

**JOURNAL OF THE
Q R P
RESEARCH SOCIETY**

EDITED BY: - J. WHITEHEAD
THE RETREAT, RYDENS AVENUE
WALTON-ON-THAMES, SURREY
Telephone: - - WALTON 1619



RADIO AMATEUR

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- Together with our usual Amateur Band, Broadcast
Band, VHF News, Club News, Mail Bag etc., etc.

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JOURNAL OF THE
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Q R P

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ISSUE No. 33
NOVEMBER 1952

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..... EDITORIAL

Our new project, which we have christened Operational Research, is well under way. Letters offering encouragement and, in many cases, practical assistance are reaching me by every post, even now, after a month has elapsed. Having been launched with the generous help of G3ANQ, we publish in this issue a further great step forward provided by George Partridge, G3CED. Furthermore, we have had his invaluable assistance in drawing up a scheme of "proposed procedure". This we shall eventually produce as a supplement, but, first, we should like everyone who is interested to let us have comments and suggestion so that, when we do put out the final copy, it shall be free from pitfalls and avoidable errors.

On the surface this project possibly appears to be strongly biased in favour of the transmitter. Actually it calls for a combined assault with our SWL members leading the way with an attack on receiver design. It has been clearly shown that far greater selectivity in receivers is needed

It is proposed to endeavour to develop such a receiver here at QRP HQ, reporting progress each month in the mag (commencing elsewhere in this issue) -- an idea which cannot quickly succeed without the suggestions, comments and general help of every keen SWL member

Don't sit back and let the others carry the load, OM!

OPERATING RESEARCH
 AN INTRODUCTION - BY G.C.C.D.

"Operating Technique" would be the more correct term, for the pioneer work in the development of efficient operating practice really started when short wave radio began to be used as a medium for regular communication between fixed stations.

PROBLEM 1: The first problem that faced the early short wave operators was that of fading. This took two forms, temporary and "permanent". Fading in the latter category was eventually discovered to be mainly due to a change in skip conditions or to the lowering of the MUF (maximum useable frequency), and research into the behaviour of the system of refracting ionised layers above the earth's surface made it possible for a reasonably accurate forecast to be made of the optimum frequencies likely to provide good communications between given areas on the earth's surface. This particular line of research is conducted today by certain scientific bodies and regular forecasts are available to the professional and amateur operator alike. Owing, however, to the vagaries of the refracting media, these forecasts, like our weather forecasts, are intended purely as a guide and quite frequently they prove very wide of the mark. As a result the operator himself is often left to explore alternative channels in order to maintain communication.

PROBLEM 2: The rapidly growing use of SW communication channels soon introduced an ever increasing and far more formidable problem to the SW radio operator. Interference from stations using adjacent channels (QRM) had to be overcome. This was approached from many angles

- (a) The receiver was made increasingly selective
- (b) The transmitted frequency was narrowed down in bandwidth and stabilised to enable the receiver to "hold" the station at "needle point" selectivity.
- (c) The transmitted frequency was "beamed" in the desired direction and the receiving antenna was likewise beamed. This beaming process was also applied to the vertical angle of radiation at both ends.

By and large all these developments have resulted, for the professional operator, in reasonably good and consistent radio communications. Even so, and in spite of the use of almost unlimited power in the Tx, relatively unrestricted ground space for the erection of beaming antenna arrays (often designed to beam the signal to one specific point on the earth's surface) and a vastly larger "pocket" -- even so, the professional operator has found it necessary (and particularly so in war time when order becomes chaos) to perfect a technique whereby communications continue in spite of the terrific barrier of QRM appearing on "his channel"

A good operator must be able to maintain communication by overcoming these obstacles. He learns by constant practice:

(a) To ignore the QRM that remains after skilfull manipulation of his Rx and choice of antenna has reduced it to a minimum, and

(b) TO DEVELOP A QSY PROCEDURE THAT ENABLES COMMUNICATION TO CONTINUE ON ANOTHER CHANNEL WITH THE MINIMUM DELAY.

It is this QSY procedure, as applied to amateur operating, that, perhaps, justifies the use of the heading "OPERATING RESEARCH", for never, in the history of radio communication, has the professional operator been called upon to face the peculiarly intense problems which today beset the amateur using QRP. Not only is the amateur population growing ever larger, but the invasion of BC high power stations, commercials and others, into what have hitherto been our own exclusive bands, calls for the development of a form of procedure that will enable ANY two or more amateur stations to continue their QSO when condx of QRM and fading build up against them.

As a first pre-requisite to the full use of any recognised form of "operating technique" the stations involved should at least be equipped for full "BK" working and the VFO should be capable of easy manipulation and should be calibrated sufficiently to enable a QSY plus or minus a few Kc/s to be carried out accurately and with minimum delay

We are now in a position to discuss the use of a standardised procedure that would convey definite and precise instructions in a compact and easily recognisable form. Even better than that, we could

lay down a plan of action that would determine a limited course of action without having to use the key at all.

The transmitting members of the QRP Research Society are peculiarly equipped to carry out this research, and, as they are more vulnerable to QRM (and particularly QRO QRM), it is they who are being called upon to carry out this research.

The eventual operation of a series of skeds and Society nets will provide the necessary testing grounds for the new technique. It is earnestly requested that our transmitting members, and especially those with long operating experience, get in touch with our editor as soon as possible. Their suggestions and comments on the procedure outlined in this issue are essential in order to make it workable and generally acceptable.

.....: PROPOSED "QSY" CODE :.....

It is suggested that, in order to facilitate the conduct of "Operating Research" on the amateur bands, the following abbreviations be given a trial when members of the QRP Research Society are in communication with each other. It is assumed that each communicating stn is fully equipped with VFO and for BK operation.

ABBREVIATIONS --

DOTS:- Receiving station interrupts transmitting stn with a string of dots to indicate serious QRM on the channel. If the Tx Stn is also affected by QRM to the extent of a breakdown of QSO Procedure 2 is immediately adopted.

"U" (FOLLOWED BY A FIGURE):- QSY about - Kc/s higher in frequency (eg. "up 5").

"D" (FOLLOWED BY A FIGURE):- QSY about - Kc/s lower in frequency (eg, down 5).

"US":- QSY higher in frequency just a shade.

"DS":- QSY lower in frequency just a shade.

"QMF":- Please QSY exactly to my frequency.

DOTS FOLLOWED BY "CL":- Receiving stn interrupts transmitting stn

to make emergency QRT.

DOTS FOLLOWED BY "CL" & A FIGURE:- As above, but Rx stn will call Tx stn in -- minutes or less.

DOTS FOLLOWED BY "CL" & A FIGURE FOLLOWED BY "H":- As above, but Rx stn will call Tx stn in exactly -- hours from now.

QSY 160 (or 80, 40, 20 etc):- Please QSY to 160 metres (or 80, 40 20 etc) and call me, if possible on or about an harmonic or overtone of this frequency.

PROCEDURE 1 FOR USE WITH PARTIAL QRM ON THE CHANNEL.

(The following is an example of the use of "QSY" code -- Station A (G9AA) is transmitting in QSO with stn B (G9BB).

B experiences bad QRM, makes DOTS.

A stops transmitting.

A & B both search for nearest clear spot either side of present frequency (having made careful note of latter).

A QSYs to nearest clear spot if QRM appears to be of persistent type. If not, QSO continues after regaining contact on existing channel A goes back to beginning of sentence that was interrupted.

B now takes control and, should he decide to move A to a clear spot, he sends DOTS followed by AS...AS. He then carefully searches on either side of the operating freq of A and discovers an apparently QRM free spot roughly 4 Kc/s lower in freq. He sends D4 three or four times

A does not reply but quickly locates the apparent spot indicated by B, QSYs and sends G9AA several times, listening carefully for B to send DOTS followed by G9AA de G9BB K.

A eventually wishes B to QSY zero beat with his freq. If QRM interrupts his reception he makes DOTS QMF, otherwise G9BB de G9AA QMF QMF K.

PROCEDURE 2: FOR USE WITH TOTAL QRM ON THE CHANNEL.

(Further example of the use of "QSY" code between stns A & B)

QRM causes a complete breakdown of communication.

(a): Both stns search for nearest clear spot higher in frequency & the stn which last transmitted (say G9AA) QSYs to this spot & sends

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his call sign G9AA about ten times.

(b): B, on hearing him, also QSYs and on completion of G9AAs makes G9EB several times. A then makes G9BB de G9AA HW K. replies with G9AA de G9BB K.

(c): If B fails to hear A, then A continues to explore each clear spot progressively higher in the band, eventually returning to the low end of the band and repeating the process. B does not transmit at all but tunes carefully in the manner described and, on hearing A, proceeds as in (b).

On the higher frequency bands and whenever skip condx produce differing QRM at each end the operators are limited to the simple use of the "QSY" code.

The following abbreviations are also recommended to facilitate operating:-

SKED?: Would you care to arrange a sked (or further sked)?

NO SKED: Sorry I cannot arrange a further sked at present.

SKED 1400/11/12/52: Can you meet me on sked at 1400 GMT on the 11th December 1952 on this frequency?

SKED 1400/11/12/52/7200: As above but on 7200 Kc/s?

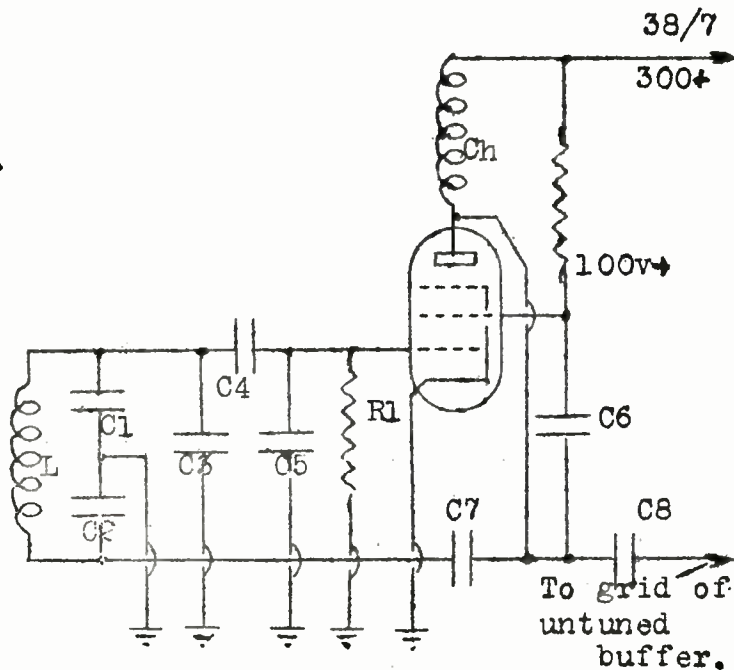
::::::::::: A STABLE V F O :::::::::::

We are indebted to our President, Mr Arthur Milne, G2MI, for the following development of the well known Clapp. The circuit shown in the sketch has quite phenomenal stability and, with changes of component values, will work right down to 420 Mc/s. As the cathode is earthed there seems no reason why battery or directly heated valves should not be used with satisfaction.

Component values are shown for 1.7 and for 28 Mc/s and other values for intermediate frequencies can be found by experiment. All fixed condensers should be silver mica and careful construction of the

coil is most important.

	<u>1.7 Mc/s</u>	<u>28 Mc/s</u>
Coil,	50 t	7 t
	1" former	½" former.
C1,	.00005	.00005
C2,	.004	.00075
C3,	.004	.004
C4,	.0001	25 pF
C5,	.001	.0003
C6,	.004	.004
C7,	.001	.001
C8,	.0001	.0001
R1,	100 K	
Ch,	2.5 uH	
Valve,	6AG7.	



.....: THE V H F SECTION. :.....
 By the VHF Secretary, GC2CNC.

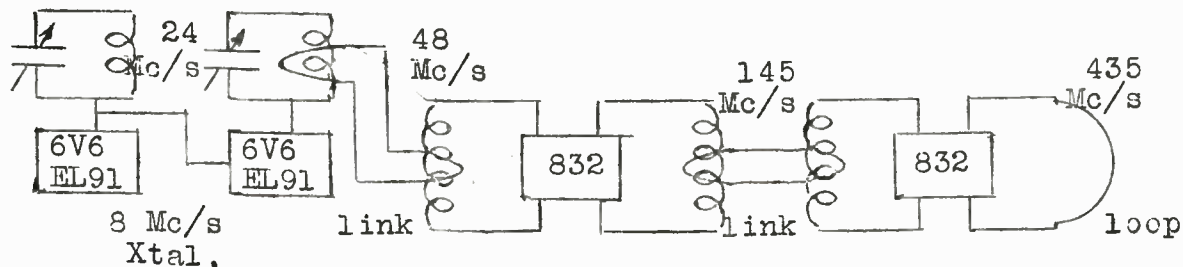
The popularity of this section increases steadily, a number of letters having been received by the writer this month which is most encouraging.

One letter says, "thanks for the antennae gen, but what about something to hitch them to?" Quite right, too, so here goes, and remember, you asked for it.

It is proposed to describe, by stages, a suitable transmitter for use on 145 Mc/s and 435 Mc/s, so that both VHF bands will be open to your research work.

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Two chassis will be required, both 10" x 8" x 3", of aluminium. Only one will be used at present, but it is as well to get everything ready. The 145 Mc/s transmitter will be a three valve job, whilst the 435 Mc/s rig will have an 832 as a tripler. Thus the power will not be in the QRO class by any means. A block diagram is as follows --



Now, before we go any further, many sound arguments have been advanced against using a stage on 48 Mc/s, because of TVI -- BUT, do let us tackle the problem in a sensible manner. What sense is there, when we are building a circuit, in including special sections which someone has convinced us will not cause TVI, when all the time the rest of the layout causes TVI and BCI from here to Timbuctoo?

Make your gear carefully, use sense and think things out first, and, if advice is needed, see your local expert (all places have them). He will certainly offer good advice. Remember your chassis will have to accommodate three valves, and the 832 will be mounted upright, so make due allowance on the chassis.

The first stage uses a 6V6 (or an EL91), the 6V6 having been chosen because of its cheapness. The stage is a straight forward triode without any complications at all. The anode output is on 24 Mc/s and, in the writer's own case, it would be on 24.189 Mc/s, since a crystal of 8.063 Mc/s is used.

You are very strongly advised to make absorption meters without delay for 24 Mc/s and 48 Mc/s, so as to check resonance on the correct

harmonics. The circuit of the first stage is given herewith. Make sure that it works properly before considering it complete. Check on a Rx for a clear, steady note and check for harmonics, trying to cut them out. Read articles on this subject and apply the readings to this first stage.

Bypass the heaters to earth at the valve end and use heavy, twisted wire for the heater circuit. The rest of the wiring should be carried out in good heavy wire, with the shortest possible leads (but don't overdo it and build the whole rig in a match box), keep resonant wiring apart and NOT parallel (for example L1 and L2), and remember to avoid nearby coils being in the same plane.

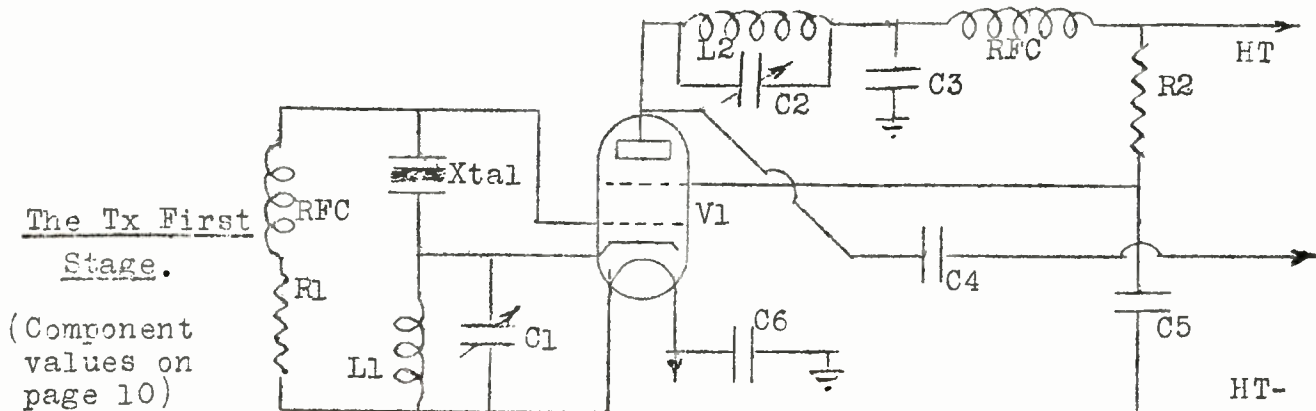
You will be well advised to use a notebook and draw the circuit each month. Make records of your results, voltages applied, current and even the position of the components etc when the transmitter is completed. The notebook will become valuable to you for study purposes.

Well, it's up to you! Press on -- and more next month.

Finally, my QTH is changed for a few months, so please note this address for use until further notice:

"c/o Dept of Agriculture (Agricultural Economics), 39 Don St, Jersey".

To avoid questions -- no, I am not living at the office!



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Component values for stage 1 of the Tx are:

C1, 60 pF C2, 60 pF C3, .005 mica C4, 100 pF ceramic C5, .005 mica
C6, .0005 mica R1, 100 K $\frac{1}{2}$ watt R2, 15 K 1 watt V1, 6V6.
The chokes, RFC, are Eddystone 1010 type. The Xtal is 8 Mc/s. L1 is 15 turns, 20 swg enam, close wound on a $\frac{3}{4}$ " dia former. L2 is 10 turns, 18 swg enam, $\frac{3}{4}$ " dia and experiment is called for to get the best results here. The max anode volts on the 6V6 should be 200 v and this should be fixed at the power pack, NOT in the Tx.

.....: SOCIETY NEWS & ACTIVITY :.....

G3IHI, Den Auton (Swindon) takes me to task, in a most interesting letter which I shall try and discuss in greater detail in the next issue, for an increasing bias to the Tx side (In the main I only edit what you chaps send me in each month, OM, so it really does largely depend upon yourselves - in policy as well as monthly reading matter).

G3AGQ, Bob Eldridge (Salisbury) has much to say about the Kaleveld Cup and offers some really useful comments. He has also reached the halfway mark in the "200" contest this month. Bob has fixed a regular sked with G3IMG (Ron Turner, Brierly Hill, Staffs) for every Sunday morning at 0800 GMT on or about 3575 Kc/s.

GC2CNC, Monty Banks (Jersey) will be off the air from the middle of November for some time owing to unavoidable circumstances, so, unfortunately, his sked with 3HJL must be postponed. However, Monty has the satisfaction of having collected his "200" certificate (see this month's contest report) just before going QRT.

G3HJL, Fred Bailey (Boreham Wood) kept the first sked with Monty on Sunday the 2nd, but it bore no fruit. (Monty heard you, OM, and gives you a good report, but apparently he couldn't shout loud enough himself! (The address you want, OM, is, I believe, 24 Watermead House, Homerton, London, E9).

Norman Bason (Peel, I.o.Man) has sent along an interesting

noise limiter circuit (ex the RL09 Rx) which we will fit in as soon as space allows (Thanks, Norman.)

G2ZC, Capt A.M.H. Fergus (Farnham) has again been taken ill (We really are most grieved to hear this, Fergie, and we do all wish you a speedy recovery, OM. Please do let us know how you progress.)

Ted Stonestreet (Willesden Green) has been instrumental in getting the Willesden R.C. going again on a re-formed basis and has been elected chairman, treasurer and Morse instructor. (With that lot on your hands, OM, it looks as if we shan't be hearing so much of you, but all the best nevertheless, and best of luck to the new club).

G3CED, George Partridge (Broadstairs) recently worked HZLAB on 20 with 5 watts (at midday). LAB is on an American air base and says QSL via W6VUO. George also sends along an interesting report from W2EQS which we reproduce in this issue (space permitting!)

G4QW, J. Allnut (Merton Park) has offered his services in our new constructional section for the calibration of apparatus and, in suitable cases ONLY, for crystal grinding and reactivation. (Very many thanks, OM -- a very fb offer indeed! Thanks also for the other suggestion you put forward. I will submit it to the Council).

"Deck" Garrard (Ipswich) has been spending much time hunting PAØ stations on 80 as he is after "PACC Certificate". He is still running the old O-V-O (HL2) and has cut the HT to 20 volts and LT to 1½. With this he has achieved 49 "veries" towards his All Counties score and has 37 countries towards his DXCC. Unlike Den Auton Deck finds "GRP" well balanced in regards Rx and Tx articles and news.

Bob Kenyon (Liverpool) has managed a letter this month which really deserves to be reproduced word for word. He feels (as we do here at HQ) that the SWL has a very major part to play in all our projects, including 'Operational Research'. (I dare not mention space again, OM, but I mean to get that letter in somehow - sometime!)

G3JMD, Mike Delany (Putney) is our latest SWL to gain a call. (Good for you, Mike, that's grand work, OM!). Mike wants a sked for Top Band, early mornings, preferably Saturday. At present he is to be found on 1875 Kc/s.

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G3ANB, Bill Creaton (Brightlingsea) will be looking for QRP contacts on 3589 Kc/s between 1900 and 1930 each Wednesday, CW only. He will end his call with QML or QLM signifying his intention of searching the band from middle to low or low to middle for any possible contact. Transmissions will be 5 watts.

Bob Murray (St Andrews) has had little time for radio lately but he has managed to get a new SH Rx as far as air tests and he has a number of modifications in line for it (Let's have the gen when you can, OM?). He also has a new O-V-1 in line.

E.W.Gardiner (Diss, Norfolk) has had quite a profitable month on twenty, having collected CR6, ZS7, ZS3, CT3, SV5, VQ3, FF8, CR4 and ZS9. He also had a session on 21 Mc/s and heard TA3AA, EA4CM, FA3JY and CN8MM.

Roy Church (Severn Stoke, Worcs) is with the RAF Signals Sect at Cirencester and only operates from home at week ends at present. He has been having antenna trouble, too, as tree felling has been going on and that wire seems to be magnetic!

G3AAJ, Bob Kenny (Enfield) is still expecting to his threatened move to GM to come off at any moment (There is no need to loose touch even so, OM, but I certainly DO know the difficulties!)

E.Bridgewater (Abberley, Worcs) is trying hard to shake off the bottom place in the C-Z panel. His antenna seems to have pretty strong directional properties and this may not be the best possible arrangement for the 'general' working needed to collect C-Z scores.

Arthur Looney (Liverpool) took second place in the Warrington Club's Top Band contest, using his 1-V-1, and loosing only five points to the winner's 640 Rx. Arthur is Hon Sec of the Liverpool club and they seem to have a strong QRP interest among their SWL members.

G2HAW, Trav Turner (Hounslow) has had a sked with Hounslow Hospital operating theatre which prevented him from having a try for the Kaleveld Cup, much to his disappointment. (There will be another opportunity next year, OM, and, in the mean time, hurry up and get well -- shall be looking for you at the "show")

.....: THE AMERICAN VIEW :.....

A welcome letter has reached us from Howy S. Bradley, W2QHH, who signs himself "The QRP W". He says:

"...Congrats on your efforts on behalf of QRP, and I wish you luck on doing something about the assinine regulations which permit the use of a kilowatt (legally, and 10 kw if you care to rub it on the sly) over here. To my mind it is ruining the ham game all over the world, and, with a decent antenna, certainly 100 watts is all that any ham needs for consistent communication on any band he may choose. As for myself, I have never run over 35 watts input to the final stage on any band - with no VFO and no beam antenna of any sort - just a simple end fed Hertz. I have been the first "W" to win many a Dx award and probably hold as many as any station in the world. So far I have wkd 212 countries postwar (with 100% QSL up to the last two). It hasn't been done easily, amidst the competition of super-kw boys, nor in my hilly country and bad local reception condx, but the records are there and they make the QRO boys' claims look a bit silly....Of course I would be out of place with most of you boys who are really QRP, as my 35 watts (I doubt that I have ever had 10 watts in the antenna on any band) represents QRO to your membership - and I may be forced to QRO to 100 watts as I have severe TVI from my QRP rigs, and there appear to be none available that are band-switched, cover 160 metres, and are de-TVId unless I go into the 100 watt class...Pse QSP my regards to 4X4CJ".

.....: THE Q R P SOCIETY COUNCIL :.....

The closing date for nominations for the 1953 Council has passed without any further names being submitted. In these circumstances, therefore it becomes unnecessary to issue a voting form since the nominations published last month have been accepted without deviation.

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The new Council will consist of :--

Mr. A. O. Milne, G2MI (President). Capt A.M.H.Fergus, G2ZC (Advisory Committee). Mr. E. Banks, GC2CNC (Contests and Advisory Committees). Mr. G. Partridge, G3CED (Advisory Committee & Spares Service Manager). Mr. R. C. Eldridge, G3AGQ (Contests Committee), Mr. Vic Cundall, G3FAU (Press Officer). Mr. P. Huntsman (Contests Committee). Mr. H. G. Wells (Contests Committee), Mr. A. L. H. Looney (Clubs Liason Officer). Mr. T. H. Carter (Student scheme Manager).

This Council will commence it's duties on Jan 1st 1953.

.....: KALEVELD CUP -- RESULTS :.....

- 1: Bob Eldridge, G3AGQ
- 2: Monty Banks, GC2CNC
- 3: George Partridge, G3CED.

These results have presented me with a very sticky problem and I am more than thankful that next year's contest will be in the hands of the Contests Committee to work out snag-proof rules and decide on the winners involved. As the present rules stand Monty has actually amassed most points by virtue of the lengths of his QSOs, but in each case he overran the maximum of 60 minutes which was laid down in the amendment issued last month. I have, therefore, deleted this point from all the entries received and this gives a clear margin to 3AGQ.

G3AGQ returned the following results:- (1) W5DQV, 4500 miles, 17 overs; (2) LZ1KAB, 1400 miles, 10 overs; (3) OK1CX, 750 miles, 10 overs. Giving a total mileage of 6,650 and a total of 37 overs.

GC2CNC submits:- (1) W2CCR, 3500 miles, 11 overs; (2) LZ1KAC, 1400 miles, 11 overs; (3) OK1AHA, 780 miles, 10 overs. Giving a total mileage of 5,680 and a total of 32 overs.

G3CED sends in:- (1) SM7BPO, 550 miles, 9 overs; (2) SM3BHT, 730 miles, 10 overs; (3) MB9CA, 600 miles, 10 overs.

A FULL REPORT AND ANALYSIS WILL BE ISSUED NEXT MONTH.

.....: THE QRP C - Z PANEL :.....

	COUNTRIES				C Total	Zones	GRAND TOTAL
	5.5	7	14	28			
1: Huntsman, P.	16	54	148	7	153	36	189
2: Gardiner, E.W.	26	17	110	28	115	32	147
3: Read, B.J.	12	8	110	7	112	31	143
4: Stonestreet, A.	18	23	89	8	108	27	135
5: Whitfield, R.	-	-	103	-	103	30	133
6: Huntsman, R.	1	34	90	-	102	27	129
7: Garrard, D.	12	6	99	-	101	24	125
8: Gordon, D.G.	22	18	86	23	92	30	122
9: Kenyon, R.L.	2	-	88	-	88	26	114
10: Basen, N.	11	19	77	-	80	23	103
11: Bridgewater, E.	-	4	79	-	79	23	102
12: Wells, H.G.	-	16	59	9	66	23	89

.....: TOP BAND SWL PANEL :.....

	COUNTRIES.	COUNTIES.	TOTAL.
Baker, W.B.	6	52	58
Wells, H.G.	5	36	41
Gardiner, E.	4	35	39
Godfre, J.	6	28	34

.....: A ONE LUNG LOG :::

During the month, on 14 Mc/s, Deck Garrard has heard the following, using his O-V-O with 20 volts HT \propto 1½ volts LT:-

CR6BW, EA6AP, EA8BJ,
EL9A, FM7AW, HE2AF, CA4BC,
TG9RV, TI2TG, VK3WR, VP2AF
VP3LF, VP7NT, VQ2DT, VS1BQ,
VS7WA, VU2BH, ZP5CF, 4WIMY, 9S4AB.

----- What a lung !-----

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.....: THE QRP "200" CONTEST

COUNTIES WORKED DURING 1952 ON:	1.8 Mc/s	3.5 Mc/s	7 Mc/s	Total
1: GC2CNC	60	71	69	<u>200</u>
2: G5AGQ	50	47	4	101
3: G3EDW	30	10	5	45
4: G3HJL	-	31	-	31
5: G3FAU	16	-	-	16
6: G3HCW	12	-	-	12

.....: THE H Q Rx PROJECT

The current interest in Operational Research has underlined the need for still greater selectivity in the Rx department, thereby offering our SWL members a chance to show their worth. Selectivity has never been the most notable asset in a QRP receiver and, when the Tx chaps speak of increasing selectivity our thoughts automatically turn to a multiplicity of valves. It seems, therefore, that the time is ripe for all the staunch adherents of QRP receiver technique (and, despite the amount of Tx matter which I edit for your interest each month, may I, once again, identify myself with these, our oldest and most faithful members) to get together and lead the way. I believe that it is possible to design a receiver which will offer selectivity equal to the best QRO rigs and yet fall so well within the QRP category as to be top value for field day and portable use. It will take time and patience but a start has already been made here with initial plans and we shall report progress each month on our bench. Give us the support of your experience where you can and disregard the scoffers who say it can't be done with QRP -- they've never tried!