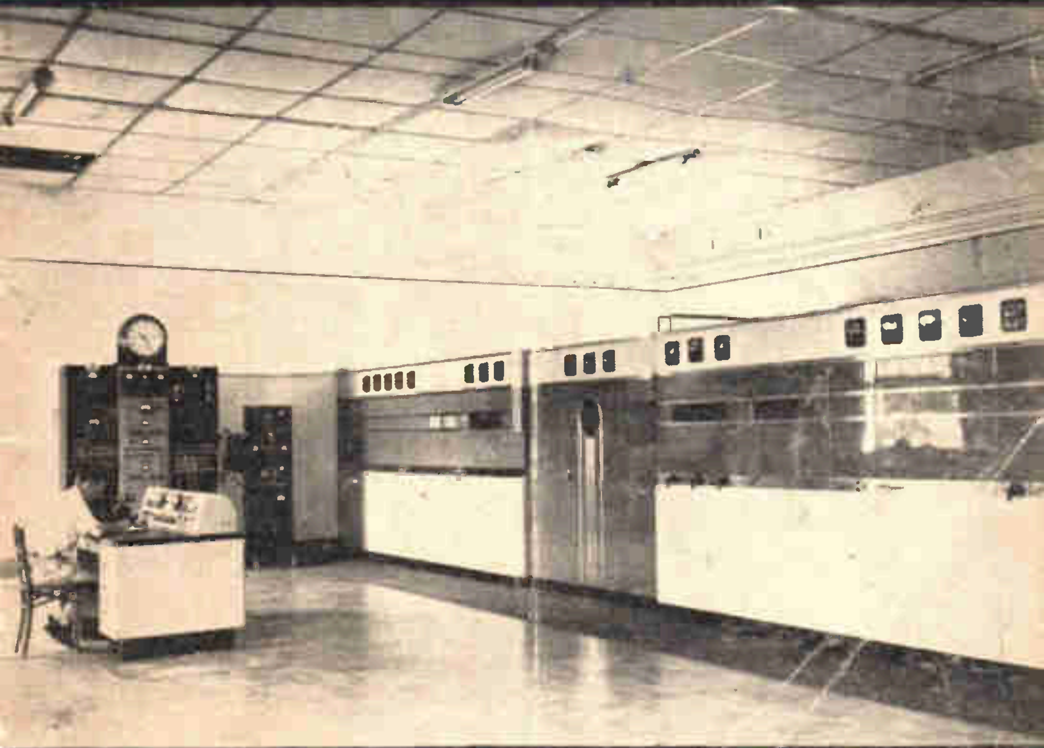
Vol. 8
Number 12
JULY
1953

The RADIO AMATEUR

incorporating "Short Wave News"



1/9

The
RADIO Amateur

Vol. 8. No. 12. Annual Subscription 18/- December 1953

Editorial and Advertising Offices—57 Maida Vale, London, W.9.
Telephone: CUNingham 6518

Editor: Dr. ARTHUR C. GEE, G2UK
Advertising Manager: FRANK A. BALDWIN, A.M.I.P.R.E.

EDITORIAL

Your Editor would like to take this last opportunity of thanking all those readers—and there have been many—who have written in expressing regret that this magazine is ceasing individual publication. Your Editor too, feels quite sad about the change, but this sadness is eclipsed by a certainty that the incorporation into " The Radio Constructor " is the logical next step to take and that the result will prove successful and agreeable to the majority of readers. We have always been ready to adjust and alter editorial policy to fit in with current trends and we ascribe the success the Magazine has enjoyed to the elasticity in editorial policy. As our older readers will know, *The Radio Constructor* originated from a demand by *Short Wave News* readers for more constructional articles, at a time when paper restrictions were imposed on new post-war periodicals. It is intriguing, but not altogether unnatural, to have now reached the stage when the flourishing offspring has absorbed the parent !

Some readers have written in almost in a strain of a farewell parting. We do appreciate their kindness, but we hasten to point out that we are not bidding them goodbye. **Data Publications** is a very active organisation now, and both via *The Radio Constructor* and through other publications which are in the course of production, we shall continue the friendly association we have always enjoyed with our readers, both new and old.

So for now " Au revoir " and we'll look forward to being with you all again through the pages of " The Radio Constructor " and subsequent publications.

A.C.G.

NEXT MONTH ASK FOR :—

THE RADIO CONSTRUCTOR

Order your copy now, so that your Newsagent knows your requirements

Component Review. Manufacturers, publishers, etc., are invited to submit samples or information of new products for review in the section.

CHEQUES and Postal Orders to be made payable to Data Publications.

ALL CORRESPONDENCE should be addressed to " The Radio Amateur," 57 Maida Vale, London, W.9. Telephone CUN. 6518.

A HOME MADE TAPE RECORDER

by

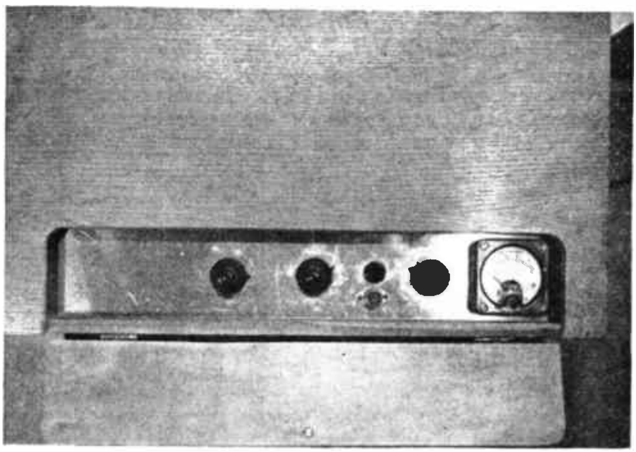
CYRIL R. GREENLAND, G4HD

Magnetic recording is becoming increasingly popular and there are now a large number of commercial instruments on the market. The amateur is also catered for by a number of tape desks, to which an amplifier and cabinet have only to be added to form a complete recorder. In addition to the many possible advantages of one of these instruments, which include the recording of talks, music, broadcast programmes, "talkie" commentaries for silent film projectors, etc., the amateur can find quite a few more interesting uses, for example, the recording of rare DX stations and contacts, and, especially for the amateur transmitter, the playing back of recordings of the other station, which of course is the ideal way of reporting on the quality of the signals, provided of course the equipment is built to a reasonable standard. Incidentally, the G.P.O. raise no objection to this being done providing no call-signs are re-transmitted, and the recording is played back only to the original station.

It is also quite simple to record one's own transmissions on an artifical aerial so that the quality of modulation can be checked before actually going on the air. Again, the recorder can be utilised for putting out automatic CQ calls, saving time and temper when conditions are bad !

The writer was recently able to acquire a Wearite tape deck, and the instrument to be described has been built around this. Two speeds are provided in the deck—7½ and 3¾ in. per sec. With the former a response up to 8000 c/s can be achieved with the amplifier circuit shown, while the slower speed can be used for recording speech where an extended frequency response is unnecessary. Switching is by single knob control and the tape does not have to be handled in any way during recording, winding or playback. Two heads are employed—an erase head and a combined head for recording and playback, and provision is made for the demagnetisation of the latter between operations. This is effective by an arrangement of contacts which allows a capacitance to sustain the output of the super-sonic oscillator for a short period after its main HT supply is broken.

The amplifier circuit shown is one originally designed by Messrs. Wright & Weaire for use with their tape deck. Owing to the comparatively low input signal levels, precautions have to be taken to reduce hum in the early amplifier stages and a common grounding point should be used for all earth returns. All leads and components carrying AC should of course be kept well away from the first stage, and screened leads should not make random contact with the



Details of the Control Panel can be well seen in this photograph. The cabinet is so constructed that the panel can be covered when not in use.

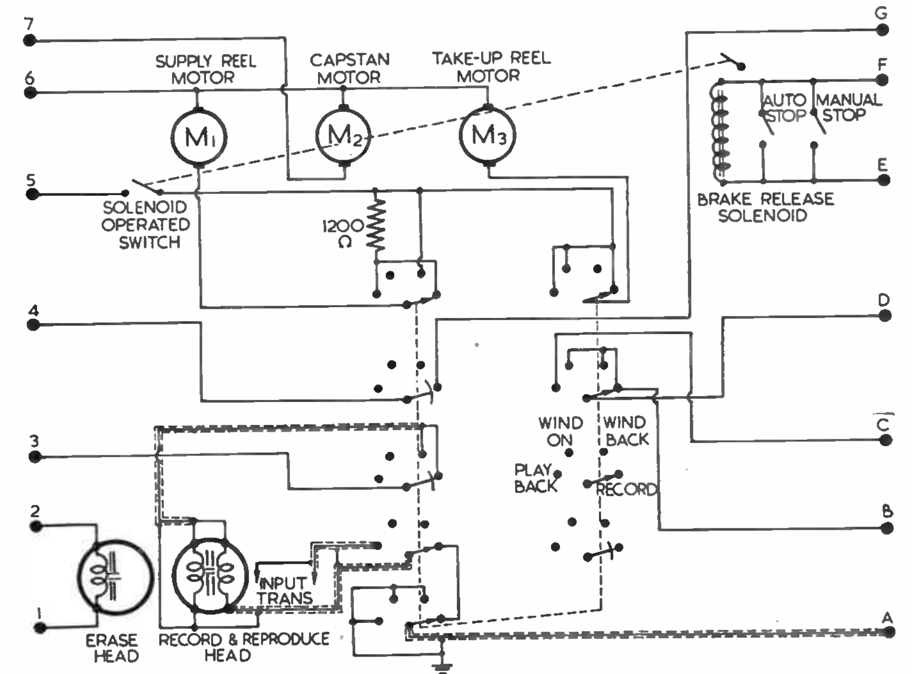


FIG. I
CIRCUIT DIAGRAM OF TAPE DECK

chassis. In addition, in the circuit shown, the heater of the first valve (EF37) is fed with 6 volts of DC although a valve with a " bifilar " heater (EF40) can be used with AC on the heater, with the centre-tap on the transformer earthed. An input transformer with a step-up ratio of 1 : 5 helps in maintaining a good signal to noise ratio.

The output valve used is an EL33 which has a high gain, although a 6V6 can be used in this position provided the bias resistor is increased to 250 ohms. The speaker is an 8-in. permanent magnet unit.

For checking the recording level, a 1 mA meter is used with a 1 mA bridge rectifier. This is much more satisfactory than a magic-eye or neon, especially as such meters can still be obtained quite cheaply on the surplus market.

The bias oscillator uses a 6V6, the oscillator coil being Wearite type 579, and this circuit provides a voltage of 15 to 30 (depending on the coercivity of the tape) for erasing, and up to 15 volts for recording. A 3K preset potentiometer controls the latter and the best value can only be determined by trial and error, unless of course one is lucky enough to have frequency response measuring equipment available.

When recording from a broadcast or short-wave receiver, the signal should be taken from the triode section of the second detector as only a small input is needed, and this method also eliminates any distortion in the output stage of the receiver. Some communication receivers are fitted with a phone jack in this position, but in any case it is quite an easy matter to måke this very small modification. A 0.1 condenser from the anode to an extra jack socket is all that is required.

Owing to the small signal input needed, it is in fact possible to make wide frequency range recordings of broadcast programmes by using a permanent crystal detector, tuning coil and condenser, the output of which is plugged straight into the recorder. This can only be done of course during daylight when there are no interfering Continental stations and adjacent home service stations are broadcasting the same programme. The quality of recordings made in this way is really amazing.

Several recordings have been made from gramophone discs, and again the pick-up is connected straight into the recorder, tone control being effected on the play-back.

When recording it has been found that the

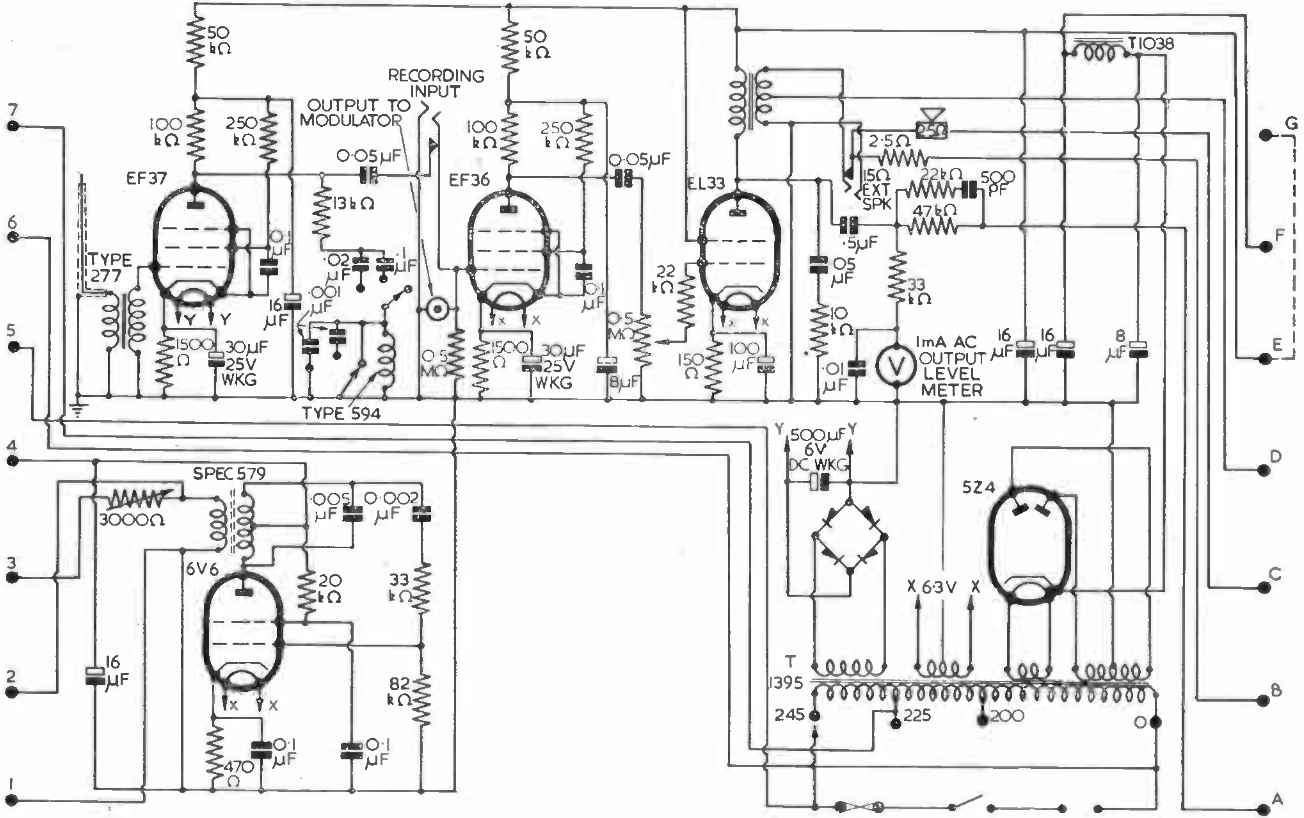
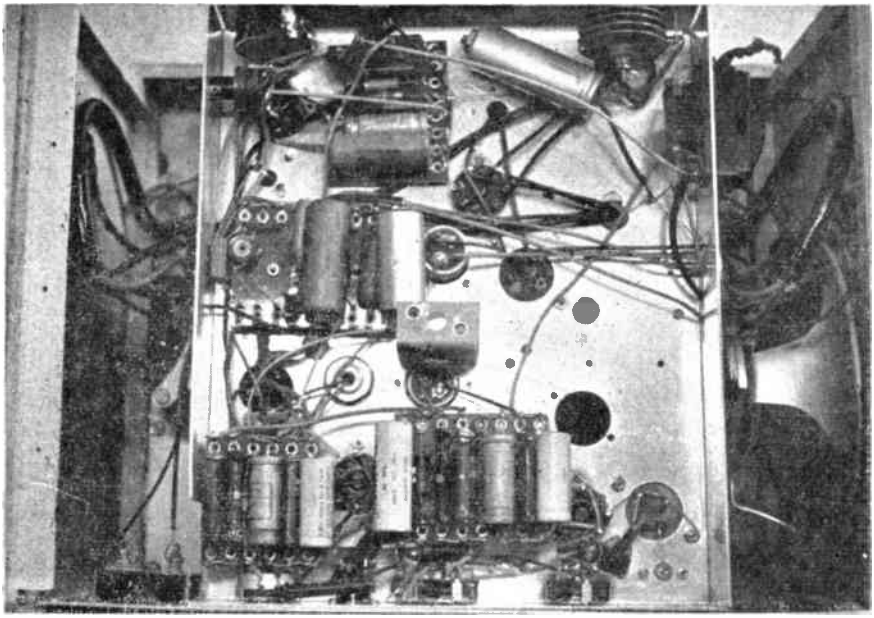


FIG. 2
AMPLIFIER CIRCUIT



Layout of underside of chassis.

best results are obtained with the amplifier gain control adjusted so that the signal level meter reading does not peak much above 0.2 mA, otherwise distortion and over-recording occurs, the latter making it difficult to completely erase. With a broadcast or short-wave receiver it is necessary to experiment with the positions of the gain controls of each. Generally, setting the recorder gain control about one-third of its full rotation and then setting the receiver accordingly, gives satisfactory results.

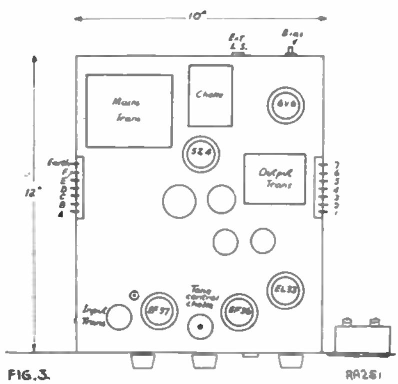


FIG. 3.

The arrangements of the components on the chassis should be as indicated in this diagram

Direct recording of music and speech depends of course on the quality of the microphone. A D104 crystal mike has generally been used and has given excellent results.

For playing back recordings through the transmitter, only the first valve in the recorder is used, a screened cable being taken from the co-axial socket in parallel with the input jack straight to the modulator input. Although in the writer's station the first stage of the modulator is a high gain pentode and there is no gain control in the stage, no overloading occurs and listeners to recordings which have been made state that they find it difficult to detect any differencc between the recording and the original.

The cabinet was constructed from ¾ in. ply, the overall dimensions being 17¼ in. × 13¾ in. × 12¼ in. high, the lid being 1¾ in. deep. The speaker opening in the side is 7 in. × 6 in.

Some excellent results have been obtained with the instrument, both direct recording and via the radio, and if any interested station should contact the writer on the air, he will always be very pleased to make and play back recordings.

SOME PRACTICAL NOISE LIMITERS for use with T.R.F. RECEIVERS

by

H· E. SMITH, G6UH

Foreword

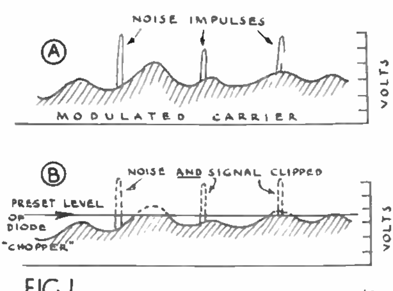
While the foregoing notes have been written expressly for the users of TRF receivers, many of the circuit arrangements may easily be adapted for use with super-hets. The user of a super-het receiver will appreciate that reference to some of the more complicated noise limiters has been omitted as they are not easily adaptable for use with TRF receivers.

It must be remembered that most of the limiters described rely upon a high signal level for 100 per cent effectiveness, but all of the circuits dealt with will prove to be of some benefit, especially where no limiter has been used previously.

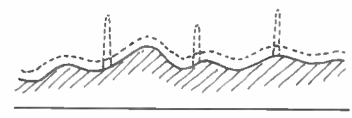
Types of Noise

In general, the function of a noise limiter is to reduce the amount of interference caused by car ignition, commutator type electric motors, and other forms of " impulse " interference. No limiter of the diode type is effective against the " hash " noise caused by corona discharge from overhead power lines, or corroded electric fire plugs.

All forms of impulse noise have a definite duration time and pulse shape, and for the most effective suppression of these pulses it is most important that no distortion or lengthening of the pulse should take place during its passage through the receiver circuits to the limiter.



These diagrams show how a fixed diode noise limiter causes distortion



The same modulated carrier with a "follower" type noise limiter in operation

Basic design insists that the super-het receiver has high " Q " IF circuits, in order that maximum selectivity shall be obtained. This of course, is very necessary, but unfortunately, highly selective circuits are the very thing we do *not* require, because the high selectivity coupled with the long time constants associated with the IF circuits causes a lengthen- of the pulse time and a distortion of its shape, making it extremely difficult to eliminate the unwanted noise peak. With the usual type of TRF receiver however, the circuit " Qs " are much lower, and no long time constants exist. It is to be expected therefore, that interference pulses will be much easier to deal with than on a super-het.

Many types of limiter require at least 10 volts of pulse for 100 per cent. effective limiting. The terrific gain of the average super-het makes this requirement possible quite easily, but the TRF will seldom produce this voltage at the anode of the detector, which is the point where noise suppression should be tackled. However, it is quite certain that in cases where no noise limiting has been employed before, the inclusion of even a simple type will ensure a noticeable improvement in reception.

Types of Noise Limiter

The simpler type of diode limiters operate on the principle that any voltage above a certain value, determined by a pre-set resistor, is short circuited through the diode, and does not appear in the output. Fig. 1 shows the effect of simple fixed limiting on a modulated carrier. It will be seen that for effective action, part of the carrier is cut off at the same instant as the offending noise pulse, thus causing some distortion of the signal. The lower the voltage the limiter is set to operate,

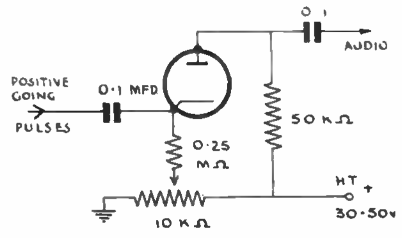


FIG. 3A.

Preset limiter with positive input

the greater will be the distortion. This can become quite objectionable on phone signals, but is not such a serious matter on CW reception. With this type of limiter it must also be realised that if the pre-set control is set for the limiter to cut off at say 2 volts and a .5 volt signal is being received, the noise will still be 1½ volts above the signal, which is quite enough to obliterate it altogether.

The " follower " type of limiter is much better in all respects, because as its name implies, the limiting action follows the carrier amplitude as shown in Fig. 2. Provided the correct component values are used, no distortion will result.

(It is of interest to note that the leaky grid detector may be described as a self-limiting device, and it can, by careful adjustment be made to self limit to a greater extent by reducing the screen volts and adjusting the value of the grid resistor. This method is seldom satisfactory however, because of the peak distortion introduced. The general effect on the signal is similar to Fig. 1.)

Single Diode Limiters

(There is a right and wrong " way round " to connect a diode when used as a noise limiter, and this depends on the polarity of the interference pulses. When a diode *detector* is in use the output peaks, when rectified, are " negative going " and connection should be made to the *anode* of the noise limiter. This also applies to the anode bend detector. The output pulses from a leaky grid detector *and* from an infinite impedance detector are *positive* and connection should be made to the *cathode* of the noise limiter diode.)

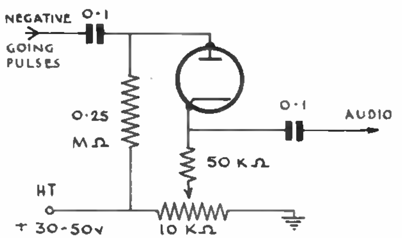


FIG. 3B.

Preset limiter with negative input

Fig. 3a shows a simple diode limiter suitable for positive going pulses, as from a leaky grid detector, and is fitted with a pre-set control for setting up the cut-off limit.

Fig 3b is a variation of the same circuit, but designed for dealing with negative going pulses, and is for connection to an anode bend or diode detector.

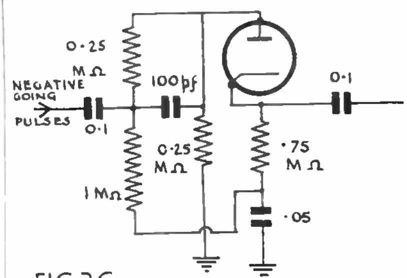


FIG. 3C

Self-adjusting limiter

Fig 3c is a more interesting type. This is a self-adjusting limiter which " sits " on the carrier and automatically adjusts itself to the carrier amplitude. Any noise impulse which exceeds the voltage of the carrier will cause the diode anode to be driven negative, and the valve will cut off. It is always important to remember that component values are of great importance in noise limiters, as it is upon these that the *time constant* depends.

Input Time Constants in Limiters

There is a general rule which should be observed as far as possible when incorporating a noise limiter into a receiver.

In order to keep the input time constant correct, the detector anode load resistor, coupling capacitor to limiter diode, and diode load resistor should be of such values that the product of the three should be between 18 and 20. The three components are clearly shown in Fig. 4. R1 and R2 are multiplied together, and the product is multiplied by C (in pf). For example, if R1 is 10k, and C is .05 mfd, R2 should be between 36k and 40k ohms.

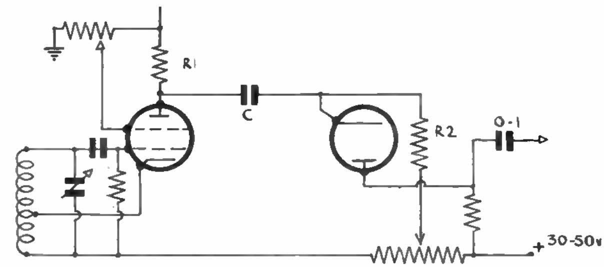


FIG. 4

Leaky grid detector with pre-set noise limiter (see text for values of R1, R2 and C.

Fig. 4 shows a pre-set limiter connected to a leaky grid detector. Fig. 4a is an even simpler version requiring no pre-set control. Both of these types introduce some slight distortion, but it is not noticeable except on high quality broadcast reception.

(It is understood of course, that where the noise limiter is shown connected to the detector anode, this will only apply when cathode-coupled reaction is being used. Where a separate coil is used for reaction, the connection will be made to the end of the RF choke, or the point where connection is normally made to the LF amplifier.) A great improvement on these last two types is the " follower " limiter shown in Fig. 5a. Component values should be followed closely and the values of R1 and C arrive at according to the simple equation already given. This one is suitable for a leaky grid detector. For an anode bend detector, it is not so simple to turn the diode upside down, so the best plan is to turn the *pulse* upside down by adding a phase inverter as shown in Fig. 5b. Any medium impedance triode is suitable for this job. No gain is required from the stage and the anode is fed via the anode of the detector.

Another simple follower type using a Germanium crystal is shown in Fig. 6. BTH CGI-C is a suitable crystal to use. The path through the crystal is maintained in a conducting state by the positive HT applied through the 2 megohm feed resistor and the audio voltage is developed across the 270-pf capacitor and the 1 megohm resistor. As the voltage across the 270 pf capacitor cannot change as rapidly as the time of the interfering pulse, the crystal shuts off for the duration of the time constant of the feed resistor pulse the 270 pf, (.0054 sec.).

Audio Noise Limiters

Audio limiters, probably the simplest of types to fit, because no modifications to the chassis are necessary, are in general more suitable for CW reception where a comparatively large amount of distortion can be tolerated. Some types entail a slight modification to the output stage, and others may be fitted externally to the receiver. Fig. 7 shows an output triode with variable control of HT voltage. If the valve is operated with as low an anode voltage as possible consistent with satisfactory signal strength, noise peaks will overload the stage, and the valve will cut off for the duration of the pulse. If therefore the control is set for the valve to give a maximum of 3 volts of audio, the noise will never exceed this value.

Fig. 8, like Fig. 7, is another system which may be set up so that the noise voltage never

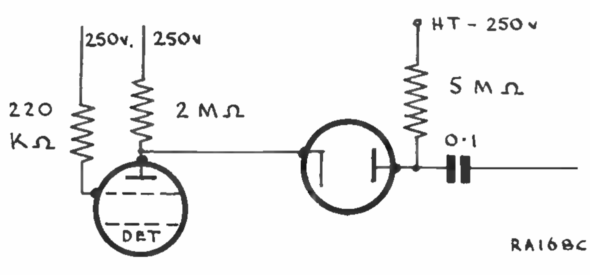


FIG. 4.A.

Self-adjusting limiter suitable for following a leaky grid detector stage. All resistor values are important

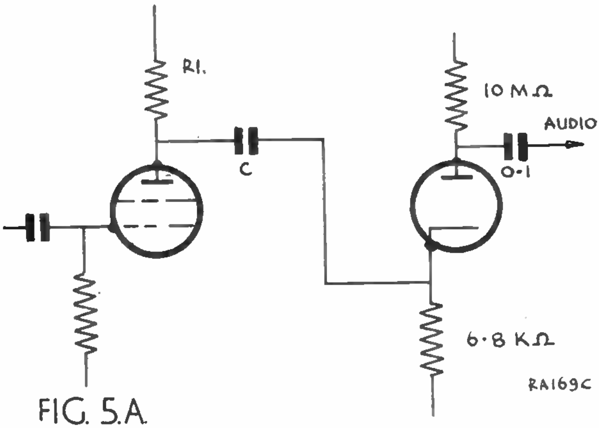


FIG. 5.A.

Leaky grid detector with "follower" type limiter

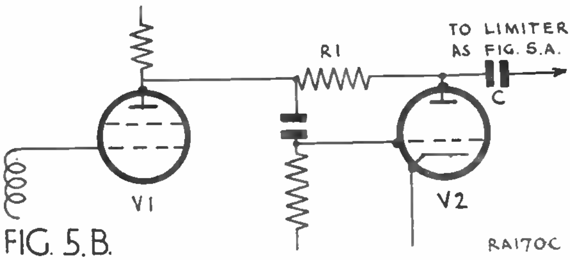


FIG. 5.B.

Anode bend detector (V1) with phase inverter valve (V2) enabling the "follower" type limiter, as shown in Fig. 5a to be used

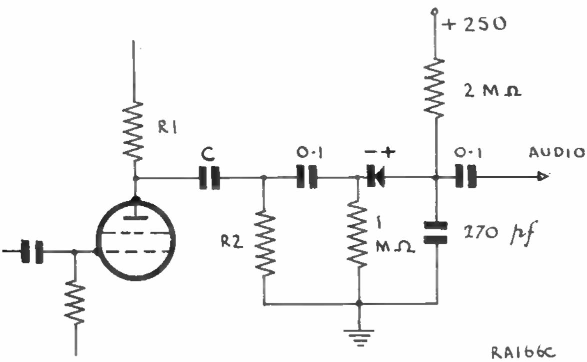
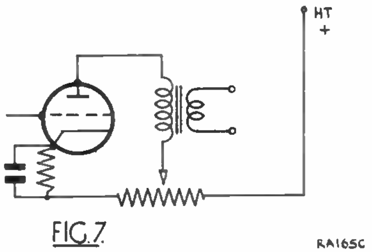


FIG. 6.

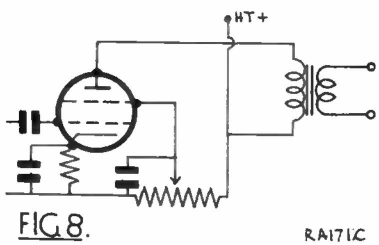
Output triode with adjustable anode voltage



Output triode with adjustable anode voltage

exceeds the signal. The screen voltage is controlled by a variable resistor. Both of these types have the advantage that the noise limiting can be " switched off " by turning the control to maximum.

An interesting audio limiting system, described in the *ARRL Handbook*, utilises two Germanium crystals and limits on both positive and negative peaks. It is designed to be made up as a self-contained unit for plugging in to the output socket of the receiver. Type IN34 crystals are specified, but GEC type GEX45/1 or BTH type CGI-C may be used. As will be seen from Fig. 9 the crystals are individually biased with 1.5 volt cells (type U2 is suitable). The variable resistor is for obtaining the correct relationship between the receiver volume control setting and the signal strength in the headphones. The switch is for rendering the unit inoperative if not required. This unit

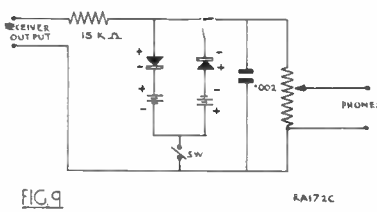


Output pentode with adjustable screen voltage

will operate equally well on Phone or CW and will ensure that no noise peaks are of greater amplitude than the received signals.

A good " peaky " audio filter will also act as an efficient noise limiter but this is only suitable for CW reception because of the terrific distortion introduced. An audio filter designed to peak at 1200 cycles and connect across the phones, will be as much as 20 dbs down at 800 and approximately 1500 cycles. As most interference pulses contain a large percentage of the frequencies up to 800 cycles and above 1500, these will be attenuated and the resultant noise in the phones will amount to little more than a muffled click.

There are of course, many other types of noise limiters than those dealt with in this brief review. Many of these require large voltages for effective operation and would be of little use on TRF receivers. No attenuation



Audio noise limiter employing two crystal diodes (GEC type GEX/45/1 or BTH CGI—C or M

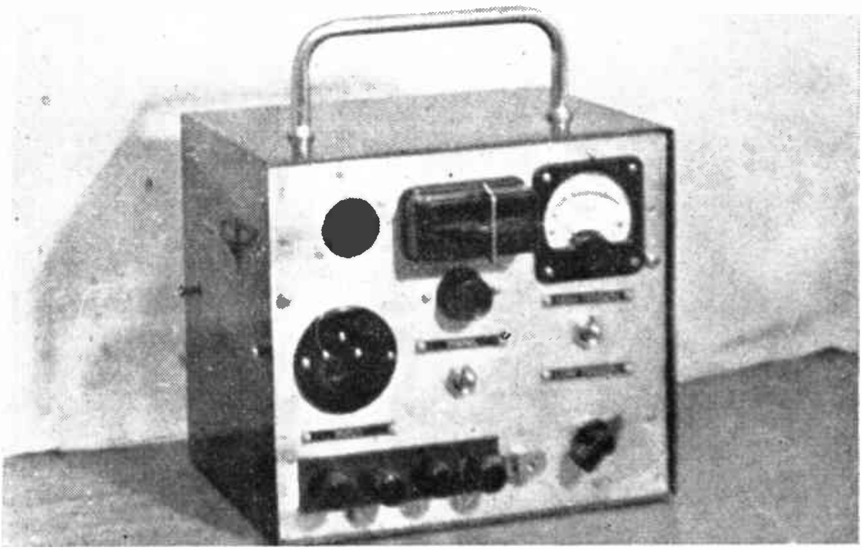
figures have been given as these will vary with the particular receiver in use and with the extent of the interference, but it is quite certain that the follower type of limiter will provide at least 20 dbs of attenuation to all car ignition types of interference. Even the simpler types will make listening much easier for those who have up till now, not used any type of limiter.

The percentage of listeners living in noisy areas is very high, and the writer hopes that these notes may assist them on the road to quieter listening.

A GENERAL PURPOSE POWER SUPPLY

by

A. BIRCH



The usual type of power packs, only give one voltage on full load. In designing this power pack, the author wanted it to give a high voltage, capable of feeding a small cathode-ray tube or a low voltage (1E 250v) for radio receiver, audio oscillator, etc. The only trouble experienced in using this power pack, was when using low current (1E 2 mA) at 500v, the voltage on reservior capacitor, rose to above the rating of which, the component was supposed to be used, consequently the component failed. By the addition of a relay and a resistor this trouble can be stopped. This power supply, using only two more switches than a normal power pack, can give voltages from 200 v to 460 v on full load. Most amateurs will already have their own power packs and can easily convert them into this very useful supply.

The circuit is very simple, and is shown in Fig. 1. The voltage appears on the secondary winding of T1. The end of the winding goes straight to one anode of V1, the other end of the winding and centre tap is connected in such a way that the earth can either be connected to centre tap, or the end of the secondary winding. When one end of the winding is earthed, the two diodes are joined together which makes V1 into a half-wave rectifier.

A paper capacitor was used for the reservior capacitor for greater reliability. One side was earthed and the other side goes to S3 and can be switched from one side to the other of L1. Different capacities for C1 will have effect on the output voltage. It can be seen from this short description that the power pack can be switched from full wave to half wave rectification and from condenser to choke input. One point that must be understood is that when using a 80 mA transformer, the current used when switched to half wave must only be 40 mA, this is the reason for having two fuses instead of the normal one. Another point to watch when wiring up is that the connections should be exactly the same as Fig. 2.

The assembly of the components on the chassis was started by bolting the mains transformer on the left hand side of the chassis, next to the transformer but in the front of the chassis, came the rectifier, and by the side of the rectifier was placed L1 with L2 just behind it at the back, and the three condensers were placed at the opposite end to the mains transformer, the complete layout is shown in Fig. 3.

Using a 250-0-250 transformer feeding into 5 Z 4 rectifier which can be substituted by a

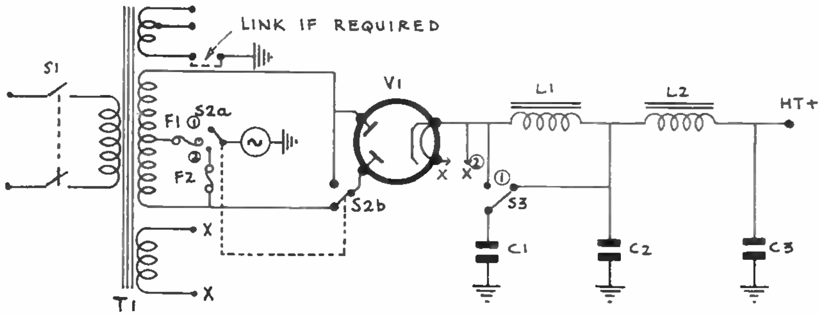


FIG. 1

RA186C

Components

If the loading unit is used, C1-2-3 can be 500 v working as these are cheaper and more readily obtained.

T1 250v-0-250v 80 mA. 5v 2 amps. 6v-4v 4 amps.
L1 and L2, 10 henries, 100 mA.
S1 Double pole ON/OFF.
S2 Double pole change over.
S3 Single pole change over.
C1 4 mfd 500v working paper.
C2 8 mfd 550v working electrolytic or paper.
C3 8 mfd 550v working electrolytic or paper.
V1 5Z4 or equivalent.
M 100 mA full-scale deflection.
F1 and F2 Double fuse holder with fuses.
Chassis 8 in. × 6 in. × 2½ in.

Components for Loading Unit

Relay 2000 ohms.
R1 25K 10w.
C4 If needed 1 mfd 200v working.
For this unit the above chassis becomes 9 in. × 6 in. × 2½ in.

Components for Test Unit

R2 ¼ meg ohm ½ watt.
R3 25K ½ watt.
VR1 ½ meg ohm variable.
S4 Double pole change over.
Neon—any neon will do, the author used a CV72.

Most of the above components and chassis can be obtained cheaply from Messrs. Servio Radio, 156/8 Merton Road, Wimbledon, S.W.19.

number of other rectifiers. Two chokes were used for the purpose of better regulation, the transformer and chokes should be placed as in Fig. 3 for the prevention of induction between transformers and chokes. Any 100 mA or 150 mA meter will do for M, the author used the type with MAG FEED written on scale, it was found to have 100 mA full scale deflection, this power pack if used with an output stage could be used to supply an 1155 receiver. If the power pack is used for this purpose care should be exercised as the case of the 1155 is above earth potential.

The graph shows the voltages at different loads. The number seen in the graph indicates the switch positions as shown in the chart (i.e., No. 1 in the graph indicates S2 in position 1 and S3 in position 1).

Loading Units

This unit was designed to keep the HT voltage from rising too high when there was small or external load. If the HT voltage rises too high the smoothing condensers in the filter will be in danger of breaking down and so cause a short earth. The condensers in this supply are rated close to the highest HT voltage as advisable, to keep the size of the whole supply as small as possible, so therefore it is better to use this unit to avoid the above mentioned breakdown.

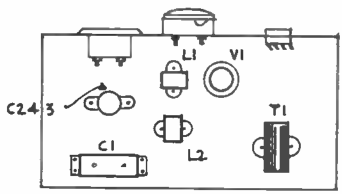


FIG 3.

RA192C

No.	*Switch Positions*		*Off Load Volts*	*Full Load Volts*
	S2	*S3*		
1	1	1	300	200
2	1	2	350	290
3	2	1	400	220
4	2	2	500	460

The relay used by the author was in ex-service 2000 ohms relay, it was found that the contacts of this relay opened when 10 mA was passing. This can be inserted in two ways, though the action is the same in both cases.

(*a*) It could be placed at the HT terminal, with one side of the coil going to the filter and the other side of the load. A 1 mfd or larger condenser should be placed across the coil terminals for better working.

(*b*) It could be placed in the position of L2 and used as a choke as well as a relay. A second choke would not be needed in this case.

It will be seen that the second method will be the cheapest as there is only one choke to buy as the relay becomes L2.

The circuit diagram of this unit is *a* and *b* in Fig. 1. The action of this device is as follows: When under 10 mA was passing through the relay coil and the contacts remained closed and the 25000 ohms resistor was connected from HT to earth, when the external load rose to above 10 mA the internal load was automatically switched off, and therefore saving HT current.

The current taken by this resistor is roughly 7 mA at the lowest voltage and 20 mA at the highest. It might be a good idea to add a dial light to this circuit to incidate when the internal load was switched on.

Test Unit

Condenser testing to the average amateur is just a thing that is almost impossible. The author wasted a lot of time trying to find dud condensers in rebuilt ex-service equipment. It is not claimed that this tester will indicate the capacity of a condenser, it is really meant to indicate if the condenser under test is a good one or not, it will be seen from the circuit that it varies slightly from a normal neon tester in that it has three terminals instead of the normal two, these are labelled A, B and C (see Fig. 1c). This tester becomes less efficient as the size of the condensers decreases.

The method of testing condensers is as follows. A link should be placed across terminals B and C, VRI should then be adjusted until flashing occurs in the neon, if the neon does not light the condenser has a short circuit, the setting of VRI is not critical. Large condensers will make the neon

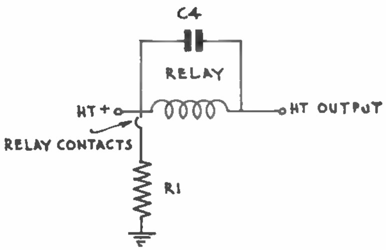


FIG 1.A.

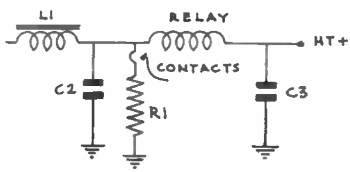


FIG 1.B

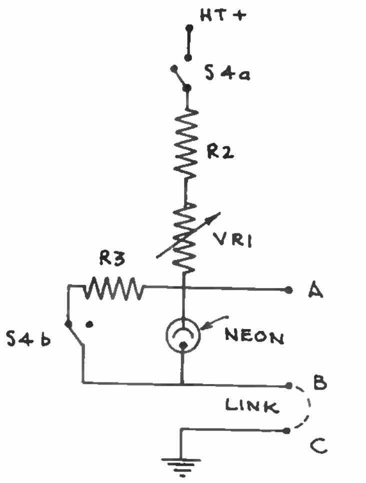


FIG. 1.c. RA189C

flash slowly, small condensers quickly. Care should be exercised in testing large condensers, because a large charge condenser can give a nasty shock, S4B was put in the circuit to discharge condensers after test S4A will remove HT voltage when S4B is operated.

Terminals B and C are provided for continuity tests (i.e. if a transformer winding is suspected the two ends of the winding should be connected to terminals B and C if the neon

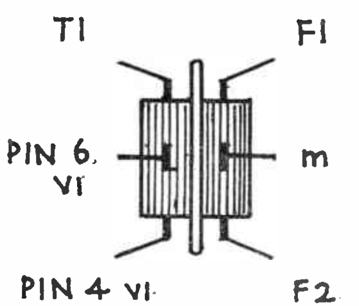
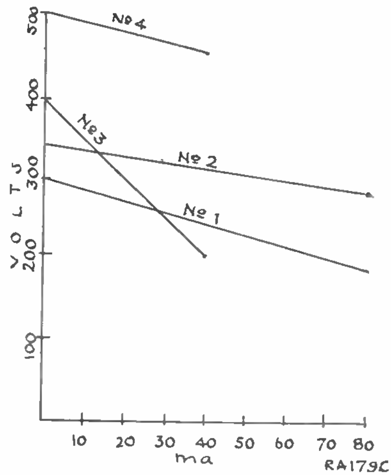


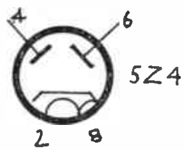
FIG. 2. RA190C

lights the winding is alright, if it does not, there is an open circuit in the winding.

Resistors R2 and VR1 are provided to limit the current to neon, the resistor placed in S4B circuit to limit surge current of discharging capacitor.

The working voltage of condensers under test should be above that of which the neon strikes.



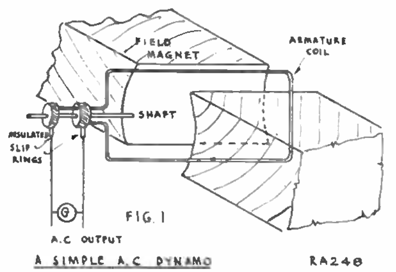


VALVE CONNECTIONS
RA191C

PETROL ENGINE DRIVEN AC SUPPLY for the AMATEUR

A design by N. WOODBRIDGE

Strange as it may seem, there are still many areas in this country where the electricity supply is DC and it seems that those unfortunate enough to live in these districts will have to put up with this state of affairs for some time to come.



We are constantly receiving letters from readers on DC mains asking us to describe gear designed especially for them. We hesitate to do this however, because their number is relatively small and these articles would therefore have but a limited space.

Some short while ago, Mr. N. Woodbridge, sent us some notes and drawings of an AC power supply he had built for his own use.

As can be seen, these drawings are so detailed, that any reader with the required workshop facilities could quite easily build himself a similar unit. Even if one has not the workshop facilities oneself, it should not prove too expensive to get the more difficult work done at the local garage. Interest in portable work seems to be on the increase, and a power unit built along the lines of that shown herewith would be ideal for such purposes.

Introducing his notes to us, Mr. Woodbridge writes:—

" Many radio amateurs who are situated away from the mains supply are faced with the problem ' how can I run my Short Wave equipment ? ' " One answer is by running a Petrol-Paraffin Engine coupled to a DC or AC dynamo. The snag arising with DC current, is the expense of large capacity batteries and rotary converters or vibrators, but with AC 290 volt one can plug in with no extra apparatus. Before going further one must understand the theoretical principles involved. Fig. 1 represents a simple AC dynamo. One half turn and the armature coil cuts the field force, generating one pulse of current which can be read with a galvonometer at the slip-rings, + to —. Another half turn and a pulse in the opposite direction is generated — to +. The current has changed its polarity twice. This is one complete cycle per revolution, see Fig. 2. By this one can see that a two-pole dynamo of this nature will give a 50 cycle per second current at 50 revs per second or 3000 revs per minute.

The dynamo shown in Fig. 3 is driven by a Governed petrol engine. The alternator is a two-pole self exciting unit, the armature rotes and carries both DC and AC windings. The AC winding is connected to the slip-rings at one end and DC winding to the commutator at the other. There are three field windings: DC exciter field, AC exciter field and a small regulating field. The rheostats seen in Fig. 3 adjust " no load " voltage and " regulation."

The automatic regulator consists of a choke coil and metal rectifier. The line current from generator passes through the choke coil and the potential difference across it feeds into the rectifier. The DC output is fed into the regulation field winding. With AC dynamos, as the load is increased the voltage drops, so that some compensation is essential. One can see that no voltage will develop across the choke at no load conditions. The voltage, however, will increase proportionally to the load, this will compensate for the drop in line voltage as the load is increased. A revolution meter of the centrifugal or magnetic type is coupled by a universal coupling to the

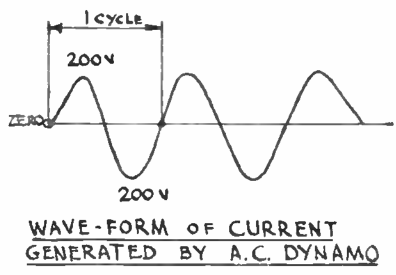
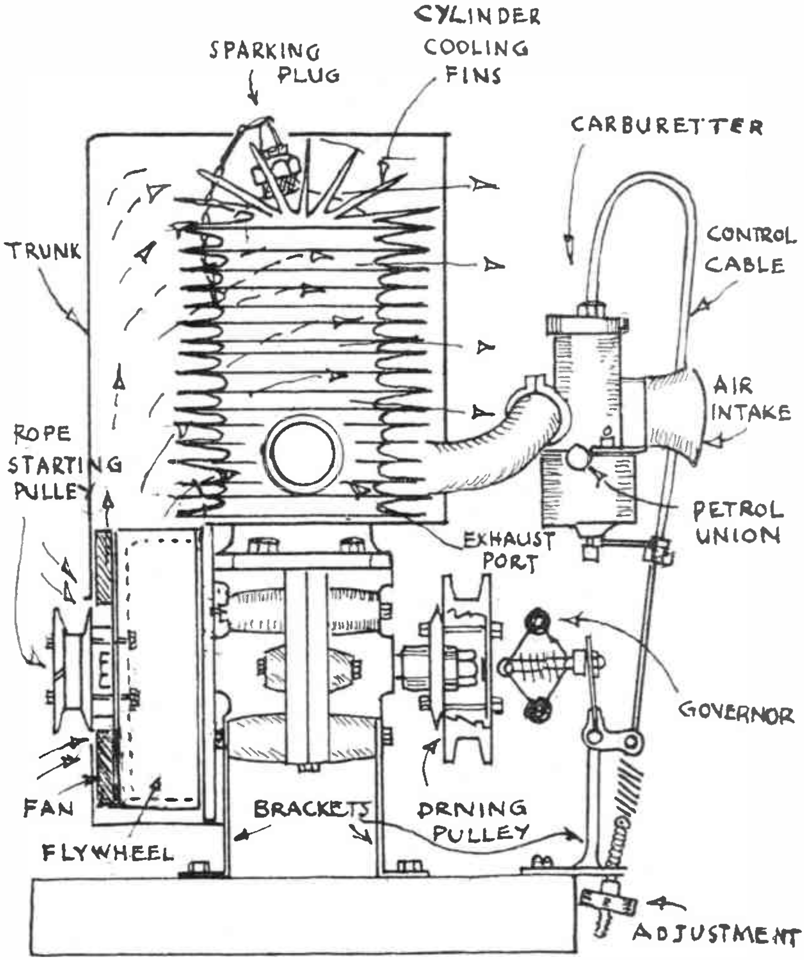


FIG. 2



TYPICAL SMALL 98CC VILLIERS
PETROL ENGINE LAYOUT AFTER MOD.

1. FAN & TRUNKING
2. STARTING ROPE PULLEY.
3. DRIVING-PULLEY
4. GOVERNOR & LINKAGE
5. ENGINE MOUNTING BRACKETS

RA245

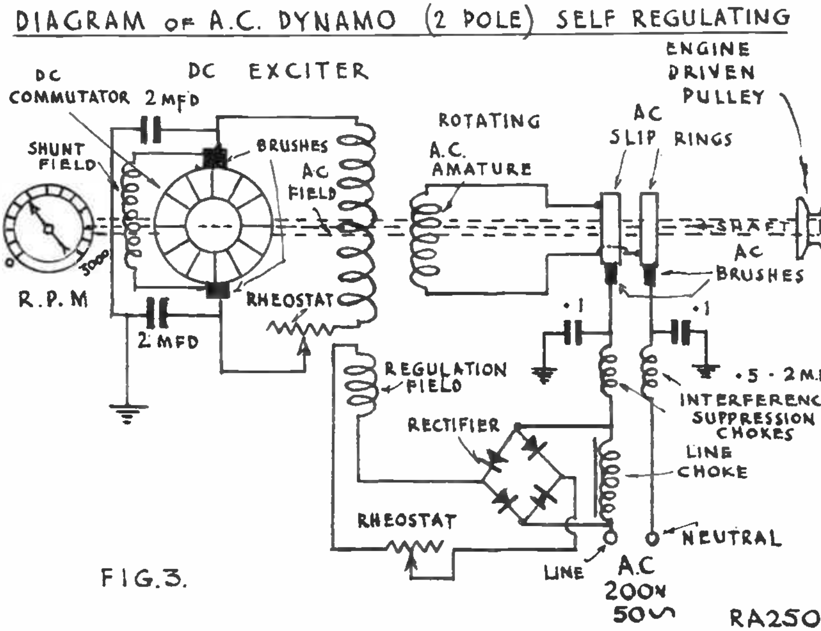


FIG.3.

generator and at 3000 revs per minute a current of 50 cycles at 200 volts is obtained.

The engine used in the unit shown is a Mk 10 Villiere 98 cc fourstroke petrol engine, developing 1.3 bhp at 3000 revs per minute. It is bolted to a bed made up of 2-in. angle iron. A suitable dynamo and regulator can be purchased quite cheaply from dealers in war surplus, electrical scrap yard and similar establishments. That used in Mr. Woodbridge's unit is an ex-WD (USA) 350-watt 200-volt AC. The regulator unit should be purchased along with the dynamo.

In a home constructed unit such as this, the dynamo is best coupled to the engine via belt drive. By using the right size pulleys, the correct dynamo speed can be arrived at, for the most economical running speed of the engine. The size of pulleys will vary in individual cases and can be easily worked out once the dynamo speed required is known.

An old motor cycle engine could well be used. Another suggestion is to use one of the small 98-cc two-stroke autocycle engines which are available nowadays.

The engine must be fan cooled as the unit will be running as a stationery engine and will thus overheat. Details of the fan and cooling ducts are shown in the illustrations. The M/S blades being rivetted on by ⅛ in. rivets. The fan is attached to a flywheel with ¼ in. bolts, passed through holes drilled in the flywheel for the purpose.

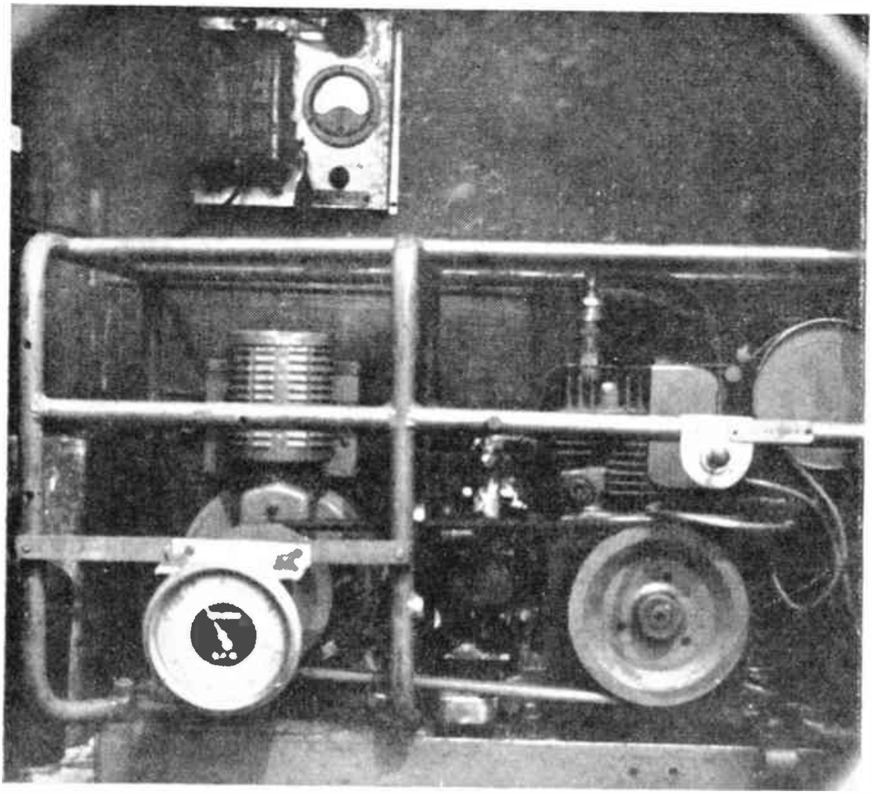
The cooling trunking is made of 22-gauge sheet M/S rivetted together. Details are shown in the drawings.

A rope starting pulley should be bolted to the flywheel with the same ¼ in. bolts as are used to fix the fan. Three large nuts acting as distance pieces are placed behind the pulley. A slot is filed to take the starting rope end knot.

In the unit shown, the dynamo driving pulley consists of a ½ in. V belt aluminium pulley, bolted to the original driving spracket by ¼ in. bolts (pinned up) and an ⅛ in. plate to take the governor bearing.

The governor is the most difficult part to make and some experimentsl work may be necessary to get it functioning properly.

" The shaft consists of a ⅜ in. bolt, with its head sawn off, two lock nuts passing through ⅛ in. plate and soldered—or brazed, to " L " brackets are also rivetted to this plate to take lever arms. The lever arms are 16 gauge M/S with $\frac{3}{16}$ in. bolts (pinned up) at ends. The centrifugal weights can be made of ½ in. M/S and can be any shape, but should balance, otherwise the action will be erratic. On the other end, a sliding bush with a filed groove and two brackets slides up and down the shaft moving the fork finger and in turn the throttle linkage, opposing centrifugal force is the



General arrangement of the unit

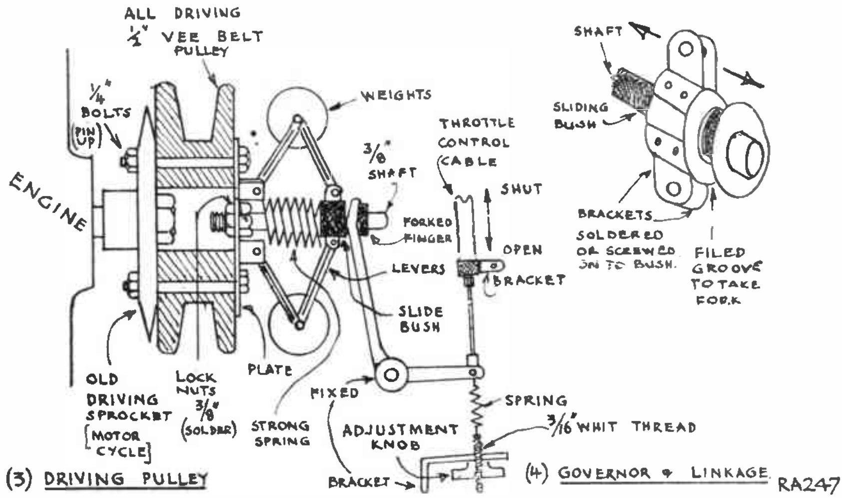
return spring which tension can be found by trial and error."

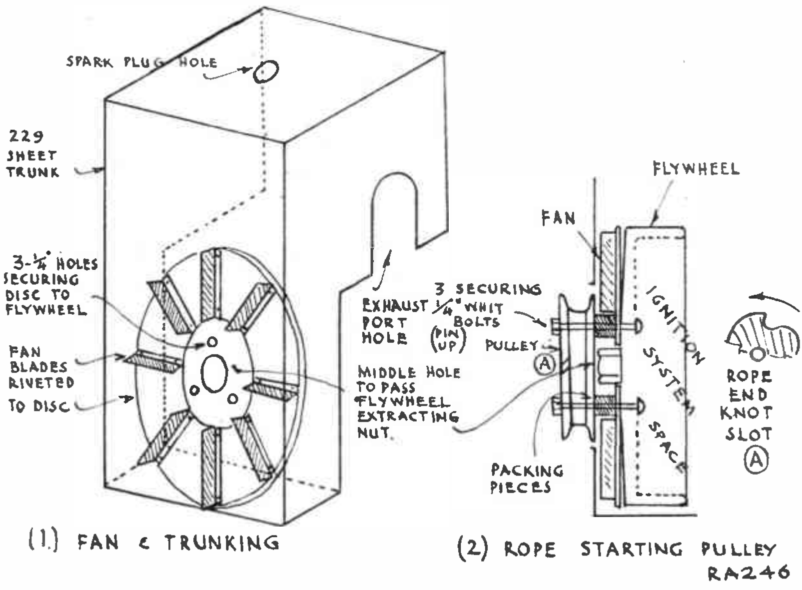
The regulator consists of a spring whose tension can be varied by a long $\frac{3}{16}$ in. whit. threaded bolt and a threaded knob. The throttle control cable has it outer sheath anchored by means of a small bracket to any convenient bolt on the engine, whilst the inner cable is connected to the eye bolt on the governor lever. It is important to make sure that all this linkage works freely. For the benefit of those who may not be familiar with the governor's mode of operation, a short word of explanation may be useful.

"With the engine running at say, 2500 revs per minute, with no load, the weights are also rotating at the same speed, centrifugal force makes them fly outwards opposing the return spring thus holding linkage and throttle at, shall we say $\frac{1}{4}$ throttle.

If say, a 100 watt lamp is now switched in circuit; the engine feels a load and instantly looses revs. The centrifugal weights no longer can oppose the return spring and the slide worked by the levers, moves outward along the shaft thus working the levers and pulling the throttle open to maintain 2500 revs per minute. As soon as the engine revs higher the centrifugal force increases and the weights fly outwards opposing the return spring, the slide moves inwards pulling the lever and thus closing the throttle. One can see by this procedure that under any varying load the engine will keep its pre-set 2500 revs."

The four engine brackets are made up "L" shaped, of $1\frac{1}{4}$ in. $\times$ $\frac{1}{4}$ in. strip, drilled at each end. The dynamo fixing holes should be cut so as to form slots, so that the belt can be adjusted for tension.





It is well to use a screened HT cable and standard, screened, suppressed plugs.

A one-gallon petrol tank will suffice and it is as well to keep this away from heat from the engine.

It is hoped that these notes, together with the illustrations will enable others to build themselves AC power supplies suitable for either portable or home use.

A Simple Intercom Unit

by P. BARRATT

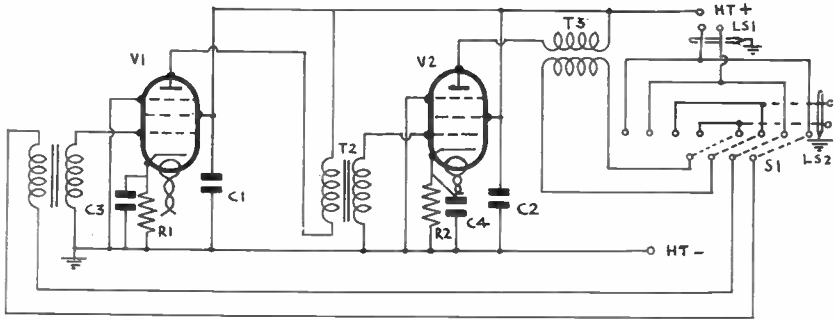
There are no novel features in this unit, but it seems that there is considerable interest in this type of equipment, but little published information on it. So the following notes on the circuit may help those who wish to rig up an intercom system. This unit works well and is quite simple to construct.

In the installation in the writer's house, screened cable was found to be desirable as there was too much electrical noise picked up from supply cables, but under more normal conditions, this should be unnecessary, and the modified circuit can be used quite satisfactorily. The external connections are made directly to the speaker speech coils—this was tried rather apprehensively. It gave no trouble however, and meant that only one mike transformer and one matching transformer need be used.

Two transformer coupled stages are used. EF50s have been used as they are cheap and readily obtainable on the surplus market, but any other similar valve could be used. Results are quite satisfactory with the low ratio for T1 but higher values could be tried. The cathode resistances were chosen after finding optimum values using a variable resistor and ohmmeter. Power supplies were from a simple half-wave rectifier which gave approximately 230 volts after smoothing.

When building the unit the various transformers should be kept as far apart as possible and their cores mounted at right angles to avoid LF instability; if this occurs first try changing the leads over to the transformer primaries or else use a shunt resistance to earth across one or more of the transformer windings.

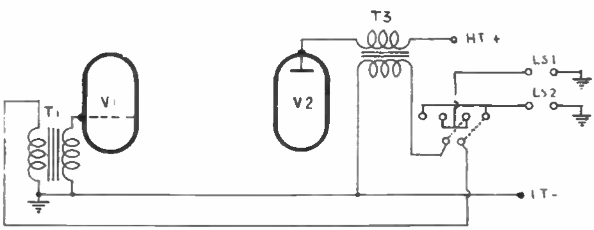
(*Contd. on p. 473*)



INTERCOM UNIT

RA174C

V_1 V_2 *EF50*	C_1 C_2 *0·001 mfd.*
T_1 T_2 *3:1*	R_1 R_2 *75 ohms.*
T_3 *3:1*	C_3 C_4 *50 mfd. 25 v.*



ALTERNATIVE CIRCUIT USING COMMON EARTH

RA173C

STRICTLY FOR THE BEGINNER

by O. J. RUSSELL, B.Sc., A.Inst.P., G3BHJ

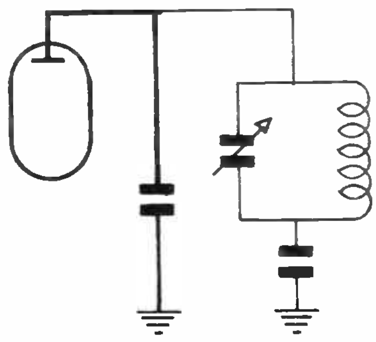
P.A. DESIGN CONSIDERATIONS

Having covered several aspects of buffer amplifier and power amplifier design, it is just as well to clear up a few odd points which may be puzzling. For a start we can deal with the question of push-pull versus parallel operation. Last month's remarks have not altogether been unchallenged in some circles, and in general it is held that push-pull circuits are inherently more efficient than single ended ones. As in all things, it does of course depend very largely on " what you mean " by efficiency. It can be said here and now that push-pull circuits are if anything, a more elegant mode of operation than parallel operation. In this connection it is a fact that the balanced push-pull circuit enables the RF circuits to be maintained symmetrical with regard to earth, and that bypassing is simplified. In this connection, the " cold " centre of the tank coil is an ideal spot to attach the HT feed choke to. Again, the RF currents in the screen circuits are in opposition. However, one delusion has been dealt a decisive blow by the advant of TVI.

The push-pull arrangement has no marked superiority in *practice* to the single ended circuit as regards harmonic suppression. In the first place the push-pull tripler circuits in vogue at UHF show that push-pull circuits are admirable generators of odd harmonics. The beloved push-pull final on 14 Mcs therefore was soon to be revealed as the generator of strong 42 Mcs TVI creating third harmonic ! Moreover, let us be quite clear about the alleged cancellation of EVEN harmonics for which push-pull stages are lauded. This is unfortunately ONLY a half truth. In fact it is only Even Harmonic VOLTAGES which are cancelled. In a push-pull stage the EVEN harmonic CURRENTS are additive. In an ideal push-pull stage this would mean very little or no even harmonic output. In PRACTICE, however, the presence of residual impedances, notably inductave components of the earth return or bypass circuits, result in appreciable even harmonic voltages being generated in such impedances through the passage of the even harmonic currents. If this is found heavy going, practical tests on large numbers of transmitters have in fact, shown that the harmonic output of push-pull transmitters is very little different from single-ended tank transmitters. By going to some little trouble it is possible to reduce the harmonic output on either type of transmitter.

One useful precaution in harmonic reduction, is to ensure that the anode tank is of reasonable Q, and the graphs previously given will enable suitable tank values to be selected. In this connection, it should be noted that the selection of a HIGHER value of tank condenser results in a HIGHER WORKING value of Q. Use of higher values of tank capacity therefore, will in practice, result in a slight sacrifice of available RF output power, but will materially improve the rejection of harmonics. Incidentally, one point of interest. Particularly in view of the reduction of stray impedance effects, is the use of an auxiliary tank condenser connected as directly as possible from anode to earth. Values of from 10 pf to 50 pf are used in this service. A condenser of low loss, low inductance and able to stand the peak voltages existing in the tank circuit is required. Vacuum fixed condensers are ideal for this service, and can often be picked up on the surplus market. Fig. 1 shows the circuit arrangement.

A further question, with regard to bypassing, is the common arrangement of the drive stages underneath a chassis. The PA stage (shall we say an 807 ?) with its top-cap well above the deck naturally has its tank circuit mounted above deck. This appears to be a very efficient and sensible layout, providing adequate shielding. As a final touch, the anode bypass is brought straight down with a short lead and firmly welded to the upper surface of the deck. This provision of a nice short bypass has one unfortunate flaw. It is skin effect. RF currents



An additional tank capacity, connected by short thick copper strip provides a low impedance path for TVI harmonics

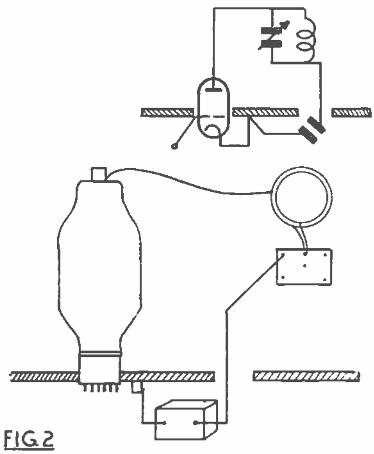


FIG.2

With the tank circuit above deck, and the cathode earthed below deck, efficient by-passing is obtained by taking the anode by-pass return THROUGH the chassis and earthing underneath. This reduces skin effect impedance troubles often found with a by-pass made to the outside of the deck

can NOT penetrate to any extent through a metal sheet. Unfortunately from an RF bypass standpoint, the anode circuit needs bypassing direct to the cathode. Unfortunately, in such an arrangement as described, the cathode circuit is UNDERNEATH the deck, and skin effect prevents the RF anode circuit bypass currents from going directly THROUGH the metal deck. What actually happens is that the RF bypass return currents wander unhappily all over the SURFACE of the deck, and only get home by crawling round edges, diving through meter holes, and so on, in order to get home to the cathode. At high frequencies this means quite a high impedance bypass return path. The solution is quite simple. A small hole is drilled in the deck, and the bypass lead taken through the hole and anchored to earth UNDERNEATH the deck. This may be an inch or two longer than the apparently highly efficient lead going straight down to the upper surface of the deck, but in fact it is a vastly lower impedance than the above chassis connection. This alteration (see Fig. 2), is recommended for all such PA stages, and the effect is particularly great on the higher bands. In the writer's case, an increase of some 30 per cent. in RF output resulted on 21 Mcs. In other cases similar beneficial results were obtained by this simple refinement. The important feature however, is not so much the improvement in output and efficiency noticed on the higher frequency bands, as the reduction of impedance. This reduction in impedance has a markedly beneficial effect upon harmonic production. It is, in fact, unconsidered trifles of this sort, which are all important in the amelioration of TVI and for efficient operation upon the higher frequencies. If your rig "takes-off" on 10 metres, or if RF output is low, inspect the bypass return. It is also offered as a tip to 2-metre operators using dish-type chassis construction with only the final tank above deck. On "two" skin effect impedances can really be something ! It is certainly worth trying !

Tank Circuits

The capacity values employed in both the grid and the anode tank circuits are important. Correct operation of the grid circuit is essential for efficient driving, while the anode tank circuit determines correct matching of the PA to the output load as well as deciding the efficiency of harmonic suppression, efficiency of energy transfer and modulation capability for phone operation. The selection of the correct LC ratio is thus of importance. Fortunately, for any given band of operation, the value of tuning capacity required can be specified. With the usual semi-circular "straight-line-capacity" condensers used for tank circuits, the amount of capacity in use can be estimated quite closely from the degree of mesh of the vanes.

While it is advisable to adhere closely to the optimum tank circuit capacity values, a reasonable variation is permissible, and generally speaking, it is as well to err on the side of extra capacity rather than too little. Moreover, at high frequencies, it is to be remembered that there are inevitable stray capacities present. The output capacity of an 807 is some 10 pf, and incidental strays will probably add another 10 pf so that an estimate of 25 pf of stray capacity is a reasonable estimate for a Tx operating on the usual DX bands. For VHF operation, it will be seen that at 2 metres it is almost impossible to get down to the optimum values of capacity in most cases, and this is one cause of low efficiency at VHF. However, choice of the wrong value of tank capacity can lead to low efficiency at any frequency. The frequent delusion that efficiency is improved by using the absolute minimum of capacity on any band is to be discouraged. One result of this practice is poor suppression of harmonics, and actual power output may decrease.

The design graphs shown provide for "optimum" tank circuit design values. They will give a working Q value of 12, which is a good optimum value for harmonic suppression, efficiency of power transfer, and permits good

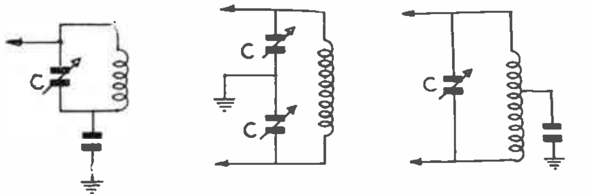


FIG. 3 CIRCUIT A. CIRCUIT B. CIRCUIT C.

Values of capacity C taken from appropriate graphs

Circuit A. Single-ended tank. (see curve " A ".)
Circuit B. Split stator push-pull. (See curve " B ".)
Circuit C. Earthed centre tap push-pull. (See curve " C ".)

anode modulation. The grid design chart provides a reasonable grid circuit design, although grid circuits can not be regarded as critical. To save bother with multiple chart lines for various bands, the graphs give the capacity required in terms of " Picofarads per metre," that is to say, the chart value multiplied by the operating wavelength in metres gives the required tank capacity. Thus, for 40-metre operation simply multiply the chart figure by 40, and the figure thus obtained is the capacity for 40-metre operation. The tank coils of course are pruned to enable resonance to be obtained with the capacity values quoted. To cover the usual types of single ended and double ended circuits, the three types of tank circuit A, B and C, correspond with the appropriate lines on the charts.

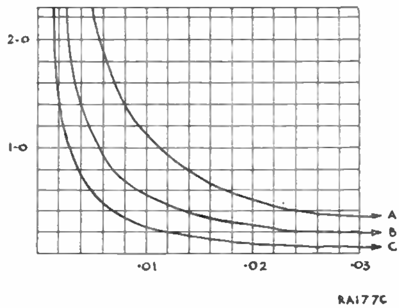
It will be noted that the grid circuit graph requires a knowledge of the RF grid driving power. As previously mentioned, this figure for a given operating condition is usually supplied by the valve manufacturer. However, the RF grid driving power can be calculated approximately by obtaining the power input representing the grid current drawn by the stage at the operating grid bias voltage, and multiplying by the factor 1.3. Thus, 10 mA of grid current at a bias voltage of 100 volts implies an RF grid driving power of 1.3 watts, rather than the DC grid power of 1 watt.

A few points about tank circuits that may at first appear puzzling may be of interest. Firstly, it is somewhat confusing to a beginner to have it stressed that " HIGH Q " circuits are essential for efficiency, and to be THEN told that the " optimum tank circuit Q is around 12," particularly as a tuned circuit with a " Q " of 200 is quite normal. The point is of course, that BY ITSELF the tank circuit should be of " HIGH Q " as this means that the tank circuit components are low loss. However, when the anode tank is LOADED by being coupled to a power absorbing " useful load "—such as an aerial or even an artificial aerial load composed of a matched resistance, the OPERATING or LOADED Q of the tank circuit is reduced. However, in the LOADED case, the " losses " are the coupled loads which are absorbing power from the tank circuit. It is immaterial that the load applied is a useful load, the effect is to reduce the Q of the tuned circuit. To make it clearer, the load applied to the tank can very well be an actual resistance —as in the case of using a resistance load for measuring power output. Obviously a resistance loaded tuned circuit has a LOW Q, and this applies whether the load is due to losses in the circuit, a coupled resistance load or indeed a radiating aerial system ! However, the efficient transfer of power to a USEFUL load is obtained only if the power supplied to the tank circuit is NOT being stolen by losses in the coil and condenser. The recipe for efficiency therefore is to start with a tank circuit having a high Q by itself, and to load it down to a low Q by removing power only into useful loads such as aerial systems. In fact, if Q_U is the unloaded tank circuit Q value and Q_L is the loaded tank circuit Q, the efficiency of power transfer is given by

$$E = \frac{Q_U - Q_L}{Q_U} \times 100 \text{ per cent.}$$

That is to say a circuit of initial Q of 100 if loaded to a Q of 10 transfers 90 per cent. of its power to the load, and yes, the other 10 per cent. heats up the tank circuit ! We can not load the circuit to a Q of nothing to obtain 100 per cent. efficiency, so the next best thing is to start with as high a Q as possible. A tank circuit of zero loss would have infinite Q and transfer all its power to a load.

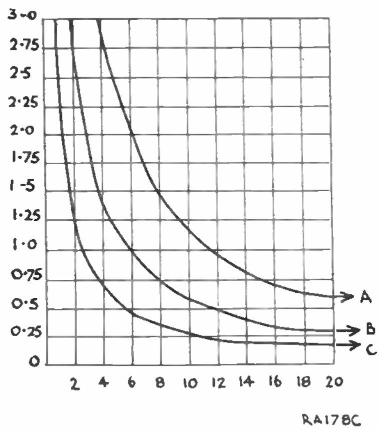
A further point, is the advantage of push-pull circuits as agianst parallel tank circuits. There is nothing to choose—at any rate on the score of efficiency—between them. The fact that in the parallel circuit valve capacities are



Grid circuit tank capacity plotted against grid drive.

$$2\frac{\text{Watts grid drive}}{(\text{grid current MA})^2}$$

doubled, is also of no consequence, as the optimum tank capacity of the parallel arrangement using a single-sided tank, is four times that of the push-pull arrangement. Again, at high frequencies, a valve drawing a relatively high current at a low voltage is an advantage, as it requires an optimum tank capacity higher than a low current high voltage valve. The high current low voltage tube thus enables efficient operation despite unavoidable stray capacities, whereas a low current high voltage valve may require an optimum tank capacity so low that strays prevent the optimum value being reached. In effect, of course, two paralleled valves are equivalent to a single valve drawing double current, and their efficiency may very well be better at HF than when used in a push-pull arrangement. Point is lent to these remarks by the fact that the latest RCA transmitting valve—designed as the successor to the 807—is actually a high current low voltage tube. The 6146 as the new tube is called, performs very well on 144 Mcs, and runs at some 60 watts with only some 450 volts HT. While valves of this type are not yet available here, it should not be long before other types of high current low voltage PA valves are produced, as this reversal of the high voltage trend has many useful features. A low voltage power pack for example is cheaper—even if of high current rating—than a high voltage pack. It is not so long ago that 1000 volts was essential for a 100-watt PA. Paralleled 807s CAN give 100 watts at 500 volts, so that the use of paralleled valves is neither old fashioned, nor for that matter, technically unsound. Parallel operation has the advantage of not requiring split stator tanks, so that single ended condensers may be used. Furthermore, of course, the popular Pi network tank circuits virtually necessitate single ended operation, and paralleled 807s are a more economical valve assembly for full power operation than a single 813.



Tank capacity plotted against

$$\frac{\text{plate volts}}{\text{plate MA}}$$

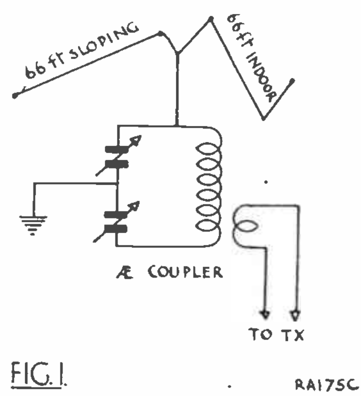
AUSTRIAN LICENCE SITUATION

From OE5YL, via G6MN, we learn that all stations are officially closed down until the new licensing laws appear in the new year. Every foreign amateur can be licensed in OE if reciprocity in the other country is granted. Four grades of licence are to be issued, viz., A—25 watts plate diss., B—50 watts, C—100 watts, and D—250 watts which will be chiefly issued to club stations. Calls will be from AA-ZZ instead of the operators initials. The prefixes will be as follows: OEI Vienna; OE2 Salzburg; OE3 Lower Austria; OE4 Burgenland; OE5 Upper Austria. All YL stations will get a Y after the number and all clubs, schools, etc., an X.

TWENTY-TWO YARDS OF WIRE

A. D. TAYLOR, G8PG

In a previous article ("A Utility Aerial Farm"), the writer described how good 14 Mcs DX coverage over a large part of Asia, Australasia, South America and North America was obtained in a location where outdoor aerials were officially forbidden. Readers may remember that coverage to the west was obtained by means of the two element fixed beam located in the loft, and to the east by means of an "invisible" sloping aerial made from 66 ft. of 18 SWG wire. The low end of this aerial pointed east and gave a good coverage of Asia and Australasia.



The unconventional 7-Mcs aerial system showing the method of feed

The object of the present article is to show how, in a sunspot minimum year with 14 Mcs conditions at their worst, the system was adapted to give reasonable results on the lower frequency bands. An all-round coverage has certainly not been obtained, but by trying one or two unconventional ideas it has been possible to put out a very reasonable signal on the 1.8, 3.5 and 7 Mcs bands without spoiling the well-tested 14 Mcs system.

When conditions became really bad on 14 Mcs, the first move made was to 7 Mcs. The 66-ft. tilted wire had previously been tried on this band and was known to possess marked directional properties. Good coverage of Scandinavia was obtained, and eastern Europe and Cyprus were fairly easy to work. To the South and West, however, there seemed to be a complete cut-off. Spain and North Africa could not be raised and (as was to be expected) no signals were getting across to North America. The problem therefore was to increase the area which could be covered, but at the same time not to spoil the existing 66-ft. aerial which was still giving excellent results whenever 14 Mcs was open to the east. Bearing in mind the impossibility of erecting poles, the problem seemed a hopeless one at the start, but much thought was given to it and much reading done: finally a possible solution began to emerge. Several of the books consulted mentioned that a centre fed aerial with the two halves placed at right angles to each other tended to radiate in all directions provided the two legs were each at least half a wave-length long. The books showed diagrams of such a system, always with the ends of the two legs supported on poles and fed by means of 600-ohm open wire feeders. No such procedure was possible in the writer's case, but an alternative system was devised and erected. Briefly, the details were as follows :—

One half-wave leg was made up of the existing 66-ft. sloping aerial. The other leg was provided by folding a second 66 ft. length of wire across the floor of the loft underneath the two-element 14 Mcs beam. About 35 ft. of wire ran across the loft, roughly at right angles to the existing 66 ft. aerial. Ten ft. was taken up in the down lead through the ceiling into the shack and the remaining 20 odd ft. were folded back at the free end in the form of a V thus providing an approximation of two half waves at right angles. The next problem was that of feeding the system. Once again the solution adopted was a little unconventional. The shack ends of the two legs were tied together and fed through the existing Pi section aerial coupler. This eliminated the need for feeders and meant that the 66-ft. sloping portion could be used by itself on 14 Mcs.

In this way the arrangement shown in Fig. 1 came into being. The next thing was to test it and see how the ideas incorporated would work out in practice. As so often happens the result was a mixture of triumph and failure. To dispose of the failure first, at no time has it been possible to put a signal out to the west, even though many stations in North and South America have been called. In other directions, however, things began to happen very rapidly. Within a few hours of bringing the aerial into use, an S8 report was received from Spain, an area which it had previously proved impossible to work. Other contacts with stations

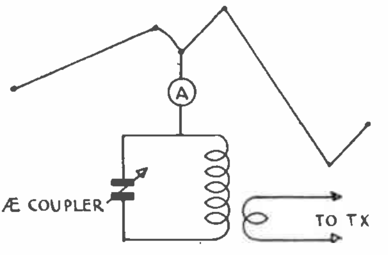


FIG. 2.

RA176C

The same system adapted for use on the 1.8 Mcs band

to the South soon followed, and in the last few months most of North Africa has been contacted. An even more unexpected development was the difference in the signal put out to the East and North. The original 66 ft. aerial had been good in these directions, but it soon became apparent that the new arrangement was really outstanding. The first inkling of this came with a series of S8 and S9 reports from Eastern Europe. These decided the writer to break his usual rule and spend a little time calling CQ to see how good the aerial really was. The results were illuminating. When conditions were moderate or above, almost every CQ brought a reply from Europe and on many occasions up to four stations were heard calling at the same time. When ZC4 and 4X4 had also been contacted, it was decided that the experiment was a success, even though trans-Atlantic coverage had not been obtained.

On 3.5 Mcs the story was not so bright. The new system was tried out first during a certain contest and after a period of missed contacts interspersed with poor reports, the writer changed back to using the sloping 66 ft. aerial by itself on this band. Considering the very low height of this aerial it works remarkably well on 3.5 Mcs, showing some directivity towards Sweden, but putting a fair signal over most of Europe.

Some weeks later, with QRM particularly bad on 7 and 3.5 Mcs, it was decided to install a Top Band transmitter so as to increase the number of available frequencies. Remembering what had happened on 3.5 Mcs, it was decided to commence operations by using the 66-ft. sloping aerial and parallel tune it against ground. This idea worked well for local contacts but, as was to be expected, results at longer distances were very poor. One Sunday morning when in contact with a local, the two 66 ft. aerials were tied together and a report was requested. The result was disappointing—" No change OM." Almost immediately, however, a GD friend of the writers broke in with a very different story. In Douglas, 90 miles away, the change had brought the signal up from S6 to S8. Since then the two aerials have been used together on this band and one new country (GI) and several new counties have been worked.

That, then, is the story of how a few hours thought—plus a 22 yard length of wire—helped one station not merely to maintain, but to improve results during a period of particularly bad conditions. It is hoped that it will prove of help to others similarly handicapped by stimulating experiments with unconventional aerial systems.

BOWLED OUT by BIAS

by

FRANK L. BAYLISS, A.M.I.E.T

Cathode Bias

Constructors are constantly coming up against the question of providing suitable bias resistors in the circuits constructed, and, whilst probably most know the simple calculations to be made and the correct method to adopt some, novitiates particularly, are perhaps rather hazy.

With the indirectly heated mains valve, the method of biasing the valve, i.e. of rendering the grid negative with respect to the cathode, has become the standard one of a resistor inserted in the cathode lead, as shown in Fig. 1.

The *whole* of the valve current—anode, screen current, etc., flows through this resistor and it is the *whole of the valve current* that must be taken into account when calculating the valve of R_1.

The calculation itself is derived from Ohm's Law, and is simple, $R = \frac{E}{I}$, where R is the required value of bias resistor in ohms, E is the voltage drop (the negative bias voltage required) across the resistor R_1, and " I " is the total valve current, as previously explained, in *amperes*.

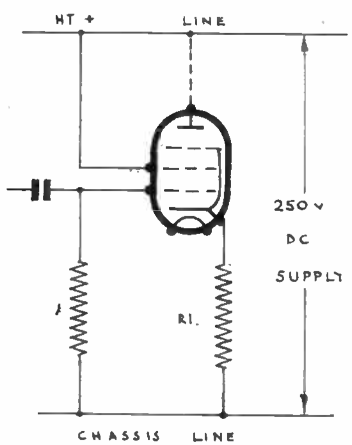


FIG.1

Thus, for a typical output beam tetrode drawing 45 mA anode current, 7 mA screen current, and requiring a bias voltage of—12 volts, the value of R_1 is $\frac{12 \times 1000}{45 \times 7} \times 230\ \Omega$ approximately.

The figure 1000 in the numerator balances out the fact that the denominator current is in milliamps instead of in amperes.

Now, this is quite a simple calculation, and the principal is the same no matter what method of biasing is adopted.

Any difference will be purely that of " *what* current is flowing through R ? "

Battery Valves

In the cathode-bias method just considered, the grid becomes negative simply by virtue of the fact of the voltage drop across R_1, i.e., the cathode is less negative than the grid.

With directly heated valves, however, there is no cathode and one has to look for other ways of obtaining the necessary grid voltage.

With battery type valves it is usual to utilize the whole receiver current by arranging for it to flow through the resistor R_2 shown in Fig. 2.

Thus, in Fig. 1, only the current through the valve flows through R_1 and the cathode is at a lower negative potential than the other end of R_1 and the valve grid.

In Fig. 2 the whole receiver current flows through R_2 and the whole chassis line is therefore less negative than point " X."

If, therefore, the valve of R_2 is calculated to give the required bias voltage for one or more valves, the valve grids need only be connected to point " X " for the difference of potential between the filament and grid to be achieved. The calculation is the same, $R = \frac{E \times 1000}{I\ mA}$, except, of course, that " I " is the *receiver* current and not only that due to any one valve.

Where, as is sometimes the case, more than one valve is to be biased, more than one resistor would be used. Remember that the voltage drop, the bias voltage, increases as the " X " points are taken farther from the chassis. The valve requiring the highest bias voltage is therefore chosen to give the *total* valve of R_2, individual resistors in this circuit being calculated to give the smaller voltages.

For instance, it is required to bias an output valve and an audio amplifying valve with

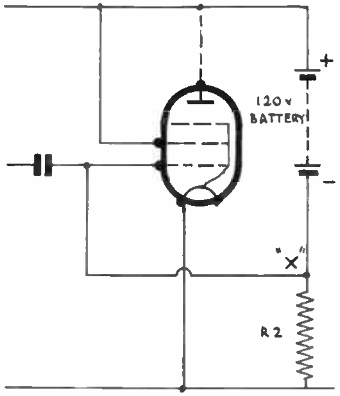


FIG. 2.

-9 and -3 volts respectively, when the receiver current equals 15 mA.

$$\text{Then R (total)} = \frac{9 \times 1000}{15} = 600\ \Omega.$$

However, the audio valve's bias resistor must form part of this figure, i.e.,

$$\frac{3 \times 1000}{15} = 200\ \Omega.$$

The total resistance must therefore be made up of 400 Ω and 200 Ω resistors in series, and connected as shown in Fig. 3, the least negative one being nearest the chassis line.

Directly Heated Mains Valves

Directly heated mains valves may be biased in much the same manner, i.e., by the insertion of a resistor in the main HT—lead, between the transformer secondary centre-tap and chassis as shown in Fig. 4.

This method is analogous to the methods of Figs. 2 and 3, the power pack replacing the HT battery as a source of HT supply, and the calculating of the valve of R_3 being similar to the method used for deriving the value of R_2.

When, however, a separate heater winding is available on the mains transformer for supplying a directly heated valve, a method analogous to Fig. 1 may be used as shown in Fig. 5.

The resistor R_4 is inserted in the lead from the heater winding centre-tap and taken thence to chassis. The current flowing through the valve must flow through R_4, and, with the valve-grid connected to chassis the filament will be less negative than the grid by the amount of voltage drop across R_4.

In this case, however, it is only the current due to the valve served by the heater winding that is computed in the calculation, but it is, nevertheless, the *whole* of that valve's current (anode plus screen, if there is a screen) as in the case of Fig. 1.

" Fixed " Bias

So far, we have considered five methods of obtaining bias, all of which embody the principal known as " self-bias " or " automatic " bias (the author personally profers the term " automatic," the term " self-bias " being more applicable, in his opinion, to cases where the rectified signal input is the bias—as in the case of the leaky-grid detector).

The name is derived from the fact that the bias voltage is only existent by virtue of the current flow in the circuit to which the bias voltage is applied: the voltage, moreover, varies in proportion to the strength of that current. In other words, without the circuit current there is no bias.

In all these methods, however, the bias voltage obtained is at the expense of the HT voltage, i.e., the original HT voltage becomes lower by precisely the amount of the bias voltage.

In the case of the circuits of Figs. 1 and 5, only the HT of the valve served by the bias resistor is affected, but in Figs. 2, 3 and 4, the whole circuit suffers the HT loss across the resistor.

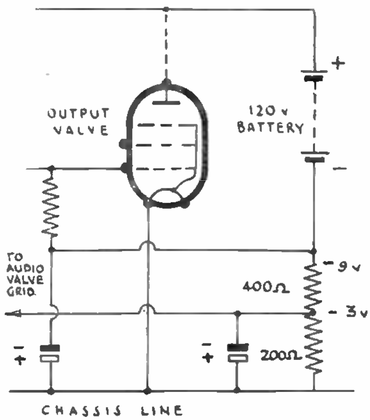
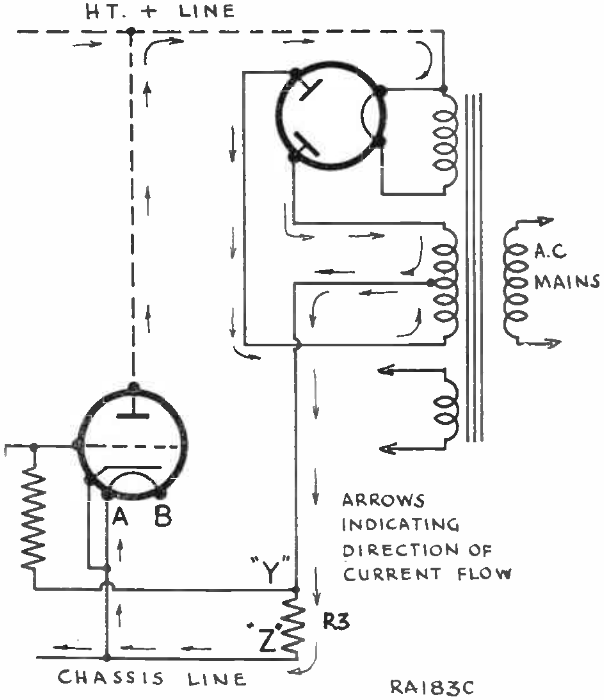


FIG. 3

FIG. 4.



If the maximum required bias voltage is small, the HT loss may be of little importance, but where, as in the case of large output triodes—perhaps in push-pull—a value of bias up to, or exceeding—100 volts is required, the loss may not be permissible.

In such a case, a convenient and simple method of obtaining a separate fixed bias voltage is required, and a useful scheme is shown in Fig. 6.

The transformer, an ordinary 1 : 3 or 1 : 4 intervalve component, is connected to the supply mains via a capacitor of from 0.1 μF to 1.0 μF in series with the primary lead. The capacitor limits the primary current to 3 or 4 mA and the voltage drop across the primary to 20 or 30 volts.

The 100 or so volts obtained from the secondary is rectified, and may be used as the bias source if the rectifier is connected in correct polarity, i.e., as shown in Fig. 6.

Use a nickle-iron cored transformer, preferably one having a bakelite case, and a good quality capacitor having a high working voltage—say 1000 volts.

The average intervalve transformer will withstand little more than 10 mA or 12 mA primary current, so be careful about increasing the capacitor valve to obtain a higher voltage.

Smoothing

The smoothing of the circuits of Figs. 1, 2, 3 and 4, may be carried out by the usual low voltage high capacitance electrolytic capacitor.

It is important, however, that this capacitor should be connected in correct polarity: however, if one remembers that the valve grid is *always negative*, and connects the negative side of the electrolytic to the *grid* end of the bias resistor, the positive end of the capacitor must always go to the other and correct end of the resistor.

Two such capacitors are shown in Fig. 3.

Direction of Current

The current, consisting as it does of a flow of electrons, is negative in characteristic, and flows always from the heated cathode or filament to the valve anode.

Thus, the electrons—or negative current—commencing at the rectifier filament (Fig. 4) cross the valve to the anodes and flow thence through the transformer secondary, through R_3 to the triode filament.

At this point, the current flow is taken up—continued, if you like—by the triode filament electron emission. This emission crosses the triode and flows back to the rectifier filament, thus completing the circuit.

Since R_3 enforces a voltage drop in the emission flowing down from the rectifier filament and since, also, the current is *negative* in characteristic, point " Y " is at a higher negative potential than point " Z."

The triode grid is, therefore, negative with respect to the filament, by the amount of the potential difference.

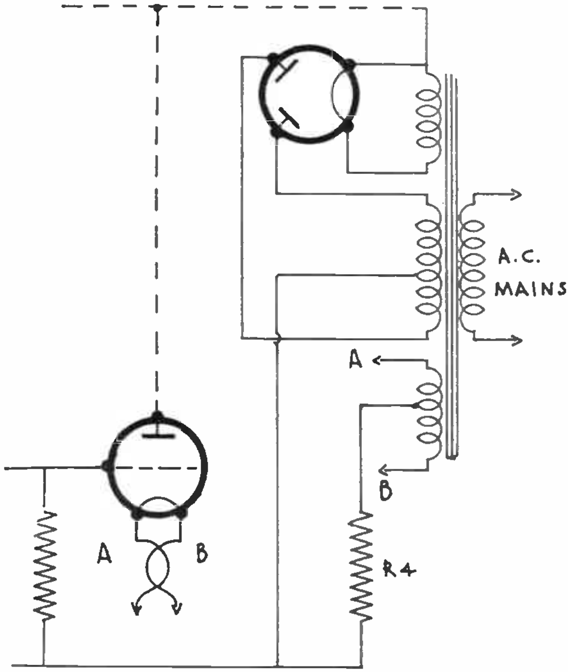


FIG. 5

RA185C

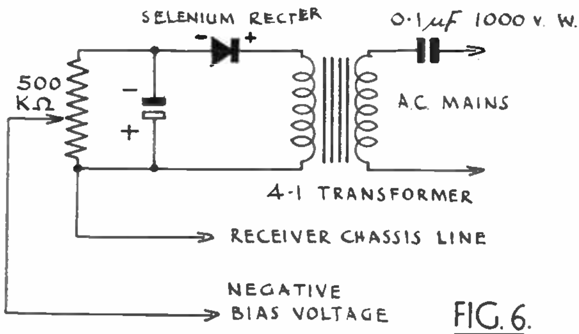


FIG. 6.

RA184C

DC SUPPLY MAINS

by

A. E. REEVE, G8WN

Perhaps the older and more experienced hams will excuse me if I address a few remarks to the younger and less experienced new-comers to this radio racket on the subject of DC supply mains.

Not many hams are unfortunate enough to find themselves on DC these days, but if you are, then perhaps a few words of advice and explanation will be of some assistance in preventing a blow-up, burn, or worse.

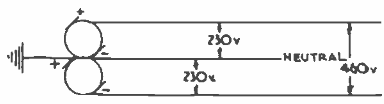


DIAGRAM. 1.

RA255

As a general rule only one pair of supply mains are run into domestic premises from a DC system, so a study of diagram No. 1 will make matters clear before we continue.

Imagine two 230-volt DC generators connected in series, with their middle point earthed. From either side to earth (or the "neutral" as it is called) gives 230 volts, whilst across the outers is a voltage of 460.

Now No. 2 diagram shows how houses in a street are fed.

G7BF and GIUS are on the positive side whilst G7US and G9UP are on the negative side, both supplies being 230 volts DC.

From this we can easily see that the first two stations have a positive that is 230 volts above earth, whilst the latter two have a positive that is at earth potential and a negative that is 230 volts above.

No further study will be required to disprove the idea that some people have, i.e. that the negative pole is at earth potential.

The writer has seen some of the results of this mistaken idea in slot meters with mercury type tilting switches, or rather what was left of the aforesaid switches. (" My husband was fixing an eliminator to our wireless " ! !)

Earthing the neutral is also not to be recommended as the middle point of the gener-

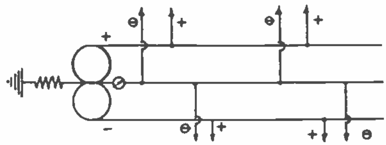


DIAGRAM 2.

RA256

ators does not always go direct to earth, but is earthed through a low value resistance; which means that if the current passing down the neutral to earth, due to an out of balance or a mains fault (and it could be high in the latter case !), is appreciable, the middle wire or neutral is then above earth potential, and the supply authority will not thank you for shorting the middle wire resistance in your home.

To sum up: Don't earth DC supply mains direct, but if you must do so, use a condenser with a breakdown voltage several times higher than the supply volts, and put a light fuse in series as a safety precaution. Remember that the VA or volt amps of the supply mains is many thousands of times greater than the amateur power pack, and when a short occurs, the amperage flowing at that moment is limited only by the resistance of the supply mains and wiring.

YOU HAVE BEEN WARNED ! RESPECT YOUR SUPPLY MAINS.

Intercom Unit—(*Contd. from page 462*)

Some loss of signal power will result from the latter remedy of course.

The cathode condenser values determine the tone of the output very drastically and will again repay for a little experiment.

As at present installed in the writer's house, the unit is located along side one of the speakers the other being about 30 ft. away, the operation of S1 being necessary for the change from " send " to " receive." By consistant use of " over " the system is perfectly efficient in practice and all speech is 100 per cent. intelligible in spite of considerable extraneous noise.

Radio Amateur Emergency Network

ANNOUNCEMENT of FORMATION of R.A.E.N. by R.S.G.B. PRESIDENT

Speaking at the luncheon which followed the opening of the Seventh Annual Amateur Radio Exhibition, Mr. Leslie Cooper, President of the Radio Society of Great Britain, announced that British radio amateurs are forming a voluntary emergency service to provide communications in time of National disaster. Mr. Cooper referred to the excellent work done by the radio amateurs during the floods on the East Coast and in the Netherlands last Winter. The new service would, he said, offer its facilities to such bodies as the Post Office, the Red Cross, and W.V.S., as well as to hospital ambulance services, public utility undertakings, rescue services, the police and civil defence units. To maintain close liaison with these bodies, an Emergency Communications Officer would be appointed in all major cities and towns throughout the United Kingdom. The emergency network would provide means of communication only when the normal Post Office Telephone services were either out of commission or over-loaded, and would feed its messages into the Post Office lines at the nearest suitable point. It would be particularly useful in clearing personal messages from stricken areas which could not be transmitted over the usual system due to excessive volume of official traffic at such times. In this way, a simple standard message could be used to alleviate the distress caused to relatives of those in such areas.

The service envisages a nation-wide system of local networks of amateur radio stations operating in the 80, 10 and 2 metre amateur bands. The main emphasis will be on the local networks, but facilities will be available, if ever required, for passing information to county, regional and national centres. The stations for the national network would use comparatively high power from fixed sites, whilst the smaller stations would be capable of being carried by one man. Mr. Cooper explained that the service would in no way usurp the normal activities of the Post Office. Indeed, for its success, it would need the co-operation of the Post Office, and he was sure that that co-operation would be freely given.

It was manifestly impossible for either the G.P.O. or the Armed Services to maintain a nation-wide network of mobile stations, except at very great cost. As it was, the radio amateurs would, in accordance with their licences and in the spirit of the amateur radio movement, provide all the equipment necessary at their own expense. In addition, they would man the service. Mr. Cooper emphasised that the enthusiasm and ingenuity of the radio amateurs would ensure that the service would be available whenever it was needed, although he hoped it would never be required.

Mr. Cooper concluded by saying that the new organisation would be known as the *Radio Amateur Emergency Network*, and that the organising committee appointed by the Council of the Radio Society of Great Britain had already set up "key stations" in towns along the East Coast.

* * *

The members of the Organising Committee of the Radio Amateur Emergency Network, set up by the RSGB, are as follows:—

Chairman: Mr. A. O. Milne, G2MI, (President-Elect, RSGB),
29 Kechill Gardens,
Bromley, Kent.

Members: Mr. L. Cooper, G5LC, (President, RSGB),
3 Summer Avenue,
East Molesey, Surrey.

Mr. F. Charman, B.E.M., G6CJ,
Orchard Cottage, Wrexham St.,
Stoke Poges, Bucks.

Mr. C. H. L. Edwards, G8TL,
10 Chepstow Crescent,
Newbury Park,
Ilford, Essex.

Mr. L. E. Newnham, G6NZ,
17 Washington Road,
Emsworth, Hants.

Mr. P. W. Winsford, G4DC,
22 Forge Road,
Three Bridges, Crawley,
Sussex.

Mr. C. L. Fenton, G3ABB,
40 Fourth Avenue,
Chelmsford, Essex.

Dr. A. C. Gee, G2UK,
East, Keal, Romany Road,
Oulton Broad, **Lowestoft**
Suffolk.

Mr. W. J. Ridley, G2AJF,
Gablehays Lodge, Springfield,
Chelmsford, Essex.

Mr. D. F. Willies, G3HRK,
The Wilderness, Grove Road,
Holt, Norfolk.

Mr. R. A. Wilson, G4RW,
The Hollows, Newry Avenue,
Felixstowe, Suffolk.

Mr. C. T. Wakeman, G4FN,
12 Westborough Road,
Westcliffe-on-Sea, Essex.

Mr. John Clarricoats, G6CL,
General Secretary, RSGB.

Mr. J. A. Rouse, G2AHL,
Committee Secretary, RSGB,
New Ruskin House,
Little Russell Street,
London, W.C.1.

Amateur Radio in Switzerland

by

ETIENNE HERITIER

The first official amateur station in Switzerland was licensed in 1926, under the call H9XA, but since the early 'twenties, amateurs were active in the frequency range below 200 metres, which was allocated by the International Radio Conference in London—1912—to the so-called "amateurs". The primitive equipment allowed contacts only over short distances; in 1923, however, many North American stations were logged during the transatlantic tests.

To-day, about 360 amateur stations are licensed. In order to obtain an operator and station license, one has to pass an examination consisting of two parts. The practical examination comprises a code test of 10 wpm, questions on national and international radio regulations, abbreviations and operating procedures. The technical examination is on the elementary radio theory and its practical application in an amateur radio station; two or three mathematic problems have also to be solved. The fee for the transmitting and receiving (also broadcast) license is Frs. 40.- a year.

Most of the active hams are members of the USKA (Union Schweizerischer Kurzwellen-Amateure). The Society runs a permanent Secretary's office and QSL-Bureau. The official bulletin, *Old Man*, is published monthly.

A number of contests are organised each year. The popular National Field Day is held together with the RSGB Field Day. The National Mountain Day serves to promote the constructing of small 80-metre transmitters and receivers; the weight of the whole equipment, antenna, key, headset and batteries included, must not exceed 6 kgs, and the station has to be located on a mountain at least 1000 metres asl. The Xmas Contest gathers many HB9's on the two Sundays preceding Christmas. A new contest, the Traffic Marathon, was introduced in 1953; it consists of six parts, each of a duration of six hours. The participants have to exchange messages of not more than 60 words, each word transmitted and received counting one point. This contest helps to improve the code proficiency and the operating skill, which can be of great importance during emergencies. The interest for DF contests is steadily growing.

A few amateurs are very active on VHF. Already in 1935, successful tests were made on 420 Mcs over a distance of 120 km. In 1947, two Swiss hams were among the first amateurs to cross the Atlantic Ocean on 6 metres. In September 1953, the first contact on 144 Mcs between England and Switzerland was established. 144 Mcs work in Switzerland often brings astonishing results: two stations can easily get in contact by using a mountain as reflector.

In the middle of 1953, the first Swiss television transmitter was put into operation, with relay stations to be installed in the bigger towns. Amateurs are now faced for the first time with the problem of TVI.

About 500 members of the USKA do not hold an amateur license. Most of them have an official SWL call (prefiix HB9R, HE9R, HE9E), issued without formalities by the PTT (fee Frs. 2.-). Unfortunately, very few amateur SWL's are really active; the number of those participating regularly on the contests (the USKA combines most of the contests for transmitting members with a competition for receiving stations) can be counted on the fingers of one hand. The number of SWL's interested in the broadcast bands is also extremely small.

The USKA issues the HELVETIA 22 Award to amateurs having confirmed contacts with one station in each Swiss canton after April 15th, 1948. The list of cantons can be obtained by writing to USKA, Box 1203, St. Gallen. This award is not easy to get, as there are two or three cantons without permanent amateur activity. This difficulty is overcome by trips made by amateurs to these spots from time to time.

Swiss amateurs are always pleased to meet foreign amateurs touring Switzerland. A request to USKA will bring you the addresses of the local group presidents in each town.

SUGGESTIONS for a RESISTANCE CIRCUIT TESTER

by CYRIL NOALL

When constructing a new piece of apparatus, the need frequently arises to insert, experimentally, various values of resistance into the circuit in order to determine which gives optimum results. In laboratories, a "resistance box" is employed on such occasions; with its aid, any quantity of resistance may be "tapped off" as required, sometimes in steps as small as 1 ohm.

The poor amateur cannot usually afford such a useful luxury (is that too Irish ?), and has to make do by temporarily wiring in odd resistors from the junk box. This is, however, a very uneconomical policy, for the said resistors quickly get damage and broken by the rough usage to which they are thus subjected.

The writer would like to suggest that it would be far better to use these spare resistors in the construction of a home-made resistance box. Their life would then be extended indefinitely, whilst the experimenter would always have at his elbow a most valuable test instrument. The cost of constructing it should not amount to more than a shilling or two.

The basis of the unit could be one of the multi-socket paxolin boards so often met with in the junk shops and which were originally designed for testing purposes, etc., in the Services. I do not intend to specify any particular type here, as so many different kinds are available. If no single panel with the requisite number of sockets can be found, two or more could be mounted side by side on a single frame.

The resistors used in the box will need to be chosen with some care. As they will be subjected to widely-varying load conditions, they should have a fairly high wattage rating—certainly not less than 1 watt; they should also be of reasonably close tolerance. Here, indeed, is an excellent opportunity for using up those numerous "gold-braided" 2 and 5 watt resistors one so frequently puts aside from dismantled radar units !

It was mentioned earlier that laboratory resistance boxes often give resistance in 1 ohm progressions. The average constructor will not require such hair-splitting exactitude as this, except, perhaps, on the very lowest range. In fact, the steps need not be smaller than those provided for in the commercial resistance ranges; but individual needs and tastes must be allowed to govern this point.

Construction of the unit is, of course, simplicity itself. One end of each resistor is anchored to its own individual socket tag, the other goes to a common return lead. A suitable plug attached to a convenient length of flex is also provided; this, inserted into the appropriate socket, brings any wanted resistance in circuit. In the interests of accuracy on the lower ohms ranges, all wiring should be kept fairly short and heavy; good quality lighting flex could be used for the external leads.

The value of each resistance must be indicated opposite its socket. This is best done by writing—or typing—the figure on a small bit of paper and pasting it in place, afterwards protecting it with a dab of varnish.

It is hardly necessary to add that the same idea could be applied equally well in the building of a capacity testing box; such an instrument should be of no less value in the shack, than the one already described.

SHORT WAVE BROADCAST STATION LIST

(T) Denotes Tentative Frequency or Station Under Construction.
(V) Denotes Frequency liable to Variation.
(E) Denotes Experimental Channel.
(I) Denotes Inactive at the time of publication.

Kcs		*M*	*Call*	*Location*
8015		37.44		Meshed, Iran.
8016		37.43	FGF3	Cotonu, Dahomey, FWA.
8036	(V)	37.34	FXE	Beirut, Lebanon.
8070	(V)	37.17		" Espana Independiente " (Clandestine).
8100		37.04		Moscow, USSR.
				Korce, Albania.
8104		37.02		" Free Yugoslavia " (Clandestine).
8120	(V)	39.95		" Espana Independiente " (Clandestine).
8215			36.52	Scutari, Albania.
8240	(V)	36.39	ZNB	Mafeking, Bechuanaland.
8250	(V)	36.37		" Free Albania " (Clandestine).
8500			35.29	Vlone, Albania.
8540	(V)	35.13		" Espana Independiente " (Clandestine).
8555		35.07		Tihwa, China.
8760		34.24		Moscow, USSR.
8910		33.67		Moscow, USSR.
8955		33.48	COKG	Santiago de Cuba, Cuba.
8970		33.45		Chania, Crete.
8984		33.38	4VPB	Petionville, Haiti.
9009		33.30	4XB21	Tel Aviv, Israel.
9030	(V)	33.22	COBZ	Havana, Cuba.
9040	(V)	33.18		Peking, China.
9047		33.15	HRA	Tegucigalpa, Honduras Republic.
9090		33.00		" Radio Free Europe."
	(V)		CR6RL	Luanda, Angola.
9144		32.80	ORU3	Wavre-Overijse, Belgium.
9145		32.80		" Radio Free Europe."
				Moscow, USSR.
9165		32.73	CR6RB	Benguela, Angola.
9170	(V)	32.72		" Radio Free Europe."
9198		32.62	CE920	Punta Arenas, Chile.
9200	(T)	32.61	ZPB	Pitcairn, Pitcairn Isle.
9215	(V)	32.55	OTH	Leopoldville, Belgian Congo.
9235	(V)	32.49	COBQ	Havana, Cuba.
9250		32.43	YSF	San Salvador, El Salvador.
9254		32.42		Bucharest, Roumania.
9273		32.33	COCX	Havana, Cuba.
9290	(V)	32.28	PRN9	Rio de Janeiro, Brazil.
9310		32.22	OXI	Godthaab, Greenland.
9315	(V)	32.19	LRS2	Buenos Aires, Argentina.
9325	(V)	32.16		Shanghai, China.
9330		32.15		" Espana Independiente " (Clandestine).
9335	(V)	32.13	OAX4J	Lima, Peru.
	(E)		BED21	Taipeh, Taiwan.
9340		32.12		Alma Ata, Kazakh SSR.
9345	(V)	32.10	CR6RG	Dondo, Angola.
9360	(V)	32.05		Madrid, Spain.
9367	(V)	32.02	COBC	Havana, Cuba.
9378		31.99		Khabarovsk, USSR.
9380	(V)	31.98	OTM2	Leopoldville, Belgian Congo.
				Alma Ata, Kazakh SSR.
9390		31.95		Moscow, USSR.
9404		31.90	OAX4W	Lima, Peru.
9410		31.88	GRI	Daventry, England.
9420		31.84		Sian, China.
9437	(V)	31.79	COCH	Havana, Cuba.
9440	(V)	31.78	FZI	Brazzaville, Fr. Equat. Africa
9444	(V)	31.76	CP38	La Paz, Bolivia.
9450		31.73		Moscow, USSR.
9455		31.72		" Free Greece " (Clandestine).
9465		31.70	TAP	Ankara, Turkey.
9470		31.68		Moscow, USSR.
9475		31.67		Cairo, Egypt.
9477		31.66	OAX5C	Ica, Peru.
9480		31.65		Moscow, USSR.
9484		31.63	APK3	Karachi, Pakistan.
9487	(V)	31.62	4VE	Port-au-Prince, Haiti.

BOOK REVIEW

BASIC ELECTRONIC TEST INSTRUMENTS, by Rufus P. Turner. 254 pages, 39 illustrations, 131 diagrams. Price $4.00. Published by Rinehart Books Inc., New York and Toronto.
Obtainable in England, price 32s., from The Modern Book Co. (Dept. RC), 19-23 Praed Street, Paddington, London, W.2.

There are few books of this type available in this country. Even though this one is of American origin, it contains a wealth of information about many useful pieces of test equipment that will be of interest to English readers. A prominent feature is the large number of circuit diagrams that are complete in every detail, and the copious notes concerning calibration and use of most of the test instruments described.

Containing 16 chapters, the book covers quite a wide field. The Author has succeeded in presenting a large amount of subject matter from pointer instruments to specialize laboratory equipment in a manner that makes delightful yet informative reading. The first two chapters are concerned with the principles and practical considerations of pointer instruments for measuring voltage, current and resistance, and multi-range meters for both AC and DC.

In the next chapter there are details of various types of valve-voltmeter. This is followed by a short section on testers for power output measurement. Next come a few pages on impedance meters. The two ensuing chapters deal with capacitance and inductance bridges, the latter containing also some details of Q-meters.

In the eighth chapter are several pieces of specialized equipment such as precision resistance bridges, skeleton R-C-L and impedance bridges, a signal source oscillator, and high-gain null indicators with and without peaking amplifiers. There is also a short note on the use of the CRO as a null indicator.

General-purpose and wide-band oscilloscopes are covered in the next chapter, which also contains information on their uses for servicing and alignment of AM, FM and TV receivers. An electronic switch for producing two displays on the CRO, and a voltage calibrator, are also described.

Signal generators with amplitude and frequency modulation, a frequency marker and a TV pattern generator appear in the next chapter. Following this, audio signal generators are discussed. In the twelfth chapter, devoted to the measurement of radio frequencies, such as absorption wavemeters, grid-dip oscillators, frequency sub-standards and heterodyne frequency meters are included. The measurement of audio frequencies is discussed in the following chapter.

Devices for testing audio amplifiers, discoursed upon in the fourteenth chapter, include distortion meters, wave analyzers and square-wave generators. The measurement of intermodulation distortion is also mentioned. The penultimate chapter embraces signal tracers, while a short discussion on the principles of operation of valve-characteristic testers forms the subject of the sixteenth, and last chapter. A useful Index is included.

This book impresses the reader favourably in many ways, and is considered good value for money. Not the least of its virtues is that very few errors exist; the most noticeable is the shunt rectifier in Fig. 1-11, drawn so that it conducts in the wrong direction, while in Fig. 11-3, the switch contact joined to the junction of C1-C3 should be drawn so that it touches the moving arc of the Range switch, S1. The clear type, neat diagrams and needle-sharp photographs are in keeping with the quality of the paper and binding. It should command a place among one's reference books, for without it a collection of technical data would be incomplete.

NORMAN CASTLE

DATA *publications* LIMITED

57 MAIDA VALE, LONDON, W.9

Telephone : **CUNingham 6518**

ORDER FORM

Please supply the following

			Price	*Postage*	*Qty.*
DATA BOOK SERIES					
D.B.4.	Inexpensive Television		2/6	2*d*	
D.B.5.	T.V. Fault Finding		5/–	3*d*	
D.B.6.	The Radio Amateur Operator's Handbook		2/6	2*d*	
D.B.7.	Receivers, Preselectors and Converters		2/6	2*d*	
D.B.8.	Tape and Wire Recording		2/6	2*d*	
MISCELLANEOUS BOOKS					
	World Radio Handbook	(*Johansen*)	8/6	3*d*	
	How to Listen to the World	(*Johansen*)	1/9	2*d*	
	Receivers	(*R.S.G.B.*)	3/6	2*d*	
	Simple TX Equipment	(*R.S.G.B.*)	2/–	2*d*	
	T.V. Picture Faults	(*T.V. Times*)	3/6	3*d*	
	The Radio Amateur's Report Pad	(*Data Publications*)	3/6	3*d*	
MAGAZINES					
	The Radio Constructor	monthly	1/6	2*d*	
	,, ,, ,,	6 months sub.	9/–	*paid*	
	,, ,, ,,	12 months sub.	18/–	*paid*	

PLEASE TICK SUBSCRIPTIONS REQUIRED AND STATE FIRST ISSUE BELOW

Enclosed find Cheque/Postal Order/International Money Order £ ....

NAME .... PLEASE

USE

ADDRESS .... BLOCK

CAPITALS

....

PLEASE CUT HERE

ALL OUR PUBLICATIONS ARE AVAILABLE THROUGH YOUR LOCAL NEWSAGENT

TRADE TERMS AVAILABLE ON REQUEST