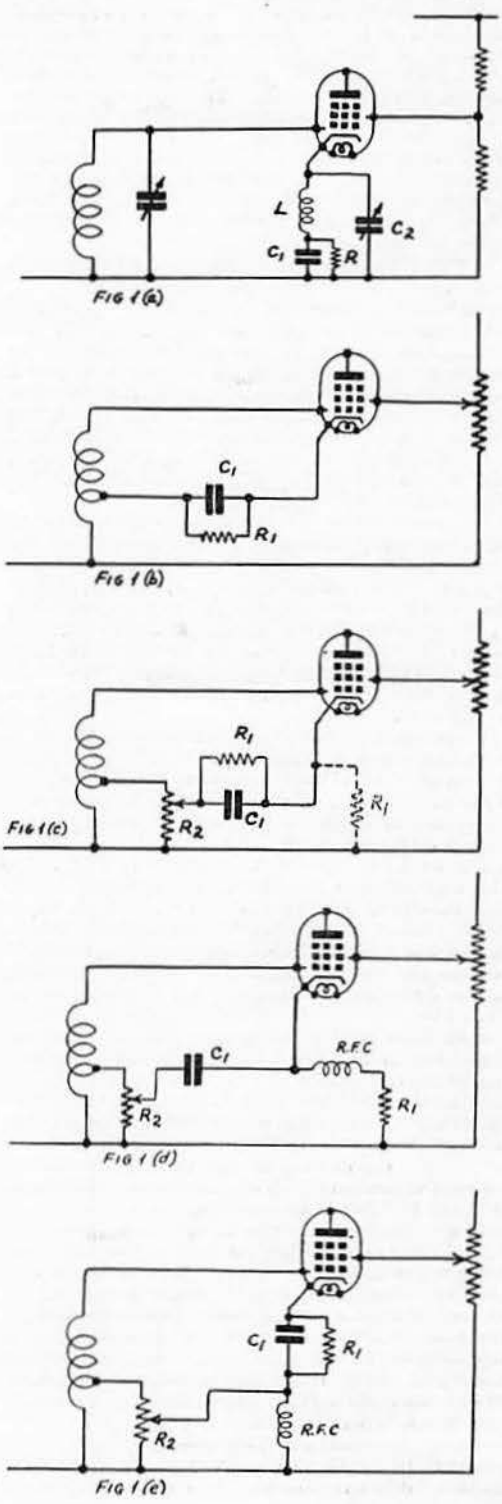


Fig. 1
Illustrating various methods of obtaining and controlling regeneration

A number of alternative methods of control are available. Possibly the most common is that shown in Fig. 1 (*b*), wherein the screen voltage of the valve is varied by means of a potentiometer. Whilst smooth control is given, this method suffers from the disadvantage that the normal amplification of the valve is varied simultaneously with the degree of regeneration. Also the point at which the cathode tap is made calls for critical adjustment and the variation of screen voltage will affect the internal impedance of the valve, this in turn influencing the tuning of the grid circuit (and the anode circuit if one is included).

In Fig. 1 (*c*) the screen voltage is fixed at a value compatible with optimum amplification, and regeneration is controlled by means of a potentiometer connected between the tap on the coil and earth. The degree of cathode coupling varies according to the setting of the moving arm, and a control even smoother than with the previous system results. It may be argued that placing the resistance R2 in the position shown, is detrimental to coil magnification, but this effect, whilst present, may be ignored in practice because such a very small portion of the coil is involved.

The disadvantage will be obvious—the bias to the valve will vary according to the position of the potentiometer slider. At either end the bias will be simply the voltage dropped across R1, but in the middle position it will be greatly increased. If, for instance, R2 has a value of 5000 ohms, the value of the additional bias resistance will be 1,250 ohms, and the gain will drop considerably, especially if, as is usually the case, a variable-mu type of valve is employed.

To avoid this difficulty, the resistance R1 could be connected direct from cathode to chassis, when the presence of C1 would prevent R2 affecting the value of grid bias. However, R1 is normally of a low value—150 to 300 ohms—and this would prevent regeneration developing.

The final circuit evolved is shown in Fig. 1 (*d*). The cathode bias resistance is connected to the chassis, but a radio-frequency choke is placed in series with it to prevent the degenerative effect. All the main factors—control grid bias, screen grid voltage and internal impedance—remain constant, as also does the tuning of the grid circuit, irrespective of the degree of regeneration applied. A variation of this circuit which gives equal advantages is illustrated in Fig. 1 (*e*), and the choice is entirely one of convenience in lay-out and accessibility.

It is regretted that the omission of the radio-frequency choke resulted in the circuit of the receiver (page 577, April, 1939, issue) being shown as in Fig. 1 (*c*), whereas the correct connections are as indicated in Fig. 1 (*e*). Particular note should be taken of this when wiring up.

Before leaving the subject, the value chosen for R2 calls for comment. The higher this resistance the less the damping effect it will have on the coil. On the other hand, if it is made too high, the control is only effective over a small portion of the potentiometer, near the coil tap, and this is undesirable. In actual practice, a value of between 5,000 and 10,000 ohms has proved most suitable, whilst the carbon track type should be chosen in preference to wire-wound.

The Noise Silencer

For convenience of explanation, the basic noise silencer circuit is re-drawn in Fig. 2, components which are not directly implicated being omitted for the sake of clarity.

By virtue of the cathode current traversing it, the resistance R19 develops a voltage. Whilst, for full output, its value should be 6.6 volts, in the present instance the actual voltage is 4.2 volts, since, by the inclusion of R16, the valve is operated at a reduced rating. Not that this is entirely relevant, but it is mentioned to explain the figures which are given in the accompanying circuit.

This voltage is communicated to the grid of the output valve as bias *via* R17. Since one anode of the EB4 double-diode valve is directly connected to the grid, and its complementary cathode to earth, a negative bias is applied to the diode anode A2, so rendering this portion of the valve completely non-conductive, signal strength thereby being quite unaffected.

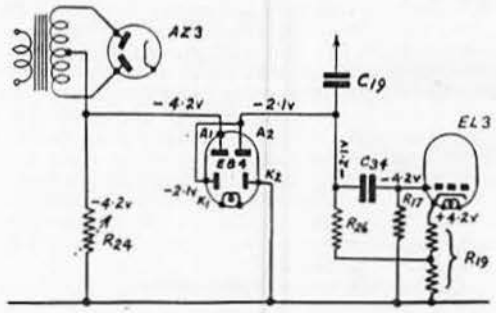


Fig. 2
Basic noise limiting circuit, as employed in the new receiver

The other cathode, K1, is connected to anode A2, and therefore acquires an initial negative bias with respect to the earth line of 4.2 volts. To secure correct operation, the voltage applied to the diode anode A1 must be 4.2 volts in excess of this—*i.e.*, 8.4 volts. This value is secured by means of a resistance, R24, in the H.T. negative line between the centre-tap of the transformer secondary and earth. The value specified for R23 is identical with that of R19, but, due to the additional current flowing, an actual voltage of 7.9 develops across it. Strictly speaking, this leads to a slight lack of balance which, however, is not noticeable in practice. It can be compensated for, and academically correct operation secured, by employing a variable resistance of 250 ohms maximum in the position occupied by R24, the working value being adjusted until a voltage of 8.4 (or whatever other value may be selected) appears across it. In passing, it may be mentioned that the positive pole of the electrolytic by-pass condenser (C33 in the original circuit diagram of the receiver), which is essential to prevent instability, is connected to the chassis.

The diodes have no effect on reception so long as the peak value of the applied signal is less than 4.2 volts (in the present instance). As soon as this value is equalled or exceeded, the negative bias present on the diode anodes is cancelled out, and the valve becomes conductive, each diode acting as a short-circuit to each alternate cycle. There is no appreciable lag, and the time occupied is dependent entirely on the character of the signal. In general, only loud peaks of interfering noise will attain the actuating voltage, and the time occupied by the

noise silencing action will be very small, the overall effect being to cause steep-sided troughs in the signal. These pass unnoticed in normal reception, and the intelligibility of the signal is unaffected instead of being greatly reduced, as would be the case if the high peak intensities of noise were allowed to appear in the output.

In many cases it will be desirable to eliminate peaks of noise which do not reach a value so high as 4.2 volts. The circuit shown in Fig. 3 will then become applicable. The bias voltage applied to the grid of the output valve must necessarily remain undisturbed, and an additional isolating condenser C34 is therefore required. Its value should be .05μF, whilst C19 should be replaced by another condenser of a value equal to C34, in order to maintain the correct overall capacity.

The lower bias voltage for the diode can conveniently be obtained by splitting R19 into two resistances and tapping off from the junction. For instance, if two resistances, each of 75 ohms, are used, a voltage of approximately 2.1 volts will be secured, and by suitably reducing the value of R24, a correct balance will again be obtained. The presence of R26, which can be of a value between 250,000 and 500,000 ohms, will reduce the audio gain, but only by a negligible extent.

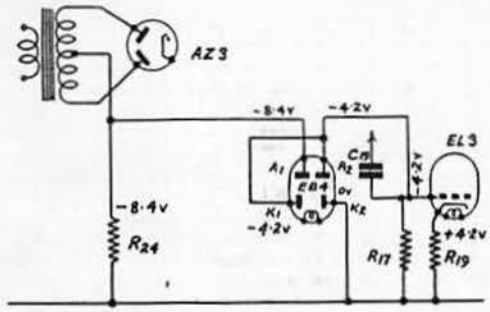


Fig. 3
Modified noise-limiting circuit, recommended for use in noisy locations

Operating Conditions of the Third R.F. Valve

A question has been asked concerning the operation of the third (untuned) R.F. valve. At first sight it might appear that, due to the inclusion of C12 and R8, this valve would tend to act as a leaky grid detector. In actual fact, this does not occur because the valve is biased to operate over the middle portion of its characteristic and with normal applied R.F. voltages it can only act as a Class A amplifier. Further, a radio-frequency load only is provided in the anode circuit and no audio-frequency voltages could develop under any circumstances. This, incidentally, is one reason why it is not necessary to provide the anodes of R.F. valves with absolutely pure D.C.—no hum will appear in the output of a receiver if the H.T. to the R.F. stages contains quite a fair percentage of A.C. ripple, although, of course, it is very essential to supply the detector valve with pure D.C.

* * *

At this point, we have reached the conclusion of the discussion concerning the operation and design of the receiver as a whole. The receiver gives a superlative performance over a wide frequency range and it can be constructed at an economical figure, especially when one takes into account the additional refinements included. It is recommended to those readers desirous of acquiring a communication type receiver capable of fulfilling practically all modern requirements and employing British components throughout.

There may be some who wish to improve their present receiver by incorporating in it some of the points of design enumerated in the foregoing paragraphs and it is to these that the following remarks are particularly intended to apply.

Building a Preselector Unit

The employment of a preselector in front of any receiver confers several advantages. The overall sensitivity and selectivity are increased and the signal to noise ratio improved, since this depends largely on the amount of R.F. amplification available.

In the case of a superhet receiver used on high frequencies and having a comparatively low intermediate frequency (such as 465 kc.) it is impossible to prevent image interference when no R.F. stage is incorporated and very difficult completely to eradicate the trouble when a single R.F. stage is included. The cure is to employ a preselector, preferably using two or more valves, this being especially necessary when no R.F. stage is already included in the receiver.

The conversion efficiency of a frequency-changer valve is poor when the signal voltage applied to its control grid is weak, whilst the modulated intermediate frequency output contains, in addition to the signal, a noise component generated within the valve itself. If the signal is boosted up by being passed through one or more stages of radio-frequency amplification, the greater applied voltage enables the F.C. valve to function with more efficiency and the signal, instead of being merged in the background of noise, stands out clearly from it.

The high gain given on high frequencies, together with its low noise properties, makes the EF8 type of valve ideal for inclusion in a preselector. The circuits appertaining to the first two valves of the receiver shown in Fig. 1, page 577, of the April T. & R. BULLETIN are suitable as they stand for inclusion in a preselector unit, the output being taken off *via* C12 to the high impedance terminals of the usual receiver.

For reasons outlined in the first article of this series, it is desirable to include the third (buffer) valve. If this is done, slight alterations to the anode circuit of the valve will be required. The coupling coil L5 should be replaced by a radio-frequency choke and the feed taken from the anode of the valve through a .0003 μF fixed condenser. The lead to the receiver should be made extremely short and, to prevent interaction between it and the aerial, it will probably be necessary to screen it. Only high-quality screening material should be used for this purpose as any losses which occur will detract from the effectiveness of the preselector. It would pay to use at this point a length of co-axial feeder, or a substitute could be devised by running a thin wire through a length of copper tubing, using small glass beads to space the wire away from the walls of the tube.

It will be essential, of course, completely to enclose the preselector in a metal cabinet. In many cases

the heater and anode power supplies can be drawn from the receiver itself, as the additional drain would be low—.6 amps. at 6.3 volts and 25 mA. at 250 volts respectively. Alternatively, a suitable power pack, of small dimensions, could be built into the unit.

For convenience of operation, plug-in coils could, if desired, be dispensed with and a switched arrangement employing four separate coils substituted. The winding on the second coil would be such as to enable both the 7 and 14 Mc. bands to be covered on it. The best material for the coil formers would undoubtedly be Polystyrene (Trolitul), suitable sizes being offered by *Denco*.

Considerable importance attaches to the switch, which must be of a low-loss type, having low inter-contact capacities. The *Wearite* ceramic switch is recommended as possessing all the necessary qualities and, when ordering, two type A28 wafers built up into a single switch should be specified.

The first and/or third valves shown in the original circuit may be omitted at the reader's discretion. The regenerative feature of the tuned stage should be retained.

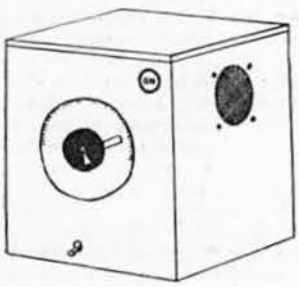
Effecting Other Improvements

Reading through the present series of articles, the reader has probably taken note of ideas, the application of which to his present receiver would enable improvements to be effected. For instance, where one or more R.F. stages are already in use the substitution of the EF8 valve will produce a definite improvement in noise level and very probably also in amplification. Or the present detector valve may not be functioning in an entirely satisfactory manner, in which case substituting an EF6 valve and following, at least in major details, the circuit given will doubtless put matters right.

In a noisy location, such as near an arterial road or a bus stop, the addition of a noise silencer will made it possible to word weak stations in comfort at all hours.

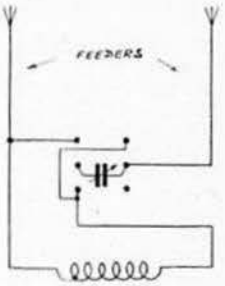
Bright Ideas

GM6MD forwards the idea illustrated for providing a frequency meter-monitor with an inexpensive "Loudspeaker." This consists of an earphone fitted opposite an opening cut in the side of the monitor case and covered with a piece of protective wire gauze. The effect is quite satisfactory and the signal output is adequate for the purpose.



A "Loudspeaker" for Frequency Meter-Monitor.

A simple switching circuit for Zeppelin feeders, using an ordinary D.P.D.T. switch comes from G8UJ. It may be new to some members who require an easy method for changing from series to parallel feed. The diagram is self explanatory.



Zeppelin Feeder Switching Arrangement.

The York P.D.M.

One of the most representative meetings of radio amateurs ever held in the district, took place on Sunday, April 16, at the Windmill Hotel, York, on the occasion of the 2, 18, and 19 Districts, Joint Provincial Meeting. This was organised by by the D.R., Mr. L. Parry (G6PY), and was by general consent, the most enjoyable gathering yet held in Yorkshire. Over 100 members and friends were present, from almost all parts, including places so far away as Sheffield, Barnsley, Nottingham and Lincoln. A very welcome feature was the attendance of many of the newer members, in addition to the regulars, who can be relied upon to turn up faithfully, for the one day in the year when personal contacts can be renewed. The proceedings commenced about 12.30 p.m., with the usual informal introductions and discussions, which were continued during the excellent lunch.

The business meeting took place after a short interval, and was opened by the Chairman (G6PY) with a few words of welcome. He then introduced the D.R. of No. 18 District (G5MV), who expressed his pleasure at being present, and recounted one or two experiences of previous meetings. To the accompaniment of acclamations, our Secretary (G6CL), with little black book, rose to give one of those heart-to-heart talks, invariably appreciated by everyone. In characteristic manner, he spoke for over an hour of matters concerning licences, Service Reserves, Convention, Town Representatives and many things concerning amateur radio. The meeting was then opened for discussion, and terminated with a vote of thanks to the Secretary, D.R., T.R.'s and Scribes for services during the past year.

It was agreed to hold the next P.D.M. at Scarborough to be organised District 18, thus taking a load off G6PY, who has done the job so well for about nine years. Tea followed, and informal discussion groups and reminiscences kept the company fully occupied, until at about 7 p.m., members living furthest afield, began to depart with handshakings and remarks of "Goodbye, O.M., see you again next year."

Thus closed the 1939 York P.D.M., a most enjoyable meeting, on a fine spring day. Thanks are due to G6PY for his splendid efforts, and we hope that the next meeting at Scarborough will be as pleasant as the last one held in York. C. S.

Experimental Section

MANAGER, A. M. H. FERGUS (G2ZC).

IT was suggested last year that at the 1939 Convention an Experimental Section meeting should be held. In the past the Technical Discussion Groups at Convention were more or less formed from E.S. members, but this year we should like to arrange a special E.S. meeting at which matters of policy, as well as technical problems, could be discussed. The success of such a meeting would, however, depend entirely on the support given to it by members. As the coming Convention will differ from those previously held, inasmuch as there will be no R.S.G.B. stand at Olympia, the gathering together of E.S. members is desirable if only for the reason that it will give us all an opportunity of getting to know each other better. It is suggested that all G.C.'s should ascertain the views of the members of their own groups and pass them to their G.M. so that we can make early arrangements, if the demand warrants it, for calling such a meeting. (Headquarters welcome this suggestion. —ED.)

Co-operation

The membership generally will be interested to know that the G.C.'s of all groups studying 56 Mc. problems are attempting to exchange information that may be of special or common interest to everyone working on this band. It is obvious that the exchange of operating data between groups working on similar problems can be of value, as each group, while studying its own particular subject, should be able to give and to receive assistance from the others. Co-operation of this nature is to be encouraged and with the inception of the scheme (by W. F. Miller, G.C. of the 56 Mc. "B" Propagation Group) the idea might be taken up with advantage by other groups specialising in stated frequencies.

Group Notes

Aerial Group : G2IM has appointed G2MV as his assistant. *Propagation Group :* The following list of the G.C.'s of the various sub-groups is published for the information of all interested in the subject of propagation :—*G.M. :* P. A. B. Malvern (G8DA). *G.M. Assistant :* L. F. Coursey (2FHA). *Aurora :* S. W. Allcorn (2FIH). *Barometric :* W. Crossland (G5CI). *Conditions :* N. C. Hobbs (G8AA). *Cosmic :* P. Murden (BRS3379). *Fading :* P. Jones (G2JT). *Magnetic :* W. G. Money (G2UP). 1.7/3.5 *Mc. :* J. Maling (G5JL). 28 *Mc.* "*A*" : Miss Corry (G2YL). 28 *Mc.* "*B*" : T. A. Iserbyt (BRS25). 28 *Mc.* "*C*" : B. Wallich (G6BW). 56 *Mc.* "*A*" : W. F. Holford (G5NG). 56 *Mc.* "*B*" : W. F. Miller (2AAH).

* * *

The E.S.M. apologises for delay in answering several letters, application forms, etc., but a change of residence and indisposition were responsible. Attention will be given to all outstanding correspondence as soon as possible.

Aerial Group

Group 2A continue experiments with vertical and tilted aerials, whilst Group 3 are conducting tests with single-wire feeders and relative tapping points for all bands. Group 4 are testing Kraus type aerials, rotable both vertically and horizontally, using 75-ohm feeder. An enlarged variometer type of aerial is also being tested which has produced good results. Activity continues in all groups and satisfactory progress is reported without there being anything to hand suitable for publication. An article on 56 Mc. aerials will appear once the data collected have been proved. Experiments regarding the thickness of feeder wires are being conducted. G2IM.

Propagation Group

Preliminary reports of the severe magnetic storm on April 17 show that radio conditions were similar to those obtaining during the storm at the end of March the 28 Mc. band was dead and long skip prevailed on 7 Mc. during the day, while nothing was heard on 14 Mc. in the late evening. During the early evening of the 18th, signals from India and South Africa were predominant, followed later by outstanding conditions for South America. North American signals were inaudible during this period and the storm obscured any effect caused by the annular eclipse of the sun on April 19.

Professor Carl Störmer, of Oslo, is providing the Auroral Sub-Group with reports of Aurora seen in Norway. This group is also observing for any effect the moon may have on radio conditions.

The Conditions Sub-Group still require new members and the observations of the Cosmic Sub-Group are proceeding, with BRS3379 taking photographs of the sun.

The Magnetic Sub-Group are studying G2UP's theory that the earth's magnetic field deflects radio waves and that increased magnetic activity tends to beam these waves along the lines of force. Amateurs with directional aerials who noticed any deviation from the Great Circle route on the days immediately following March 26 and April 15 are asked to send a report to the Propagation Group Manager.

The 1.7 and 3.5 Mc. Sub-Group are using a standard report form giving details of atmospheric and radio conditions. Mr. J. J. Shaw, the seismologist, is assisting the Sub-Group in their study of G3GH's theory that earth tremors cause fadeouts and bad flutter.

The 28 Mc. Sub-Groups are in doubt as to whether magnetic storms or decreased ionisation were responsible for the falling off in conditions during March. G6DH is surprised that VU2AN still hears signals in the region of 40-45 Mc., as the critical frequency limit at his station was 28-30 Mc. during March. The marked fall in the upper frequency limit during February and March appeared to be due to magnetic activity.

As pointed out last month, 56 Mc. waves may be reflected by the sporadic E layer during the summer. The maximum skip for a single reflection is about 1,200 miles, so that co-operation is earnestly requested from stations on the Continent, particularly in the South of France, Italy and North Africa. The 56 Mc. Sub-Group "B" are active from 22.00 to 22.30 B.S.T. on Wednesdays. Egyptian stations are active at this time and from 12.00 to 14.00 on Sundays. G8DA.

Receiver Group

In our April notes mention was made of a method of obtaining constant detection characteristics in a straight receiver. It has been suggested by M. H. Munroe (G6MF) that the insertion of a small resistance in the cathode lead of an E.C.O. detector would give improved results. This has been tried out by T.R.F. Sub-Group, and preliminary experiments have shown that the reaction is more constant and also much smoother. On C.W. it was found that a considerable band width could be covered without altering the reaction. Experiments are continuing.

D. Sherley-Price (BRS1550), of the Superhet Sub-Group, has found that frequency drift in commercial superhets is often due to the type of trimmers used in the B.F.O. circuit. The insulation of these trimmers is often of a very poor nature which warps on heating. The substitution of ceramic insulated trimmers cured all frequency drift.

In connection with home-constructed superhets, the placing and adjustment of padding condensers sometimes offer some difficulty. It can be shown, however, that in many cases a fixed condenser can be used. This means a slight reduction in cost, besides saving the constructor the need for mounting it in an accessible position in the receiver. It further reduces the number of variables when lining up the receiver. Ordinary fixed condensers can be obtained whose capacity is rated to about ± 15 per cent., and although this may appear too approximate for use in a tuning circuit, it must be realised that the padding condenser is in series with the main tuning condenser, consequently if the ratio of the padding capacity to tuning capacity is large the possible 15 per cent. error in the padding condenser capacity is reduced to about 1 per cent., which is sufficiently small. For circuits in which closer tolerance is required condensers are available with capacities rated to ± 1 per cent. Details of circuit constants are dealt with very fully by A. L. M. Sowerby (1).

When constructing receivers for use on 56 Mc., trouble is sometimes experienced with resistances. It should be remembered that the values of commercial resistances are considerably less than their rated value at ·56 Mc.(2). As a rule resistances below about 50,000 ohms are not seriously affected, but above this value allowance should be made for the effect of the high frequency. It has been shown that a resistance rated at 100,000 ohms at low frequencies is reduced to one-fifth of this value at 56 Mc., and a resistance rated at 1 megohm is reduced to about 100,000 ohms.

G5HF.

Transmitter Group

A fair percentage of questionnaires have been returned, but there still remain a number of members who have not yet indicated their present interests. To enable the group re-allotment to be carried out in a single operation, those concerned are earnestly requested to fill in and return their forms without further delay.

One fact which emerges from a perusal of the questionnaires is the great interest being taken at the present time in crystal control on the ultra-high frequencies. A majority of the returns indicate a primary interest in the 56 Mc. band, which is as it should be, since a wide field of experiment remains open in this particular direction. From present indications it would seem that most of the groups will soon be working on problems connected with 56 Mc., although the interest shown in the 1.7 and 14 Mc. bands is also quite considerable.

GM6ZV makes some interesting comments on one of the problems recently set to the Transmitter Group members. A 56 Mc. power amplifier originally constructed on a plywood foundation has been re-built on an aluminium chassis. The new P.A. is identical with the old, the components having been transferred *en bloc*, leaving the original wiring intact. The result has been a slight increase in output.

Another interesting experiment carried out by GM6ZV relates to the measurement of crystal current when using a 28 Mc. crystal, a thermo-couple meter being employed to ensure accuracy. With 230 volts to the anode of a 6J5G valve, the crystal current was found to be 170 mA. with the valve loaded, and 200 mA. unloaded. Since these figures are in the region of the manufacturer's maximum ratings, efforts have been made to reduce the current, but the value remains constant, despite extensive alterations in the circuit constants.

G2NG is another member who has been actively conducting experiments on the ultra-high frequencies, many of them being quite out of the ordinary run. It is hoped to publish further particulars at a later date.

G5JU.

(1) *Ganging Tuning Controls of the Superhet Receiver.* By A. L. M. Sowerby, M.Sc., "Experimental Wireless," Feb., 1932.
(2) *The Behaviour of Resistors at High Frequencies.* By L. Hartshorn, D.Sc., "Wireless Engineer," July, 1938.
High Frequency, Mixing and Detection Stages of Television Receivers. By M. J. O. Strutt, "Wireless Engineer," April, 1939.

Cosmic Notes

Sunspots

THE period March 28 to April 28 began with very low sunspot activity. On March 30 Tokio reported only five groups and thirteen spots, and on April 1 two groups and fifteen individual spots, giving Wolf-numbers of approximately 30 and 17 respectively. With the exception of a short period in December, 1937, this is the lowest figure for several years. No spots at all were visible at the end of March with the writer's apparatus. Later in the period spots became more numerous and dates of central meridian passage calculated from observations at G2XC were April 12, 13, 14, 15, 19, 21, 22, 26, 28. The largest of these groups were those of April 15 and 26. On the latter date two large groups and one small group crossed the central meridian and on several days as many as eight or nine distinct groups of spots were visible.

The International Astronomical Union's Solar Bulletin for the fourth quarter of 1938 has come to hand. Dates of C.M.P. of large spots are given as follows: October 11 and 12, November 10 and 28, December 25. It is interesting to note that these dates check exactly with those given in these notes month by month as a result of the writer's personal observations. The mean monthly and yearly sunspot numbers for 1934 to 1938 are given. The year 1937 with a mean figure of 114.4 was the highest, whilst in 1938 the mean was 109.55. The

(*Continued on page* 700)

THE HELPING HAND

By J. N. WALKER (G5JU).

PART XX—TRANSMITTER INTERFERENCE AND ITS ELIMINATION

THE subject of interference produced by a transmitter is approached with some diffidence, since a good deal of information about it is already available, but, in view of the fact that many amateurs still experience trouble from this source, it is thought that an article delving still further into the subject will be welcome.

Broadly speaking, interference may be grouped under two major headings: (1) that emanating from a telegraphy transmitter and (2) that from a telephony transmitter. The treatment necessary to effect a cure also falls into two groups: (1) methods applicable to the transmitter and its associated equipment and (2) other methods of protecting the receiver.

Certain fundamental precautions are applicable under all the foregoing headings and these, in themselves, will confer a large measure of freedom from possible trouble. We will, therefore, commence with an outline of such precautions.

The Earth

The importance of a good earth cannot be overestimated. All radio equipment, including transmitters, receivers and power packs, should be directly connected to a low-resistance earth by the *shortest possible length of wire*. The reason for this is not to complete the aerial to earth portion of the circuit (as is often required with a broadcast receiver) but is done in order to ensure maximum stability throughout the equipment. If the receiver is left more or less "up in the air," it is much more likely to be affected by external influences and that in a more irregular manner, than when it is properly tied down to earth. This principle particularly applies to apparatus incorporating high-gain valves, such as is to be commonly found to-day in many amateur stations. An example is a receiver of all-metal construction in the construction of which great pains have been taken to screen the various stages from each other. If no earth is employed, or if it is of high resistance, it is quite possible that the metal work, far from acting as a screen, will act as a coupling between the stages and will not only render the receiver unstable but will cause it to be unduly sensitive to outside interference.

If a short earth lead cannot be conveniently arranged, the next best thing is to employ an insulated wire, with a second wire wrapped around it to screen it from external influences. Both will be connected to earth at ground level but the outer wire will be left free at the "shack" end.

If the earth lead is short, all the equipment may be connected to a common earth, but if it is long it is often advisable to use a separate earth to the transmitter in order to avoid common couplings occurring in the earth wire.

Keeping R.F. Out of the Mains Wiring

Unquestionably much of the interference caused by a transmitter to nearby broadcast receivers is carried *via* the mains, since a direct metallic connection between the two sets of equipment is unavoidable. The radio-frequency currents may reach the mains in two ways—one by radiation off the transmitter and its aerial, the other directly by virtue of some R.F. being present in the transmitter power supply.

It is therefore necessary to take measures to eliminate entirely all trace of R.F. from the mains wiring, both in the house containing the transmitter and in the one wherein the receiver is located. A simple filter may suffice in some case, but to ensure absolute freedom from possible trouble it is wise to instal several devices at different points, as indicated in Fig. 1. A filter, consisting of two radio-frequency chokes (L1 and L2) and two fixed condensers (C3 and C4), should be connected as shown at a point as close as possible to the equipment, which will be the transmitter in the first case and the receiver in the second. *All* power should be taken through the filter, by which is meant that it will not be advisable for the majority of the power transformers to be connected to the far side of the filter, and one or two filament transformers, for instance, to the mains side of the filter. The chokes may be of the old honeycomb type (between 150 and 250 turns) or, better still, of the

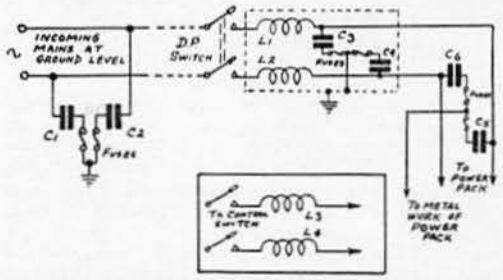


Fig. 1.—A complete mains filter installation. Condensers C5 and C6 should be mounted on the power pack chassis itself. One of the simple filters shown inset should be placed very close to the main transmitter control switch and another to the key terminals.

modern type specially made for this class of service and marketed by several manufacturers. The filters, as a whole, should be built inside a perforated metal box, which is itself earthed.

It is undesirable to place condensers on both sides of the chokes, since by so doing undesirable coupling may occur in the common earth connection. The position shown will generally prove most satisfactory, but a trial may be made with the condensers on the mains side of the chokes, if trouble is still encountered.

Condensers C1 and C2 should be located as close as possible to the point at which the mains enter the house, their purpose being obviously to by-pass to earth any energy the house wiring may have collected by radiation off the transmitting aerial. All the condensers shown should be of a value not exceeding .02 μF., whilst it is probable that a smaller size, say .002 μF., will prove more satisfactory on amateur frequencies. The choice of a capacity of this order will have the advantage of enabling the employment of mica condensers, with a consequent improvement in the radio-frequency by-pass effect. Fuses, of low ratings, should be inserted as shown, to avoid interruption of the house electricity supply should a condenser fail.

Some broadcast receivers are particularly susceptible to interference from the spark which occurs on operating a switch. Such interference is likely to be worse when the circuit switched is mainly inductive, as is the case with transformers. To prevent this trouble, chokes should be placed very close to the contacts of the particular switch with which the main control of the transmitter is effected. The chokes may again consist of the old honeycomb type and it does not appear to be necessary to screen them. The use of condensers is not advised. A similar filter should be fitted very close to the key contacts.

If for some reason a householder interested in broadcast reception only, should show some objection to the installation of the devices mentioned, it should be explained that, in addition to clearing up interference from a transmitter, the devices will also help towards reducing background noise in the receiver, with a consequent improvement in the general reception of broadcast stations, particularly those at a distance.

Any interference that is audible on a neighbouring receiver after the foregoing precautions have been taken must definitely be caused by radiation off the transmitting aerial picked up directly by the receiving aerial, in which case it becomes necessary to deal in detail with the particular type of interference experienced in individual cases.

Key Clicks

The interference most commonly met with from the operation of a telegraphy transmitter takes the form of clicks or thumps as the contacts of the key "make" and "break." These may not only affect nearby receivers, tuned to a frequency far removed from that employed for transmission, but may also be audible on receivers tuned to the same band and situated many miles away, thereby causing considerable inconvenience to other amateurs. The causes, which are the same in both cases, may be due either to the too-sudden application of power to the valves in the transmitter or to incorrect adjustment of the transmitter as a whole, thereby resulting in the radiation of a broadly tuned wave or, in the worst cases, to a combination of both.

Correct Transmitter Adjustment

Primarily, therefore, it is essential to ensure that the transmitter is adjusted in such a way that the minimum degree of interference results. Loose coupling the aerial to the final stage should be a *sine qua non*, for not only does it give a more sharply tuned wave but it will also prevent "shock excitation" of the aerial system. In this connection, it must be remembered that an aerial may be resonant at several frequencies other than the one in use. As an example, consider an aerial 132 ft. long, end-fed and tapped on to a tuned circuit, one end of which is held down to earth potential. In addition to being resonant at various frequencies falling within the amateur bands, the whole system, will act as a Marconi aerial on a frequency which will most likely fall in the lower part of the medium-wave broadcast band. On the sudden application of a high D.C. voltage, such an aerial will be "shocked" into oscillation at all the resonant frequencies, from which it will be apparent that interference is almost bound to occur over a wide area. When the aerial circuit is inductively coupled to the transmitter, only a gradually built-up R.F. voltage is applied to it and the effect is thereby overcome.

Care should be taken to avoid loading any stage of the transmitter to a degree such that the tuning becomes very flat. From all points of view, therefore, it is well to keep interstage couplings slightly below the point at which optimum transfer of power occurs.

The action of keying results in the production of transient frequencies occupying a wide spectrum and to these are added further frequencies caused by the spark which occurs at the key contacts. These spurious frequencies modulate the carrier (the transmitter produces a carrier even though it is completely modulated by Morse characters) and give rise to wide side bands, unless suitable precautions are taken to eliminate them. The main precaution is, of course, to eliminate them at the source by means of a key filter, the design of which is discussed later. At the present moment it is desired to point out that the maintenance of sharply tuned circuits will have the well-known effect of attenuating the side bands, which explains the reason for recommending loose couplings throughout a transmitter.

Further, the greater the number of tuned circuits the greater the attenuation, from which it follows that the key should be placed either in the oscillator circuit, when the design of this permits, or in the stage next following, so that as many tuned stages as possible intervene between the key and the aerial.

Regulation of Power Supplies

Too much trouble cannot be taken to secure the best possible regulation of the power supply delivering voltage to the keyed stage. If the voltage surges to a comparatively high value when the load is removed by breaking the circuit at the key contacts and then suddenly reduced on "make," it will prove a most difficult matter entirely to prevent clicks. This applies even when grid or screen-grid keying is employed since, although the value of the actual power supply broken is small, high-voltage surges will occur on the anode of the valve. If the anode or cathode circuit is keyed,

(*Continued on page* 667.)

Seventh Annual National Field Day

JUNE 3 and 4, 1939

WE publish below a complete list of the call signs, station sites and frequencies of the British Isles stations participating in our Seventh Annual National Field Day. The rules for the event were published on pages 523 and 524 of the March issue.

All official British portable stations will call "Test N.F.D." and will suffix their calls with the letter "P." Members of the Society who wish to operate private portable stations during this event are asked to suffix their calls with the letter "P," but to prevent confusion with the official stations they should refrain from calling "Test N.F.D." We recommend that the operators of these private stations either reply to "Test N.F.D." calls or send "Test Port."

District	Call Sign	Site of Station	Band to be used Mc.
1	G2OI	Grants Farm, Walmesley, Nr. Bury	1.7
	G2IN	The Marsh, Marshside, Southport	3.5
	G2HW	Height House Farm, Whalley Old Rd., Sunny Bower, Blackburn	7
	G6KS	Jones Building Estate, Woolton Hill, Linkstor Road, Woolton, Liverpool	14
2	G6SN	Denton Moor, Nr. Ilkley, Yorks.	1.7
	G5HK	Field belonging to H. S. Beckett, Redmires Road, Lodge Moor, Sheffield, 10	3.5
	G6PY	Medlam's Farm, Pogmoor, Barnsley	7
	G5VD	Top of Bank, Thurstonland, Nr. Huddersfield	14
3	G6KR	Mr. Pearce's Farm, Weeping Cross, Nr. Shrewsbury	1.7
	G5VM	Moneymoor Farm, Canwell, Nr. Sutton Coldfield	3.5
	G5BJ	Waseley Hill Farm, Rubery, Nr. Birmingham	7
	G5GR	Dirty Cap Farm, Burton Green, Nr. Coventry	14
4	G6VD	Owston, Leicestershire	1.7
	G5VU	Crich Stand, Nr. Matlock, Derbyshire.	3.5
	G8SA	Warsop Windmill, Nr. Mansfield	7
	G2IO	Kirklington, Southwell, Notts.	14
5	G5JH	The Meadows, New Road, Hardwick, Glos.	1.7
	G6RB	Southlea Farm, Pensford, Nr. Bristol	3.5
	G8DT	Hartley Farm, Leckhampton Hill, Cheltenham	7
	G6GN	c/o H. Ayliffe, The Monument, Hawkesbury Upton, Badminton, Nr. Chippenham, Wilts.	14
6	G5AK	On the Quantock Hills in the Parish of Broomfield	1.7
	G6GM	At Mr. Merriman's Farm, Holsworthy, Devon	3.5
	G5SY	Pound Farm, Whitestone, Nr. Exeter	7
	G3TX	Wembury, Nr. Plymouth	14
7	G2FI	Hartley Hill, Old Lodge Lane, Purley	1.7
	G6GS	Mr. Holt's Farm, Farley Green, Nr. Shere, Surrey	3.5
	G5AO	Nash's Farm, Junction of Southcote and Circuit Lanes, Off Bath Road, Reading, Berks.	7
	G6YK	Field of Briggs & Son, Builders, London Road, Purbrook, Portsmouth	14
8	G5PA	Ray's Field, Nr. Hangers Wood, Stagsden, Beds.	1.7
	G5JO	Mustill's Mill, Swavesey, Cambs.	3.5
	G3BK	Mr. M. Crouch's Farm, Fodder Fen, Manea, Isle of Ely, Cambs.	7
	G5DR	c/o Mr. Doggett, Hill Farm, Lolworth, Cambs.	14
9	G8MU	Reavell's Sports Ground, Ipswich	1.7
	G5QO	Marsh Farm, Acle New Road, Nr. Gt. Yarmouth	3.5
	G8VW	Mangreen Hall Farm, Nr. Norwich	7
	G2JD	Reavell's Sports Ground, Ipswich	14
10	GW3AJ	Penyrheal Farm, Wentwood, Nr. Newport	1.7
	G2JL	Penyrheal Farm, Wentwood, Nr. Newport	3.5
	GW8NP	Ridds Farm, Lavernock Point, Nr. Penarth, Glam.	7
	G8PU	Plas Farm, Gordon Road, Blackwood, Mon.	14
11	GW6AA	Mynydd Llanelian, Denbighshire	1.7
	GW6OK	Penrhyn Hall Grounds, Penrhyn Bay, Caernarvonshire	3.5
	GW5FU	Prestatyn Mountain, Flintshire	7
	G6US	2 miles West of Oswestry, Salop.	14
12	G5UM	Welwyn Heath, Welwyn, Herts.	1.7
	G5WW	Post Office Stores Dept., Sports Ground, Barnet Gate, Herts.	3.5
	G5FA	Near Fieldsweir Loch, Hoddesdon	7
	G6ZO	Hendon Park Farm, Highwood Hill, Mill Hill, N.W.7 (Nr. Mote Mount)	14

District	Call Sign	Site of Station	Band to be used Mc.
13	G3ZJ	Westerham Heights Guest House, Westerham Hill, Kent	1.7
	G2CX	Botley Hill Farm, Warlingham, Surrey	3.5
	G2JB	Dulwich Hamlet F.C. Ground, Champion Hill, S.E.	7
	G2RC	Westerham Heights Guest House, Westerham Hill, Kent	14
14	G6UT	Rookwood Hall, Abbess Roothing, Nr. Ongar, Essex	1.7
	G8AB	Tye Cottage, Tye Green, Nr. Harlow, Essex	3.5
	G5XI	Thundersley Glen, Thundersley, Essex	7
	G5RV	Danbury Common, Danbury, Essex	14
15	G6RW	Rush Green Farm, Rush Green, Denham, Bucks.	1.7
	G5VB	Broadmoor, Nr. Dorking, Surrey	3.5
	G6PR	Berry Farm, Wexham Street, Stoke Poges, Bucks.	7
	G6CJ	Berry Farm, Wexham Street, Stoke Poges, Bucks.	14
16	G2UJ	Halls Hole, Hawkenbury, Tunbridge Wells	1.7
	G2IZ	The Mill, Shorne, Kent	3.5
	G2ZV	Bury Hill, Sussex (4 miles N.W. of Arundel)	7
	G5JZ	Brightling Needle, Nr. Heathfield	14
17	G5XL	Red Hill Farm, Bracebridge, Lincoln	1.7
	G8FC	Brauncewell, Nr. R.A.F., Cranwell	3.5
	G5JB	Knowle Hill, Nr. Boston.	7
	G8PV	Roger's Farm, North Thoresby	14
18	G3KS	Oliver's Mount, Scarborough	1.7
	G2KO	Garton-on-the-Wolds, Yorks.	3.5
	G8KU	Oliver's Mount, Scarborough	7
	G6OS	Southwold Farm, Brantingham, E. Yorks.	14
19	G5RI	Nr. Red Lion House, Hexham, Northumberland	1.7
	G5WZ	Kenton Bar, Newcastle-on-Tyne	3.5
	G2FO	Gypsy Lane, Nunthorpe, Nr. Middlesbrough	7
	G8JO	North Pastures Farm, Whiteleas, S. Shields	14
Northern Ireland	GI3ML	Killennican, Killinchy, Co. Down	1.7
	GI5SJ	Pirrie Park, Castlereagh, Belfast	3.5
	GI5UR	Craigantlet, Holywood Hills, Co. Down	7
	GI5QX	Windmill Hill, Portaferry, Co. Down	14
Scotland A	GM2LO	Temple House, Balmore, By Torrance, Stirlingshire	1.7
	GM5ZX	Temple House, Balmore	3.5
	GM8HJ	The Park, High Blantyre, Lanarkshire	7
	GM6JD	South Hillhead, East Renfrewshire	14
Scotland B	GM2OX	Waterside Farm, Birse, Aberdeenshire	1.7
	GM6IZ	Ordhill, Peterculter, Aberdeenshire	3.5
	GM3RL	Kinghorn Wood, Straloch, Newmachar, Aberdeenshire	7
	GM6VO	Netherley Post Office, Banchory-Devenick, Nr. Aberdeen	14
Scotland C	GM6RI	Logie Pert, By Montrose	1.7
	GM6RT	Downiebank Farm, Monikie, Angus	3.5
	GM8MN	Fowlis Wester, By Crieff	7
	GM8HM	Kerrystone House, Kellas, By Dundee	14
Scotland D	GM6SR	Newhailes Estate, Musselburgh	1.7
	GM6SR	Newhailes Estate, Musselburgh	3.5
	GM3GG	Newhailes Estate, Musselburgh	7
	GM5GK	Newhailes Estate, Musselburgh	14
Scotland F	GM6RV	Shiphaugh Farm, Stirling	3.5
	GM6XW	Greyrigg Farm, Avonbridge, Stirlingshire	7
	GM6XW	Greyrigg Farm, Avonbridge, Stirlingshire	14
Scotland G	GM3TD	Over Whitlaw Farm, Over Whitlaw, Selkirkshire	1.7
	GM5FT	Over Whitlaw Farm, Over Whitlaw, Selkirkshire	3.5
	GM2IA	Over Whitlaw Farm, Over Whitlaw, Selkirkshire	7
	GM8CN	Over Whitlaw Farm, Over Whitlaw, Selkirkshire	14
Scotland H	GM3ND	Chapel Farm, Chapel, Nr. Kirkcaldy	1.7
	GM6JJ	Grangehill Farm, Kinghorn	3.5
	GM8MQ	Drummaird Farm, Kennoway	7
	GM8KR	Camilly Farm, Auchtertool	14
Eire	EI6F	Co. Dublin	1.7
	EI6J	Co. Dublin	3.5
	EI3L	Co. Dublin	7
	EI9N	Co. Dublin	14

HELPING HAND—(*Continued from page* 662)

it will mean that the spark at the key contacts will be both stronger and more prolonged, whilst the conditions with which an associated filter has to cope will be continually varying.

It is possible to secure practically perfect regulation—by which is meant a load to no-load voltage change of less than 2 per cent.—by suitable choice of circuit and component values, providing a well-designed H.T. transformer is employed. A choke input filter will be essential, combined with the correct value of " bleeder " resistance, and although

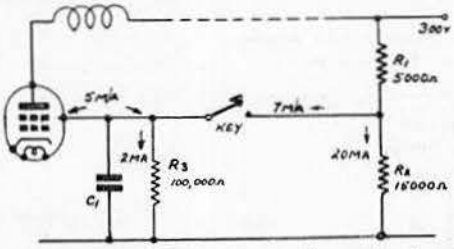


Fig. 2.—Method of keying a pentode or tetrode valve. C1 should not exceed .01 μF. The resistance values shown are correct when the screen current is approximately 5 mA.

such a combination will give a lower output voltage than a power supply incorporating condenser input, the advantages secured greatly outweigh the disadvantages.

The regulation of following stages should also be good, although it is not so necessary to keep the voltages absolutely constant. High voltage surges in any of the transmitter circuits will give rise to the undesirable transient effects previously described and care in their avoidance will be well repaid in the improved quality of the transmitted signal.

Position of Key

An important factor to consider is the position of the key, because the strength of the spark at the key contacts is dependent on the amount of power being broken. Many different methods of keying are described in *The Amateur Radio Handbook* and it is proposed to discuss here only one or two methods which particularly lend themselves to the elimination of interference.

Undoubtedly the best position is in the lead to the screen-grid of a pentode or tetrode oscillator (or doubler) valve, but, if satisfactory operation is to be secured, several points must be borne in mind. In cases where the screen requires a lower voltage than the anode (and it is always best to operate it at a lower voltage), the only way to maintain the screen voltage absolutely constant is to employ a separate well-regulated power supply. As a voltage of about 200 will usually suffice, the cost of a separate supply will be met by the saving effected in the elimination of other components which would otherwise have to be inserted in later stages to reduce key clicks. If this method is impracticable, then the supply feeding the anode of the valve must naturally be used.

Series feed cannot be employed because the voltage at the screen end of the resistance will instantaneously build up to the value of the voltage applied to the high-tension end of the resistance when the key is up. This means that the actual voltage applied to the screen grid will rapidly fluctuate with the keying, which, as pointed out earlier, is the very condition which must be avoided.

Potentiometer feed is therefore the only satisfactory method, and a suitable circuit is shown in Fig. 2. The two resistances, R1 and R2, comprising the potentiometer must be so proportioned to allow of the voltage on the screen grid being maintained sensibly constant despite the current drawn by this electrode. Fortunately, modern pentode and tetrode valves are designed to take only a small screen current and if the total potentiometer resistance is calculated to pass about three times the current drawn by the screen, all will be well. The values shown in Fig. 2 will be found suitable in the majority of cases and, in a later article, full information will be given on the correct design of this part of a transmitter.

With some modern valves, oscillation tends to continue when the positive voltage on the screen-grid is removed. Therefore, to minimise this effect, the screen must be held down to earth potential by means of R3 when the key is up. A high resistance is desirable to avoid unduly increasing the current drain; a value of 100,000 ohms is suitable.

The by-pass condenser, C1, must not be too large otherwise the charge it holds will enable the valve to continue to oscillate strongly over an appreciable fraction of a second, giving rise to a " tail " on the signal. Its value should not exceed .01 μF., whilst in most cases a capacity of .002 μF. will be found quite large enough to effect efficient by-passing.

Where two pentodes of similar type are in use, a more complete signalling cut-off is obtained if both screens are keyed simultaneously. It will be necessary to alter the values of the potentiometer resistances and the fluctuation of voltage will be greater. In such a case, it is most advisable to employ a separate power pack to feed the screen-grids only.

It may be said, in passing, that it is no great drawback if the oscillator valve (if this is the one being keyed) continues to oscillate with the key up, providing the amplitude of the oscillations is not sufficient to " trigger " the following valve. The fact that the valve and crystal are not compelled to stop and start oscillating suddenly will result in a smoother keying action.

Grid Block Keying

The other method of keying to receive mention here is that known as " grid-blocking," an example of which is illustrated in Fig. 3. On opening the contacts of the key, which is situated between the cathode of the valve and the negative line, the grid assumes a potential negative relative to the anode by an amount equal to the value of the high-tension voltage. This results in the impedance of the valve rising to a practically infinite value and the current flowing is quickly cut off. The reverse takes place when the key is pressed, the overall action being akin to an electronic relay, thereby greatly reducing the spark at the key contacts. This method is applicable to any type of valve, although a separate filament winding must be provided in the case of one directly heated.

The same object may be achieved in a number of other ways, for particulars of which the reader is referred to the *R.S.G.B. Handbook*.

The Key Filter

If interference from C.W. transmission is to be avoided, each separate signal must build up and die away gradually. It is possible to so design a circuit that this action takes place quite slowly, but the signals will then be difficult to read because of the " tail " formed. In addition, the signal will not have sufficient time to build up to its maximum value, before (with the power removed) it commences to die down again. This state of affairs is obviously undesirable and matters have to be arranged to allow the energy in the various circuits comprising a transmitter, to build up rapidly as well as smoothly. This fact has been borne in mind in the preceding paragraphs and we now come to the design of the key filter, which, if it is to be thoroughly effective, has to perform two functions. The first is the final smoothing out of keying surges and the other the removal of the spark, which is liable to occur at the key contacts.

In Fig. 4 is illustrated a condenser-cum-resistance type of filter. This is actually only one part of the complete filter, its duty being mainly to deal with the surges which occur at " break." The value allocated to the resistance R is higher than that usually specified in filters of this kind and calls for explanation.

As indicated, it is assumed that a current of 40 mA. is flowing through the valve being keyed and its associated circuit. With the contacts of the key closed when the power is switched on, condenser C will remain uncharged. When the key is opened, the current flowing will be diverted to the filter circuit and will charge up the condenser. If the filter circuit is designed to accept only the *exact* amount of current previously traversing the key, it will be apparent that since, for the moment, a diversion only of the current will take place, the disturbance in the associated valve circuit will be very small, whilst little or no spark will occur at the key contacts.

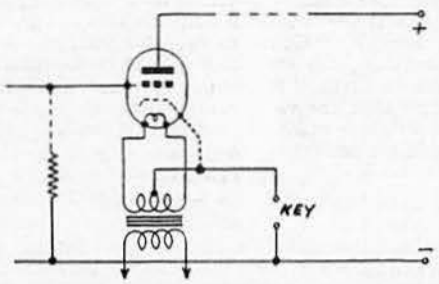


Fig. 3.—Cathode keying results in a high negative potential being applied to the grid, thus cutting off quickly the current flowing through the valve.

The value of R will therefore depend on the value of the applied voltage. In the example shown in Fig. 4, a resistance of 10,000 ohms will pass 40 mA. with 400 volts across it, and this is the correct value to use. To cope with differing conditions it is suggested that R be made variable, 10,000 ohms being a suitable value where currents of 40 mA. or more will be encountered, and a proportionally higher value when the current is less.

On pressing the key, the contacts will necessarily have to carry the sum of the currents flowing through the valve and through the filter circuit (as the condenser discharges). This is another, though not so important, reason why the current flowing in the filter circuit RC should be restricted.

Setting up in practical form the circuit shown will prove these points and will show that the value of resistance usually advocated (often 400 ohms or so) is too low, because it allows too high a current to build up across the condenser at moments of make and break. The reader will be familiar with the fat spark which can be obtained on shorting a condenser which has been just previously connected to a source of high voltage ; it is this effect which occurs in a filter employing too low a value of series resistance.

It must also be remembered that the resistance R has to absorb a certain amount of power—16

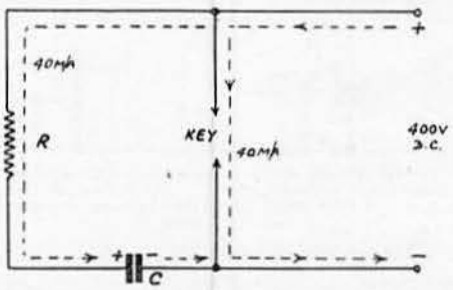


Fig. 4.—Reference to the text will explain the action of the key filter shown above.

watts in the present instance. Admittedly the maximum current flows only for a fraction of a second and is progressively reduced as the condenser charges up, but at the same time the power absorption occurs at both make and break and, if signalling is being carried out at a rapid rate, the total time is quite appreciable. If a fixed resistance is employed, it should be of the wire-wound type and rated to dissipate between 5 and 10 watts. A carbon type, especially if of low dissipation, will quickly succumb to the severe strain imposed upon it. The *Varley* variable resistance type CP63 is to be recommended for duty in this particular circuit, and, although it is rated to pass 42 mA., no harm will result from the application of high momentary overloads of, say, 80 mA.

The application of Ohm's Law will enable the correct value of resistance to be ascertained when the voltage and current handled are of different values to those given in the example. Of course, when grid-block or pentode screen keying systems are employed, the voltages and currents will be small. The correct value of resistance will accordingly be increased, whilst the dissipation will be decreased ; in such cases, a one or two watt fixed resistance of the carbon type will be perfectly satisfactory.

Choice of Condenser Capacity

The capacity of the condenser C in Fig. 4 is not governed by the voltage applied but by the time constant of the circuit as a whole. In this connection it is of interest to work out the time occupied by Morse characters as by so doing a better idea will be gained of the importance of correctly designing the filter.

(*Continued on page* 700)

THE MONTH ON THE AIR

A RUNNING COMMENTARY OF RADIO CONDITIONS FOR THE MONTH OF . . . . . APRIL, 1939

by H. A. M. WHYTE (G6WY.)

BY all accounts, April was a patchy month on 14 Mc.; one could never be quite sure whether DX would be there or not, but when it was—it was! 7 Mc. is still producing some interesting countries, and we wish we could obtain some information on EA9I and EA9RA, both claiming to be in Ifni. Now that the Spanish War is ended there is good reason to suppose that odd EA calls will be heard. Reports on all genuine EAs will be welcomed.

Some news from VU7BR, in Bahrein, is of interest. He is using 25 watts from a receiver power transformer with an HRO receiver and has been very active on 28 Mc. inside the American 'phone band—28,700 kc. He remarks on the fact that frequently the band is dead until he calls CQ, when a reply is usually received from some station who apparently has made a rapid QSY from 14 Mc. He intends to stop on his present frequency as he claims the QRM is less! He asks us to wonder at his location: imagine a camp, about a mile square, with every house having several receivers (about 300 in all) working between 17 and 25 metres. If his key contacts get dirty—woe is he!

G5BD was kind enough to forward details of the outstanding work done by ON4HS on 3.5 Mc. 'phone during the winter. It is a well-known fact that this station appears to stay up all night, but even allowing for this, it is a remarkable achievement to have worked all U.S.A. districts on 3.5 Mc. 'phone. Cards have been received from each of the following to prove his claim:—W1AAH, 2IWU, 3FJU, 4CDG, 5GZA, 6OXQ, 7CEO, 8PUN, 9SLW, VE1GR, 2HL, 3UO. He just struck the right conditions to work W5, 6. VE1GR (with whom he runs a regular schedule) had previously paved the way for this astonishing piece of DX.

We told you that 7 Mc. had produced some odd things—here is what G5CI heard: EA9RA, LX1X, LX1EF, EV1AB, CS2V, HV1J, YV1AD—all on CW. If we can really believe these odd prefixes, HV1J should be in the Vatican City, EV leaves us guessing and, of course, CS2V is that "special experimental station" in Lisbon. We wonder if he got the idea about being an "experimental station" from some G's? Here's another EA. This time, G6YL was informed during a QSO with ST6KR that the latter worked EA8AF on 14,405, who asked that his card should be awaited before QSL-ing. A message was received from SU5KW to the effect that he is now off the air in Egypt, but will use the Palestine call ZC6KW on the same frequency as SU5KW. All cards should either be sent to his permanent Egyptian address or through the usual channels.

2BGN wonders, and so do we. He heard TA5F giving his QRA as "near Istanbul" when working a G. Other DX includes VS7RA, KA1ME, VQ2CM (popular favourites to the 14 Mc. 'phone gang), and PK4KS and VU7BR on CW. G3UP looks like being an unlucky man. When he was a BRS he received a card from U9AL, but now that he has worked him he is wondering whether his luck will hold, but on second thoughts we think it will—U9AL is one of the few U9's to oblige. SM7QD, the s.s. *Monark*, is still active on 7 Mc. G8IL has come to life again; for your guidance, he moved into a large block of modern flats and you can guess it was not easy. He has, however, managed to string up 138 ft. of thin wire, 14 ft. above the roof, and with this he raised CR7AF, OQ5AQ, ZD4AB, VQ8AF, VP2AB, VP5PZ, CR4HT, VE5HR, K7HEU, VU7BR, KA1SP on CW and PY and VS7GJ on 'phone. We can now imagine that G8IL will be receiving letters requesting details of this unusual aerial in consideration of the lower power he uses. While we think of it, CR4HT has actually sent through his first batch of cards.

G8IG, the first G8 to obtain his B.E.R.T.A certificate, was told during a 'phone QSO with YU7AY that considerable danger is caused by British stations, both transmitters and listeners alike, sending reports direct to Jugoslavian amateurs; in fact, one YT was fined about £50 and had all his apparatus confiscated at the end of last year. The only safe way to send cards for YT/YU is via the R.S.G.B. Bureau, as the QSL forwarding address in the current call book is incorrect. As far as European countries are concerned, it appears unnecessary to try and send a card direct—Europe was the home of the QSL bureau system and it really works in all countries, albeit a bit slow at times.

G3JR worked his 100th country in 38 zones just five days before he had been licensed a year. This surely must be a record in amateur radio history, especially as his final is an RK25 at 10 watts, and we happen to know he can't exceed this input. The month of April gave him 13 new countries: VK7LZ, 14,370, 15.50; PK1VM, 28,250, 13.20; VU7BR, 28,700, 15.00; CR7AU, 14,250, 19.50; XZ2AB, 14,310, 18.10; ZS2AL, 28,200, 13.30; HK2BL, 14,400, 02.10; HC1HM, 14,420, 02.30; ST6KR, 14,350, 19.30; PK1LK, 14,220, 16.30; 1VX, 14,350, 16.30; KA1SP, 14,400, 16.00; CE3BF, 14,415, 00.30; CE4AD, 14,430, 02.00; YV5AE, 14,420, 02.15; CE3AJ, 14,395, 02.45; PK4KS, 14,040, 16.00; XE1CM, 14,430, 03.15; ZC6AA, 14,300, 21.00; K6FAZ

14,370, 07.50; PK4FS, 14,340, 18.30; HI6Q, 14,420, 23.00; CX2AJ, 14,415, 01.15; OA4R, 14,415, 03.15 included these 13, and the best worked at G3JR—an amazingly good performance for QRP. Only five more States are required for WAS and WAC/WBE were also obtained on 28 Mc. What a grand radio month!

ST6KR (via G3JR) asks that VE stations shall look for him so that he can qualify for B.E.R.T.A. He hopes to be on 28 Mc. 'phone and CW soon, and will be home on leave next November. G6YL sends her B.E.R.T.A. score, which would appear to give her the certificate—25 Dominion Districts and 18 Colonial Areas, so we await her cards. This has been done with an input never exceeding 10 watts and generally running at 6. Why *do* we use high power!!

G4AJ appears to be the first G4 to work all continents. VK/ZL, ZS5, 6, ZC6RL, PY1, 2, K4, W, VE and Europe have been raised. PY1DH, giving him his sixth continent, on April 7, and VE1DB his W.B.E. on April 13. Are there any G4s who will come forward and refute his claim? PK1TM gave him 579 for a new country. We have not had many reports of the Gatti Expedition to Belgian Congo (OQ5ZZ), but BRS3213, of London, S.E.19, reports he is running a schedule with G6ML on 'phone. Other 'phone DX includes VP3CO, 6MR, 6FO, 6YB, VU2FA (an outstanding QRP signal), VQ2CM (ditto), K6PRZ, PK3WI, 4PF, 4JD, HR5C, CX2CO and other S. Americans.

BERS195, of Northern Australia, agrees that 2AOU has a higher British Empire QSL percentage than he, but that he has heard a greater number of Empire countries, namely, 57, with cards from 49. He remarks that TG9BA has changed his QTH; this is correct, and it is as well to publish it here: W. C. Bay, Chalet McKenney, Calle Montufar, Guatemala City. VS5CA, recently logged by G2YL, has not been heard in VK8, indicating that he is not likely to prove genuine. Eric wonders why Bahrein should receive a VU7 prefix. The reason, as far as we can discover, is that all licences for this island must be issued by the India Office, who are only familiar with VU; we hope, however, that permission will eventually be obtained to change to VS8BR to regularise this anomaly. 7 Mc. produced some interesting DX for "195," as the following list will show: CR6AF (20.30), KD6OPJ (10.30), KA3RA (11.00), VE5AW (who never QSLs) (11.00), VP2AT (21.30), ZE2JC (19.00), ZC6RL (20.00), while 14 Mc. was not lacking with CS2V (Hoogli River, N.W. India), HC1FG (07.00), HK2BL (23.00), K6QHX/KD6 (07.00), VP1DM (23.00), XU2AA (11.00), XU7A (11.10) and ZD4AB (22.00).

2AOU, of Jersey, must, of course, come next! He has now heard 163 genuine countries (i.e., not including doubtfuls) with 79 on 28 Mc. Unusual countries heard include AC4YN (14,300), XU2AW (14,310), HR5C (14,120), VU2AA (14,280), EA7AV (14,290), EA9AH (on 7 Mc.) and II1A: the latter was probably a ship. He sportingly congratulates BERS195 on his score in B.E.R.U. receiving contest.

And now some news from U.S.A. W2IXY represents the 'phone fraternity with information to the effect that VP6FO has a new rotary beam which is carving holes in the band; TG9BA is going to New York for several weeks, while a visit was received from SM5YU. VP3LF is the new call of VP3AA (ex-VP3BG) and ZX4M is the call of a ship bound for N.Y. Dorothy would be pleased to arrange contacts for any station with VP7NS, VP6FO and PK4KS, with whom she runs regular schedules; the QTH of PK4NS is on Banka Island. W2IXY'S record must surely be unique—83 countries verified for two-way 'phone, with five more owing. W9TJ, in Missouri, is maintaining a regular schedule with KD6QHX, Hal Reid, c/o Pan-American Airways, Midway Island, via Honolulu, Hawaii. J8PG, on 14,250, is located in the Territory of Darien, which is attached to Manchukuo, projecting into the Yellow Sea, and counts as a separate country.

G8II worked "YA2AB" and requires details—who wouldn't? G3PS called "Test" on 14 Mc. 'phone and was astonished to receive a CW reply from EA9RA, who claimed to be a German operating in Ifni, and then requested a QSL via the R.S.G.B. (The R.S.G.B. knows nothing of this station, so hold your cards.) Recent contacts on 'phone from G3PS include K4FAY, W5ASG and VU2LL. In reply to a recent query, G2AX kindly forwards a card from VE5LD which has a map of the NWT with the exact QTH of this Arctic station marked thereon. The hamlet is known as Gjöa Haven in King William I., and cards take about 18 months to arrive. Incidentally, G2AX believes that his contact was the first with this station on February 17, 1937.

G2YL informs us that ON4AU, while recovering from 'flu and jaundice, managed to work 14 new countries, including AC4YN. This will soon bring him out on top of the DX Century Club by a good margin, we should imagine. Besides this activity, ON4AU worked LU1EP on 3.5 Mc. early in April, thereby giving them 4BTOC. G2YL records a contact with OQ5HR, the s.s. *Kindu*, which is a hydrographic ship sailing on the River Congo in mid-jungle. He QSLs too, and the operator is ex-ON4HR, but you can send cards either to the captain of the ship at the Port of Kindu, Belgian Congo, or via the R.S.G.B.

BRS3319, of Thurnby, Leics., sends a very comprehensive log and asks if EA9RA is someone trying to be funny. If he is not genuine, we should scarcely describe such an action as "funny" but rather pathetic; he remarks on the outstanding signals from VU2FA, PK3WI and ZS5Q during the month, and VP1AH appears to be a newcomer from British Honduras. SU5BO, YV5ABF, 5AK, CX2CO, CE3AT, HH2B, HI3N, VQ4ECJ were among his best 'phone catches.

G3AH reports terrible conditions during April. Even so, he worked XU8ZX (14,370, T8, 15.16), a U.S.A. warship stationed at Swatow, China. His card was later received with the request that all QSLs should be sent via W6ATP. Other DX worked includes J5CC (14,300, 15.45), CX2AJ (14,420, 22.40), PK1WA (14,320, 16.05), VQ2MI (14,330, 19.40) and TA3CC giving Ankara as his QTH—shades of TA1CC? A card from CT3AB informed G3AH that it was not he who made this contact, therefore it would appear that another "funny" man has been at work.

Finally, it will be of interest to CW operators to hear of Mr. Arthur Sheard, of Adelaide, South Australia. From a cutting sent by BERS195 we read: "On August 5, 1938, in the course of ordinary business, Mr. J. W. Jones, telegraphist,

transmitted in morse code 110 words in plain language (108 five-letter words) in 1 minute 58½ seconds, severe contractions being used throughout. The performance was timed and verified. Mr. Sheard *penned* this copy and, with the exception of the word "government," *did not use any contraction*; all capital letters were used correctly and the matter set out fluently on four slips used for the copy." This represents about 53 w.p.m. with a pen, but is in reality faster owing to absence of contractions in the final copy.

"Up and Down the Ham Bands"

As from the July issue, Mr. A. O. Milne, G2MI, 29, Kechill Gardens, Hayes, Bromley, Kent, (Hurstway 1877), will take charge of our popular monthly feature dealing with DX conditions.

The title of the article will be changed to "Up and Down the Ham Bands" and it is requested that members at home and abroad shall forward all information of interest direct to Mr. Milne as from June 1st next. News for the June issue should of course be sent to Mr. Whyte, to reach him by May 27th.

We shall continue to give members the latest news of DX conditions and other items of general amateur interest.

THE 28 Mc. BAND

By NELLY CORRY (G2YL).

DURING the past three years conditions in April have been fairly good at the beginning of the month, and have gradually deteriorated so that by May 1 the band appeared to be more often "dead" than "alive." This year the month started with the latter type of conditions, and they were maintained with surprising consistency. But there is no doubt that it pays, even under present conditions, to keep a regular watch on the band, as there are occasional days when things look up, and DX QSOs can be effected free from the usual winter QRM.

PK1VM and PK2WL were the sole representatives of Oceania reported during the month, and it rather looks as though VK/G QSOs will be difficult during the next few years. PA0FB worked PK2WL twelve times during the period April 1-15.

In Asia VU2AN, VU2FO, and VU2FS found the band extremely erratic, with European contacts few and far between. VU2FO reported that on April 16 conditions were worse than on any Sunday in the previous three months, as he heard nothing from 0800 to 1330 G.M.T., and only worked OH7NF and heard XZ2EA in the next half-hour. On the following Sunday the only signal heard from 0800 to 1300 G.M.T. was FB8AA. VU7BR (Bahrein Island) was active daily from 1300 G.M.T. and had 79 QSOs in 18 days, in spite of thunder and sand storms. He worked 17 different G stations up to April 19, and his most regular contacts were with F8CT (10), G2YB (8), G4BL alias VU2AU (6), FA3JY (6), G6DH (5), G6YL (5), and VU2AN (5). The remaining QSOs were with FB8AA, ZS4AA, CT1, D, EI, F, G, HA, I, OH, ON, and SP.

The majority of African signals logged were using 'phone, but CN8MQ, FB8AA, VQ3HJP, VQ3TOM and ZE1JG were heard on c.w. Egyptian 'phone signals were among the loudest on the band from any country, and 16 different ZS stations were heard active, usually peaking around 1600 G.M.T., and often audible when the band seemed dead in all other directions.

About 20 South American stations were logged during the month, at various times of day, but particularly in the evenings. Unusual calls were CE1AH, CX1FB, and HC1PZ heard by 2AOU, HK1BM and HK3JO heard by BRS3179, and HK3CL heard by G8JQ. Others active included VP3AA, VP3LF, five LUs, and six PYs. Stations in Central America and the West Indies were heard more consistently than North or South Americans, and a list of calls reported from this region includes 17 stations in CM, HI, HP, K4, TG, TI, VP1, VP6, VP9, and XE. BRS3179 logged HP1A and BRS3003 heard W9BHP, s.s. *Steelmaker*, in the Caribbean Sea on April 14.

Ws in Districts 1, 2, 3, 4, 5, 8, and 9 came through on about 10 days, but no West Coast stations were heard by any of the British amateurs who reported this month. Europeans were rarely heard, but G6YL logged a few weak signals from D, EI, F, HB, OH, ON, and PA, and stronger ones from CT1 and SP.

Judging by conditions, magnetic disturbances must have occurred fairly frequently during the month, and the Hissing Phenomenon was reported by G6DH on April 5, by G6YL on April 7, and 20, and by VU7BR, BRS3179 and G2YL on April 17.

Reports from G2XC, 5MV, 6YL, 8JQ, 2AOU, BRS3003, 3179, PA0FB, VU2FO, and VU7BR are acknowledged with thanks.

Summer Tests on 28 Mc.

The 1938 Summer Tests proved that communication with North and South America was possible on many occasions during the supposedly "dead" summer months. They also indicated that there is a regular cycle of about 27 days between maximum periods of optimum propagation conditions.

The tests will be continued this year from May 1 to September 17, when C. W. and telephony transmissions will be made daily by British stations at the following times:

Sunday: 1000, 1200, 1400, 1600, 1800, 2200.
Monday: 1230, 1330, 1500, 1800.
Tuesday: As Monday, also 2000.
Wednesday: 1330, 1830.
Thursday: As Monday, also 2200.
Friday: As Monday, also 2000.
Saturday: 1400, 1600, 1800, 2000.
Times are G.M.T.; add one hour for B.S.T.

Transmissions will consist of a 3-minutes' test call, 3 minutes listening, 3 minutes' test call, 3 minutes' listening.

Reception reports giving exact time, R.S.T., type and degree of fading, weather, phase distortion, etc., will be welcomed, and should be sent at the

end of each month to L. F. Coursey, Christ Church Vicarage, Cheltenham, Gloucestershire. British reports to G stations should be sent to the Amateur concerned.

It is unfortunate that G6BW, GM6RG and G6VK, who carried out the 1938 tests, are unable to devote full time to them this year. But the following other stations have notified their intention of participating: G2MQ, G5BM, G5ZT, G6KS, GI6TK, G8JQ and G8UB. A number of overseas stations will also take part, including: ON4XX, PK2WL, W3GSV, W4FBI, W6NLS, W7BJS, W8BTO, W9UUR, K4EZR and K4FKC.

The 1939 "GW 56 Mc. Trophy" Contest

The rules for the privately arranged "GW 56 Mc. Trophy" Contest, which will take place during the week-end of July 29-30, are given below. A slight alteration has been made to Rule 4 to clear up any difficulty which may have existed in working out scores. Suggestions have been made that a break should occur during the night hours but, as others maintain that those who wish to make contacts during darkness should be given the opportunity to do so, the operating hours will remain as in previous years.

No restriction has been made with regard to the type of transmission which may be employed, this being left to the discretion of the individual. Many requests have been received to limit the contest to C.W. operation and this will, in all probability, be a condition added to the rules in the next contest. To conform with licence regulations, some form of frequency stabilisation must be employed and this fact, which is not always clear, should be borne in mind by intending entrants. C.W. transmission should be used as much as possible and, when operating on telephony, the call-sign in Morse should be given at frequent intervals.

The rules governing the event are as follows:—

1. The contest will run continuously from 1900 B.S.T., July 29 to 1900 B.S.T., July 30, 1939.
2. Only fully paid-up members of the R.S.G.B. are eligible and licence conditions must be strictly adhered to.
3. Logs should give all relative information and should be accompanied by a report of the apparatus and aerial systems used. R3, S3 is the minimum report acceptable.
4. Points will be allocated on the following scale:—

A. Under 10 miles	1
B. Over 10 but not exceeding 15 miles	2
C. Over 15 but not exceeding 20 miles	3
D. Over 20 but not exceeding 30 miles	5
E. Over 30 but not exceeding 40 miles	8
F. Over 40 but not exceeding 50 miles	12
G. Over 50 but not exceeding 75 miles	20
H. Over 75 but not exceeding 100 miles	35

and five extra points for every 10 miles (or fraction thereof) in excess of 100.

Completed entries should be posted in time to reach Mr. J. N. Walker (G5JU), 4, Frenchay Road, Downend, Bristol, by August 12.

The 56 Mc. BAND

By J. M. R. Sutton (GW2NG)

ALREADY there are signs that this summer season will be an active one for users of the 56 Mc. band. Stations have reported that they are, or will be, operating during the expected period of "Summer DX." Several reports of contacts in excess of 100 miles have also been made and the band already appears livelier in the month of April than it has been since the beginning of the year. 28 Mc. appears to be fading out, although this information has been culled from a regular user of the band and not from personal observation. If this is true we hope that confirmed adherents of this band will consider another frequency doubling stage, a straight receiver, and migrate to 56 Mc.!

British Reports

Welcome news of a request for 56 Mc. schedules comes from G5ZT in Preston, Lancs. He suggests that contact be first made on 1.7 Mc. and then each station QSY to 56 Mc. 5ZT will then transmit on 56 Mc. while listening for a report on 1.7 Mc. The listening station will report the reception or otherwise of 5ZT's 56 Mc. signals *via* his 1.7 Mc. transmission. The procedure can then be reversed. He finds that this system is working splendidly locally, and he is so keen on it that he has two complete transmitters and receivers going at the same time. He transmits on 1.7 Mc., on 'phone, with a 1.7 Mc. aerial and also on 56 Mc., on 'phone, with a 56 Mc. aerial, speaking into two separate microphones. He requests stations hearing the 1.7 Mc. transmission to listen on 56 Mc. and to report reception on 1.7 Mc. first.

The equipment at his station consists of a 14 Mc. 42 CO followed by two RK 25 frequency doubling stages and an RK 35 PA. The input is 50 watts and CW, ICW or 'phone can be used as required. The frequencies are 57,000 kc. with 50 watts input and 56,020 kc. with 25 watts input. The aerial is a *Johnson* 56 Mc. rotatable horizontal "Q," 55 ft. high. Various straight and superhet receivers are in use.

The best QSO yet has been with G6TL, Stalybridge, Manchester, and reports have been received from Blackburn, Blackpool, Fleetwood, Morecambe and Ashton-under-Lyne. He transmits nightly at 23.30 BST on 56,020 kc. 'phone and listens on 1.7 and 56 Mc. for replies. Please arrange schedules with 5ZT who will welcome them heartily. The QRA is H. Jones, G5ZT, 69, Ribbleton Avenue, Preston.

G6QZ reports after an interval and is still the only 56 Mc. station in District 9. However, 5IX is now going on A.C. mains in his country QRA and hopes to be active very soon. Although regular schedules have been kept with 6DH the first contact of the year did not take place until February 8. The next was on March 21, and others have taken place on March 31, April 11 and 14. Regular schedules are now being maintained every Tuesday and Friday, at 21.45 BST. 6QZ was in QSO with 5BY on April 7 (105 miles) and reports of 449 were exchanged. 5BY has not been heard again although regular schedules are being kept on Tuesdays and Fridays at 22.00 BST.

The TRF-v-1 receiver is still in use although work has commenced on a superhet with acorn

frequency-changer and an IF of 3 Mc. Great things are hoped for from this circuit. The final amplifier is still the T 20, running at 25 watts input, but is now driven by a 14 Mc. 6L6 Tri-tet followed by a 6L6 doubler stage. The aerial is an *W8JK* two section, four element, horizontal and rotatable and performs very well. Everything is ready for the "Summer DX."

G2ZV comments that although few stations have been active things are now beginning to liven up. He has maintained his thrice-weekly QSO's with G2OD. Signals have never been below S6 'phone either way, at a distance of 45 miles. Here are brief extracts from his log. In contact with SU1SG on 28 Mc. on March 4 he learnt that this station will be on 56 Mc. with 250 watts by April 15. On April 7 conditions were very good on 28 and 56 Mc. and he was in contact with VU, ZS, FB8. In the evening he heard 5BY for the first time for months, although 5BY has been active nearly every evening. 5BY was 579 and was calling 6QZ. On April 8 a QSO was commenced with 5BY, at 22.15, but he faded out completely at 22.40. This semi-contact was heard by 6DH and a schedule was arranged, but this has not been successful so far.

On April 12 the three-element rotary beam was taken down and replaced by a four-element one. 6DH was heard calling at 339 at 22.50, but faded completely in 20 seconds. However, at 23.30 2ZV was in contact with 8OS, a Q5 S8 report being exchanged. G5TX, Newport, Isle of Wight, made his appearance for the first time at 23.25 on April 13, at 588. 2ZV received a report of 589 in return. 5TX, who is near to 60 Mc., uses 6J5 CO, RK 39 FD-PA and an aerial 100 ft. high. Several more contacts have taken place with 5TX, and also one with 5MA who put out Q5 R6 'phone. The four-element rotary beam is working very well and 2ZV observes that the semi-DX contacts took place during the sudden hot spell. This usually occurs when 100-200 mile contacts are obtained.

2ADZ reports quite exciting conditions on the band. These have coincided with the "heat-wave" and the consequent rapid changes of temperature. Before the rise in temperature 6DH was heard on April 2 at 559 with QSB to zero. The warm weather commenced on April 8 and that day produced 6DH (72 miles), 2ZV (40 miles) and 6CW (120 miles). The latter station was 559, peaking to 579, with a very "watery" note. Conditions held up on April 9 and 2ZV (579) and 8JV (120 miles, 559) were heard. Unfortunately 2ADZ was away on April 10 to 12 when the record temperature of over 75 degrees F. was recorded. By April 13 the temperature had dropped to 65 degrees and 6CW (120 miles, 549) and 8KD (160 miles, 4/5 59) were the *only* stations to be heard.

No DX signals were heard on April 14, but harmonics of 14 Mc. signals were frequent. Conditions dropped to normal on April 15, 16 and 17, but improved again on April 18, when another minor heat wave began. 5TX (63 miles, if portable in the I.O.W.) and 2ZV were heard. April 19 gave 6DH and 6FO (118 miles). The weather continued warm and there was a "DX-flutter" on signals on April 20. On April 21 signals were heard from G5UK (50 miles), 2ZV, 2UJ and 6DH.

2ADZ adds some useful comments on other stations. The band appeared wide open on April 7 for, on that day, 6CW worked 5OX (West Wickham, Kent) and heard 5MQ (100 miles) at 569. At 22.00 G.M.T. on the same day 8JV worked 5MQ, over the Pennines, the QRB being 80 miles. He also thinks that 5BY worked 6FO on April 18 and 19. It certainly appears that there is something in the theory of 2ADZ!

G8LY is hoping to be portable over weekends (Sunday afternoons mainly), on 58,828 kc, CC CW. Reports from anywhere will be welcome and she hopes CW activity will be maintained by all users of the band.

2BIL welcomed the warm weather, as it enabled him to operate from his portable site on the Devil's Dyke, near Brighton. He was there from April 7 to 10 and on April 16 and 23. On April 7 G300 was heard on 'phone and ICW. Due to the lack of activity it was difficult to estimate conditions, but the reception of 300 pointed to conditions being good. Aeroplane static was very bad on all days. No stations were heard on April 8, but G5TZ (I.O.W., 47 miles) was heard at S7/8 on April 9. The large number of holiday-makers present over the holidays made necessary a move to the west side of the Dyke, which is overgrown with small shrubs and poor for 56 Mc. reception. The consequent lack of signals was not unexpected. Bad weather on April 16 and 23 curtailed operation. An interesting point from the receiver description is that the use of an 8-turn reaction coil permits the direct-coupling to the grid of a 135 ft. aerial and a definite gain of three S-points results. The detector valve, *Hivac* D210SW, is choke-coupled to the LF stage and voltage-controlled reaction is used.

Further news of 56 Mc. activity outside the British Isles appears below. Activity on the Continent is the British chance for Summer-DX. See to that transmitter and straight receiver—before it is too late!

Opportunities for 56 Mc. DX

The following news of 56 Mc. activity at DX distances has been received at GW2NG, *via* G2YL:

OH5OD, 7ND, 2NB and 7NF are carrying out tests on 56 Mc. nearly every day, but particularly on Sundays from 10.00 to 11.30 G.M.T. 2NB is using 50 watts CW to a vertical beam with one director and one reflector.

ON4AU reports to 2YL that J3FJ is transmitting regularly on 56 Mc. CW at 01.00, 09.00, 13.00 and 21.00 G.M.T., using a pair of 100 TH's in the final. J2KJ is operating with the same type of final amplifier. VE5AAD is also active and VU2AN is stirring up 56 Mc. activity in India. He and VU2DR are already equipped for the band.

56 Mc. Activities

Whilst members desirous of carrying out co-operative portable tests on 56 Mc. are catered for during the summer by two major events, nothing has so far been arranged for the special benefit of those whose main interest lies in operating from their homes with crystal-controlled transmitters. Last year G2WS ran a relay test which was well supported, but it is understood that he will not be in a position to organise a similar event this year.

Will those who would give their support to another relay test please advise G5JU immediately? If arranged it is intended to restrict entrants to the use of C.W. exclusively and to bring in as many

fixed stations as possible, although co-operation from suitably equipped portable stations would be very welcome.

Possibly an event savouring of both relay and contest would meet with general approval. If interested members will indicate their wishes, something to suit the majority will be arranged to follow after the events already scheduled, probably during September.

1938 VK/ZL DX Contest

From Mr. Ryan, VK2TI, we have received a detailed report of the above contest, which took place last October. Unfortunately space limitations prevent us reproducing the account in full, but we shall be glad to forward it for perusal to any member who may be interested.

In the Senior Section the leading British Isles entrant was Mr. Garnett, G6XL, with a score of 4,565 points, whilst G6WY (3240), G6JV (2368), and G2LB (2070) occupied 2nd, 3rd and 4th positions. Mr. Garnett's score was the highest returned from Europe, beating the leading German (D4AFF) by 440 points.

In the Junior Section G6XL was again the leading British Isles station with a score of 3,340. He was followed by G2LB (2304), G2XC (1576), G2NN (1246) and G8UD (1043). In the Receiving Section Mr. Bourke (2AOU) was first amongst British Isles entrants with a score of 7,590, followed by BRS1173 (6470) and 2AOL (5930). Mr. Bourke was the leading receiving entrant outside Australia.

The winner of the trophy presented to overseas competitors was won by VR4BA with a score of 8,656, G6XL occupying second place.

We have been asked by the organisers of the contest to thank all members who competed.

F.O.C. Notes

By R. WEBSTER (G5BW).

With more stations on the air than ever, and another N.F.D. in the offing, perhaps a few suggestions regarding contest operating may not be out of place. One of the chief objects to be achieved is the reduction of interference caused by (*a*) unnecessary calling, and (*b*) stations " bunching " in particular sections of a band. Unnecessary calling can be reduced if field stations will, during each Test call, indicate from which end they intend to search the band. In view of the fact that we may expect a great deal of activity during the contest, it is unlikely that field stations will have to search a complete band before getting an answer to their calls, and such being the case, it might be better to use QLM instead of QLH, and QHM instead of QHL. However, whether they use QLM/QLH or QHM/QHL, it is probable that home stations working in the middle of a band would make less contacts than stations at either end. This state of affairs could be improved if field stations used QMM (I am searching for calls round the centre of the band) at frequent intervals. Full use of any band and equal opportunities for all home stations (irrespective of frequency) could be achieved if the field stations used QLM, QHM, and QMM alternately throughout the contest. Towards the end of last N.F.D., two or three home stations on the extreme L.F. end of 7 Mc. practically had a monopoly of QSOs solely due to the fact that nearly all N.F.D. stations were searching from the L.F. end almost exclusively.

Generally speaking, N.F.D. QSOs are very brief affairs, and the liberal use of QRZ ? may be advantageous, instead of embarking on a complete Test call every time. It is really a matter for the operator's discretion, as we assume that in any case Test calls will be quite brief (certainly on the L.F. bands).

Field Day is definitely an occasion when BK-in operation can be most useful, and we hope to see more stations using the system this year. In the past, however, a certain amount of confusion has been caused by stations using the signal BK when they are merely employing a rapid change-over system. BK-in operation signifies the ability to hear the distant station through your own sending whenever your key comes up, and permits the distant station to stop you immediately at any time by merely sending a few dots. The system is an invaluable time-saver, particularly when interference makes its appearance on the transmitting station's frequency during a QSO.

One final suggestion to all taking part in the contest: To save misunderstandings and avoid repetitions with their attendant waste of time, don't send faster than you can receive !

We should like to answer the points raised by G5GH in his recent letter. Firstly, the use of K *after* AR is correct—see the latest P.O. Handbook, Part 5, Para. 83. Secondly, the interpretation of QRT in the case referred to is surely obvious from the context, but to remove the slightest possibility of misunderstanding, we suggest the substitution of CL for QRT. Thirdly, when we made our reference to " long QSOs," what we had in mind was more particularly Para. 5 of the G.P.O. licence conditions.

An error occurs in the final sentence of the last paragraph of the April notes. The sentence should read : " GM3UM's suggestion is that stations should interpose QLH *or QHL* at frequent intervals, etc."

G6YR and GW6AA have been elected during the month, and the total membership is now 63.

Please address correspondence to Radio G5BW, Willingdon, Eastbourne.

War Office Announcement

The War Office advises us that Tele-communication Assistants are required for radio work at Army stations in Great Britain. The pay is 95s. a week, rising by annual increments of 2s. 6d. a week, for approved service, to 102s. 6d. a week.

Candidates should preferably be under 45, and must possess sound, practical and theoretical knowledge of commercial short-wave transmitters and receivers, and should hold the Final (Grade III) Certificate of the City and Guilds of London Institute Examination in Radio Communication or an equivalent qualification. A thorough knowledge and practical workshop experience of testing, servicing and the repair of short-wave transmitters and receivers is essential.

Suitable candidates may be given a short theoretical and practical test. Those selected will undergo a course of instruction, and will be required to enlist in the Territorial Army (with rank of Staff-Sergeant).

Preference will be given to ex-Service men, other things being equal.

Application forms are obtainable by post-card from the Under-Secretary of State (C.5), The War Office, London, S.W.1. Quote Appts. No. 134.

Contemporary Literature

By L. FRYER (GM2FR)

CRYSTAL OSCILLATOR CIRCUITS FOR EXPERIMENTERS. *Television and Short Wave World*. April, 1939.

In this, the first instalment of a two-part article furnished by the *Bliley Electric Co.* of America to their British distributor G5NI, the fundamentals of crystal oscillators are discussed in general, and then classified according to the type of valve used and discussed in more detail. The article is illustrated by circuit diagrams.

* * *

SAFETY TECHNIQUE IN TRANSMITTER OPERATION AND CONSTRUCTION. George Grammer (W1DF). QST. March, 1939.

An article of great interest to all amateurs, it introduces the A.R.R.L. safety codes, one covering the precautions that should be taken when working about transmitters, the other dealing with methods of making the transmitter itself safer in ordinary operation.

* * *

FREQUENCY MEASUREMENT AND REGULAR CHECK. A. K. Robinson (W7DX). QST. March, 1939.

A description of a frequency meter incorporating an idea which provides crystal-generated check points and compensation for temperature and voltage variations. A feature is that any good quality amateur band crystal can be used, no special frequency is necessary and the crystal is still available for use in the transmitter.

Provision is made for monitoring as well as direct frequency checking.

* * *

A PORTABLE STATION FOR A.C. OR BATTERY OPERATION. Harley E. Steiner (W7DTJ). *QST*. March, 1939.

This article describes a compact unit with a crystal-controlled C.W. or telephony transmitter and a super-het receiver built on a 7 by 13½ inch aluminium chassis with a 7 by 14 inch dural panel.

The outfit, exclusive of power supply, is housed in a hardwood cabinet measuring 11 by 15 by 8 inches outside, sufficient room being available to house the aerial equipment, power cable, one spare set of coils and a log book and pencil in the lid of the cabinet. The outfit works equally well on 1.7, 7 and 14 Mc., and has a power input of 18 watts.

* * *

POOR MAN'S ROTARY BEAM. F. G. Southworth (W5EOW). *QST*. March, 1939.

The author of this article has certainly solved the problem of the cheap rotary beam aerial, describing a very simple aerial of the "8JK" type, rotatable through 180 degrees, and costing complete about twelve shillings.

* * *

A 15-WATT CRYSTAL CONTROLLED FIVE METRE 'PHONE. Glen H. Pickett (W2IDV). *QST*. March, 1939.

A fine crystal-controlled five metre transmitter is described in this article. The R.F. section comprises a type 89 valve used as oscillator with provision for use either crystal-controlled or self-excited, and a single amplifier stage using a type HY-61, and is capable of putting 15 to 18 watts into the aerial on one given frequency using a ten metre crystal.

The audio section uses a 6F5, 6C5, 6C5 and a pair of class AB 6L6's as modulators. The common power supply giving 400 volts at 250 mA, and two L.T. supplies of 6.3 volts at 3 amperes uses a type 83 rectifier.

* * *

AN 813 BANDSWITCHING TRANSMITTER. Leigh Norton (W6CEM). *Radio*. April, 1939.

A description of a transmitter using a 6F6 crystal oscillator, 6L6 doubler-quadrupler (for 14 and 28 Mc. operation) and an 813 final amplifier providing an output of from 175 to 250 watts on the 28, 14, 7 and 3.5 Mc. bands.

* * *

HIGH EFFICIENCY FREQUENCY DOUBLING. Frank C. Jones (W6AJF). *Radio*. April, 1939.

This article, written for the purpose of clarifying the operation of standard frequency doubling circuits also presents a new circuit which has many advantages. Using the new circuit which provides a means of adding some third harmonic to the fundamental in the proper phase relation, a 6L6 driver and an 809 doubler showed in tests an increase in power output of 10 per cent. and a decrease of D.C. plate current of 10 per cent. in the 809 stage, representing an increase of nearly 25 per cent. in output for a given input.

* * *

A COMPACT ALL-BAND PORTABLE TRANSMITTER. Donald G. Reed (W6LCL). *Radio*. April, 1939.

The author describes a portable transmitter covering all bands from 56 to 1.7 Mc. with good quality 'phone. The layout used is 6A6 crystal oscillator and buffer-doubler driving a T21 in the final, with another 6A6 speech amplifier driving a T21 modulator and a 5Z3 rectifier in the power supply.

The total weight is 28 pounds and the power output between 25 and 30 watts. Full building details, including data for a metal cabinet, are given in this well illustrated article.

* * *

RECEIVING PULSES FROM THE IONOSPHERE. Albert W. Friend (W8DSJ-W8KIU). *Radio*. April, 1939.

In this particularly well illustrated concluding instalment of his article on the making of ionosphere soundings the author describes how to receive the transmitted pulses and interpret them, thus enabling one to make measurements of the ionosphere height, determine critical frequency and thereby obtain much interesting information enabling one to predict conditions on the high frequency bands.

* * *

A C.W.-PHONE MONITOR AND FREQUENCY METER. Kenneth L. Kime (W6KSX). *Radio*. April, 1939.

The author describes a combination monitor and frequency meter which monitors both 'phone and C.W. signals with sufficient volume to drive a small magnetic speaker. Many of the parts used can be obtained from an old broadcast receiver, making the cost of the instrument surprisingly low. The valves used are two 56's and a 24A.

HEADQUARTERS CALLING

The Amateur Radio Handbook

Members are advised that supplies of the first edition of our Handbook are now exhausted.

No decision has yet been reached in regard to the second edition, but it is anticipated that this will appear next year.

W.B.E. and B.E.R.T.A. Claims

During the past month Headquarters have received several W.B.E. and B.E.R.T.A. claims from members, without a power guarantee being given. Unavoidable delays in dealing with claims will occur unless members adhere to the rule which clearly states that a member must give a guarantee that his licensed power has not been exceeded in making the contacts upon which his claim is based.

* * *

Council has ruled that cards confirming contacts made with N.F.D. stations cannot be allowed to count for B.E.R.T.A. and W.B.E. claims.

W.A.C. Claims

Home members are reminded that W.A.C. certificates can only be issued after approval by R.S.G.B. Headquarters. Cards should be sent by registered post, and stamps enclosed for their return. After approval, I.A.R.U. Headquarters are notified, and the certificate is issued direct from their offices at Hartford, U.S.A. A period of six to seven weeks usually elapses between the date of approval and receipt of the certificate.

Compulsory Military Service

Members affected by the recently introduced Compulsory Military Service Bill are asked to note that possession of a G.P.O. amateur transmitting licence will not in itself exempt them from training.

We do, however, strongly recommend that such members should mention their technical qualifications to the appropriate authority when called upon to report for service.

High Power Permits

We have been informed officially by the G.P.O. that for the time being it is probable that no applications for the use of power in excess of 50 watts will be successful. British amateurs already licensed to use power in excess of 50 watts will not be affected by this decision, and provided technical reasons are submitted permission will, as hitherto, be granted for the use of input powers up to 50 watts.

R.S.G.B. members will continue to be recommended for 25 watt permits if applied for *via* the Society.

Whilst Tension Exists

During these troubled times we would urge all members to refrain from unduly worrying either the G.P.O. or Headquarters on matters affecting licence conditions.

The Council is fully aware that delays are likely to occur in connection with the issuing of new licences and extended facilities, but they urge that patience be exercised until the international outlook improves.

Several important decisions affecting existing licences are awaited from the G.P.O., including rulings covering operation in the 3.5 Mc. and 7 Mc. bands after September 1 next.

Efforts are being made by the Society to obtain authority for experiments to be conducted in the 234-240 Mc. band and a clearer understanding is being sought regarding 56-60 Mc. operation.

These and many other similar matters are engaging the careful attention of Council, but until the tension relaxes we doubt whether decisions can be obtained.

CONVENTION DATES

SEPTEMBER 21-22-23, 1939

BOOK THEM NOW

R.E.P. Contest

We are advised by the Rede dos Emissores Portugueses (R.E.P.) that their Fourth Annual International Telegraphy Contest will take place during the first three week-ends in June, commencing at 0001 G.M.T. on Saturdays, and concluding at 2400 G.M.T. each Sunday.

Only one contact per band is permitted with a specific station, and operation is confined to 3.5, 7, 14 and 28 Mc.

Each CT station will transmit a control group of six figures, the first three figures representing the RST, and the other three a self-assigned serial number.

Cards confirming QSO's with CT amateurs should show the serial number received, date and time, and all such cards must reach R.E.P. by September 30, 1939.

Certificates will be awarded to the foreign amateur in each country working the greatest number of CT1, 2 and 3 stations.

QSL cards referring to each contact are indispensable for classification.

The address of R.E.P. is Rua Das Chagas 35, Lisboa, Portugal.

Swiss Portables

Mr. Stuber (HB9T) informs us that the U.S.K.A. will again participate in N.F.D. A complete list of call signs is not yet available, but this will appear in the next General Circular to D.R.s and T.R.s if it reaches Headquarters in time. It is known, however, that the following will be active :

HB1C	...	Berne
HB1L	...	Schaffhausen
HB1CE	...	Zurich
HB1BJ	...	Basel
HB1BS	...	Basel

These and some 15 other HB portable stations will work on all bands except 1.7 Mc.

Norwegian Portables

We understand that several Norwegian portable stations will operate during N.F.D. They will use the prefix LB and activity will be confined to 7 and 14 Mc.

District 4 Representation

The Council has been pleased to appoint Mr. L. Ridgway (G2RI), 90, Romway Road, Leicester, as their representative for District 4, in succession to Mr. W. A. Scarr (G2WS), who is now resident in London.

Mr. Ridgway has been a member since 1934, during which time he has taken a very great interest in local R.S.G.B. activities. Mrs. Ridgway shares her husband's enthusiasm, having held the call 2BLR for some years.

We feel confident that under the guidance of its new D.R. our East Midlands District will continue to make good progress.

Stray

Lieut. J. R. Farr, ex-BERS456, now VU2JG, is experimenting with aerials directed towards Great Britain. His QRA is : 1st Battalion, The Devonshire Regiment, Connaught Barracks, Rawalpindi, Punjab, India, and all reports sent direct or *via* R.S.G.B. will be acknowledged.

Visit of W9BNX and W9SLG

Mr. E. H. " Bill " Conklin (W9BNX, ex W9FM), Associate Editor of *Radio*, and his wife (W9SLG) sailed from New York on April 20, and are due to arrive in England around May 16-18.

Mr. Conklin desires to see as many amateurs as possible, particularly those who are interested in 28 and 56 Mc. He wishes to write a story of the trip for *Radio*, but suggests that amateurs send direct, to his home, pictures of themselves and their station. This is to avoid the possibility of his own photographs getting lost or damaged on the trip. Glossy prints are preferred.

Amateurs wishing to meet W9BNX should address a letter to him *via* R.S.G.B., or write to GW2NG for a detailed itinerary, sending a stamped addressed envelope.

G5RA-VS7RA

Mr. Walker-Alexander advises us that his British call sign, G5RA, is being persistently pirated. We would draw the attention of members to the fact that Mr. Alexander is now in Ceylon, and that calls made under G5RA are illegal.

Stray

Mr. A. N. Braude (VS6AL), who will shortly be operating with a beam directed on London, is anxious to work British stations. He will use an input of 14 watts 'phone, and c.w. on 14,164 kc., but an E.C.O. will also be available. The above information reaches us *via* 2DZZ.

JOHN STADLER (VE2AP)

It is with very deep regret we have to record the death in a flying accident on March 5, of John Stadler (VE2AP).

Mr. Stadler, who was 32 years of age, was one of Canada's leading amateurs, and during 1937 (after the Bucharest C.C.I.R. meeting, at which he represented I.A.R.U.) the Council of the R.S.G.B. had the pleasure of entertaining him in London in company with Mr. James Lamb, of the A.R.R.L.

Mr. Stadler joined the Canadian Broadcasting Company when it was first formed, and within a short time was appointed manager of the two Montreal stations. At the time of his death he was executive assistant to the assistant general manager of the C.B.C.

He was founder and past-president of the Westmount Radio Club, and a past-president of the Montreal Amateur Radio Club. His station was one of the best known in Eastern Canada, and many British Isles amateurs were indebted to him in the early days for their first contact with Canada.

By the passing of VE2AP Amateur Radio has lost one of its outstanding personalities. We are proud to have krowa him and to have enjoyed his friendship.—J. C.

NEW MEMBERS

HOME CORPORATES

D. A. W. BALL (G3FU), 64, Broadmead Avenue, Worcester Park, Surrey.
D. R. IBBETSON (G3HV), 2, Parkside Row, Dewsbury Road, Leeds, 11, York.
J. CAIRNS (G3UC), 66, Windermere Road, Lancaster, Lancs.
K. MOODY (G3VY), 96, Churchdale Road, Frecheville, Sheffield, Yorks.
A. J. WARD (G3WD), 90, Other Road, Redditch, Warwickshire.
J. P. EDWARDS (G3WH), 3, Autumn Crescent, Horsforth, Leeds, Yorks.
J. R. MACPHERSON (GM3XO), 41, Balgarvie Crescent, Cupar, Fife.
C. S. FROST (G3XX), The Lowlands, Oldfield Lane, Stainforth, Doncaster.
L. D. TOGHILL (G3YT), 64, York Road, Montpelier, Bristol, 6.
REV. H. E. COCKREM (G3ZC), The Parsonage, St. Martin's, Scilly Isles.
J. BANNER (G3ZV), 46, Crescent Road, Bromley, Kent.
E. G. WALSH (G4FH), 21, Old Bath Road, Cheltenham, Glos.
W. C. LEES (GM4FT), 6, West Claremont Street, Edinburgh, Scotland.
D. ALIMUNDO (G4HK), 10, Clarence Road, Chorlton-cum-Hardy, Manchester, Lancs.
S. BAYLISS (G4IA), 210a, St. Georges Road, Bolton, Lancs.
N. G. V. ANSLOW (G4GD), 35, Gilpin Avenue, East Sheen, London, S.W.14.
J. H. GURR (G4JG), 7, Beltinge Road, Herne Bay, Kent.
E. F. BAKER (G5OQ), 19, Wilman Road, Tunbridge Wells, Kent.
W. T. SHANNON (GI8HS), 21, Abbeydale Park, Belfast, N. Ireland.
W. H. NUTTALL (2AGP), 30, Mill Lane, Leigh, Lancs.
F. P. CAWSON (2ART), "Winander," Croft Drive East, Caldy, Wirral, Ches.
R. W. KINNEAR (2BHB), 83, Derby Road, Beeston, Nottingham.
B. K. GEORGE (2BKZ), 416, Sarehole Road, Hall Green, Birmingham.
L. KETLEY (2CLK), 57, Ravensworth Road, Doncaster, Yorks.
P. A. THOROGOOD (2DLY), 35, Gibbs Green, Edgware, Middx.
R. F. WIBBERLEY (2DRH), "Hazels," Tuesley Lane, Godalming, Surrey.
R. E. SEPPINGS (2FUL), 94, Norwich Road, Lowestoft, Suffolk.
S. A. DEVERELL (2FVX), 8, Warwick Road, New Southgate, London, N.11.
H. H. THOMPSON (2FXK), "Rosedene," Walsall Road, Aldridge, Staffs.
C. E. LAMBERT (2FXY), 3, Broadway East, Carlton, Nottingham.
E. H. R. TERRANEAU (2FYO), "Casa Mia," Coombe Park, Kingston Hill, Surrey.
MAJOR A. C. CURTIS (BRS3590), Claremont, Station Road, Bedfont, Middx.
W. B. EDWARDS (BRS3591), 21, Alderton Road, Horfield, Bristol, 7.
R. WINCKLER (BRS3592), 215, Victoria Avenue, Hull, E. Yorks.
J. CASSON (BRS3593), The Retreat, Alfreton Road, Sutton-in-Ashfield, Notts.
H. N. WOODNUTT (BRS3594), 78, Southampton Road, Fareham, Hants.
D. W. H. FFENNELL (BRS3595), Martyr, Worthy Place, Winchester, Hants.
S. H. LEDBROOKE (BRS3596), 8, Lower Shirburn Road, Torquay, Devon.
G. RAAIHAUGE (BRS3597), Wavertree, Wolfreton Lane, Kingston Road, Willerby, E. Yorks.
R. H. COATES (BRS3598), 839, Fulham Road, London, S.W.6.
P. A. BOLEY (BRS3599), East Huntspill, Highbridge, Somerset.
P. MACKENZIE, JUNR. (BRS3600), "Hillside," Monktonhall, Midlothian.
B. S. ATKINS (BRS3601), 14, The Paddocks, Wembley Park, Middx.
R. J. HITCHCOCK (BRS3602), 65, Prince of Wales Road, Kentish Town, London, N.W.5.
H. BARLOW (BRS3603), 42, Prestbury Road, Macclesfield, Cheshire.
J. R. EXALL (BRS3604), 4, Kent Road, St. Johns, Tunbridge Wells, Kent.
J. M. C. GRIEVE (BRS3605), 30, Empress Road, Derby.
MISS G. BENDELY (BRS3606), 32, Avondale Gardens, Hounslow, Middx.
D. RABBAGE (BRS3607), 8, Carlton Terrace, Dawlish, S. Devon.
F. G. LAMBETH (BRS3608), 21, Bridge Way, Whitton, Middx.
A. E. BREESE (BRS3609), "Blue Haze," Highfield Avenue, Pinner, Middx.
S. W. FOLLAND (BRS3610), Southview, Kingsdown Avenue, Luton, Beds.
T. RUTHERFORD (BRS3611), Summerville's Buildings, Hill Street, Cowdenbeath, Fife.
H. SCHOLES (BRS3612), 6, Ferndene Road, Holyrood, Prestwich, Lancs.
E. MURPHY (BRS3613), Scotch Street, Downpatrick, N. Ireland.
T. B. SUTTIE (BRS3614), 25, Campfield Road, Broughty Ferry, Dundee, Angus.
E. A. BROCK (BRS3615), 492, London Road, South Lowestoft, Suffolk.
K. HOLYLAND (BRS3616), Swincliffe Side, Hampsthwaite, Harrogate, Yorks.
H. E. WALKDEN (BRS3617), 143, New Bedford Road South Luton, Beds.
H. P. GRICE (BRS3618), 14, Wilford Road, Ruddington, Notts.
R. G. TAYLOR (BRS3619), "C.1" Flight, "C" Squadron, No. 2 Wing, No. 1 E. & W. School, R.A.F., Cranwell, Lincs.
H. J. GRAYSON (BRS3620), 20, Bower Road, Starbeck, Harrogate, Yorks.
MAJOR R. L. YATES (BRS3621), The Royal Scots Fusiliers, c/o Lloyds Bank, Cox Branch (F.2), 6, Pall Mall, London, S.W.1.
R. D. QUARMBY (BRS3622), 17, New Road, Halifax, Yorks.
H. S. HARPER (BRS3623), 34, Monkton Avenue, Lowestoft, Suffolk.

DOMINION AND FOREIGN

V. H. GILCHRIST (VK9VG), Bulolo Power House, Bulolo, New Guinea.
R. N. W. GITTENS (VP6MY), The Banyans, Bay Street, Barbados, B.W.I.
L. G. RAOUL THOMAS (VQ8AI), Thompson Road, Vacoas, Mauritius.
P. A. C. V. WILSON (VS7PW), Battawatte, Madulsima, Ceylon.
N. A. PRINTER (VU2FU), 24, Cadell Road, Mahim, Bombay, N.16, India.
S. HELT (W1S), Chief Engineer, Radio Station W1S, Columbia, S.C., U.S.A.
A. C. HAUSEMAN (W8DST), 346, Pulteney Street, Geneva, New York, U.S.A.
N. O. MERZ (W9YNB), 1211, Superior Street, Racine, Wisconsin, U.S.A.
R. K. MCKEE (BERS467), Imperial College of Tropical Agriculture, Trinidad, B.W.I.
H. A. LINAY (BERS468), 35, Broad Street, Jersey, C. Isles.
G. E. FLINT (BERS469), c/o Mrs. C. E. Flint, 1, Watermill Lane, Sidley, Bexhill-on-Sea, Sussex.

W.B.E., H.B.E. and B.E.R.T.A. Certificates

The following W.B.E., H.B.E. and B.E.R.T.A. certificates have been issued :—

W.B.E.

H. Jager ...	D4DLC	April	3
W. D. Manson*	G8PW	,,	4
J. F. Salisbury	G8GB	,,	5
R. S. G. Bartle ...	G6OB	,,	22
L. G. R. Thomas	VQ8AI	,,	24
D. Mullen* ...	SU1DM	,,	24
G. E. Cooper ...	G3PP	,,	26
C. B. Raithby ...	G8GI	,,	27
L. Tranmer ...	G6TG	,,	27

28 Mc.

H. Mee	G5MY	April	3

H.B.E.

G. McL. Wilford	G2WD	April	28

B.E.R.T.A.

C. G. Allen ...	G8IG	March	10
E. W. V. Butcher	G5AN	April	3
F. W. Garnett ...	G6XL	,,	6
G. McL. Wilford	G2WD	,,	28

* *Non-members.*

R.S.G.B. Slow Morse Practices

Details appear overleaf of the slow Morse practices organised by the Society for those members wishing to learn or improve their code. As usual, test matter will be taken from recent issues of THE T. & R. BULLETIN. The page number and month of issue will be given at the end of each test by telephony. A telephony announcement will also be given at the commencement of each test to assist those interested in tuning-in the sending station. It is emphasised that reports will be appreciated and are desired in order to ascertain useful range and numbers utilising the service. If, however, a reply is desired, a stamp should be sent. G2CF, of Charlton, Near Kingsbridge, South Devon,

FOR YOUR BOOKSHELF

THE RADIO AMATEURS' HANDBOOK

(Reprinted annually by the American Radio Relay League.)

A Manual of Amateur High-Frequency Radio Communication.

PRICE: To Members, 5/6; Non-Members, 6/-

THE RADIO AMATEURS' CALL BOOK

(Published quarterly in U.S.A. on the 15th of March, June, September and December.)

Contains Call-Signs, Names and Addresses of all Transmitting Amateurs.

PRICE: To Members, 6/-; Non-Members 6/6

THE "RADIO" HANDBOOK

(Reprinted annually by Radio Ltd.)

A Handbook covering the Theory and Practice of Amateur Radio Communication

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Five types are available. Each book contains 350-400 sheets bound between stiff cloth covers. Sample sheets free on request.

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COAT BADGES OF EMBLEM	
Brooch Type	*PRICE* 1/6
Lapel Type	*PRICE* 1/6
NOTE PAPER (100 Sheets)	*PRICE* 2/6
RUBBER STAMPS OF EMBLEM	*PRICE* 1/6

All goods are sent post free but orders must be accompanied by a remittance.

R.S.G.B. SALES DEPT.

53, VICTORIA STREET, LONDON, S.W.1

has now discontinued. Mr. Howes reports that besides local reports, his transmissions were taken in North Wales and London districts. In the schedule below North Wales will be represented by Mr. J. W. B. Evans (GW3GL), The Apiaries, Conway. Will stations in areas not at present served offer their services to Mr. T. A. St. Johnston (G6UT), " Normandale," Little Hallingbury, Essex (telephone: Bishop's Stortford 785). To any member interested in the purchase of Morse Code gramophone records, Mr. St. Johnston will, on application, be pleased to put them in touch with a source of supply.

	B.S.T.	kc.	Station	Location
Sundays ...	0900	1755	G8NF	Manchester
	0900	1865	G3LP	Cheltenham
	0930	1792	G8AB	Loughton
	1000	1800	G8PR	Staffordshire
	1015	1920	G6VC	Northfleet
	1015	1765	GW3GL	Conway
	1230	1758	G6VD	Leicester
Tuesdays ...	2200	1934	G3GH	N. Devon
Wednesdays	2215	1865	G3LP	Cheltenham
	2230	1813	G4AU	Charlton
Thursdays...	2130	1765	GW3GL	Conway
	2200	1934	G3GH	N. Devon

Trade Notice

Holiday and Hemmerdinger, Ltd., 74-78, Hardman Street, Manchester, inform us that they are agents for Premax aerial elements and accessories.

These kits are available for rotary beams of the W8JK (Kraus) type and other arrays.

Corulite double-end elements permit easy installation of three element rotary beams for 28 Mc. operation. The kit in this case consists of three telescopic units having central sections 6 ft. long by ¾-in. diameter, and two outside sections each 6 ft. long and ¾ ins. diameter.

An interesting kit for the amateur with limited space is the Premax 10-metre Hi-Q Vertical Radiator. The aerial, which is of the two element type, can be mounted to a chimney stack or on a roof. The overall height is approximately 27 ft.

We have no details of prices, but these can be obtained from the above company, who will also provide full technical data of these interesting aerial kits.

* * *

International Majestic Radio Corporation, Ltd., 173-175, Farringdon Road, London, E.C.1, are the sole concessionaires and exclusive distributors of *Hytron* transmitting and receiving valves.

In the transmitting range appear several valves eminently suited for low power work, good examples being HY 25 (25 watts plate dissipation), HY 40 (40 watts), HY 57 (40 watts) and HY 51A (65 watts). All of these valves are suitable for PA work, or for Class B modulation.

The anode is brought out to a top cap in each case and Graphite anodes are used for the 40 and 65 watt types. Ceramic bases are standard for all Hytron valves which are very moderately priced.

The HY 60 and HY 61 are beam tetrodes, suitable as R.F. amplifiers, oscillators, frequency doublers or audio amplifiers. The R.F. output of the HY 60 in Class C is 16 watts and 37.5 watts in the case of the HY 61.

Inter-electrode capacities have been kept low, typical figures being :—

Grid to Plate 7.5μμf.
Grid to Filament 6.0 μμf.
Plate to Filament 2.0 μμf.

for the HY 51A.

Half-wave mercury rectifiers are coded 866 and 866 JR, the former being listed at 14s. 6d. and the smaller size at 10s. 6d.

A low loss replacement of the popular 6L6 is offered at 15s. 6d. under the code 6L6GX, whilst an interesting ultra-high frequency triode suitable for use as oscillator, R.F. amplifier or detector is offered under the code HY 615. A plate dissipation of 3.5 watts is guaranteed at an anode voltage of 250.

A leaflet giving full details of Hytron receiving and transmitting valves is available on request. Members are urged to mention this Journal when writing.

* * *

Messrs. T. A. Butler & Co., Ltd., 48-50, Vittoria Street, Birmingham 1, have very kindly supplied a full set of chromium name plates for the above transmitter. Each plate measures 2 ins. by ½ in., and the lettering is engraved and filled with black.

We understand the above firm is willing to undertake the manufacture of all types of metal name and number plates for amateur apparatus.

Calls Heard

ERIC W. TREBILCOCK (BERS195), Powell Creek, North Australia. March 6-March 30, 1939 :—

7 Mc. C.W. : g2yy, 3tk, gm3qa.

14 Mc. C.W. : g2ft, 2fz, 2im, 2ma, 2mi, 2vf, 2vz, 2xc, 3ah, 3ic, 3jr, 3kp, 3ot, 3pp, 3qv, 3zj, 5il, 5rs, 5so, 5wh, 6ag, 6ku, 6nf, 6py, 6rb, 6wb, 6wo, 6td, 6xa, 8dv, 8dx, 8go, 8hf, 8ip, 8it, 8jb, 8jo, 8lu, 8pl, 8vr, gi5qx, gm6hz, 8sv, gw8uh.

In Search of B.E.R.T.A

Call	Dominion Districts	Colonies	Total
G3BS	25	14	39
G2HX	25	13	38
G5OJ	25	13	38
G8IL	25	13	38
GM8HA	25	11	36
G2UX	22	14	36
G6ZO	21	15	36
G3JR	21	13	34
G5ND	24	10	34
G3BI	24	10	34
VU2AN	20	14	34
VU2FO	23	11	34
ZS6DM	21	13	34
ZS6BT	18	15	33
G2GK	25	8	33
G8KP	23	9	32
GM8MQ	21	10	31
W1IKT	21	9	30

Please send to G6WY your total of confirmed contacts for listing in the above table.

NOTES and NEWS from the BRITISH ISLES

DISTRICT REPRESENTATIVES.

DISTRICT 1 (North-Western).
(Cheshire, Cumberland, Lancashire, Westmorland.)
Mr. J. Noden (G6TW), Fern Villa, Coppice Road, Willaston near Nantwich, Cheshire.

DISTRICT 2 (North-Eastern).
Yorkshire (West Riding, and part of North Riding).
Mr. L. W. Parry (G6PY), 13, Huddersfield Road, Barnsley, Yorks.

DISTRICT 3 (West Midlands).
(Shropshire, Staffordshire, Warwick, Worcester.)
Mr. V. M. Desmond G5VM), 199, Russell Road, Moseley, Birmingham.

DISTRICT 4 (East Midlands).
(Derby, Leicester, Northants, Notts.)
Mr. L. Ridgway (G2RI), 90, Romway Road, Leicester.

DISTRICT 5 (Western).
(Wiltshire, Gloucester, Hereford.)
Mr. J. N. Walker (G5JU), 4, Frenchay Road, Downend, Bristol.

DISTRICT 6 (South-Western).
(Cornwall, Devon, Dorset, Somerset.)
Mr. W. B. Sydenham (G5SY), "Sherrington," Cleveland Road, Torquay.

DISTRICT 7 (Southern).
(Berkshire, Hampshire, Oxfordshire, Surrey.)
Mr. W. E. Russell (G5WP), "Milestones," Westfield Road Mayford, Woking, Surrey.

DISTRICT 8 (Home Counties).
(Beds., Cambs., Hunts and the towns of Peterborough and Newmarket.)
Mr. S. J. Granfield (G5BQ), 47, Warren Road, Milton Road, Cambridge.

DISTRICT 9 (East Anglia).
(Norfolk and Suffolk.)
Mr. H. W. Sadler (G2XS), "The Warren Farm," South Wootton, King's Lynn, Norfolk.

DISTRICT 10 (South Wales and Monmouth).
Mr. A. J. Forsyth (G6FO), 29, Stow Park Avenue, Newport, Mon.

DISTRICT 11 (North Wales).
(Anglesey, Carnarvon, Denbighshire, Flintshire, Merioneth, Montgomery, Radnorshire.)
Mr. D. S. Mitchell (GW6AA), "The Flagstaff," Colwyn Bay, Denbighshire.

DISTRICT 12 (London North and Hertford).
(North London Postal Districts and Hertford, together with the area known as North Middlesex.)
Mr. S. Buckingham (G5QF), 41, Brunswick Park Road, New Southgate, N.11.

DISTRICT 13 (London South).
Mr. J. B. Kershaw (G2WV), 13, Montpelier Row, Blackheath S.E.3.

DISTRICT 14 (Eastern)
(East London and Essex.)
Mr. F. A. St. Johnston (G6UT), "Normandale," New Barn Lane, Little Hallingbury, Bishops Stortford.

DISTRICT 15 (London West).
(West London Postal Districts, Bucks, and that part of Middlesex not included in District 12.)
Mr. H. V. Wilkins (G6WN), 539, Oldfield Lane, Sudbury Hill, Greenford, Middlesex.

DISTRICT 16 (South-Eastern).
(Kent and Sussex)
Mr. W. H. Allen (G2UJ), 32, Earls Road, Tunbridge Wells.

DISTRICT 17 (Mid East).
(Lincolnshire and Rutland.)
Mr. W. Grieve (G5GS), "Summerford," New Waltham, Lincs.

DISTRICT 18 (East Yorkshire).
(East Riding and part of North Riding.)
Mr. E. Mitchell (G5MV), 40, North Marine Road, Scarborough.

DISTRICT 19 (Northern).
(Northumberland, Durham, and North Yorks.)
Mr. R. J. Bradley (G2FO), "High Crest," Yarm Road, Eaglescliffe Co. Durham.

SCOTLAND.
Mr. James Hunter (GM6ZV), Records Office 51, Campbill Avenue, Langside, Glasgow.

NORTHERN IRELAND.
Mr. J. A. Sang (GI6TB), 22, Stranmillis Gardens, Belfast.

New Members are cordially invited to write to their local District Representative.

DISTRICT 1 (North-Western)

DO not forget the P.D.M. at Chester on Sunday, May 21.

Blackburn.—Congratulations are offered to G4JS on obtaining his radiating permit. Easter holidays were spent with portable gear of the type to be used during N.F.D., and the members who took part in the tests are very satisfied with the results obtained. Several members visited Bury on March 12 to join in their "Hamfest," which was a great success, and thanks are extended to 2GA and 8NL for the arrangements made for the Blackburn visitors.

Will members who propose to attend the P.D.M. at Chester please notify the T.R. as early as possible?

Burnley.—Aerial tests are very prevalent—G3KT, 3VO and 5ZN are trying new aerials, 3VO is working VK with a two-section 8JK beam, 3KT is using an extended 8JK and 5ZN 136-ft. Hertz. 3SJ has had remarkable results on 14 Mc. using a 7 Mc. dipole and a 14 Mc. dipole with the twisted feeders in series. During one afternoon he worked all continents on telephony except South America.

No further reports have been received, but the following have been heard on the air: G8TD, 2RB, 3HK, 3IY and 3WU.

Bury.—An open "Hamfest" was held in Bury on Sunday, March 12, and the event was well supported, 43 members of R.S.G.B. and friends attending. The programme consisted of station visits, a "hot-pot," a draw for radio components, and, finally, the Society films were shown, which were very much appreciated. This event will now become an annual affair in the Group Calendar, and the T.R. would like to thank all those who rallied round to make the first "Bury Hamfest" such a success.

The usual monthly meeting was held on Tuesday,

March 21, at the Elsinore Café, Bury, and eight members attended. A membership subscription scheme was discussed and N.F.D. arrangements settled. It is hoped that several new R.S.G.B. members will be recruited during the coming month.

Reports have been received from G3ZN; 8NF, who is building the N.F.D. transmitter, which incorporates several interesting features; 8NL, who is building PA for 28 Mc. as a final to the exciter described in the February BULLETIN; and BRS3008, who is now 2BTO. 2GA, 3CJ, 8QS and 2BDA are also active.

Liverpool.—Members are requested to support, where possible, the P.D.M. arranged for May 21.

Members are also requested to send notifications of their intended support of N.F.D. to the T.R. unless they have already done so.

Manchester.—A good attendance was recorded at the last Manchester meeting to discuss N.F.D. arrangements. G3MR is going ahead with the transmitter, which will comprise CO/PA, and there will be a choice of two receivers, a 1-v-1 to be loaned by 2DRR and a superhet to be loaned by 2ARC. 6OM has kindly consented to supply the generator, and a small petrol motor driving a generator designed and built by 2ARC will also be available. Arrangements for the tent are in the hands of 5YD, and aerial masts and fittings and catering are in the hands of 2OI, to whom a note should be sent as soon as possible by all those intending to take part in the event.

The location will again be at Grants Farm, Walmesley, near Bury, and for the benefit of those who have not been there before the directions are as follows:—Take a bus or train to Bury, then catch a Walmesley bus and get off at the path leading to Grants Tower, climb the hill, and look out for the tent and aerial. Those coming by road should take a right-hand fork before coming to the hill from Bury. An R.S.G.B. sign will be erected on a post at this fork, so follow this sign. It's a pretty steep climb, but a car can get right up to the farm.

The following crystals are available, namely: 1778, 1808, 1820 and 1830 kc.; any other frequencies will be welcome. Each operator is asked to bring his own headphones. The following will be in attendance full time: G2OI, 2DF, 3AH, 5YD, 2ARC, 3228 and 2DSF. Part-time attenders will be: 3MR, 3DC, 4HK, 5OZ, 6OM, 2SC, 5CH and 2DRR, but remember, this is *your* field day and the more the merrier!

The following are active on 56 Mc.: 2OI, 5YD, 6TL, 5HF, 3BY, 2RA, 8BI, 6LC. On other bands: 3SP, 2DSF, 2FAN, 2DRR, 3545, 3228, 2ARC, 3DC, 4HK, 5OZ, 2KY, 6OM, 2HW, 3AH, 3MR, 2JC, 5WR, 3DA, 8JS, 2DH, 2QW and 2LK.

DISTRICT 2 (North-Eastern)

The main event of the past month was the P.D.M. at York, recorded elsewhere. At this meeting T.R.'s were arranged for Keighley and Leeds, as no election was made at the beginning of the year. The respective T.R.'s for previously unrepresented towns are now:—G3WH for Leeds, G8UO for Keighley, and G6WJ for Wakefield. These members are well known in their areas, and should be well supported, and kept informed of individual members' activities. The arrangements for N.F.D. stations are well advanced, and in most cases the transmitters are already in operation. The sites are detailed in the BULLETIN, and full particulars can be obtained from the T.R.'s. All members or friends are invited to attend.

Bradford.—Most of the local stations are active, the newer licensed ones being heard almost daily. A party paid a visit to the York P.D.M., having an enjoyable day. The 1.7 Mc. station in N.F.D. will be on Denton Moor. Route for cars, *via* Ilkley, over the New Bridge, first right past the bathing pool, second to the left by the road marked "To Denton Only." Turn right and then left in Denton village, following the road through three gates and ending in a field, when the site will be seen a little distance in front. Visitors coming by the Ilkley bus from Bradford get off at Ben Rhydding toll bridge, cross the bridge, turn right, and follow the road marked "To Denton Only." About 1½ miles from toll bridge.

Leeds.—The Leeds Group have not been as well represented recently in the District Notes as their numbers and activity warrants. A new T.R. has been appointed, and the many active stations in the area are asked to keep in touch with him and see that they take their share of the privileges and responsibilities in the district work. All reports should be sent to G3WH, 3, Autumn Crescent, Horsforth ('Phone: Horsforth 81228). Many stations are experimenting with either some form of beam or rotary aerial. Best wishes are sent to G6GA on the occasion of his recent marriage. G8WS has recently received the WAC phone certificate. The following stations are active: G2VC, 2UZ, 2XY, 3HV, 3WH, 5PW, 5WQ, 6AZ, 6QS, 6XL, 8FP, 8OG and BRS2317.

NORTH-WESTERN PROVINCIAL DISTRICT MEETING

SUNDAY MAY 21st 1939

AT

THE BARS HOTEL, FOREGATE STREET, CHESTER.

Assemble	12 noon
Lunch	1 p.m.
Meeting	2.30 p.m.
Tea	4.30 p.m.

5/6 inclusive

Reservations to Mr. J. Noden, G6TW, Coppice Road, Willaston, Nantwich, not later than May 15th.

Keighley.—G8UO has been appointed T.R., and all members in or near this area should keep in touch with him, and send him reports of activity if notes from this part are to be a regular and useful feature. He is very active on 1.7 Mc. at 13, Chandos Street, Keighley. This area covers Keighley, Bingley and Baildon. A new call has been issued in Skipton, G4HI, and it is hoped to include him in the local activity. G3QJ is a ship operator, and is now on duty at sea. 2VO has returned to London again after the vacation. 4DU is busy on 7 Mc. using a battery operated transmitter with good

results. 6MC is erecting a 14 Mc. rotary beam to try and contact some of the more difficult countries. Active stations include G3UV, 4DU, 5VC, 6MC and 8UO.

Barnsley.—The call of the Barnsley station in N.F.D. will be G6PYP. Local members are asked to give all the assistance they can with this station, and not only with the operating duties.

Doncaster.—The first annual general meeting of the Doncaster and District Amateur Radio Society was held at the Wheatley Senior Boys' School, when Dr. Lawton, B.Sc., Ph.D., the Principal of the Doncaster Technical College, was elected to the office of President. The members are very pleased to have the services of such a distinguished person for this office. At the meeting was a full display of amateur constructed gear, including a cathode ray oscilloscope by 2BCQ and 56 Mc. gear by G3NJ. A number of receivers were displayed, as well as 14 and 7 Mc. transmitters by 2CKR and 2FTO, the latter a very fine piece of apparatus. Mr. L. Ketley is now 2CLK. Activity is well established, and the following are active: G3NJ, 4DP, 8IC, 2AMT, 2BCQ, 2CLK, 2CKR, 2FTO, BRS193 and 3494.

Wakefield.—G6WJ has been elected to the post of T.R., and members are asked to give him their support.

DISTRICT 3 (West Midlands)

Once more the Scribe appeals for news from members and T.R.'s. Please send reports to reach him before the 25th of each month.

Cannock.—G6SW is temporarily inactive owing to transformer trouble after obtaining R7/8 from CE on 14 Mc. 'phone. 4CN is on 7 Mc. C.W. 2YV hopes to be active shortly with a new rig. 2AMG is the proud owner of a "Skychampion" and finds DX at his fingertips.

A contest, arranged by the Cannock and District Short Wave Club, is being held between transmitting and receiving members, for the most countries worked or heard on 7 Mc., with the former using a multiplier of 3, each country counting 1 point for either side. It is hoped shortly to extend membership to the Club; all interested are asked to apply to the Secretary, G2YV, Shoal Hill, Cannock.

DISTRICT 4 (East Midlands)

At Mansfield, on April 23, 41 members attended to wish Mr. Scarr (G2WS, the retiring D.R.) the very best of luck in his new appointment and to express their appreciation for the valuable work he has done for this district. G2RI takes over and will be glad to hear from old-timers and new members.

Mr. Scarr gave us a most interesting résumé of experiences in radio from school-days up to date, starting an instructive argument in which some of the newer licences, including A.A. men, conclusively demonstrated that more thought is being given to useful operating than QRM producing rag-chewing.

All sections reported on N.F.D. arrangements, and as far as can be seen almost everything is ready except the score which we hope is to be a record.

Mansfield.—Reports on activity are rather sketchy this month, but the T.R., G8SA, informs us that PA0FB, SU1GP and PK2WL are active on 56 Mc. in the afternoons. Final details for the 7 Mc. N.F.D. station will be made at a meeting to be held on Sunday, May 21.

Leicester.—G3BU is moving his QRA, but all other stations are active, whilst 2FNW, 2HBG and 3588 are busy building gear. Members of the

FORTHCOMING EVENTS

May 17.—District 1 (Liverpool Section), Meeting at 56, Whitechapel, Liverpool.

,, 17.—District 14 (East Essex Section), 8 p.m., at G5UK, "Newhaven," 19, Meadway, Westcliff-on-Sea.

,, 18.—District 12, 8 p.m., at Carlton Tea Rooms, 77A, Queens Road, Watford.

,, 19.—District 12, 7.30 p.m., at Orpheum Cinema, Temple Fortune.

,, 21.—Provincial District Meeting in Chester. See separate announcement.

,, 22.—District 13 (Woolwich Area), 8 p.m., at Memorial Hospital Hall, Calderwood Street.

,, 23.—District 14 (East London Section), 7.30 p.m., at G2HR, 25, Clivedon Road, Highams Park.

,, 24.—*District 15, 7.30 p.m., at G6RW, 81, Studland Road, Greenford Avenue, Hanwell, W.7.

,, 25.—*District 13, 8 p.m., at Brotherhood Hall, West Norwood.

May 31.—Scotland "A" District, 7.30 p.m., in Room "A," Institute of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow. Lecture by Mr. I. Smith, "Microphones," Pre-amplifiers and Modulation."

June 1.—District 14 (Colchester Section), 7.30 p.m., at G8PZ, 19-21, Artillery Street, Colchester.

,, 3-4.—National Field Day.

,, 5.—District 14 (Chelmsford Section), 8 p.m., at G6LB, 17, Longstamps Avenue, Chelmsford.

,, 7.—*District 1 (Manchester Section), 7.30 p.m., at Brookes Cafe, 1, Hilton Street, off Oldham Street, Manchester.

,, 7.—S.L.D.R.T.S., 8 p.m., at Brotherhood Hall, West Norwood.

,, 11.—Romford Radio Society, D.F. Field Day.

,, 18.—Provincial District Meeting in Southsea. See separate announcement.

*Sale of disused apparatus at these meetings.

C.W.R. G2IX, 6VD, 2AA, 4BJ, 3AN, 2RI, 2HBG spent a very instructive afternoon on Saturday, April 22 at an R.A.F.V.R. aerodrome where demonstrations were given of transmission gear under actual Service conditions.

Leicester members do a large amount of work on 1.7 Mc., and in this connection are particularly anxious to co-operate with stations lying east of their city. Skeds may be arranged for 'phone or C.W.

The next monthly district meeting will be held at Trent Bridge Hotel, Nottingham, on May 21, at 3.30 p.m., when the programme will be in the hands of G8DZ. Please make every effort to attend, and don't forget we have a junk sale at every monthly meeting.

DISTRICT 5 (Western)

At the *Bristol* monthly meeting interest centred around the P.D.M. and N.F.D. Arrangements were made regarding accommodation and gear for, and transport to, the N.F.D. sites. Those volunteering to carry out special duties, and especially those in connection with transport, deserve the thanks of all concerned. New members welcomed to this meeting were G3YT, 2FVG, BRS3563, 3564, and two more who are awaiting their BRS numbers.

Activity on 1.7 Mc. has been very high during the month, more Bristol stations now operating on this frequency. G4CM and G3RQ are using telephony and putting out strong signals. G6VF has a new superhet receiver working to his satisfaction, and G6GN is experimenting with unusual modulation systems. G3YH is accomplishing good work with low power. G5UH is at present in London.

G8GB is shortly getting married and moving into Bristol from Winscombe. G6BW's rotary beam aerial is proving very successful, signal strength in the U.S.A. having increased by some 35 dB as compared with his previous beam. The new aerial is similar to the one about which GM6RG wrote in last month's issue. Other transmitters active include G8TC, 8PH, 8WW, 6JG, 6RB, 6VK, 5WI, 5JU, 3HN, 3YT, 2IK and 2YT. The following A.A. members report various building activities: 2FKK, 2FBV, 2FHP, 2BAR, 2FBG, 2BQP, 2BSU and 2BVD.

New calls in *Cheltenham* are G4FH and G4GQ. G3LP finds there is a critical height above ground for a counterpoise, in his case 7 to 8 ft. giving best results. A counterpoise placed to the south of his aerial appears to direct his 1.7 Mc. signals to Scotland and the North, whilst placing it to the north of his aerial improves reports from the direction of Bristol.

G5BM's single section 14 Mc. W8JK beam aerial, directed on South America, enables him to put good signals into PY and LU. G6ZQ has been testing a portable 1.7 Mc. transmitter. With ½ watt input he has worked phone over 50 miles, whilst with 4½ volts H.T. it is possible to put a readable signal across the town. G8LB and G8ML are co-operating with G6IH, of Malvern, in 56 Mc. tests. G5NI, of Birmingham, has been heard on this band by G8ML. Others active include G3YZ, 5BK, 8DT and 8DT.

Amateur radio activity in *Stroud* is progressing satisfactorily. Mr. F. N. Hitchcock (G5HC, "Highgrove," Bisley Road) has been appointed T.R. for that town, and will look after the interests of members locally. A Morse class has been started at the local club and is proving helpful to many.

It is regretted that the announcement in last month's Notes with regard to the formation of a club in *Salisbury* was somewhat misleading. Actually the club has been in existence for four years, although the D.R. must confess he was completely unaware of the fact. Meetings take place every Tuesday at 85, Fisherton Street, and all interested in amateur radio are welcome. 2ACC (the Club Secretary) and 2AFR send reports of activity. The latter has recently fitted an 1851 valve to his SX16 receiver, and the resulting improvement can be judged from the fact that the television signal now moves the S meter to S8 as against zero previously.

Salisbury also qualifies for a T.R., and one will be appointed shortly.

DISTRICT 6 (South Western)

Arrangements for National Field Day appear to be complete for all four stations in the South-West. It is hoped that greater success will follow the efforts of those concerned than has been the case in former years. Those who will take part in the event are very enthusiastic and will fully deserve any successes that come their way. It will help the organisers considerably if those BRS and A.A. members who intend to be present at the various stations will communicate at once with those in charge of the stations.

Taunton.—At the meeting on April 16 the T.R. and twelve members were present. The T.R. reported all relevant matters contained in General Circular No. 16 and great appreciation was expressed concerning paragraph 13. Reports were received on the recent QRP competition, of which G5TN was the winner. A member who had recently toured the Midlands reported that local contacts were being carried out there on 7 Mc., often with 50 watts input, the excuse being that permits could not be obtained for 1.7 Mc. The possibility of a Conventionette in Taunton was discussed.

North Devon.—At the meeting, held on April 5 at G8US, details in connection with N.F.D. were settled; and once again we have to thank G6GM for providing the station site.

G6GM is pleased with the performance of a new transmitter which he has recently completed. 8US, not content with his 14 Mc. "bag," is now putting out a very strong signal on 1.7 Mc. 3BO is using Zepp feeders with success on 7 and 14 Mc. 2ID has gone over to A.C. mains and is fully modulating a strong carrier. All other stations report active.

Plymouth.—There was an attendance of seven members at the April meeting held at G3TX. G2HX has left for Bristol, and we wish him every success in his new appointment. 3TX has built the N.F.D. transmitter, and 2DLJ is supplying the receiver.

Torquay.—The April meeting, the last of the 1938-39 session, took the form of a visit to the Newton Abbott Power Station; this station serves an area of about 400 square miles and is one of the largest in the South-West. There was an attendance of 17, and all expressed themselves very interested

in all they saw. One very intriguing feature of the station was the coal conveyer, which is the longest in the country. We should like to record our thanks to those who arranged the visit.

Exeter.—At the meeting on April 27 there was an attendance of 18, including the D.R., who was happy to renew several old acquaintances.

SOUTH OF ENGLAND PROVINCIAL DISTRICT MEETING

SUNDAY, JUNE 18th, 1939.
at the
QUEEN'S HOTEL, SOUTHSEA

Assemble	12.15 p.m.
Lunch	1.15 p.m.
Meeting	2.30 p.m.
Tea...	4.30 p.m.

Inclusive charge 6/6 if reservations are made before June 10th after that date, 7/6

Reservations, which need not be accompanied by a remittance, to Mr. E. A. Dedman, 75, Woodlands Avenue, Coombe, New Malden, Surrey.

DISTRICT 7 (Southern).

The result of Mr. Dedman's appeal for information as to the number likely to be attending the Southsea P.D.M. was overwhelming—not one reply was received! This is the last reminder members will receive before the charge is increased. Full details appear on this page, so please advice G2NH now if you are likely to attend. Real co-operation is asked for from all members in Southern England.

Kingston.—The K.D.A.R.S. and T.V.A.R.T.S. are holding a combined field-day on May 21, and are to run combined meetings. G5LC has returned to the air and his new rig is well up to expectations. The T.R. would appreciate 7Mc. crystal frequencies as he is compiling a chart for Kingston and District. QRA, 20, Dale Road, Walton on-Thames. The following are active: G2GK, 2NH, 3MF, 3OR, 5LC. 5MA, 6NK, 8SM, 2DLK.

Portsmouth.—Forty members of the South Hants R.T.S. enjoyed a lecture at Fareham by a representative of *The Mullard Wireless Service Co.*, on "Receiver Valve Development." G5TX operating CC on 56 Mc. from Arreton Down, Isle of Wight, reports hearing stations up to 100 miles. Contacts have been made with 2XC and 2ZV for what are believed to be the first 56 Mc. contacts between the island and mainland.

Reigate.—The success of the first annual dinner of the East Surrey Short Wave Club was largely attributable to the generosity of the President, G8HH, and the Chairman, G6JF. "Clarry," whose presence gave great encouragement to the club, gave an interesting talk, after which the Hon. Secretary, G5LK, wound up an enjoyable evening with a vote of thanks. We welcome G4BL (better known as VU2AU), who, unfortunately, has to return to India shortly. G6JF, 8HH, and 8MP are active on R.N.V.W.R. exercises. G5LK has received his W.A.C. phone certificate.

Guildford.—There will be no local meeting in June owing to N.F.D. and the P.D.M. At the last meeting G2NH demonstrated an all-band exciter made by the *National Co.*; the output from a 6L6 on 56 Mc. was amazing. The following are active: G4AP, 5RS, 5WP, 6GS, 6LK, 6NA, 6YZ, 8CV, 8IX, 8LT. 8NT, 8UG.

DISTRICT 8 (Home Counties).

The monthly District Meeting was held at the Waffle Café, Petty Cury, Cambridge, on Sunday, April 16, when seventeen members attended. Field Day arrangements were reviewed, and where a shortage of equipment was reported, one member or another kindly volunteered to construct the necessary gear. It was decided that a resolution should be forwarded to the R.S.G.B., asking Council to consider the advisability of officially adopting the F.O.C., or alternately forming a similar section of the Society to encourage better operating procedure.

Mr. J. F. Lucas (G2HK), by arrangement with *Messrs. Peto-Scott, Ltd.*, attended to demonstrate a Trophy 8 receiver, with pre-selector, and was plied with numerous questions at the close.

It was decided that the next meeting should be arranged for a week-day evening, instead of a Sunday.

Reports are scanty this month, though there seems to be a fair amount of activity in the District.

Cambridge.—G2XV is in great danger of becoming a Television fan, though he still manages to find time for early morning DX work. 5DR has worked CR4HT (Cape Verde Island), and believes it to be the first G contact. 8SY considers that his disappointing results on 14 Mc. are due to chalk in his locality. 5DQ is using phone on 14 Mc. but finds DX easier on CW. 5OV has joined 5PU as a civilian radio engineer at Witton Aerodrome. He still works Asiatic stations with astonishing regularity, and can claim nearly two hundred contacts with VU2DR. There will be a pleasant reunion when XZ2DY arrives from Burma on six months' leave. 5BQ has managed some new countries on phone, including VS7RA, VP9G, HK3CO, and VP1WB. At last G5JO's new station is completed. It is in the true JO tradition—switched bands, and myriads of lights—and does it work? On April 22 he was W.A.C. phone in about one hour, his contacts including VK2OZ, SP1QE, VE1BB, ZS6BY, FN1C, and PY2BA. During the evening he added CX2CO, LU2BG, VQ2BI, and at least a dozen other real DX stations.

Peterborough.—G2NJ has been putting in a good deal of time on 1.7 Mc., but deplores the lack of stations on that band until late evening. He reports a decided "echo effect" during the eclipse on April 19. 5NP is building a fine rack transmitter, and hopes to be active shortly.

Whittlesey.—G3DY is active on 14 Mc., using phone.

March.—G3BK continues to get out very well on 14 Mc. with CW. 3WW is active with phone on 7Mc.

Bedford.—G5FO is very busy with Television, but is active on 7 Mc. most mornings. Other stations are active, but have nothing to report.

Luton, St. Ives, and Other Areas.—No reports are to hand. Come on, the T.R.s—let's hear from you.

DISTRICT 9 (East Anglia)

Ipswich.—The weekly ragchew still continues to be popular, and we were pleased to welcome G2DT, of Cambridge, and 8WI, of Orford, at a recent meeting.

Stations do not seem to have been so active of late. G2JD has at last received his W.A.C. and W.B.E., and is now busy carrying out a rebuild. 8MU is still persevering on 1.7 Mc. ; 6TI is preparing for 7 Mc. DX ; 8IS is on the air again after a spell of trouble with power packs : 8AN is to be heard on 14 Mc. phone ; 3OJ is receiving very good reports on 1.7 Mc. with his rebuilt modulator, whilst 2AN is using a full-wave Windom for 14 Mc.

Great Yarmouth.—G3RW is making progress on 1.7 Mc., and is getting good results, using an input of 5 watts. 2BXS is constructing a frequency meter, and is becoming acquainted with 3.5 Mc. in preparation for his share in operating the Yarmouth Field Day station ; 2BIC is testing on 1.7 Mc., and he is shortly moving to a new QRA ; BRS3366 has applied for his A.A. call, and BRS3468 and 2999 are active.

Norwich.—G6QZ is very active on the high-frequency bands. He has weekly QSO's with 6DH, of Clacton, on 56 Mc. 6QZ is having difficulty in inducing an RK 34 to oscillate on 224 Mc.,and he would welcome any suggestions from other U.H.F. exponents. G5LW has built a new modulator, and now operates on 1.7 Mc. ; 2UT is still working DX on 14 Mc.

Lowestoft.—Activity is again on the increase, and we welcome another new member in Mr. Edwin A. Brock, now BRS3615 ; G5QO is designing and constructing some new QRP 56 Mc. gear ; 2CWO has made a successful job of running his new superhet off D.C. mains through a convertor ; and 2CPL has completed his new transmitter.

Beccles and District.—G3RK is making comparative tests on 14 Mc. with W3EDP and doublet aerials ; 8FL (North Walsham) is operating on 1.7 and 14 Mc. and experimenting with directive aerials. The following are known to be active :—G3UT, 5UF, 8WI, 3XT, 3IN, 2FFT and 2APD.

King's Lynn.—G5UD, 6FB and 2XS are active.

DISTRICT 10 (South Wales and Monmouthshire)

The various areas are very busy with their N.F.D. plans, and it is hoped to see many of those members who are within reasonable distance of the locations given in the N.F.D. Station List in this issue.

The two outstanding events to report this month are the *Swansea* meeting on April 26 and the *Tonyrefail* hamfest on the 27th, both attended by the D.R. At Swansea a very full and frank discussion took place on the circumstances surrounding that area's participation in this year's N.F.D. It became evident that misunderstandings had arisen due to the lack of personal contact and the ambiguity of correspondence relating to N.F.D. arrangements, and it was agreed that the allocation of frequencies was better left to the D.R. G6FO was asked to take Swansea a message from Cardiff and the eastern end of the District generally, suggesting that a few joint meetings be arranged from time to time at mutually convenient centres in order to establish the very desirable personal contact between the areas. The Swansea group was very willing to accept this idea, and the upshot of the general discussion on this point was that a summer meeting be fixed at Bridgend or Porthcawl for the District as a whole.

It is pleasing to add that the meeting on April 26 made it clear that active Swansea members are most anxious to co-operate with the rest of the District and to play their full part in its various activities in a spirit of mutual understanding.

At *Tonyrefail* on the 27th an attendance of no less than 36 was recorded, complete with group photographer. It is in no way derogatory to the local membership to say that the visitors expected neither such numbers nor such excellent arrangements, as we were given to understand that it was a first attempt at a hamfest in this part of the District. There is no doubt whatever that amateur radio is well established in the Tonyrefail area, and for this much credit must go to GW3GO, 2FRK, GW3QB and GW3CR, well backed up by the *Rhondda Valley* members. 2FOF has a special function in the organisation, which it is not necessary to explain to those who were present on April 27 !

This hamfest was supported by contingents from the Cardiff, Newport and Swansea areas, which in itself was a matter of much gratification to the D.R.

The proposed District meeting at Porthcawl (or Bridgend) could take place shortly after N.F.D., and T.R.'s are particularly requested to consult their members on the matter, forwarding their views by the middle of June, so that arrangements can be announced in the July notes.

DISTRICT 12 (London North and Hertford)

The D.R. wishes to place on record his thanks to all who contributed to the success of the District's second annual dinner and social evening. In particular he would mention the names of the organising committee, Messrs. Howard (G8TY), Solder (G5FA) and Watson (G2YD).

Thanks are also extended to *Webb's Radio*, *Premier Supplies* and *Hamrad Wholesale* for donating various items to the draw, and to *Russell Wood, Ltd.*, of Barnet, who loaned the P.A. equipment.

An account of the dinner appears elsewhere in this issue.

* * *

No North London meeting was held during April, but two meetings of the Watford Group under G8MH took place. An attendance of 20 was recorded at both meetings. New members welcomed were 2AHR, BRS3585, 3586 and G5RW, who has moved from Chelmsford.

G3KP, 3NR, 5RD, 8CK and 8MH are active.

DISTRICT 13 (London South).

An apology is due to all members for the absence of notes in these columns last month. The D.R. was unfortunately taken ill with 'flu and found it quite impossible to draft out the notes in time for publication. We trust that no one was inconvenienced by the lack of information as to meetings. As a matter of fact only six members arrived for the meeting at Norwood on April 20 ! The D.R. was one of the six and a very enjoyable hour was spent chatting about various subjects. Two further meetings were held within the district during April ; Woolwich and Wimbledon both on

the 24th. The D.R. was glad to be able to be present at Woolwich where a very interesting lecture and demonstration covering modern communication receivers was given by *Webbs Radio*. An excellent attendance was recorded and many interesting points came to light. No report of the Wimbledon meeting has been received.

Reports of activity within the district are scarce this month, although all the usual stations are known to be active. G5ZD informs us that he is now using a " T " aerial on the 14 Mc. band with quarter wave elements zepp fed at the base, reports on his transmissions would be welcomed. Both 3ZJ and 2BMH report extreme pressure of business whilst 2RC has been busy with examinations. 2GZ and 2LW are active as usual.

Once more N.F.D. is upon us, and elsewhere in these pages will be found details of the stations arranged to represent District 13. To all taking part we would say " Good luck." N.F.D. is essentially a team event and is an occasion on which all petty differences should be sunk in an effort to bring South London as a whole to the top of the list. The D.R. would like to thank again all those who are responsible for assisting in the running of the event. The same excellent spirit of co-operation has again marked the arranging of all the details. It will be noticed that the D.R. himself is not running a station this year. His headquarters will be at the 3.5 Mc. station, and it is hoped that a considerable amount of time will be available for visiting the other stations and forming a more comprehensive opinion of how they are run.

It is proposed to hold a Junk Sale at West Norwood on May 25. May we make a special appeal to everyone to be present with plenty of gear and plenty of money!

In conclusion the D.R. would like to record his regret at his inability to be present at the North London dinner on April 21. We would offer our heartiest congratulations to our friends across the Thames on their highly successful evening; may we refer those critics of allowing ladies to attend gatherings to this District 12 success.

DISTRICT 14 (Eastern).

Brentwood.—G4AG is doing well on 7 Mc. CW. G3JW is building a new 14 and 7 Mc. rig. G3MV is having trouble with his 210 P.A. The Brentwood Radio Society is active and their call G8HVP is heard regularly. We welcome G2UK to the district. G3LA has a 56 Mc. portable permit.

East Essex.—Most members have reported being active during the month. G5UK has his 56 Mc. rotary beam working and is finding it very successful, both for transmitting and receiving. G2KH is using a vertical beam, and DX is being worked to order! 2BQN has finished the N.F.D. transmitter and by the time these notes appear will have it working to maximum efficiency. G5VS reports activity on 7 and 1.7 Mc. G5XI's aerial has come down. Congratulations to BRS2538 now 2CMF and to BRS3466 now 2CVA. BRS2625 is applying for his full call in one stride.

At the April meeting held at G6IF a good attendance was recorded. N.F.D. arrangements are well in hand. The Southend Radio Society held two meetings during the month. Mr. Nixon, of the G.E.Co., gave a lecture on cathode-ray tube equipment, and Mr. Veevers, of E. K. Cole, Ltd., gave a very interesting demonstration of signal generators and accompanying equipment. The T.R. takes this opportunity of asking all members to do their utmost towards making N.F.D. a success.

East London.—There was an average attendance at the April meeting held at G4BZ Highams Park. The aerial array at the station was greatly admired. A junk sale with BRS3270 as auctioneer realised a profit for N.F.D. funds. G8AB will be using a petrol-driven generator for N.F.D. G2HR has applied for 25 watts and 3.5 Mc. permits. G6UT recently worked SM on 1.7 Mc.

Chelmsford.—G2SA reports that a brand new WAC Certificate lends added charm to the shack. 2KG and 5RV are busy with a new line of experiment—the elimination of QRM to local television receivers. 3BS has sufficient QSL cards to apply for the DY Century Club runners-up section. 8PB, 3OX, 4AC, 2ARA and 6ST are active but do not report. 5RW has put up a new ½-wave aerial for 3.5 Mc. and continues his weekend working.

VQ4WES, who is on leave, visited G5RV and met some of the local members.

DISTRICT 15 (London West, Middlesex and Buckinghamshire).

The *Mullard Wireless Valve Company* supplied the District at its April meeting, at which 44 members and visitors were present, with a very fine lecture entitled " Recent Receiving Valve Developments." This is a record for the district. See Forthcoming Events for May meeting.

A motor coach trip is being planned to the Cambridge Conventionette. Mr. Bradley (G8KZ), who is sponsoring the plan, would be glad to hear from all those who would like to join the party. The approximate cost will be 12s. 6d. inclusive.

From G3HT comes a report of the activities of the Edgware Short Wave Society. This Society seems very active and recent lectures included one by G2IM on aerial experiments and another by Mr. Rice, of Mullards, on Oscilloscopes, Signal Generators and Cathode Ray Tubes. The Society has its own power pack—G3*HT*, G3*LT* and G4*GB*!!

G6CJ is understood to be progressing towards full health. Congratulations to 2DIY, now G4IQ. G2TJ reports piracy of his call on 1.7 Mc., which band he has not used for years.

Arrangements for N.F.D. are progressing and final details will be fixed at the May meeting.

The T.R.s report they get no support from members in supplying information on their activities and can only pass on what they have gathered themselves. This state of affairs is appalling, considering that this is such an active district.

West London: G6CO and 2DRF report. *Wembley:* G5SR and 6WN are finding some new countries. *Edgware:* Active—G2IM, 2QY, 3HT, 3LT, 3VW and 4GB. *High Wycombe:* Active—G2RL, 3MI, 6JK, 8JK, 8VZ, 2AKZ, 2BOA and BRS3292. *Slough:* Active on telephony—G3XJ, 8ID, 3GZ and 6PR. G5LY on C.W. G8ID as a newcomer is welcome to the town.

Although each section which has a T.R. has sent a report, it is a great pity they have to initiate them themselves.

DISTRICT 16 (South Eastern)

By the time these notes are read, N.F.D. will be imminent, and it is suggested that those members who wish to visit any of the four stations in the District should get in touch with the respective operators in charge whose calls appear elsewhere in this issue.

A South of England P.D.M. will be held at Southsea on June 18, at which all members will be welcome. Full details will be found on an earlier page.

Bognor Area.—The Sussex Short Wave and Television Club is in a flourishing condition and Morse classes are well attended. 2DDD, who is fitting up an RF stage to his 56 Mc. superhet, using an 1852 valve, is now employing a rotary dipole for that band. 2ZV is building a 35T PA stage for his 56 Mc. transmitter, and is also busy with gear for the 7 Mc. N.F.D. station. 2FCY has passed his Morse test and awaits a full call.

Gravesend.—A junk sale held on March 27 was voted a great success, and produced a welcome increase in the club funds. At the meeting held ou April 17, G6VC was presented with the Chairman's award (£2 2s. in cash) for his work on 56 Mc. 6VC in replying, emphasised the great trouble the Chairman (G6PG) had himself taken to further work on this band, and expressed the hope that other members licensed for 56 Mc. work would take an active interest. 6PG afterwards gave a talk on his transmitter, and later established two-way communication on 56 Mc. from the club-room to 6VC at his home station. 2IZ reports that his Morse classes continue to be well supported, and that members are making good headway with the code. 6BQ made a score of 5500 points in the A.R.R.L. Contest with 132 contacts, of which 110 were on 7 Mc. 5SI now has his 25-watt permit. BRS3530 has completed an excellent receiver and is applying for his A.A. licence.

Maidstone.—G5XB gave a talk on the principles of the superhet receiver at a recent meeting, and some further R.S.G.B. films were shown. It has been decided to hold a D.F. field day, whilst it is probable that a portable station will be operated during N.F.D. Activity :—G5XB, 8UC, 2BXW, 2763, 2834, 3552.

Tunbridge Wells.—Considerable interest is being shown locally in the C.W.R. and the majority of members have now joined. 2AKQ, who is now G4IB, is active on 1.7 and 7 Mc. 6ML, who continues his aerial experiments, now uses a half-wave radiator and close spaced director for Westerly contacts on 14 Mc. The efficiency of this aerial, which is constructed of electric wiring conduit, has been considerably increased by the installation of a tuned circuit for matching purposes mounted directly on the aerial. He was recently successful in obtaining a lengthy and 100 per cent. contact on 14 Mc. phone with the Gatti Expedition in the Belgian Congo. He used a W8JK beam for the purpose. Active :—G2UJ, 4AY, 4DM, 5KV, 5OQ, 6OB and 8NO.

Whitstable.—Congratulations to 2AQG on obtaining the call G4JG. 4BY and 4FI are active on 1.7 and 5CI on 7 Mc. Local members will operate a portable station on 1.7 and 7 Mc. during N.F.D. under the call of G5CIP.

DISTRICT 17 (Mid-East).

Owing to the almost total absence of information it is becoming increasingly difficult to compile district notes which will be of general interest and the scribe would appreciate more co-operation from those stations who have so far failed to report.

Lincoln.—5XL reports a scarcity of information. Stations known to be active in this area are : 5XL, 4BU and 2LX. The T.R. asks all Lincoln members to rally round and assist with the N.F.D. arrangements.

Sleaford.—G8GI, of Pointon, near Sleaford, sends in a very interesting individual report. He informs us that he is now W.A.C. and W.B.E. on C.W. and only requires Asia for 'phone W.A.C. Is busy now testing a "V" beam aerial and checking on the results.

Brigg.—The D.R. and Scribe visited 8AP during the month and spent a pleasant evening looking over a very neat and efficient station.

Grimsby Area.—Activity is centred around N.F.D. and all stations are taking part. The following report active :—G2VY, 3ZG, 3TZ, 5GS, 6AK, 8PV, 8JN, 8CI. 5GS, 3ZG and 6AK attended the District 18 P.D.M. and had pleasure in meeting many old friends.

DISTRICT 18 (North and East Yorkshire)

The York P.D.M. on April 16 was very well attended by members from this district, and an enjoyable time was had by all. Last year G2CP travelled the 40 miles on a pedal-cycle to attend, but this year the opposite extreme was surely reached by G3KS, who arrived with a 35-seater coach! He was quite surprised when the hotel boots turned him away from the car park!

The meeting unanimously decided to hold next year's P.D.M. at *Scarborough*, thus giving Hull members the opportunity to come by sea if they wish. The D.R. agreed to organise the 1940 meeting and to arrange for the entertainment of visiting ladies. As a full report of the P.D.M. appears elsewhere, no further mention is necessary here.

Our thanks are due to H.Q. and to our printers (Messrs. Loxley Bros.) for their effort in despatching the BULLETIN to all Yorkshire members the day before the P.D.M., in spite of the usual delays due to Easter holidays.

A hearty welcome is extended to G6BI, who has taken up residence in Market Weighton, near York. Previously operating in Egham, Surrey, he is interested in 7, 14, and 56 Mc. 6TG would be pleased to arrange skeds with him on the latter band as soon as he settles down.

The Scarborough Short Wave Society, affiliated to the R.S.G.B., continues preparations for N.F.D., when two stations on 7 Mc. and 1.7 Mc. will be in use. Offers of help, especially during the Saturday erection period, will be greatly appreciated. Will any members in the District, who have no N.F.D. site in their vicinity and who could spare the time to visit Scarborough, please communicate with the D.R., G5MV ?

Driffield.—G6UJ is now the possessor of a Cathode Ray Oscilloscope.

Hull.—As the Hull members decided at a recent meeting not to make use of these columns for the purpose of recording their activities, the T.R. is now spared the task of endeavouring to obtain

something he has never been able to get, *i.e.*, a report!

The idea of inviting non-members of the Society to attend the monthly meetings met with immediate success, the April meeting being the best-attended for some time.

Members will appreciate that it is no easy matter maintaining interest month after month at these meetings, and as the attendances increase so the need for interesting talks and demonstrations becomes more necessary. The T.R. would therefore welcome assistance in this direction, and appeals particularly to members with full calls for their support.

Arrangements for running the 14 Mc. station during N.F.D. are now well in hand. The site will be the same as last year, Southwold Farm, Brantingham. All that is now required is the promise of adequate assistance on the two days.

Scarborough.—As a result of "Clarry's" helpful remarks at York, two *Eddystone* ECR receivers are coming this way. Both G3KS and 6TG are part-exchanging their American receivers for this British product. 6TG has had his claims accepted for both W.A.C. and W.B.E.

G2TK is on 14 Mc. telephony, and in his first fortnight of activity worked 3 VK's and other DX. He is using an 807 in the final, and has changed his *Howard* receiver for a *National* 81X.

Thirsk.—G3MB has been granted a 25-watt permit, and is commencing the necessary rebuilding. He will use a T20, driven by a 6L6.

York.—A new member has been proposed since P.D.M., and this will complete the required five members necessary for a T.R. appointment. Provided no one leaves the city in the meantime, this will be decided very shortly.

* * *

The remarks in the last paragraph of the April notes still apply to those members concerned.

DISTRICT 19 (North-Eastern)

Stockton-on-Tees.—G2FO has been busy during the month building the Field Day transmitter, but has found time to work several Continental stations on 1.7 Mc. 3YK is pleased with his new beam aerial and has made WAC (phone) during the last few weeks. Other active stations are 5XT, 8CL, 8PS, 8OH.

South Shields.—Successful fortnightly meetings continue to be held at 5WZ. Morse practice is given for the benefit of all members. 5YO has made a welcome reappearance on the air after being closed down for some months. 5WZ is building for 56 Mc. 5TG is moving to new address. 6XO, 8VV, 5SB, and 8IF are active.

Scotland

"*A*" *District.*—The response to repeated appeals, both in these notes and at meetings, for volunteers for N.F.D. crews has been nil. However members were reminded again at the April meeting that N.F.D. was entirely their business and as such they would require to run it. Several members decided to take the matter seriously, consequently the crews needed to run the four stations are practically up to strength. More volunteers will of course always be welcome, especially from the younger members. Mr. A. McQueen, BRS3321, is welcomed to the district from "C" district. At the April meeting, Mr. Eadie, 2DNK, gave a most interesting lecture entitled "Hatching QRM." Mr. Eadie brought along a very fine transmitter and receiver, the construction of which reflects great credit on him. The lecture, which was of a practical nature, dealt with the trials and tribulations of the newcomer to the "game" and how various difficulties were met and solved. Another interesting lecture has been arranged for the May meeting and will be given by an old ex-transmitting member Mr. I. Smith, who held the call 2OL about twelve years ago. The subject he has chosen is "Microphones, Pre-amplifiers and Modulation." Through the generosity of Mr. Stove, GM5ZX, a receiver was raffled and the N.F.D. funds benefited to the extent of 19s. It was decided to hold a meeting on the last Wednesday of June for the purpose of discussing N.F.D. and hearing the interim report of the auditors. Only one member sent in a report this month—are all the other members inactive?

"*D*" *District.*—Meetings are being well supported. GM5YX reports adding 2 R.F. stages to his T.R.F. receiver with considerable increase of QRK, while GM6SR is testing the N.F.D. transmitters. The following report active, GM3GG, 3UM, 3YN, 4CV, 4FT, 4HB, 5YX, 6LS, 6SR and 6XI.

"*E*" *District.*—The usual monthly meeting was held on March 22, in Ayr, when Mr. D. G. Gray (GM6DG) gave a lecture on "Cathode Ray Tubes and Associated Equipment" to a large attendance. Mr. Gray brought several pieces of apparatus and thus was able to illustrate his lecture by practical demonstration of some of the many interesting points made. The lecture was given through the courtesy of *The Mullard Wireless Service Co., Ltd.* The morse class, which has been well attended throughout the season, held its last meeting on April 18. It has been voted a great success. BRS3198 is now 2ASP and BRS2916 is now 2BUD, BRS3460 awaits call. We welcome new members, 2BTV and BRS3571. The final meeting for the season was held at the Cairndale Hotel, Dumfries, on Sunday, April 30. No further meetings will take place until September and the members in the district will be advised of the opening date.

"*H*" *District.*—Increase in membership continues slow but sure, and the D.R. takes this opportunity of welcoming new members as pressure of business at the moment prevents him from writing them personally, as is his custom. Mr. J. C. B. Carr, BRS2148, is now 2HBR. GM8MQ reports active on 14 Mc. looking for BERTA contacts and states that he finds conditions on the band rather peculiar. GM4AN will be glad if the station operating on 7 Mc. with a T6 note and signing G4AN (QRA near London) will kindly collect his QSL cards from GM4AN to whom they are useless. At one of the recent meetings a talk was given by 2HBR on dual diversity receivers, his talk being illustrated by a diagram of the circuit employed. At another meeting there was a general discussion on contest operation procedure. The following are active: GM2NQ, 3LO, LG, ND, NH, UU, 4AN, FK, GK, 6JJ, 8KR, KQ, MQ and FB. Those active on 1.7 Mc. are GM2NQ, 3ND, 4GK and 6JJ.

"*C*" *District.*—A large district meeting at Broughty Ferry on April 25 saw the 1938 N.F.D. and Scrap Book films, which were accorded an

(*Continued on page* 700)

All Roads Led to Barnet

By SONNY SOUTH

BARNET, renowned in history, witnessed during the evening of April 21 one of those rare sights—an R.S.G.B. function attended by members *and* their ladies.

A traffic census taken early that evening on the Great North Road would have revealed enormous activity a hundred yards from the St. Albans turn, for in the commodious car park of the Salisbury Hotel, each passing minute brought a fresh consignment of " hams " and their " attachments " to the Second Annual District 12 Dinner.

It seems rather surprising how this District has always loomed so large in R.S.G.B. affairs, and it was good to see so many of the prominent members of the Society, who live in North London, present in person. This point was further emphasised during the dinner, when messages of goodwill were read from Messrs. Leslie McMichael and Rene Klein, founders of the original Society, and both District 12 residents.

Among the many visitors present were Mr. A. D. Gay, G6NF, Mr. and Mrs. H. A. M. Clark, G4WY, Mr. and Mrs. Milne, G2MI, Mr. and Mrs. Higson, GW2PH, Mr. and Mrs. Bert Allen, G8IG, Mr. and Mrs. Bradley, G8KZ, and a dozen or more West London amateurs with their ladies.

The dinner itself, attended by nearly 120, was presided over by the District's popular representative, " Buck of G5QF." An interesting and pleasing innovation was the presentation by Mrs. Buckingham of a box of chocolates to each lady.

Informal toasts were drunk with enthusiasm, following which the Loyal Toast was acclaimed.

Mr. Leslie Gregory, G2AI, proposed the toast to the R.S.G.B., which was responded to on behalf of Council by Mr. A. D. Gay.

The visitors were, for the second year in succession, treated to a special display of HAM eloquence, for their health was proposed by Mr. H. A. M. Clark, G6OT, and the reply came from Mr. H. A. M. Whyte, G6WY, who thanked the District for their hospitality.

Mr. W. E. Brigden, G6WU, to whom fell the task of proposing the health of " The Ladies," caused much amusement by his reference to the alleged remark of one of the ladies present, that this was the first time for months she had succeeded in getting her husband to a meal before it was cold !

Miss May Gadsden, of Headquarters staff, in a few appropriate words, replied on behalf of the fair sex.

The final toast, that to the District, was proposed by Mr. Arthur Milne, and replied to by the D.R., who spoke warmly of the splendid work achieved by the Organiser, Mr. S. Howard, G8TY, and by Messrs. Solder, G5FA, and Watson, G2YD, members of the Dinner Committee.

At this point in the proceedings the gathering received a pleasant surprise in the arrival of Mr. and Mrs. Watts. In a brief speech, our President expressed his pleasure at seeing such an excellent attendance from other Districts.

At the conclusion of the speeches, which had occupied less than 30 minutes, a draw for components donated by *Webbs Radio*, *Premier Supplies*, and *Hamrad Wholesale*, took place under the watchful eye of the instigator of Convention " Swindles " —G6CL !

The Ladies
Mr. W. E. Brigden, G6WU, proposes the health of the Ladies

Miss Gadsden from Headquarters, deep in thought

The thanks of the District were conveyed to the three companies who had contributed to the draw.

The floor having been cleared, dance music provided by an excellent P.A. equipment loaned by *Russell Wood, Ltd.*, of Barnet, effectively put the final touch to an outstanding social function. We wish, however, that it had been possible for someone to have recorded for posterity our worthy Secretary dancing the polka as a solo turn with Mrs. G8TY ! Needless to say, everyone else kept close to the walls !

During the dancing the ladies had the time of their lives, splitting up ragchews without ceremony, and whisking their unfortunate partners on to the floor. The number of well-known amateurs who could not hold a full QSO that evening was pathetic to behold !

This function was one of the first R.S.G.B. gatherings held in London to which the ladies had been invited, and judging by their obvious pleasure at being " allowed " to partake in the enjoyment of the evening, we have little doubt that the District 12 experiment will lead to an invitation being extended to ladies when future social events are arranged.

For ourselves, we hope the idea *will* spread.

Why not start with our next Convention ?

Letters to the Editor

The Editor does not hold himself responsible for opinions expressed by correspondents

THIRD HARMONIC INTERFERENCE TO TELEVISION RECEIVERS

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—The following notes on the reduction of television interference due to third harmonic radiation from 14 Mc. Amateur transmissions may be of help to other members in the television service area. Being in the unusual role (for me!) of the broadcast complainant, I found that my television picture and its accompanying sound were completely wiped out when G3VK was operating on 14 Mc. The end of G3VK's transmitting aerial is approximately 20 yards from my television aerial, so that this interference was not entirely unexpected.

Before going to the length of introducing suppression stubs, etc., at the transmitting end, we decided to try the effect of changing the transmitter frequency. Using a 7138 kc. crystal, giving a final frequency of 14,276 kc., the interference was almost unbelievable, but moving the frequency to 14,150 kc. gave a considerable improvement. Finally a shift to 14,080 kc. completely cured the trouble, and I could detect no sign of interference on either vision or sound, in fact, G3VK can operate either 'phone or c.w. right through the television programme without me being aware that he is on!

The television receiver in use here at the time was on *H.M.V.* Model 905, which I had on loan, but in view of the importance of the problem we have since carried out the same experiences with the following television receivers: *Cossor* Model 437T, *Ultra* Model T22, *Ultra* Model T24. With the co-operation of neighbours owning television receivers, and all living within a radius of 200 yards of G3VK, we find that the remedy is effective on *Baird* Model T20 and *Murphy* A56V, but unfortunately in one case in which another make of receiver was involved it was not effective, due, it is thought, to the fact that this model employs a straight T.R.F. circuit, whereas all the other models mentioned are believed to be superheterodynes. However, we were not able to investigate this case fully, as the owner changed to an *Ultra* T24 receiver and has had no further trouble.

It is interesting to note that the third overtone of the transmission frequencies used at the London television station is 13.8 Mc. for sound, and 15 Mc. for vision, no allowance being made of course for modulation band width. In view of the wide frequency acceptance circuits of television receivers, it is difficult to see why a change of less than 200 kc. in the amateur frequency should make such a radical difference to the interference caused, especially as in the case of the sound channel, the move brings the 3rd harmonic nearer to the carrier frequency. Perhaps the answer is wrapped up in the use by most television manufacturers of a common h.f. amplifier stage for both vision and sound, but the views of any of our members connected with the television industry would certainly be of interest.

In conclusion, this remedy is not offered as a universal cure-all for all types of television interference from amateur transmissions, as it is realised that G3VK's power of 6 to 8 watts input makes the cure easier than it would be in the case of a higher power station. Nevertheless, the close proximity of our two aerials is a very severe test.

Yours faithfully,
E. A. DEDMAN (G2NH)

Editorial Note

We shall welcome correspondence from members who have overcome third harmonic interference to television reception or have carried out experiments without achieving success.

In all cases we would urge members to quote the type of television receiver involved.

Members are reminded that devices designed to overcome this type of interference are described in Chapter XI of The Amateur Radio Handbook, whilst a full-length article dealing with the subject appeared in the November, 1937, issue of this Journal.

SIGNAL STRENGTH INDICATORS

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—I was much interested in G8JQ's article in the February issue entitled "Why Not an S Meter?" as I have been using the same circuit for some time at my own station with a NC 100X. I notice the author states that he is not satisfied with the arbitrary method of calibration which he used and proposed going further into the matter; the following suggestion may therefore be of use to anyone who is now using this system, at any rate with the NC100 series of receivers.

With these particular sets the R.F. gain control is calibrated in conjunction with the Electron Eye tuning indicator so that it can be used as a measure of signal strength, and a graph for the conversion of gain control settings to S units is given in the instruction book. It will be found that if the gain control is turned to its maximum position and the S meter then adjusted to read zero, any anti-clockwise movement will cause a progressively increasing reading. The dial is divided into ten sections and a reading of 6 is, according to the graph referred to above, equivalent to S9; to calibrate the meter switch to Manual instead of AVC, turn the gain control to 6, then mark the meter dial S9 at the reading shown. The lower calibration points can be transferred in a similar manner. In my own case the higher S values are more crowded than the lower, which are well spaced

out. Whilst this method of calibration depends on the accuracy of the makers' original graph it seems preferable to a purely arbitrary scale.

Yours faithfully,
L. A. LAFONE (G8QC).

QSL CARDS

The Editor, THE T. & R. BULLETIN

DEAR SIR,—It will no doubt be agreed that it is not an easy matter to run over a few QSL cards and extract uniform reports. The amount of information varies, and is sometimes hidden in odd corners under a part of the design.

It would be a pity to check variety in the general appearance, but, after all, the card has an experimental purpose first of all.

I suggest that there be a R.S.G.B. standard both in respect of the amount of information and of its position.

If a standard layout were adopted, it could be printed in black, and all necessary data would then be readily available. The personal or artistic design could be overprinted in colour, and would usually contain the call sign as at present.

In this way, collectors of data and of "wall-paper" would both be satisfied.

Yours faithfully,
H. RIDGE (G3HR).

THE F.O.C. REPLIES TO CRITICS

To the Editor THE T. & R. BULLETIN

DEAR SIR,—We have taken careful note of the various criticisms and accusations levelled against our Club in a recent BULLETIN letter. Although the majority of the charges are so fantastic that at first sight we were not inclined even to accord them a bare denial, we have finally decided that some answer is advisable. Actually, we have had considerable correspondence from Mr. Jones in the past, and its nature leaves us in grave doubt that his published letter is not largely provoked by personal malice. In view of this, perhaps we may be forgiven if we do not attach to the letter the importance which the authors doubtless attribute to it themselves.

Apparently the whole atmosphere of condemnation and censure pervading the letter has been painstakingly built up by long periods of eavesdropping on QSOs by F.O.C. members, selecting isolated incidents which have occurred over a long period, and basing on these incidents general charges against our Club as a whole. (Whether the time occupied by such amateur "detective work" could not have been more usefully employed is not for us to say.) An organisation like F.O.C. cannot exercise a rigid authority over all its individual members, and it is quite likely that in the future, as in the past, critics may be able to single out isolated cases for complaint. We are, however, perfectly confident that the lurid picture of our organisation painted by Mr. Jones and his friend is absolutely unrepresentative of the true state of affairs. Furthermore, their present (and past) assertions on questions of operating are of such a nature that we have little confidence in their eligibility to dogmatize on the subject.

F.O.C. realises that it takes all kinds of people to make up what is generally referred to as the "Amateur Radio Fraternity," and if our members find themselves in disagreement with other Amateurs they do not regard that bare fact as being sufficient excuse for launching a violent attack on them. As an organisation our chief object is to effect an improvement in the general standard of British Amateur operating, and we desire to co-operate (peacefully) with all sections of the British Amateur movement. Mr. Jones, on the other hand, has not yet learned to "live and let live," and has often expressed his contempt and antagonism towards such Amateur activities as contests, ragchewing, certificates, DX and QSL hunting, operating for its own sake, and telephony operation in general. If he finds that his *sole* interest in Amateur Radio lies in research, we hardly know whether to congratulate or sympathise with him. We certainly envy him if he possesses or has access to the expensive apparatus and sub-standard instruments without which little of such work can be effectively undertaken. It is our opinion that the average British Amateur, while having his particular technical "speciality," also likes to participate in the varied activities implied by the expression "Amateur Radio."

The F.O.C. notes which appear from time to time in the BULLETIN do not purport to be the last infallible word on any of the subjects dealt with, and are merely intended as helpful suggestions and pointers for such persons as care to heed them. We receive and welcome correspondence referring to them, and indulge (*via* the post) in many profitable discussions on the subjects concerned. There is no compulsion for anyone to act on the information presented, or even to read it, and we believe that R.S.G.B. members are quite capable of deciding such matters for themselves.

The Club has several times been charged with attempting to commercialise British Amateur operating, but this is only a half-truth. The fact is that where we consider commercial practice can, with advantage, be introduced then we advocate it, but we are quite aware that to adopt such procedure "in toto" would result in confusion and defeat its own ends. We deny Mr. Jones' implication that all is well with Amateur operating in this country. That criticism is either unwarranted or unnecessary, and we cannot accept his proposal to regard a first-class Naval telegraphist as a standard of reference. The operating standard of F.O.C. members is at least equal to that required by the G.P.O. for the Unrestricted First-class Certificate of Proficiency in W/T, and nobody is considered for membership who cannot attain that standard.

Mr. Turner's contention regarding the "Acknowledgment of Receipt" paragraph in February's F.O.C. notes is surely of minor importance, and in view of the length of this letter, we can only deal with it briefly. We still see little, if any, justification for using the "Received" signal concerning an incomplete transmission, and instead of Mr. Turner's "R most" or "R part," we suggest "Most OK" or "Part OK." This avoids the use of "R," which can be introduced whenever a solid copy of a transmission is obtained.

In conclusion, may we make it clear that in future we shall not attempt to answer attacks or criticism either publicly or privately unless we are satisfied that they originate from a responsible quarter. A continuation of our correspondence

with Mr. Jones, for example, would serve no useful purpose, and would probably deteriorate into a fruitless and acrimonious exchange of personalities. We consider that valuable BULLETIN space can be more usefully employed, but if Mr. Jones feels impelled to have the last work he may do so secure in the knowledge that not even his most outrageous charges will provoke any further official reply from F.O.C. In the meantime we shall just keep on keeping on, and despite all such "slings and arrows," we have an idea that we'll "muddle through" somehow.

Yours faithfully,
J. MACINTOSH DAVIE.
A. C. F. DEARLOVE.
T. C. R. LITTLEMORE.
C. J. PEACH.
W. A. ROBERTS.
F.O.C. Committee.
R. B. WEBSTER, Secretary.

(EDITORIAL NOTE.—The F.O.C. Committee having replied to recent criticisms, this correspondence is now terminated. We thank those members who have written in favour or against the previously expressed views.)

CRYSTALS AND CRYSTAL OSCILLATORS

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—We beg to be allowed the use of a little of your valuable space to mention one or two points which we believe affect most of the amateur transmitters of this country.

In our opinion, the use of a fuse-bulb in series with the crystal is of the nature of a "snare and delusion." We base our opinion on the fact that the majority of crystal failures are due to *sudden* increases of power in the crystal circuit to a value greater than the crystal can stand. Of these, the majority occur at the instant of switching plate supply to the oscillator. In these cases the amplitude of crystal oscillations is built up to an intolerable value in about ten cycles of the crystal's oscillation. That is to say, within about a millionth of a second, the crystal may be beyond recall. No fuse will blow in this time, whilst even if a hundredth of a second were allowed instead of a millionth, few fuses are good enough to blow at less than ten times their rated current. Again, apart from the products of our own British makers (of the best quality) most so-called 60 mA fuses will barely glow at this current, let alone blow rapidly. A fuse will blow if the circuit is slowly adjusted to increase the crystal current but this is not what destroys crystals but the surges, against which a fuse offers no protection at all.

Our second point is the tendency to run crystal-oscillators at voltages greatly in excess of that required to fully excite the next stage. A recent example is that of using a 6V6g tritet at Va=350 to drive another 6V6g as neutralised P.A. at the same voltage. Why? We should regret being forced to think that the average amateur is too ignorant to appreciate the fact that, in the above case, 150 volts would have fully driven the next stage. Is it carelessness? We hope not, for carelessness has cost too many lives and limbs among the amateurs of the world. Many amateurs like to use the minimum number of R.F. stages in their transmitters. (We like to do so ourselves at G2CR), but we submit that crystals are too expensive to warrant "economy" by running them at their limit to save using another valve, costing about six shillings. The difference in current consumption between a high power tritet and a low power crystal oscillator and buffer-doubler is negligible.

Finally, when using crystals, it is well to remember that the crystal frequency given on the certificate is the frequency produced when the crystal is used under the exact conditions specified and that changing from a '47 straight pentode to a 6L6 tritet, or running the crystal warm or with a holder different from that in which the crystal is tested, will tend to change the oscillatory frequency and, these effects may be additive and be sufficient to put the final frequency outside the band.

In this connection, it is worth while to consider possible retroaction of the final stage on the crystal oscillator, especially if the output frequency is the same as the crystal fundamental. It is wise, therefore, to have at least one stage of frequency doubling when using any of the higher frequency bands. This confers the additional benefit that crystals can be made to rather better accuracy and reliability for the two low-frequency bands than for the forty or twenty metre bands, and the crystals are invariably more robust. Think, therefore, whether it might not be worth while to use another low power doubler, or low power tritet and gain in stability, safety, and reliability, eliminating that slow, steady creep which is so annoying to anyone using a crystal-gate super on the higher frequencies.

In conclusion, we are ready, and feel that other makers of crystals in this country are also ready, to offer any assistance in their power to any amateur who cares to write, especially if he or she cares to reduce the work by enclosing a stamped, addressed envelope.

Again thanking you for your valuable space and the opportunity of addressing these words, which we hope will help to enable amateurs to obtain the best results from their gear.

Yours faithfully,
S. O'HAGAN (G2CR),
pp. Radio Construction Service.

ALL-BRITISH TRANSMITTER

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—There is one point to which I should like to draw attention with reference to the "All-British Three-Stage Transmitter" described in the April issue.

For the final tank circuit a 50×50 μμF split stator condenser, series connected, *i.e.*, 25 μμF, has been specified. This value, together with the 10 μμF in the valve itself, gives only a total of 35 μμF at maximum capacity.

With the D.C. plate resistance of approximately 12,500 ohms at which the valve is operated, surely 35 μμF tank capacitance is not even enough for the correct L.C. ratio on 14 Mc., let alone for 7 Mc.

As the whole of the tuned circuit impedance is across the valve output, the same values apply as to a grid neutralised amplifier. Taking the tables in *Radio* Handbook as an example, the optimum capacities would be approximately as follows:—28 Mc., 20 μμF; 14 Mc., 40 μμF; 7 Mc., 80 μμF.

In the tables given by G5KG in his article in the

November, 1938, T. & R. BULLETIN, even higher values of capacity are given, after allowing for the fact that G5KG's values are for plate-neutralised circuits.

Would it not, therefore, have been better to use the 50×50 μμF condenser with the sections in parallel ?

Yours faithfully,
R. W. ROGERS (G6YR).

To the Editor, THE T. & R. BULLETIN

DEAR SIR,—With reference to Mr. Rogers' comment, I would refer him to *The Amateur Radio Handbook*, Fig. 15, page 76, which shows that for a D.C. plate resistance of 12,500 ohms a value of 1 μμF per metre wavelength is correct. Thus for 7 Mc. the optimum value should be approximately 42 μμF, whilst for 14 Mc. and 28 Mc. the values should be 21 and 10 μμF respectively.

If the R.S.G.B. Handbook figures are accepted, the "All-British Transmitter" operates more closely to theory on 14 Mc. than on 7 and 28 Mc. In the former case a slightly larger capacity could be used to advantage, whilst for 28 Mc. operation a smaller condenser might prove more satisfactory.

For three-band operation, however, a compromise is necessary, and the value of 25 μμF specified would seem to be reasonable.

It should, however, be borne in mind that the theoretical values give in L/C Ratio Tables or Charts are at the best only a compromise between best efficiency and harmonic reduction. We have no reason to suppose that our source of reference in this respect is any less reliable than the one quoted by Mr. Rogers.

Yours faithfully,
S. BUCKINGHAM (G5QF).

Editorial Note

The following are the dial readings and resonance (off load) current values obtained with the "All-British Transmitter" when operated on telegraphy at 1,150 volts and with the tank inductances specified :—

Frequency Mc.	Dial Reading	Off Load Current
7	70°	10 mA.
14	30°	12 mA.
28	25°	25 mA.

Assuming a straight line capacity law for the tank condenser the capacity employed to obtain resonance in each case would be :—

7 Mc. ... ... $\frac{70}{100} \times 25$ μμF = 17.5 μμF

14 Mc. ... ... $\frac{30}{100} \times 25$ μμF = 7.5 μμF

28 Mc. ... ... $\frac{25}{100} \times 25$ μμF = 6.25 μμF

To these values must be added the valve capacity (10 μμF) plus stray capacities (say, 5 μμF).

The final capacities thus become :—

7 Mc. ... ... 32.5 μμF (Optimum 42 μμF)
14 Mc. ... ... 22.5 μμF (,, 21 μμF)
28 Mc. ... ... 21.5 μμF (,, 10 μμF)

which confirms Mr. Buckingham's view that the transmitter operates more closely to theory on 14 Mc. than on the other two bands.

For 28 Mc. operation it would be preferable to use four turns of inductance, but when this change is made the band is not fully covered on the condenser.

CALIBRATION SECTION

Crystals and frequency meters of the heterodyne type can be accepted for calibration and these should be sent **direct** to the Calibration Manager :

Mr. A. D. Gay (G6NF),
156, Devonshire Way,
Shirley,
Croydon, Surrey.

Crystals should be enclosed in a small tin and securely packed to avoid loss in transit, whilst frequency meters should be packed in a wooden box or substantial cardboard container.

Return postage for crystals and frequency meters must be enclosed as stamps and not attached to the postal order. The Society cannot accept responsibility for any loss or breakage that might occur in sending apparatus for calibration through the post.

Calibration Fees

Crystals, 1.7, 3.5 and 7 Mc. types... 1s. 6d. each
Crystals, 100 kc. type ... ... 2s. 6d. ,,
Heterodyne frequency meters 5 points within the amateur bands ... 5s.
For each extra point at any desired interval 6d.

Stray

G5BW, Willingdon, Eastbourne, will be pleased to hear from any member who has successfully adapted the W3EDP aerial for 1.7 Mc. operation.

BRITISH EMPIRE NEWS AND NOTES

Australia (Queensland)

By VK4GK

Activity has eased somewhat in VK4 during the past few weeks, a respite after the B.E.R.U. and A.R.R.L. Contests. The 14 Mc. band is only open for about three hours in the early morning, G stations are then well to the fore, but as most amateurs like to stay in bed once they get there, the few enthusiasts who rise with the candle light have a right royal time. 28 Mc. has fallen off considerably, but a brightening up about the end of August is anticipated.

At the annual meeting of the VK4 Division of the W.I.A., which was held on March 24, Mr. Scholz (VK4HR) was awarded the trophy for the most meritorious performance during the year. VK4HR was active on five bands, and well deserved his win. 4UR was runner-up for "The Best work in Contests" trophy. 4KH is constructing an eleven-tube super using three stages of R.F., but finds time to work a few G stations on 'phone, both he and BERS463 have added oscilloscopes to their station equipment. 4AP is running a weekly schedule with VP5PZ. Mr. Hagarty is now in charge of the radio at Cloncurry Aerodrome. His station, VK4WH, is dismantled completely, but we hope he will not be off the air indefinitely. 4RJ has done much to further the interests of Association football in VK4, and much of his spare time is taken up in this direction, although he is still active when opportunity permits.

The VK4GK family went to Maryborough for the Highland Gathering on Easter Saturday. They were met by 4BB, who spared no pains in making their brief stay an enjoyable one. Thanks, Mr. and Mrs. Beatson.

We should be pleased if members in country districts who see these Notes would send a few lines to let us know what they are doing, we might guess wrong!

Australia (Western)

By VK6WZ

Activity on 56 Mc. is on the increase here. The April 2 Field Day at which 6IG scored highest points, was most successful and proved the occasion for new "DX" records for VK6. 6IG and 6RW from field locations in the Darling Ranges contacted metropolitan stations about 20 miles distant. Since then 6LW, 6BB and 6BW—all using crystal control—have conducted tests over similar distances, the first-named taking portable gear to the hills in his car and the other two remaining at home. Further impetus is to be given to U.H.F. work during the long week-end, April 29-May 1 (inclusive), during which several crystal-controlled stations will be set up at selected points about the metropolitan-suburban area of Perth and one (6GB) will operate at points along the road to Northam (60 miles away). It is hoped to run 48 hours solid operation with relays of operators. Eastern VK has been notified and U.H.F. pioneer VK2NO has promised to arrange listening schedules. 6BB, 6BW, 6GB, 6GM and 6LW will operate, and others have promised co-operation if gear can be assembled in time.

14 Mc. continues to be patchy here, but 7 Mc. seems to be improving for DX. As winter approaches this characteristic should develop.

British West Africa

By ZD2H

Nigeria.—ZD2H, who is still looking around for a suitable power supply, complains that listening to DX is tame compared to working it! Using a new 66 ft. Zepp from a location 4,000 ft. up a mountain slope, he is hoping that his QRP signals may be heard somewhere. The operator of ZD2KM is probably in G on leave. This station is genuine and cards forwarded via the R.S.G.B. QSL Bureau reach 2KM in due course. BERS440, with his usual promptitude, obliges with a radio-telegram whilst still at sea, announcing his impending return from leave.

Gold Coast.—Nothing has been heard recently from ZD4AA or ZD4AB. It is probable that 4AB is inactive preparing for his vacation leave, due to commence in May.

British West Indies

By VP2AT

Conditions during March were disappointing, especially on 28 Mc. The 14 Mc. band has also fallen off, although one of our new stations, VP3CO, in British Guiana, has been putting a good signal into Europe. VP3LF is the new call of VP3AA, both he and 3CO work on 'phone exclusively. VP4TR (brother of VP2AT), another new station, is using C.W.

Channel Islands

By 2AOU

Jersey.—2FDJ has had his licence application accepted and awaits a code test. G3GS has had a visit from G5GP, and reports very erratic conditions on 7 Mc. for inter-G working, having worked only two GM's during early mornings in a fortnight. 3GS also complains about stations who call him, but fail to give their own call a sufficient number of times. One station called 47 times without signing once. 2DUP, who has been trying out a C.O. using a 53, is learning the code. 2AOU reports bad conditions on 28 Mc. and is back on 14 Mc. He has received a card from VP2SC.

Alderney.—G3XN, who will be returning to Guernsey soon, has applied for permission to operate on 28 and 56 Mc.

Guernsey.—No reports have been received again this month.

Toastmaster G6CL, at District 12 Dinner, amuses G5QF, whilst Peter Bradley, G8KZ, prays silently—for what?

QRA Section

Manager: H. A. M. WHYTE (G6WY)

When sending in a new, or changed address members are requested to print their names and addresses in block letters, as frequently signatures and names of streets are illegible. This necessitates reprinting the corrected address in the next issue of the BULLETIN.

New QRA's

GW2HH.—H. HARDING, Treve Cottage, Beulah Place, Ebbw Vale, Mon.
G2JP.—M. C. ELLISON, Tenter Lodge, Knaresborough, Yorks.
G2JW.—W. PALMER, 170, London Road, Leicester.
GW2PH.—S. HIGSON, The White House, Sandycove, Kinmel Bay, Denbighshire.
G2WS.—W. A. SCARR, M.A., 8, Beckenham Grove, Shortlands, Bromley, Kent.
G2ZC.—Capt. A. M. HOUSTON FERGUS, Churt House, Churt, Surrey.
G3BP.—R. M. GARRETT, Coppise, Cheltenham Road, Ballinger, Gt. Missenden, Bucks.
G3BU.—H. G. SMITH, 15, Abbeymead Road, Abbey Lane, Leicester.
G3KJ.—K. D. JACKSON, 55, Berkeley Avenue, Reading, Berks.
G3PX.—H. T. WOOD, "Pendleton," Port Hill, Shrewsbury, Salop.
G3QI.—R. BEAN, 20, Grafton Square, Wetherby, Yorks.
G3SK.—R. G. KITCHENN, 13, Norton Road, Letchworth, Herts.
G3WW.—R. F. G. THURLOW, Cotswold House, 6, St. Peter'sRoad, March, Cambs.
G4BU.—R. H. DRAPER, Bracebridge Heath, Lincoln.
G4BZ.—R. A. WATSON, 45, The Avenue, Highams Park, London, E.4.
G4CJ.—C. SHARRATT, 22, Devon Road, Blackburn, Lancs.
G4DM.—E. G. W. SCRACE, 33, High Brooms Road, High Brooms, Tunbridge Wells, Kent.
G4DP.—A. DICKINSON, 111, Sprotborough Road, Doncaster, Yorks.
G4DU.—A. E. HYDE, 1, Prune Street, Ingrow, Keighley, Yorks.
G4FB.—F. BARNARD, 30, The Village, Charlton, London, S.E.7.
G4FJ.—P. F. ATKINSON, 102, Prenton Road East, Birkenhead, Ches.
G4FO.—G. E. COCKCROFT, 18, Harborough Road, Oadby, near Leicester.
G4FZ.—A. E. HOWARD, 53, Woodhill Crescent, Kenton, Middlesex.
GM4GK.—J. C. IMRIE, 8, Balgonie Place, Markinch, Fifeshire.
G4GI.—S. M. GAMBLES, 1, Lindum Terrace, Lincoln.
G4GN.—W. FLETCHER COOPER, Ravenswood, Weston Road, Glos.
G4GT.—L. J. GROVES, "Berkley," Canewdon View Road, Ashingdon, Essex.
G4GW.—G. A. PARRIS, South Lodge, Early Lane, Heathfield Sussex.
G4GY.—M. P. KING, Greystone, Cleeve Hill, Cheltenham, Glos.
G4HD.—C. R. GREENLAND, 37, Bratton Road, Westbury, Wilts.
G4HL.—N. D. WHITEHEAD, 35, Higher Swan Lane, Bolton, Lancs.
G4HO.—R. DALE, Glendale, 54, Church Hill Road, Solihull, Warwickshire.
G4HU.—W. MORRIS, 34, Birch Avenue, Romiley, Ches.
G4HV.—E. SPENCER, 16, Keswick Gardens, Ruislip, Middlesex.
G4IB.—L. S. KING, "Mountfield," Five Oak Green, Paddock Wood, Kent.
G4IG.—R. P. BRETT, 48, Fordwych Road, London, N.W.2.
G4IL.—H. P. SINGLETON, 33, Auburn Grove, Blackpool, Lancs.
G4IN.—F. V. HALL, Hinwick Road, Wollaston, Wellingborough, Northants.
G4IO.—F. B. WILFORD, 40, Church Lane, Eston, Middlesex.
G4IT.—E. H. PAULTON, "Inglewood," The Plantation, Worthing, Sussex.
G4JS.—J. SIMPSON, 26, Laurel Avenue, Darwen, Lancs.
G5DY.—W. H. DERRY, 57, Uplands Road, Woodford Bridge, Essex.
G5TH.—T. F. CROWTHER, "Antwerp House," 198, South Drive, St. Annes-on-Sea, Lancs.
G5XV.—R. Y. PARRY, "Dunkerque," Kingsway, St. George, Bristol, 5.
G6BI.—D. N. BIGGS, 4, Cliffe Road, Market Weighton, E. Yorks.
G6DV.—C. NOKE, 237, Katherine Street, Ashton-under-Lyne, Lancs.
G6FK.—F. SMITH, 1, Swan Bank, Penn, Wolverhampton, Staffs.
G6YJ.—F. R. CANNING, "Bradford House," 9, Devizes Road, Swindon, Wilts.
G8BR.—B. RAYNER, 919, Wimborne Road, Moordown, Bournemouth, Hants.
G8FJ.—H. S. NORRIS, 20, St. Werburgh Crescent, Hoo, Rochester, Kent.
G8HN.—J. R. T. MORTON, 26, Manor Lane, Sunbury-on-Thames, Middlesex.
G8PM.—J. D. MACKAY, c/o Lennon, 147, Knella Road, Welwyn Garden City, Herts. (Incorrectly reported in last month's list.)
G8QX.—K. HOPKINSON, Daisy Bank, Killamarsh, near Huddersfield, Yorks.
G8VM.—N. F. YOUNG, 46, Coleridge Road, Crouch End, London, N.8.
2AJV.—R. JENNISON, 28, Park Drive, Grimsby.
2AJM.—A. J. EVANS, Dorset Lodge, Station Road, Wylde Green, Sutton Coldfield, Warwickshire.
2ATZ.—J. HARRIS, "Wyncote," Hawkswood, Hailsham, Sussex.
2BIL.—G. F. KEEN, 51, Tisbury Road, Hove, Sussex.
2BTY.—L. LEWIS, "Kandersteg," Pond Head Lane, Earley, Berks.
2BXJ.—A. F. THOMPSON, 5, Analey Street, Gt. Yarmouth, Norfolk.
2BYA.—R. G. LANE, Lynn, Glendale Drive, Burpham, Surrey.
2CBB.—H. R. HATCH, 1, Delcombe Avenue, Worcester Park, Surrey.
2CLR.—INTERNATIONAL SHORT WAVE CLUB, R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8.
2CMF.—H. J. PACKE, St. Kilda, Victoria Avenue, Langdon Hills, Laindon, Essex.
2CNL.—A. ROWNEY, "Camrose," Rectory Road, Llandough, Penarth, Glam.
2CNO.—L. G. BLUNDEN, 39, Railway Road, Newhaven, Sussex.
2CPL.—N. J. BRUNDLE, 11, Gunton Drive, Lowestoft, Suffolk.
2CVA.—H. G. COLLARD, 94, Earls Hall Avenue, Prittlewell, Southend-on-Sea, Essex.
2CYC.—G. E. CHISHOLM, 46, Woodfield Road, Leigh-on-Sea, Essex.
2CZB.—E. A. OLIVER, 43, Deeplish Road, Rochdale, Lancs.
2DLM.—H. MARSDEN, 2, Pinkwell Lane, Harlington, Hayes Middlesex.
2DHM.—W. D. ANDREWS, 4, Steep Street, Chepstow, Mon.
2DRD.—J. J. THOMSON, Jericho, By Forfar, Angus, Scotland.
2DSF.—N. BOOTH, 20, Gordon Avenue, Levenshulme, Manchester, 19.
2DUU.—K. G. COE, 25, Suffolk Road, Barking, Essex.
2FKU.—F. E. BARLOW, Drakeford, Poolhead Lane, Wood End, Tanworth-in-Arden, Warwickshire.
2FSY.—F. J. BROCK, 9, Christian Fields, Norbury, London, S.W.16.
2FTN.—S. MCKAY, 8, Ashgrove Road West, Aberdeen, Scotland.
2FUD.—A. W. OWEN, "Tan-y-Bryn," North Road, Caernarvon, N. Wales. (Incorrectly reported in last month's list.)
2HAK.—R. WILSON WILLIAMS, Gamelyn, Ala Road, Pwllheli, Caerns.

Cancelled.—2AKQ, 2BFK, 2CJO, 2CJP, 2CSD, 2CTZ, 2DFF, 2DHC, 2DHD, 2DNG, 2DPN, 2DWL, 2FAG, 2FCY, 2FDZ.

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HELPING HAND—(*Continued from page* 668)

If it is assumed that the normal ratios are as follows: three dots equal one dash, the space between each dot and dash equals one dot; the space between each letter three dots, and ten dots between each word; then a signalling speed of twenty words per minute, each word consisting of five letters, would result in each dot occupying a time of .06 seconds, or, put more conveniently, 60 milli-seconds.

Let us now suppose that a value of 1 μF. has been chosen for the condenser C. Making use of the Time Constant formula :—

$$\text{Where } T = \frac{2.3 \times R \times C}{10^6}$$

which applies for a 90 per cent. drop of the voltage across C, it will be found that the time constant of the circuit is 23 milli-seconds. The time during which the condenser is discharging will have no effect as it will occur whilst the key is down and a signal being radiated, whilst the rate at which the signal builds up will be dependent on other factors. Instead of the signal dying away instantly when the key is up, a " tail " lasting for 23 milli-seconds will be heard and this will cut into and reduce the time of 60 milli-seconds which elapses between each character. The effect of the whole process, continually repeated, will be to reduce considerably the intelligibility of signals, especially when fading, echo and similar conditions are prevalent.

Reducing the capacity of C to .1 μF. will reduce the time constant to a tenth of its previous value, *i.e.*, 2.3 milli-seconds, which is just about right to smooth out surges without detracting from the clear-cut character of a signal.

The rapid charging and discharging of the condenser will cause any inherent fault in it to show up more quickly than would be the case if only a steady potential had to be withstood and, for this reason it is recommended that the working voltage rating of the condenser chosen should be well in excess of the maximum voltage likely to be applied. Alternatively, two condensers, each of double the capacity specified, may be connected in series, this arrangement making remote the chance of a break-down occurring.

From what has been said, it will be clear that rarely will any condenser or resistance that may be to hand be suitable for inclusion in a key filter and, further, that the correct choice of the component values will vary according to the current flowing in the circuit being keyed.

The Filter Choke

The choke employed in series with the key forms an equally important part of the whole filter, its purpose being to remove a surge of current at " make " and, at the same time, allow the energy in the circuit to build up rapidly but gradually. It therefore deserves treatment at greater length than is possible in the present article and due attention will be given to it next month, when methods of reducing forms of interference other than from key clicks will also be dealt with.

COSMIC NOTES—(*Continued from page* 660)

highest monthly mean was July, 1938, with 165.3; July, 1937, came second with 145.1.

Magnetic Elements

The data which follows is for the period March 24 to April 24. The period has been generally disturbed. A moderate disturbance which began about midday on March 27 increased in severity on March 28 to the magnitude of a storm. The intensity became moderate again on March 29 and continued so until midnight April 1 with a short break on March 31. It is interesting to compare this magnetic activity with the extremely small number of sunspots at the same time. There were further moderate disturbances on April 4 and 8. And another moderately disturbed period lasted from April 10 to midday on April 12.

A disturbance which began late on April 16 increased in severity suddenly at 0158 on April 17. This storm continued throughout that day and then with moderate intensity until April 22. After a few hours of quieter conditions a further storm occurred on April 23, starting at 0545. An even greater storm, accompanied by an auroral display (witnessed in south England), was experienced on April 24 beginning at 1740. This disturbance continued with moderating intensity through the following day.

The Ionosphere

Coincident with the severe magnetic disturbances, several ionosphere storms were reported. These were as follows :—2000 March 29 to 1100 March 31 (severe); 0500 April 1 to 1100 April 2; 0500 April 3 to 2000 April 3; 0700 to 1000 April 6; 0300 April 17 to 1700 April 18 (severe); 0500 April 20 to 0400 April 23 (severe); 0600 April 23 to 1000 April 24 (severe); 1500 April 24 to 1100 April 25 (severe). Numerous Dellinger fade-outs were recorded.

Critical frequencies for the F2 layer at Washington were April 5, 11,000 kc., April 12, 10,200 kc., April 19, 12,200 kc., April 26, 9,300 kc.

All times in the above report are G.M.T.

G2XC.

DISTRICT NOTES—(*Continued from page* 692)

appreciative reception. Thanks are due to Mr. Norman Brown for finding time after a busy day to attend to the projection. N.F.D. arrangements are well ahead and the district hopes to finish well up in the list this year. New members to be welcomed to the fold include Messrs. Robertson, Wallace and Suttie. Mr. D. A. Macqueen has left the district for Glasgow and our good wishes go with him.

EXCHANGE AND MART.

RATES.

Members' private advertisements 1d. per word, minimum 1s. 6d, maximum 10/-. Trade advertisements 2d. per word, minimum 3s. First line, if desired, will be printed in capitals. One inch Semi-Display, 10s. per insertion. Terms : Cash with Order. All copy and payments to be sent direct to Advertising Manager, Parrs, 121, Kingsway, London, W.C.2, not later than the 30th of the month for the following month's issue.

CALLBOOKS.—Few copies Winter edition to be cleared at 4s., post free.—G5KA, Goodmayes, Ilford, Essex.

FOR SALE.—All in perfect condition. Speech Amplifier and Modulator, 75-watts output ; 6C6, 76, 2-76, 2-6A3, 2TZ20 Stancor Transformers, including modulation, moving coil meter ; cost over £10, £7. Final Amplifier, 2-RCA800 P.P. circuit (page 195, A.R.R.L. Handbook), 2 m.c. meters, Filament Transformer, National Variable Condensers and plug-in mounts ; cost £13, £8 10s. Power supplies (parts by Major Co.), 120 v. 200 mA. H.T. Filament Transformer, L.T. 6.3 v. 1.5 a., 2 a., 2-5 a., 866 Rectifiers, two section Filter ; cost £11 10s., £8. 1000 v. 250 mA., H.T. 866 Jr. Rectifiers, two-section Filter, but no filament transformer ; cost £7 10s., £5 10s. ; all 230/250 primary. National HRO. Junior Receiver, 230 A.C. power supply, 10-20 coils ; what offers ? Wanted, Rotary Converter, 6 or 12 v. input, 300 v. 150 mA. or higher output.—GM2UU, 29, George Street, Stranraer.

FOR SALE.—Complete medium-power Station and Workshop, including RME.69 and DB.20. in one cabinet one month old ; elaborate plate-modulated transmitter ; cathode ray oscilloscopes ; 36-range Avometer ; meters ; power packs ; generators, 1,000 and 2,000 volts ; Drummond lathe ; power drill ; grinder ; set high-speed drills ; electric motors ; details and prices on request.—KENNEDY, Rushmere, Weedon Road, Northampton.

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Printed in Great Britain for the Inc. Radio Society of Great Britain, 53, Victoria Street, London, S.W.1, by Loxley Brothers, Ltd., 50, Southwark Bridge Road, London, S.E.1.