THE P.W. ELECTRONIC ORGAN

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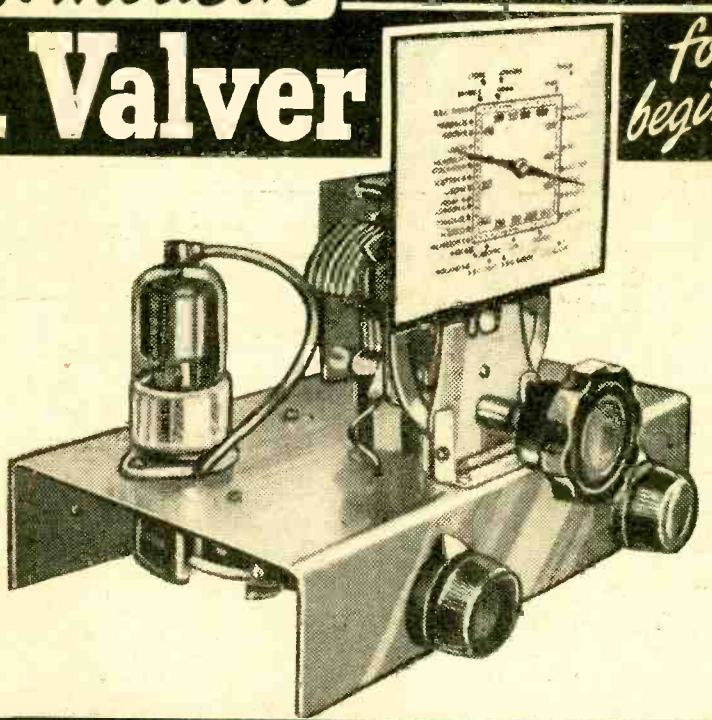
Vol. 18. No. 552
OCTOBER - 1952

EDITOR:
F.J. CAMM

PRACTICAL WIRELESS

A Modern 1 Valver for beginners



IN THIS ISSUE:

Practical Wireless

EVERY MONTH
VOL. XXVIII, No. 552 OCTOBER, 1952

Editor E. J. CAMM

20th YEAR OF ISSUE

COMMENTS OF THE MONTH

By THE EDITOR

The Loudspeaker Tax

THE LOUDSPEAKER TAX

WITHOUT justification and without consultation with the industry an Order was made by the Treasury on July 29th, considered by the House of Commons on July 31st, and brought into operation on August 4th, imposing purchase tax on loudspeakers! It is significant that we did not receive any notification of this proposal until after the event. We telephoned several speaker manufacturers who similarly knew nothing about it until it was *de facto*. Some, even, have not received a notification to date. Apparently the tax is designed to bring relay organisations into line with the ordinary domestic receiver industry but it will, at the same time, also affect the latter and home-constructors who buy speakers separately.

The tax came at an unfortunate time, because manufacturers had already settled their prices for the coming season and their literature was already printed. This caused last-minute changes in prices before the show at Earls Court. Our investigation shows that the Order was brought into being because of the increase in television relay services, but this, in our view, is an inadequate reason and cannot in any case justify the indecent haste with which the Order was almost secretly rushed through without Parliamentary debate, which cannot in any case now take place until October, as Parliament is in recess.

FIRST AWARD FOR TECHNICAL WRITERS

THE first of the Radio Industry Council's Premiums for technical writing to be awarded to authors of technical articles deserving to be commended by the industry has been won by Mr. J. R. Acton. B.Sc., of Ericsson research laboratories, who receives an award of 25 guineas for his paper on "The Single Pulse Dekatron." The dekatron is the new type of gas-filled cold-cathode-ray tube now being developed for computers and other electronically controlled apparatus. He received his cheque at a lunch at the Radio Show. Further awards are to be announced at the end of the year.

As previously announced in this journal, the industry will award up to six of such premiums every year.

The dekatron was independently invented by Great Britain and the U.S.A. Mr. Acton was responsible for the British invention. His paper deals with another invention arising from further development of the dekatron.

TV SALES SOARING

MANUFACTURERS report a falling off in sales of sound radio receivers, but an increase in the sale of TV receivers. As most radio manufacturers also manufacture TV receivers, what they lose on the roundabouts they are gaining on the swings, and they are merely exchanging one form of business for another.

It is obvious that at some time absorption point must be reached in the number of broadcast receiving licences and, therefore, in the sale of broadcast receivers. It is equally obvious that the sale of TV receivers and the issue of TV licences will continue to rise for many years to come, until, indeed, parity is reached between radio and TV licences. This enormous potential market, temporarily stultified by high purchase tax and, therefore, high selling prices, is an indication of the commercial possibilities.

In the meantime our companion journal *Practical Television* has brought the benefits of TV entertainment to tens of thousands of homes, which would not otherwise have it, by means of the various receivers it has sponsored. But the construction of radio receivers by experimenters continues unabated and is ever on the increase.

OUR QUERY SERVICE

WILL readers please note that we must insist upon the query coupon and a stamped, addressed envelope being included with every query submitted. It has come to our notice that a number of queries are sent by those who are not readers of the paper; indeed, a number have come from readers of other journals which have not an advisory service and pass their readers' problems on to us. We must decline to answer such letters as we feel that it is the responsibility of the journals concerned to answer problems aroused by their articles.—F. J. C

ROUND the WORLD of WIRELESS

British Radio Exports

ALTHOUGH the British radio industry's exports in June were the lowest in value since February, 1951, the total value for the first six months of the year was £12,169,000, nearly 20 per cent. higher than in 1951 and 66 per cent. higher than for the first six months of 1950.

Owing to the introduction of import restrictions in important overseas markets, there was a fall during the second quarter in the export of domestic receivers, but this was partly made up by exports of components and capital equipment. The export of components and associated products is now proceeding at the rate of £9 million a year, compared with £7 million in 1951, £4.8 million in 1950 and £0.4 million before the war.

More Tugs Employing V.H.F.

MORE tug companies are equipping their vessels with Pye Marine V.H.F. radio-telephones. From fixed stations installed on the Thames and the East Coast, these companies can now maintain constant two-way communication with vessels which previously had to rely on ordinary land telephone when they came alongside.

The Cement Marketing Co., Ltd., has equipped two of its tugs towing cement up and down the river. Their V.H.F. fixed station will be at Northfleet. Silvertown Services Ltd., a subsidiary of Tate & Lyle, are re-equipping all their tugs with the latest type of Pye V.H.F. in the frequency band 156-165 Mc/s.

The British Electrical Authority have ordered a fixed V.H.F. station to be installed at their Ipswich depot so that their colliers, the *Barford* and *Cliff Quay*, can communicate there.

New Address for Britannia

THE London sales office of Britannia Batteries Ltd. has just been transferred from its old address at 66, Victoria Street, S.W.1, to new premises at 53, Victoria Street, S.W.1. The telephone number and telegraphic address are: Abbey 6168-9 and "Britanicus, Sowest, London."

Pye in Record Event

BREAKING record after record, the Pye radio-telephone equipped Jaguar XK120 coupé raced round the race-track at Montlhery, near Paris, at speeds of well over 100 m.p.h.

Leslie Johnson, owner of the Jaguar, realised his two-year-old ambition to complete a seven day and seven night run. Months ago, when he began working out the details of the run, Johnson decided to include radio-telephone in his plans. The radio-telephone, a Pye PTC116, enabled the driver to be in direct and continuous communication with his colleagues, in the pits, who used a similar set. Essential information concerning refuelling, times, speeds, etc., can be passed without the driver having to watch the pits for visual signals.

Reports from Montlhery say that the radio-telephones, which were loaned by Pye, worked perfectly.

Obituary

THE General Electric Company Ltd. announces with deep regret the death at Kingussie, Inverness-shire, in his 78th year, of Mr. J. Baptist Kramer, scientist, inventor and pioneer in the field of magnetism as applied to industry. He founded the Witton Kramer Electric Tool and Hoist Works, of which he was general manager, in 1909 and worked in collaboration with the G.E.C. until his retirement 30 years later.

Mr. Kramer was best known for his work on the development of magnetic cranes in this country, and in the use of photo-electric cells as detector devices. He gave many lectures and demonstrations of his work in all parts of the country and was the author of a number of scientific publications.

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended June 30th, 1952.

Region	*Number*
London Postal ...	2,411,407
Home Counties ...	1,704,384
Midland	1,771,385
North Eastern ...	1,971,795
North Western ...	1,664,017
South Western ...	1,084,922
Welsh & Border Counties	755,882
Total England & Wales	11,363,792
Scotland	1,171,516
Northern Ireland ...	213,070
GRAND TOTAL	12,748,378

A Leevers-Rich "Synchropulse" magnetic tape recorder in use on board a ship. A twin cable connects with a ciné camera (on the ship's deck), pulses from which enable sound to be recorded and reproduced synchronously.

New Mullard Manager

NEW to the Equipment Division of Mullard Ltd. is R. R. C. Rankin, O.B.E., A.M.I.E.E., recently appointed Technical Manager, who also holds the corresponding position in Mullard Equipment, Ltd.

Mr. Rankin has a wide experience in the telecommunication field. During the later part of the war he was associated with the pre-invasion communication planning, and later at S.H.A.E.F. on the staff of the Chief Signal Officer. Since the war he has been with Standard Telephones and Cable on transmission systems planning.

In the Mullard organisation Mr. Rankin's duties will embrace a broad co-ordinating responsibility for engineering on all types of electronic equipment, both telecommunication and industrial.

Australian I.R.E. Address

WHILE Richard Arbib, Managing Director of Multicore Solders Ltd., who is a member of the R.I.C. Exhibition Organising Committee, was at the Radio Show at Earls Court on the opening day, August 26th, he was heard reading a Paper to the Australian Institute of Radio Engineers Convention at Sydney on the same day.

The Paper, "Considerations of Soldering Technique in Radio and Television Assembly," was prepared by Mr. Arbib with the co-operation of Bush Radio, E. K. Cole, Electric and Musical Industries, the G.E.C., Murphy Radio, Plessey and Pye Ltd.

Mr. Arbib could not visit Sydney to deliver the Paper personally, so as he is a home recording enthusiast, he recorded his speech on his Ferrograph tape recorder and sent the tape by airmail to Sydney.

British Technician to Visit Stockholm

MR. H. J. FINDEN, M.I.E.E., who is responsible for the development and design of electronic instruments in The Plessey Co. Ltd., Ilford, Essex, is to read a Paper on "Developments in Frequency Synthesis" at the conference on Instruments and Measurements, Stockholm, Sept. 22nd to 25th, arranged under the auspices of The Royal Academy of Engineering Sciences (IVA) and The Association of Technical Physicists (TFF).

The Paper develops the method of synthesis of frequencies previously described by the author and refers to equipment in which the frequency has been extended to 100 Mc/s. Consideration of the significant products of the mixing process leads to solutions whereby the lowest order of harmonics can be determined.

Ministry of Supply School of Electronics, Malvern

T. E. GOLDUP, M.I.E.E., a director of Mullard Ltd., has been appointed Chairman of the Board of Governors of the Ministry of Supply School of Electronics, Malvern, in succession to Professor Willis Jackson, D.Sc., D.Phil., M.I.E.E., Professor of Electrical Engineering, City and Guilds College, London.

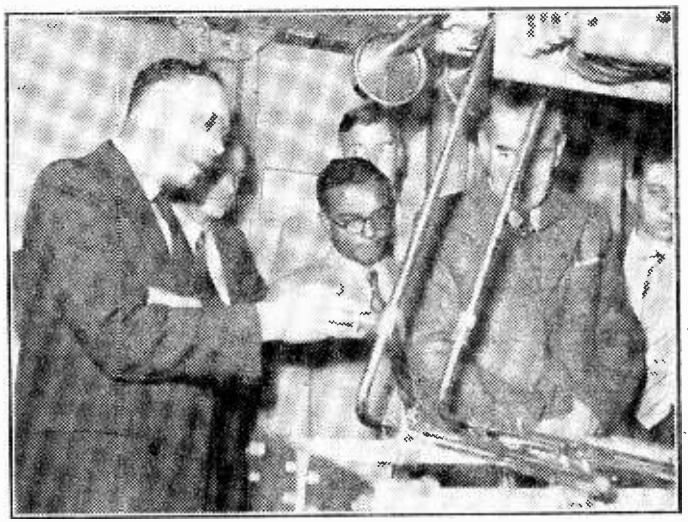
Mr. T. E. Goldup, who has been with the Mullard organisation for over 29 years, and was formerly a member of the Research Staff of Signal School, Portsmouth, brings with him a wide experience of technical education in the electronics field.

His many activities include representation of the Company on various Committees of the Radio Industry Council. He also serves on certain Committees of the British Standards Institution and other organisations connected with the electronics industry.

In addition to being a governor of the Ministry of Supply School of Electronics since 1949, Mr. Goldup is a governor of the Wandsworth Technical College, and a member of the Advisory Committee of the Norwood Technical College. He is also a member of the Radio Research Board of the Department of Scientific and Industrial Research.

Standard Frequency Transmissions

THE broadcasts from station WWV now include simultaneous round-the-clock transmissions on 2.5, 5, 10, 15, 20, and 25 Mc/s. Carrier frequencies have an accuracy of 1 part in 50 million (.02 cycle per megacycle). Amplitude modulation of 440 cycles and 600 cycles is used for alternate 4-minute periods. These are separated by 1-minute time announcements in which each second is marked by a 1 Kc/s pulse. Warnings of propagation disturbances and predictions of transmitting conditions in the North Atlantic area are sent in code twice every hour. WWVH (Hawaii) provides a similar service on 5, 10, and 15 Mc/s only.



During the Commonwealth Broadcasting Conference held in London delegates paid a visit to the works and research laboratories of Marconi's Wireless Telegraph Co., Ltd., at Chelmsford. Picture shows, right to left: Mr. Eric Middleton, Head of Transcription Service, South African Broadcasting Corporation; Mr. R. T. B. Wynn, Deputy Chief Engineer, BBC; Lt. Col. Charles Moses, General Manager, Australian Broadcasting Commission; Mr. J. Perera, Additional Director-General Radio Ceylon; Dr. A. R. A. Rendall, Head of Designs Department BBC; Mr. A. N. Thomas, Head of Planning and Installation Department, BBC.

A Bench Power Pack

A STABILISED SUPPLY FOR THE WORKSHOP

By R. Hindle

(*Continued from page* 398, *September issue*)

From the details given last month it will be seen that :—

E across R3	$= I.R3$ (by Ohms Law)
E across R4	$= I.R4$
E across R3+R4	$= I.(R3+R4) = E_o$
E_N	$= I.R3$ (approx.)
$\frac{E_o}{E_N}$	$= \frac{I.(R3+R4)}{I.R3}$
	$= \frac{R3+R4}{R3}$
E_o	$= E_N . \frac{R3+R4}{R3}$

(Where E_N is the burning voltage of the neon)

The output voltage can thus be varied by varying R3 and the resulting voltage output can be calculated approximately by the above formula. In practice, however, there are limitations arising from the characteristics of the valves used. For instance, V1 must not be operated at less than the minimum grid bias to prevent grid current from flowing, generally about 1.5 volts for the type of valves suitable for this position. This sets a minimum to the voltage drop across the valve, generally in the order of 150 volts so, for instance, for a 350 volt unregulated supply the maximum regulated output is about 200 volts. A lower limit is set by the need to keep the grid of V2 very nearly the same potential as its cathode. If a neon burning at 100 volts is used the output voltage cannot drop below this figure. In actual fact it cannot drop so far or the cathode, grid and anode of V2 would all be at about the same potential and there would be no current through the valve or through R2 to sustain the grid voltage to V1 and keep its equivalent resistance high, as is needed for low voltage output. The current through a valve depends on the anode voltage as well as the grid voltage and voltage control by variation of R3 is operative only so long as the increase in anode current caused by the change in grid voltage is not offset by the opposite tendency for the anode current to fall due to the effect of the smaller anode voltage. The minimum regulated output is E_N plus the minimum voltage across V2 to sustain amplification plus the minimum bias for V1 (which must appear across R2). For a 100 volt neon the lower limit is about 150 volts.

The output current is limited by the maximum permissible anode current of V1 as specified by the valve maker because the output current has to be drawn through the valve. Consequently, unless only a very small output current is required, a power output type of valve has to be used in V1 position. To increase the permissible current output two valves can be used in parallel. This does not decrease the minimum voltage drop required across V1, which will still be of the order of 150 volts.

Voltage Range

The characteristics of V1 place limitations on the range of voltage adjustment in addition to those noted already arising from the action of the amplifying valve V2. The makers specify a maximum anode voltage, for instance, and the output voltage should not be allowed to go below the voltage that may be applied to the anode of V1 in the most favourable circumstances by the power circuit to be used less the maximum rated voltage of the valve. For instance, with a nominally 350 volt supply and zero load current the unregulated voltage will be found to be in the region of 500 volts with normal mains. If the mains go up 10 per cent. the unregulated voltage goes up to 550 volts. Now if the valve used has a maximum rating of 400 volts the unregulated output should not be allowed to drop below 550—400 volts, i.e., 150 volts. By choosing a valve capable of withstanding 500 volts the lower limit would be 50 volts, i.e., less than the burning voltage of a neon and consequently need not be considered.

The maximum rated anode dissipation (i.e., load current multiplied by the voltage drop across the valve) of V1 must not be exceeded either, but this can be avoided if necessary by running two valves in parallel, the same measure as was used to avoid passing too much current, so effectively doubling the permissible dissipation.

The stabilising action of the series valve is also effective in reducing ripple existing in the unstabilised output. A part of any hum voltage in the stabilised output is fed back to V2, amplified and fed to the grid of V1 in the correct phase to oppose the ripple passing through from the power source, very much like the normal negative feedback circuit used in audio amplifiers. The potentiometer formed by R3, R4 is necessary, from a D.C. point of view, to reduce the voltage at the grid of V2 to something approaching that across the neon, but so far as A.C. is concerned, and particularly with regard to ripple frequency, a much more effective cancellation takes place if the whole output is fed back. This is done without upsetting the D.C. operation by wiring a

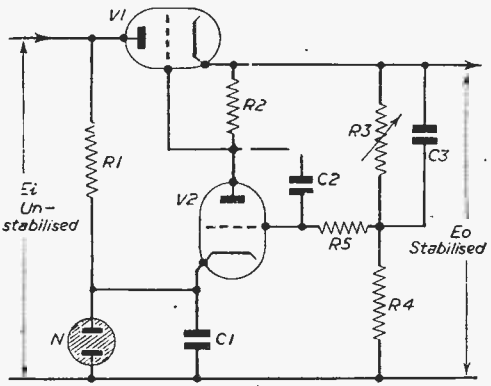


Fig. 3.—Development of the series stabiliser.

condenser, say .25 μF, across R3. A condenser across N also helps to hold steady the reference voltage applied to the cathode of V2 and, in particular, smooths out any alternating interference that might otherwise find its way to V2.

As with all negative feedback amplifiers, there may be a tendency to instability at some high frequency due to phase shifting within the feedback loop. The cure is to reduce the gain within the loop at those frequencies and the method is to include a grid stopper in the circuit of V2 with a small condenser (20 pF) from grid to anode. Fig. 3 gives the resulting circuit in which C1 is the additional condenser to smooth the reference voltage, C3 is the feedback condenser to reduce further the ripple and C2, R5 form the attenuator to prevent instability.

Power Pack

The complete circuit of a power pack designed on the lines just described is given in Fig. 4. It will be seen that the basic power supply conforms with standard practice except that the reservoir condenser, C5, is the paper dielectric type instead of the more usual electrolytic. This gives a rather higher degree of reliability. A bench power pack is more likely to be subjected to abuse than the pack built into a receiver, being left unused at times for long periods and at other times being called upon to give a widely fluctuating power output. An electrolytic could be used if desired, with a slightly increased risk of breakdown. C4 has to withstand less violent fluctuations but it could be a paper type if it is desired to eliminate electrolytics completely. The output of the unstabilised power circuit appears across the smoothing condenser C4 and is led to an output terminal for use when stabilisation is not needed and when a higher voltage or current output than can be provided by the stabilising circuits is required. A 5Z4 rectifier is used, giving a rated maximum (unstabilised) output of 125 mA. If the need for a higher current output is foreseen a valve of higher rated output could be substituted (bearing in mind the maximum rating of the transformer used) but in practice the 5Z4 has been found adequate.

The stabilising circuit incorporates the features discussed previously. Two 6L6 valves strapped as triodes and connected in parallel form the series variable control resistance. The current output would fall far short of the required 100 mA if only one valve was used. There is the possibility of dropping 400 volts across the valve when adjusted for minimum stabilised voltage and the mains voltage is on the high side. The maximum dissipation of a single valve is 20 watts and consequently the maximum current that can be budgeted for with the single valve is in the order of 50 mA ; two valves will just handle the requirement within the safe level.

The Stabilising Circuit

The effective resistance of the series valves is determined by the applied grid voltage, which is the voltage across R9. R8 and R10 are merely grid stoppers to prevent the generation of unwanted oscillations. The minimum bias to V2, V3 must be sufficient to prevent grid current (about $-1\frac{1}{2}$ volts). Thus no current is allowed to flow through R8 and

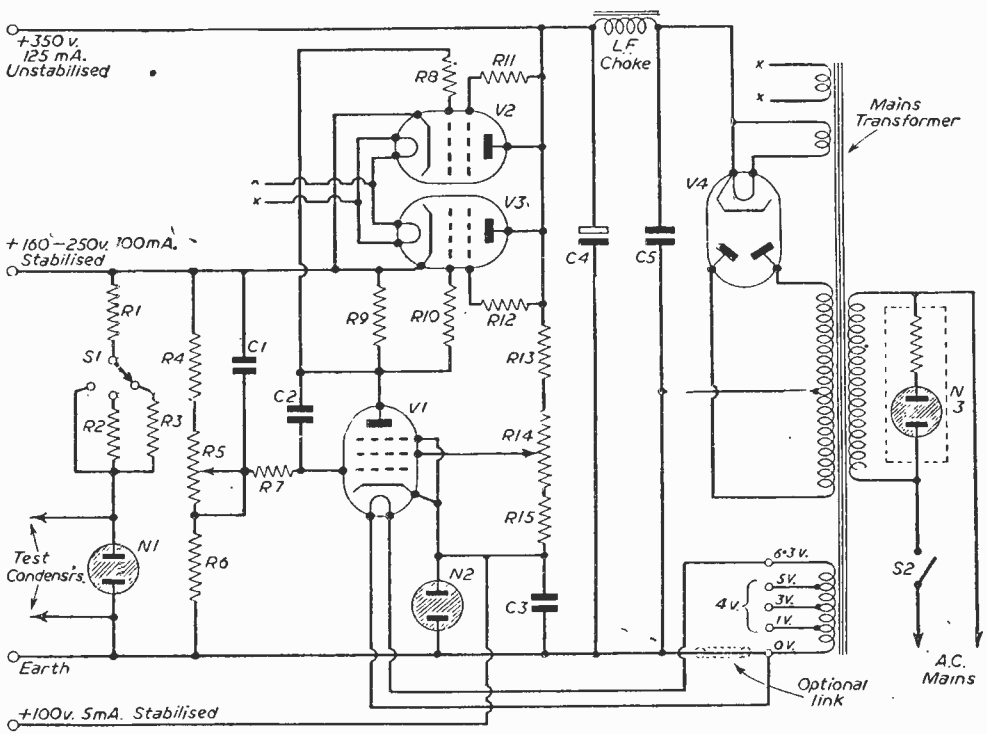


Fig. 4.—Circuit of the complete Bench Power Pack.

R10 and these therefore have no effect on the voltage of the applied bias. R11 and R12 are also included to counter any tendency to spurious oscillation and have no effect on the working of the control circuit. They are so small that, to all intents and purposes, the screened grid is strapped to the anode, giving triode working.

V1 is a steep slope pentode, a 6AC7, working with a high value of anode resistance, R9, so that only a small change in anode current (and consequently only a small grid voltage change) is required to produce the whole range of voltage needed to vary the effective resistance (r_a) of the series valves over the operative range. The grid voltage fluctuation is derived from the change in voltage of the stabilised output and therefore the higher the gain of V1 the better the regulation of the stabilised output.

The potential divider of which R4, R5 form the upper limb and R6 the lower limb, determines the proportion of the stabilised output to be applied to the grid of V1 and the voltage at the cathode is determined by the burning voltage of N2 (in the case of the neon tube specified it is 105 volts) which provides the reference voltage. As explained in part 1 of this article, the voltage across R6 is substantially equal to the voltage across N2 and, as the current through R4, R5 is the same as that through R6, by Ohms Law the stabilised output voltage across R4, R5, R6 is equivalent to :—

$$\frac{R4+R5+R6}{R6} \times \text{voltage across N2.}$$

Control of the output voltage is achieved by varying the resistance R5. R4 is included to limit the variation of the upper limb of the potential divider to the effective range of control ; this potential divider would lose control if the grid voltage was allowed to approach the voltage applied to the anode of V1. R5 can actually be calibrated in voltage and the calibration is independent of variations in either the mains input or the current output up to the maximum of 100 mA.

The screen of V1 is fed from the potential divider formed by R13, R14, R15, the middle element of which is made variable so that the optimum voltage for best regulation can be found, but when once set this control is not likely to require readjustment unless the resistances change their relative values and so a preset control is used. To ensure stability wirewound components should be used in the two potential dividers feeding V1.

The purposes of the condensers in the circuit of V1 were explained earlier. Briefly, C1 short circuits the upper limb of the potential divider R4, R5, R6 so far as A.C. is concerned, so improving the filtering of ripple from the stabilised output. C2, with the grid stopper R7, forms an attenuator to reduce the loop gain of the feedback circuit to the higher frequencies that may be subject to phase shifting sufficient to make the feedback positive and so they prevent instability that might otherwise be caused. C3 smooths out any flutter in the voltage across N2. The voltage across N2 is led out to a terminal for use when a lower voltage than is provided by the main stabilised output is needed.

Condenser Testing Circuit

The circuit for condenser testing comprises R1, R2 and R3 with N1 and appears across the stabilised output. R1 is the limiting charging resistance which is always in circuit. R2 or R3 can be brought into circuit at a turn of a switch. When the condenser under test is connected across the flying leads (which, for convenience, are terminated with crocodile clips), a form of neon oscillator is completed. The condenser is charged through R1 (and R2 or R3 if brought into circuit) until the striking voltage of N1 is reached. Now if the series resistance is too high to allow the minimum burning current of N1 to pass (as will be the case if either R2 or R3 is in circuit), N1 will draw current from the condenser, discharging it until the voltage drops to the extinguishing voltage of the neon, which then goes out and the process starts at the beginning. The leakage resistance of the condenser, however, is compared with the series resistor and if the leakage is of such a value as to prevent the voltage across the condenser reaching the striking voltage of N1 the process of oscillation is prevented because the neon cannot strike. For instance, supposing the voltage regulator control is set at 200 volts and the series resistance is 5 megohms. A condenser leakage resistance of 1 megohm limits the possible voltage across the neon to $\frac{1}{6} \times 200$ volts, i.e., 17 volts, and the neon cannot strike. This is calculated by ignoring the capacitance of the condenser and considering its leakage resistance only as in series with the 5 megohm resistance across the source of voltage. The voltage is then distributed across the resistances in proportion to their sizes, i.e., $\frac{1}{6}$ of the voltage across the condenser and $\frac{5}{6}$ of the voltage across the series resistor. If the striking voltage of the neon is 100 volts and the series resistance is 5 megohms as before with 200 volts applied, the condenser must have a leakage better than 5 megohms to allow the neon to strike.

Frequency of Oscillation

The frequency of oscillation is determined by the time constant of the charging resistor and the condenser under test. The values of R2 and R3 used are respectively 5 megohms and 20 megohms (actually made up of four 5 megohm resistors in series). With the larger resistance, R3, in circuit it is possible to detect visually the speed of flash for a condenser of .005 μF or higher and consequently the capacitance above this minimum can be estimated by timing the flashes. The smaller resistance R2 can be brought into use for large condensers for which the frequency of striking with the larger resistance would be inconveniently slow. It also allows for the determination of the leakage of a smaller condenser which is found to be not good enough to oscillate with R3. With R3 in circuit the condenser leakage has to be better than 20 megohms to permit the neon to strike ; with R2 in circuit a leakage resistance down to 6 megohms will allow the neon to strike.

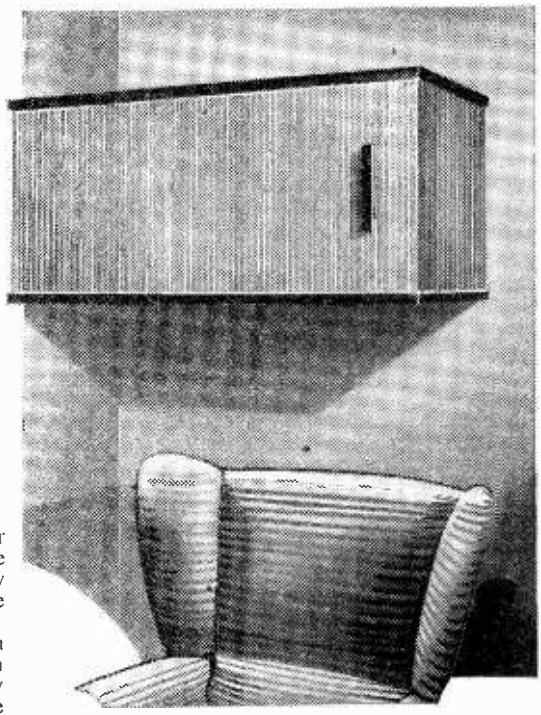
The purpose of the first position of the selector switch with only R1 in circuit is two-fold. First, large paper condensers of, say, 8 to 10 μF take quite a time to charge through R2 or R3 and by switching to the first position the charging up process is accelerated. When the neon strikes the switch can be turned to one of the other positions to time the interval between strikes. The charging time between connection of the condenser and the striking of the neon is itself dependent on the size of the condenser, and this could be timed to give the condenser size.

(To be continued)

HOUSING The Home-made receiver

A SUGGESTION FOR A NEW TYPE OF RECEIVER CABINET

By "Experimenter"



CABINET making is a skilled craft and amateur efforts, especially those of one more at home with soldering iron and hand-drill, scarcely stand comparison with pieces of furniture which are rightly the pride of the home.

By avoiding invidious comparisons a solution can be worked out which takes advantage of a modern trend in decoration, calls for little skill in joinery and is adaptable to almost any circumstances. The result is sufficiently far enough away from both contemporary *furniture* and the usual cabinets of commercial wireless sets to stifle any criticism.

The basis of the idea is a hanging wall cupboard consisting of two shelves, one above the other and panelling round the two or three visible sides.

The construction of the cupboard is simple. Vertical braces are slotted into the shelving in such a way as to avoid screwing into the end grain of the wood—Fig. 1. Fixing to the wall is effected simply by screwing through the two rear upright braces.

Fig. 2 shows in plan how the basic design has been adapted to take both wireless set and loudspeaker and fit the whole assembly into the corner of a room beside a fireplace.

The loudspeaker is fitted inside the cupboard pointing downwards through the cutaway corner. A wooden frame was made to take the speaker chassis and the cracks filled in with wetted newspaper and plaster.

This sketch shows also the disposition of the vertical braces with the cutaway corner. The left-hand corner actually projects a couple of inches beyond the chimney breast and the inside brace is wider than shown—enough to get a fixing into the wall at this point as well as the rear wall.

"Gooch's Splints"

The double lines and the plate with the peculiar hole are part of the panelling arrangement. So much of the decor at the South Bank Festival exhibition consisted of wood panelling in thin vertical strips that the idea eventually found a home and was adopted for this panelling.

Scaled down, this vertical stripping is most attractive and lends itself to both panelling and door construction. With very little skill in carpentry this panelling can be made to slide and roll up in the space of the hole plate shown.

The idea was first tried with the aid of "Gooch's Splints," a material consisting of thin wooden strips stuck to fabric backing. The wood is pine, nicely grained and cut very nearly through to the fabric.

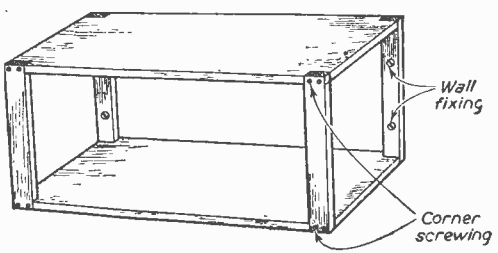


Fig. 1.—Carcase of the cabinet suggested in this article.

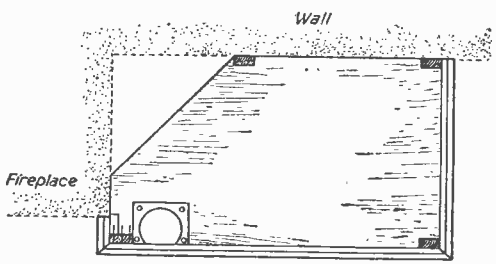


Fig. 2.—An adaptation providing for downward sound radiation.

By the time it has been sandpapered and used for a few weeks the whole thing is very flexible and smooth in operation.

The double lines in Fig. 2 show a picture-frame moulding, used as channelling for the panel material. The only skill required on the whole job is in this mitreing. Good mitres at all corners and only reasonable skill in polishing the panelling—the close grooving breaks up the surface and hides errors of french polishing—and the job defies detection as an amateur one.

Fig. 3 shows alternative arrangements of channelling. At " A " there is a simple channel section where the running level of the panel is equal to the thickness of the shelf. At " B " a simple L section moulding has a thin lath backing, where the running level and the shelf are equal. Where the shelf thickness cannot, for some reason, be made to match up to the moulding the run-off to the curling plates must be catered for by chiselling out the shelf at that point. That is, of course, both shelves—the top surface of the lower shelf and the under surface of the top shelf.

The lower part of Fig. 3 shows the panelling in the *closed* position, with a lead of panelling running into the curl plate and a chamfer on the static part of the panelling. This latter precaution prevents the polished surface getting scratched and leads the moving panel smoothly into its curl. The whole thing is merely a horizontal adaptation of the familiar vertical roll-top desk and roll-fronted cabinet.

The arrangement shown opens by rolling from right to left. The static portion at the left should be matched by a similar amount at the handle end, where the join between moving and static panelling is quite undetectable. Where the roll begins there is bound to be a crack and if it is considered excessive a light spring leaf can be inserted to press the moving strip against the chamfer of the static panel.

The other visible parts of the cupboard are panelled in the same way—except, of course, the top and under sides. In the two cupboards made in this way these surfaces have been painted to match the walls.

All the wear of running takes place on the lower shelf and where chiselling has to be done to get the right level it is as well to go sufficiently far down to permit a smooth plate to be put in. A little hard wax helps initial lubrication.

Fitting a loudspeaker cornerwise is a well-known dodge and one which works amazingly well in this case. The armchair of the man of the house is immediately underneath and he enjoys excellent listening as does, of course, everyone else in the room.

To anyone who can build his own wireless set this work should not provide any difficulty. The mitres could be carried out by a picture-frame maker, but highly accurate measurements would be necessary unless he could be given the rest of the construction to work from.

Fixing the mouldings to the shelves is best carried out by screws well sunk and disguised with plastic wood, afterwards stained to match the moulding.

Two such cupboards have been made. One for a wireless set in the way described and another to match across the other side of the room. There were inevitable differences.

An Alternative

The second set of panelling was made by cutting up some pine boards on a circular saw, sanding each strip individually and sticking them on to wide tape. The effect is to close the joints and make the finished panel look less attractive. If such a method is adopted, the front edges should be chamfered to widen the grooves.

This cupboard opens left-handed, but no difficulty

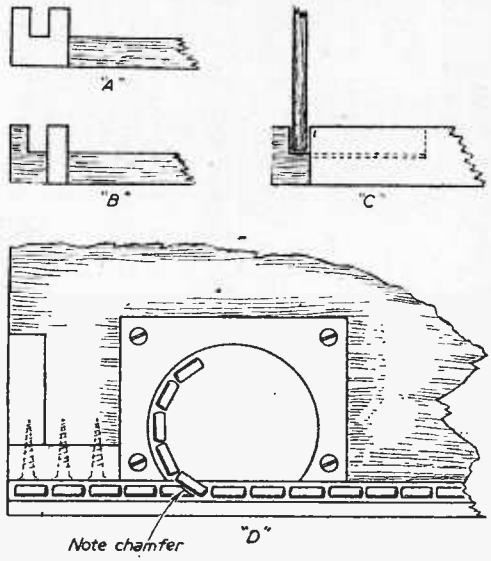


Fig. 3.—Details of the channelling, etc.

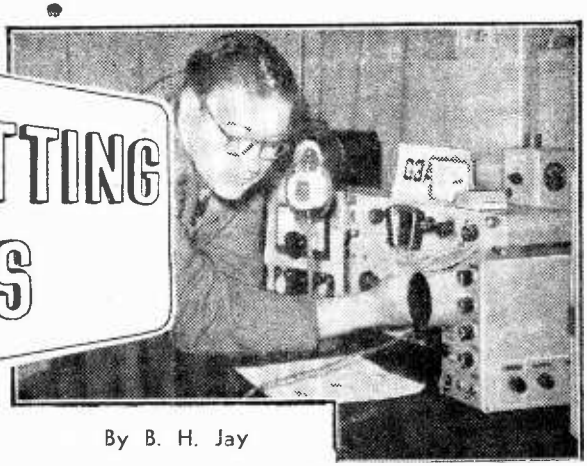
was experienced on that account. A plane was used on this occasion to smooth all the joints and the job was made easier in consequence, but in view of the way in which one part hides another it is not essential. That is an amazing statement, perhaps, where cabinet making is concerned, but some thought will show how few finished joins are left visible in the completed cupboard-cum-cabinet.

Book Received

" Radio Interference Suppression as Applied to Radio and Television Reception," by G. L. Stephens, A.M.I.E.E. Published by Iliffe and Sons, Ltd. Price 10s. 6d. (postage 5d). 65 diagrams and photographs.

THIS practical handbook is an up-to-date guide to the various methods of suppressing electrical interference with radio and television reception. The author, an engineer with extensive experience in this field, describes in detail the origins of interference and the whole theory of suppression technique. He then gives many practical applications. Typical interfering appliances discussed include engine ignition systems, switches, thermostats and contactors, electric motors and generators, rotary converters, lifts, neon signs, fluorescent and other types of discharge lighting, trams, trolleybuses and electric trains, radio-frequency heating apparatus, welding apparatus, oil-fired boilers, television receivers, spectrographic equipment and valve rectifiers.

TRANSMITTING TOPICS



AERIAL IDEAS

By B. H. Jay

SUGGESTIONS for transmitting (and receiving) aerials for amateur-band operation invariably assume that plentiful space is available for aerial erection. At any rate, no indication is given as to how aerial designs can be tailored to fit into the awkward-shaped spaces that are often the only room in which the town-dwelling amateur may erect an aerial. Furthermore, an amateur with space for, say, a 40-metre dipole, is often desirous of operation upon 80 metres or the top band. The only way out seems to operate the aerial against ground as a series-tuned Marconi. This is usually a highly inefficient arrangement in practice. In theory it is excellent. However, the practical snag is that a Marconi system requires very efficient earthing arrangements, involving a radial earth-wire system to avoid excessive losses. With even a good, single "earth," however, the result is that most of the transmitter energy is lost in ground losses. A site capable of accommodating an efficient ground system would, in fact, be amply big enough for a much more ambitious aerial! The average town-dwelling amateur is thus severely handicapped. However, it is possible to overcome this handicap by applying suitable techniques. In fact, it is quite possible to operate effectively with an indoor aerial and work DX. For outdoor aerials, where space is limited, much better results can be obtained by suitable measures.

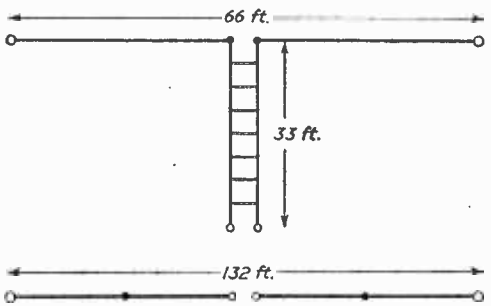


Fig. 1.—The 40-metre dipole with quarter-wave feeders if "pulled out" is revealed as a total length of 132 ft., and thus has a fundamental resonance in the 80-metre band. See Table 1.

The difficulties of limited spaces often arise from the delusion that the aerial "top" must be an exact resonant length. This is no more than a delusion. No theoretical justification exists for this myth, current in amateur transmitting circles. In point of fact, lengths in excess of a half-wave are often better than an exact half-wavelength. Conversely, lengths shorter than a half-wavelength are quite efficient radiators. By disposing of the obsession with exact resonant length-radiating portions, an efficient aerial can be fitted into odd-shaped yards or gardens. Clearly, if an unfortunate town dweller is only able to put up a maximum length of 40 ft. of wire, then a system giving efficient operation with this on 40 metres is almost as good as the full 66ft. top. Again, if, say, 100ft. of wire can be accommodated, then a top of this length will give if anything a slightly better 40-metre performance than the conventional 66ft. or so of top carefully trimmed to resonance. As we shall see, the top length can be anything within reason and yet provide an efficient aerial. Needless to say, the short-wave receiving enthusiast may also find that an aerial of this type will give improved short-wave listening. The secret is to make the entire aerial and feeder system resonant, although the actual aerial portion need not be a resonant length by itself. Such an arrangement provides a system that overall is resonant, and gives good efficiency on both transmission and reception.

An Example

This can best be explained by considering the

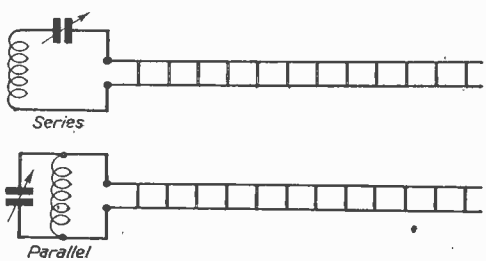


Fig. 2.—Series- and parallel-tuned coupling circuits for loading tuned feeder system aerials.

simple example of the conventional 40-metre dipole with quarter-wave feeders. The top length is, say, 66ft., and the feeders 33ft. in length. The system is commonly regarded as having a fundamental wavelength of 40 metres. However, this is only true of the actual radiating top. The aerial and feeder system actually has a fundamental wavelength of 80 metres. This is immediately obvious if we imagine the feeder section pulled out into a straight line. The overall length of wire (including two lengths each of 33ft. in the feeder) is 132ft. This overall is the resonant length for a fundamental of 80 metres! The fact that in the aerial considered half the length of the total amount of wire is folded up in the middle to form the 33ft. twin feeder does not materially affect the fact that the total length of wire is 132ft., and as such resonates to a fundamental of 80 metres. In point of fact, by employing a series-tuned coupling circuit at the transmitter end, the whole system loads up beautifully on 80 metres and radiates efficiently. The losses are, in fact, very much less than with the usual grounded Marconi system. Furthermore, the use of a sufficiently large coil in the aerial-tuning circuit will enable this system to be resonated even on the top band. Experience with such a system has shown that it is very effective in transmitting applications. By using the tuning system in conjunction with a receiver, very effective amateur-band reception is also ensured. It must be admitted that the need for series tuning on 80 metres has hidden this useful property of the conventional centre-fed 40-metre dipole with quarter-wave feeders. Normally, on 40 metres and the higher bands, a parallel-tuned circuit is necessary. Any attempt to load up on 80 metres using a parallel-tuned circuit will be foredoomed to failure. However, with a series-tuned coupling circuit, a 25-watt transmitter will put about an ampere of R.F. current into the feeders.

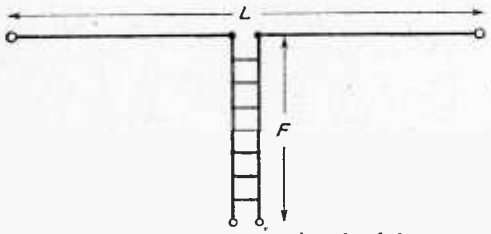


Fig. 3.—The overall resonant length of the centre-feed system is given by (L+2F).

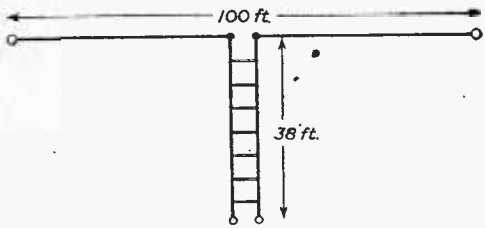


Fig. 4.—"All Band" Special. This aerial operates efficiently on all amateur bands from 1.7 Mc/s to 28 Mc/s. Despite this, it is more compact than an 80-metre dipole. (See Table II for tuning circuit requirements.)

TABLE I
DIMENSIONS FOR 80-METRE FUNDAMENTAL AERIALS
L+2F=132 feet. (See Fig. 3.)

Top Length L.	Feeder Length F.
100ft.	16ft.
90ft.	21ft.
80ft.	26ft.
70ft.	31ft.
66ft.	33ft.
52ft.	40ft.
50ft.	41ft.
40ft.	46ft.
33ft.	49½ft.
30ft.	51ft.
28ft.	52ft.

Tuning circuit.—3.5 Mc/s. Series; 7 Mc/s., 14, 21, 28 Parallel.

Space Saving

The above unexpected use of a "40-metre fundamental" aerial on 80 metres provides an immediate solution to the problem of efficient 80-metre operation with space for only 66ft. of radiating top. However, it is easy to extend this, for we can obtain the required overall resonant length by any suitable combination of top length and feeder length that will add up to the required fundamental half-wavelength. The only rule is that the total top length plus twice the feeder length is equal to a resonant length. (Twice the actual length of the feeders is necessary as the feeder is actually two wires, each of which has to be considered in the total system length.) Thus, we could use a top length of only 33ft., with 49½ft. feeders. This is no more or less than a 20-metre dipole with three-quarter-wavelength feeders. Yet the fundamental frequency of the overall system is still 80 metres, as the total length of wire involved is still 132ft.

With the above simple rule to remember, it is an easy matter to devise an aerial system that gives as large a length of radiating top portion as possible. There is absolutely no need to adhere to a resonant length for the open radiating top portion, provided that the combined feeder and top lengths add up to make an overall resonant length at the desired fundamental frequency. On harmonic frequency bands, the system will behave in all respects like the normal aerials of the same resonant length. To save calculations, the lengths of some simple combinations

(*Concluded on page* 482)

TABLE II
TUNING CIRCUIT REQUIREMENTS FOR THE "ALL BAND" SPECIAL
(See Fig. 4.)

Band Mc/s.	1.7	3.5	7.0 and 14	21	28
Circuit type	Series	Parallel	Series	Parallel	Series or Parallel

On your Wavelength

by THERMION

About Patents

SOME firms who are manufacturing articles which are the subject of letters patent are surprisingly ignorant of patent law. A technical journal has only to publish an article on a patented article, either about it or telling people how to make it, for such firms to write to the editor concerned a letter of protest threatening proceedings. This journal, I understand, is no exception to that rule. Many years ago, for example, we published an article on a special receiver called the Stationdecator, which incorporated a device for illuminating on the dial the name of the station being received. Such a device was not on the market, but it appears it had been patented and the inventor dashed off to a solicitor who was equally ignorant of patent law as the patentee with the result that a letter arrived at this office claiming damages! At the time, an article was published in this journal setting forth the patent law, and I quite thought that by this time those who obtain patents realise exactly what rights they have and what rights others have.

I mention this because publication of an article in this journal dealing with a simple electronic organ evolved in the P.W. laboratory has evoked a letter from a firm which manufactures such instruments. This letter claims (a claim since withdrawn) that they market a "patented circuit" for such an instrument. The letter then goes on to quote the numbers of two "patent applications." I thought everyone by this time knew that anyone can apply for a patent but such may not necessarily be granted. It is not until the official search takes place that it can be ascertained whether the invention is novel or whether it has been anticipated. Indeed, it is an offence to describe an article as patented until the patent has been granted. The most an inventor can do is to mark the goods "patent applied for," and if, subsequently, it is found that the idea has been anticipated, and in the meantime he has commenced to market, he may be and probably will be sued for damages.

However, this firm took a "serious view" of the publication of our article and asked us, under the usual threat of going to solicitors, to draw attention to their "patent applications." Needless to say, they are wiser now, for it has been pointed out to them that *there is no infringement of a patent by publication*, and there is no such tort as infringement by publication. Nor is there infringement of a patent if someone makes a patented article for *experimental purposes and not for resale*.

The onus is entirely on the person making and selling to ascertain whether he is free to do so and whether he is infringing the rights of others. No journal can give a warranty that constructional articles do not deal with matters which are subject of letters patent, and indeed, technical journals and the publication of technical books would be quite impossible if the law were otherwise. For practically everything is or has been the subject of a patent. In every issue of this journal appears the following notice: "Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent."

Readers may quite safely and without fear of prosecution build anything which is described in this or our associated journals provided that they do not offer such for sale.

The Radio Show

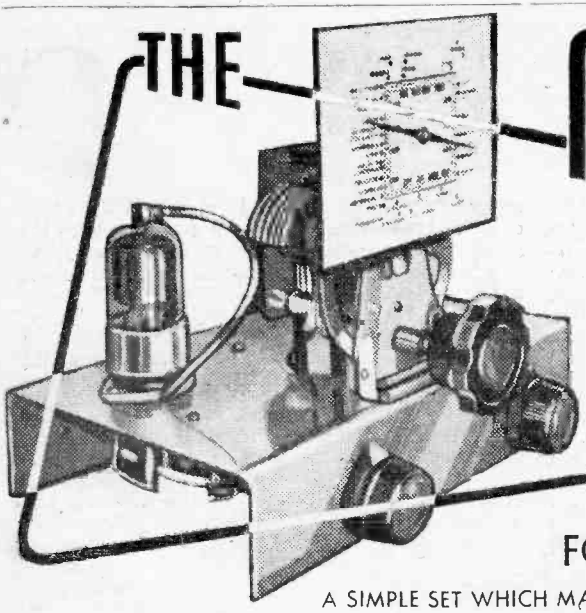
THE tape recorder to be sponsored by our companion journal *Practical Mechanics*, October issue, was exhibited at the Radio Show and it created a great amount of interest. From discussions with readers it seems that preference is for tape rather than for wire. The latter is inferior to tape for recording music and wire breakages are frequent. That has been my experience and as wire is expensive one can understand the preference. It is particularly annoying when you lose an hour's dictation because the wire has jumped its guides and tangled itself up inextricably. The *Practical Mechanics* tape recorder will record dictation, music or radio programmes and you can get an hour's recording in one run with fast playback. It is much better if you are running a party to record your favourite records and then run the machine for an hour without having to change the needle (I know this does not apply to crystal pick-ups) or without having to buy special recordings for auto-record changers. The tape can, of course, be used over and over again, erasures and dubbing-in can be quickly effected, and it will record direct from a radio receiver. It can be used to record conversation.

Car Radio

I OFTEN receive requests for circuits for car radio receivers and I am glad to know that a section on this subject complete with circuit and wiring diagram is given in the new edition (the 8th) of the *Practical Motorists Encyclopaedia*, which costs 18s. by post from the offices of this journal. Fitting instructions are given and notes on operation and the remedy of faults.

Brit.I.R.E. Premiums and Awards for 1951

THE senior award of the Brit.I.R.E., the Clerk Maxwell Premium is to be made to Mr. H. P. Williams, Ph.D., for his paper on "Subterranean Communication by Electric Waves," which was published in the Institution's journal during 1951. This premium is for the most outstanding paper published during the year. Other awards go to R. E. Spencer, B.A. (Heinrich Hertz Premium), Emlyn Jones, B.Sc. (a contributor to our companion journal, *Practical Television*, who receives the Louis Sterling Premium), R. G. Kitche, B.Sc. (Lesley McMichael Premium), Mr. G. E. Roberts (Brabazon Premium), E. G. Rowe, M.Sc. (The Marconi Premium). The papers for which these awards have been made are of a very high standard indeed.



THE MODERN VALVER

FOR THE BEGINNER

A SIMPLE SET WHICH MAY BE ADDED TO AS EXPERIENCE IS GAINED

OPERATING wholly from dry batteries, this receiver has a high degree of sensitivity and tunes medium- and long-waves. The more powerful transmitters may be received at excellent strength even when using a very short indoor aerial and when no earth connection is available. With an earth and an aerial of average efficiency quite a large number of stations may be picked up, especially towards evening, when many European transmitters come within range of the receiver. The constructor who requires better results than those obtained with a crystal set will find such a receiver ideal, and it is, of course, very considerably more sensitive and selective than a crystal set. It can also form the basis for a loudspeaker receiver of efficient and economical type, if desired, by the subsequent addition of an output stage.

An octal pentode is used and this has a 1.4 v. .05 amp filament. Though a 1N5 is specified, equivalents which will perform equally well can be used. These are the Mullard DF33 and the Marconi/Osram Z14. The 1N5/GT type is equally satisfactory, merely having a glass bulb of different size. As will be seen, the current consumption is very small, which means that the batteries will have a long period of useful life. If midget or layer-type batteries are used they may be situated on the chassis, where sufficient space is left to accommodate them. A H.T. voltage of 45 to 60 or so is ample, and suitable "Drymax" Exide batteries of layer-type are the 502, 45 volts, or 501, 67½ volts. Other batteries of similar type, produced by different manufacturers, are equally suitable. With such a battery the receiver may be enclosed in a cabinet approximately 8in. by 8in. by 5in. from back to front (inside dimensions), thereby being self-contained and quite compact. For filament supply a wide variety of dry batteries are available. That used may be of the type especially made for "All-Dry" receivers, or a torch or flash-lamp battery can be used. In the latter case, it is essential to remember that the voltage must not exceed 1.4 (as obtained from a single dry cell, or two or more cells wired in *parallel*). If more than one cell is used for filament current, the cells should be connected in parallel and the carbon rods (centre connection) will form the positive terminal.

If size is of no object then a H.T. battery of ordinary type can be used; these are substantially cheaper and have a longer life than the midget types. Such batteries are the Exide H.1,003, 60 volts and H.1,156, 45 volts. These batteries are too large to accommodate on the chassis. In the event of such types not being in stock they can always be obtained from the makers. Similar batteries of other manufacture are also available.

Chassis and Construction

The chassis is made from a piece of aluminium 8in. by 8½in., two runners being bent along the shortest edges so that the completed chassis is 8in. by 5in. by 1¾in. deep. If the metal is held tightly

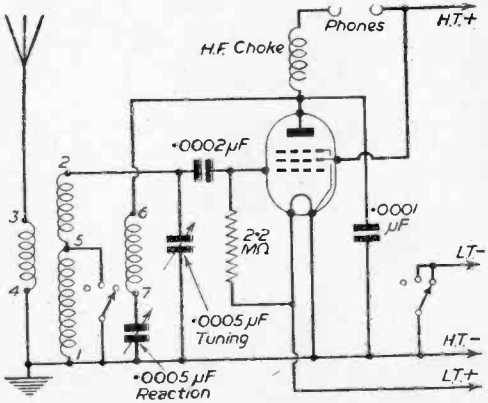


Fig. 1.—Theoretical circuit.

between two boards secured in the vice these bends may be accomplished readily and accurately. The positions of the various holes will be seen from the diagram, and that for the valveholder is best made with one of the special cutters available for this purpose. The holes for the switch and reaction condenser, situated on the front runner, require to be about ⅜in. in diameter. Holes of this size should also be drilled to clear the aerial and phone sockets, where these project through the rear runner. It is preferable to drill all holes before mounting any of the components, to avoid possible damage and keep the various parts free from metal fragments.

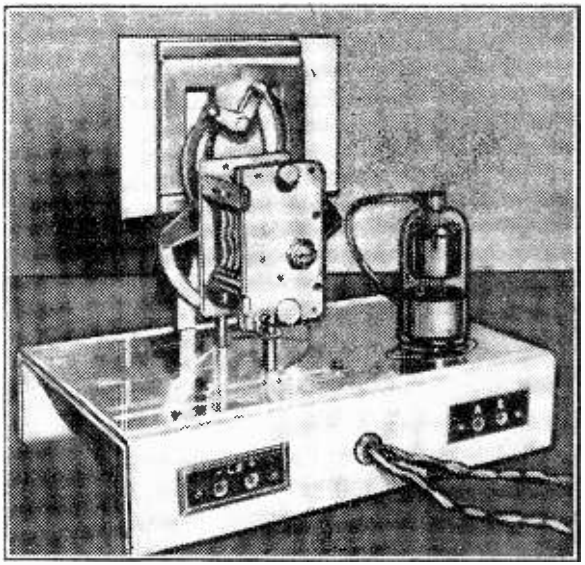
When bolting the valveholder and socket strips in place soldering tags are added to provide earthing points. These are marked M.C. to show that the leads in question are returned to the chassis. 6 B.A. bolts about ⅜in. long are a convenient size to use.

In order that the spindle of the tuning condenser may be high enough to reach the tuning dial bush, it is necessary to employ spacing pieces under the mounting feet of the condenser. The exact length of these is not important because the dial has a slotted mounting bracket so that its height may be adjusted, but they should be not less than ⅜in. in length. Bushes may be used, or ⅜in. long bolts, each with three nuts, two being locked against the chassis to raise the condenser, as illustrated.

The H.F. choke is secured by a single 6 B.A. bolt driven into the tapped hole at its untagged end. The tuning coil is mounted on the chassis by the long tag or loop provided; this also returns the one winding to chassis. When wiring up, the battery leads are passed out through a hole in the rear runner, and a rubber grommet is necessary here in order that the insulation does not become cut, thereby causing a short circuit. A suitable hole for this purpose should be drilled initially.

COMPONENTS FOR MODERN 1-VALVER

.0005 μF. J.B. tuning condenser with feet. (Coventry Radio.)
.0005 μF. "Wavemaster" reaction condenser. (Coventry Radio.)
Dual-wave coil with reaction and primary. (T. G. Howell.)
H.F. choke type QC1. (Osmor Radio Products, Ltd.)
J.B. square 2-waveband dial, complete. (Stern's Radio.)
Knobs:—one K254 for tuning, two K6 for reaction and switch, or similar. (A. F. Bulgin & Co., Ltd.)
Aerial, earth, and output sockets. (Stern's Radio.)
½ watt 2.2 megohm grid leak. .0002 μF. grid condenser.
McMurdo international octal valveholder. (Premier Radio Co.)
2-pole 3-way rotary switch. (Coventry Radio type C1780T, or similar.)
Chassis, 8in. wide by 5in. by 1⅞in. deep.
1N5 or equivalent valve. Valve cap, leads, etc.



Rear view of the receiver.

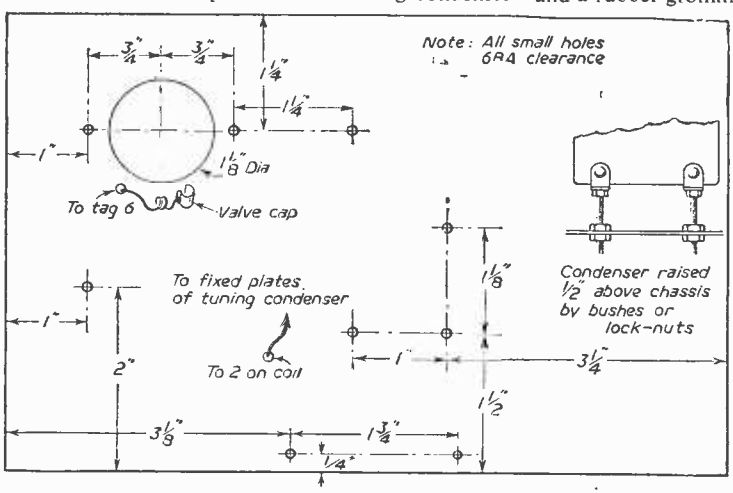


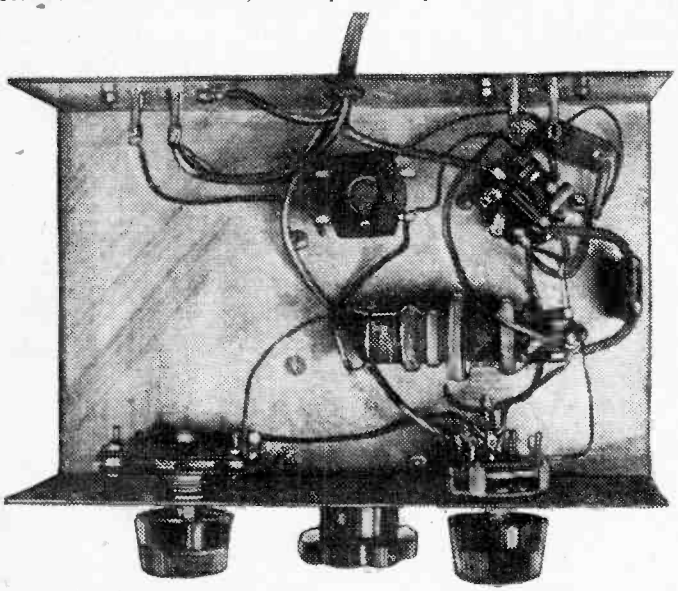
Fig. 3.—Details of the chassis and drilling.

Wiring Points

All the connections are illustrated, and only two pass through the chassis. One of these goes from tag 2 on the tuning coil to the fixed plates tag of the tuning condenser. The second, of thin flex, goes from tag 6 on the valveholder to the top clip of the valve. Tag 6 is only used to secure the 2.2. megohm grid leak and .0002 mfd. grid condenser, and no pin to correspond with it is present on the valve.

The wiring to the switch should present no difficulty, even to beginners, and a rear

view of the tags is given. In one position the set is "Off." When the switch is turned to the next position the filament supply is switched on and tag 5 and the coil returned to chassis; this position provides



Compare this with the illustration below.

"medium waves." In the third position, the set is still switched on, but tag 5 is not returned to the chassis. This position accordingly provides "long waves." The five coil tag connections will also be seen from the inset diagram, which shows the coil as seen from the end equipped with bracket or loop to bolt to the chassis, as already mentioned.

Any thin insulated wire may be used for the connections, something in the neighbourhood of 22 S.W.G. tinned-copper being easy to work with and solder. (*Very* thin wire should not, of course be used.) The moving plates of the reaction condenser will already be in contact with the chassis, through the fixing bush. However, as this may give rise to loud crackling, as the control is operated, a lead from tag to chassis, as indicated, is necessary.

Operational Notes

When wiring is completed the valve should be inserted, the top clip placed on, and the batteries connected. The L.T. leads must be marked to distinguish them from the H.T. leads and more than 1.4v. must not be applied to the filament. The headphones should be of the usual type, preferable of high impedance. Suitable phones are available from many different sources, but low-impedance phones should be avoided, or used with a high-to-low impedance *headphone* matching transformer.

The receiver will give good results with many different aerial/earth systems. If long-range reception is required, a good aerial and earth will prove helpful. A very short indoor aerial will be sufficient for local station reception. Such an aerial can consist of a length of thin flex placed as convenience allows. With a more effective indoor aerial, consisting of an insulated wire along two walls of the room, near the ceiling, a somewhat greater range will be obtained.

As the coil has an aerial coupling winding a good degree of selectivity results for this type of receiver and tuning is quite sharp. With a very long aerial, however, it will be desirable to include a small condenser in series with the aerial lead-in. A pre-set of .0001μF. is most generally suitable. If a fixed condenser is used, a capacity of .0001 or .00005 μF. is likely to be best. Smaller capacities will further increase selectivity, but will reduce volume unduly. If the receiver is used very close to a major transmitter, this condenser is recommended, even with an indoor aerial.

A station near the middle of the tuning range should be tuned in accurately and the tuning pointer may then be adjusted slightly as necessary to give an accurate indication.

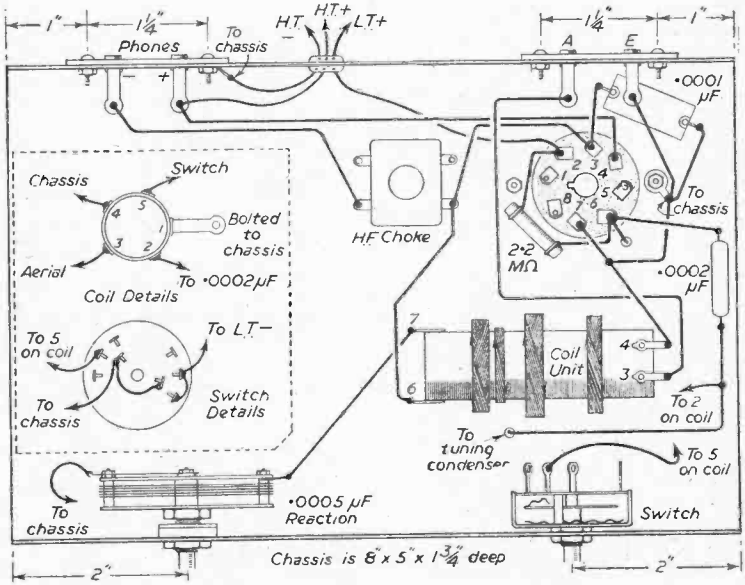


Fig. 2.—Wiring diagram.

Principal Exhibits Reviewed

Aerialite, Ltd.

TELEVISION aerials formed the mainstay of this exhibit, which was augmented by many small items associated with aerials and their mountings and supports. Among the newly-introduced components was a plug for car radio aerial connection. [Stand No. 50.]

Amplion (1932), Ltd.

THE principal feature on this stand was the "Activette," the novel dry-battery recharger which can be used for all types of dry battery, from those used in standard radio equipment to the small units employed in hearing aids. Also featured was the "Convette," a mains unit which is designed to enable a battery set to be used in conjunction with A.C. mains without any conversion to the set. The Amplion Testmeter was also displayed with volume controls, loudspeakers, coil packs, I.F. transformers and battery chargers. [Stand No. 54]

Automatic Coil Winder & Electrical Equipment Co., Ltd.

UNDER the well-known "Avo" trademark this exhibit featured the many popular types of test instrument as well as coil-winding machines. The Model "8" is no doubt now standardised in the majority of service rooms or workshops and may be used for general tests on A.C. and D.C. with the utmost reliability. This and the No. "7" are almost too well-known to need further description. [Stand No. 46]

Belling & Lee, Ltd.

EXHIBITED here were television aerials, broadcast aerials, special purpose aerials, transmission lines and terminations, interference suppressors, terminals, valveholders, fuses, fuseholders, and plugs and sockets. The keen constructor could find almost any item he required on the constructional side for making a home installation neater and more readily open-circuited for testing, etc., and the new range of flexible terminal mounts covered a long-felt want. [Stand No. 25]

Chloride Batteries, Ltd.

THE principal display among the exhibits set out on this stand was a group of Drydex H.T. and G.B. batteries. These represented a range from which the special requirements of every known make and type of battery-operated or portable radio receiver may be satisfied. Examples from the various series were shown, including two recently-introduced unspillable accumulators in tough transparent moulded polystyrene containers. In addition, the various multi-plate types in both glass and celluloid containers were exhibited. [Stand No. 94]

E. K. Cole, Ltd.

UNDER the popular Ekco trademark Messrs. Cole were showing a wide range of television receivers as well as many old and new radio receivers. At one end of the scale was the A.C./D.C. transportable, Model U159, weighing only 7lb. in an attractive plastic cabinet, and at the other end a three-speed radiogram for standard and L.P. records. Car radios were also displayed. [Stand No. 24]

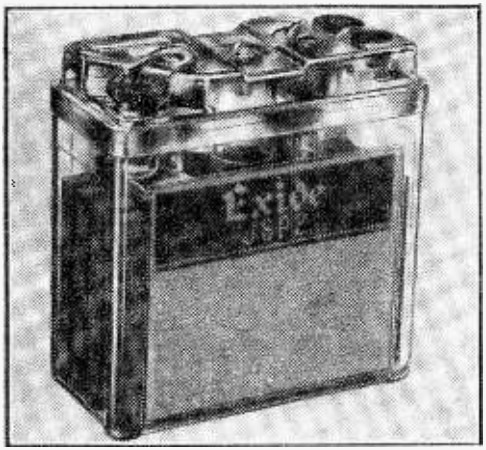
Collaro, Ltd.

HERE was a comprehensive range of gramophone components including the newest three-speed units and pick-ups designed to "take all records." The changers were confined to four models for single and three-speed operation, and all included arrangements for plug-in pick-up heads with colour-identifying base plates. All these changers, it should be noted, are provided with identical unit plates to facilitate interchanging. All single speed record changers are capable of playing nine 10in. or nine 12in. records, and the three-speed models play also

the 7in. discs. Also shown were Micrograms, which are complete record-players with self-contained amplifier and loudspeaker. [Stand No. 91]

Dubilier Condenser Co., Ltd.

THIS exhibit featured capacitors of the latest design, fixed, variable and adjustable resistors —including miniature volume controls—and suppressor units specially designed and approved for the suppression of electrical interference to the reception of radio and television. A new range of the



From the popular Exide range comes this new non-spill accumulator in a container of moulded polystyrene.

popular BR electrolytic condensers was seen for the first time, and these have been reduced in physical size whilst still retaining the main electrical features. [Stand No. 79]

Edison Swan Electric Co., Ltd.

MAZDA was the prominent name featured on this stand, and included the wide range of standard radio and television valves as well as cathode ray tubes. In addition, there were the portable electro-physiological recording equipment, loud-speaker-phone communication equipment, stabilised power pack, low-frequency oscillator and the incidental items for which Edison Swan are now main distributors. These include many Plessey components as well as the well-known Clix range of components. [Stand No. 62]

Felgate Radio, Ltd.

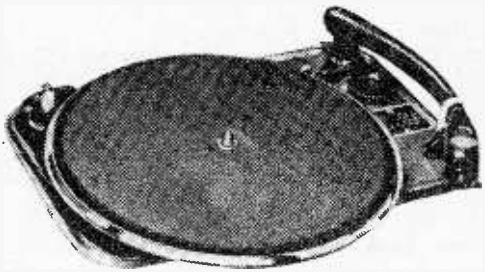
UNDER the trade name " McCarthy " this exhibit featured, in addition to combined de-luxe radiogram-television combinations, a range of radiograms and table-model radios, designed both for home and export markets. The highlight of the exhibit was, of course, the big combination which included optional F.M. switching. [Stand No. 7]

Ferguson Radio Corporation, Ltd.

THE special display on this stand was concerned with the new big-screen television receiver, but also featured were the various radio receivers and radiograms, among which the small transportable ivory plastic model and the neat and compact radiogram were probably the most prominent. The mains battery portable Model 341BU was shown in three attractive colour schemes—Moonlight Blue, Autumn Rose and Easter Green. [Stand No. 88]

Ferranti, Ltd.

AS with most firms, television was the keynote of the Ferranti exhibit, six different models being on view. Radio receivers shown were placed into three important price levels, below £20, £25 and £30, and included suitcase portables, battery and mains/battery models. Models 125 and 225 were two new table models and a feature was made of the fact that this year external aerial and earth

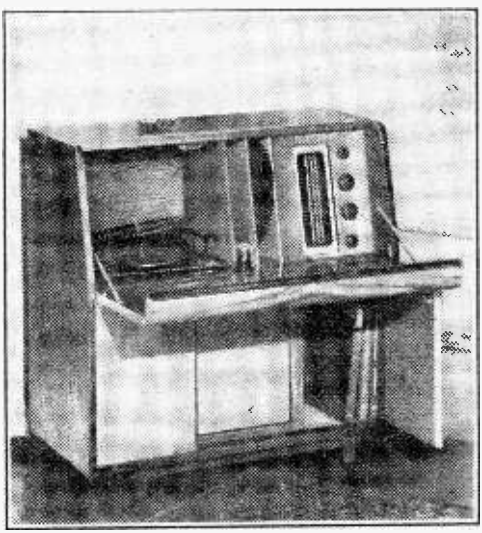


An autogram unit for all types of record, including L.P. This is a Garrard Model

sockets are provided on certain models for use where frame aerial reception is not entirely satisfactory. [Stand No. 14]

Garrard Engineering & Mfg. Co., Ltd.

CHIEF among the new things seen on this stand was the RC.75 record-playing unit, which accommodates batches of 10 records, of either 10in.,



From Ferranti comes this auto-radiogram, which includes record storage space. It is Model 425.

12in. or 7in. at 78 r.p.m., 33 r.p.m. and 45 r.p.m. In the latter category, 7in. 45 r.p.m. records with the 1½in. diameter centre hole have been an exclusive American monopoly, but may be accommodated on this changer. A new form of record change mechanism is used in the new changers.
[Stand No. 92]

General Electric Co., Ltd.

AGAIN the accent was on television, but there was a wide range of normal radio apparatus ranging from complete receivers for home and export on Stand No. 26 to valves, cathode-ray tubes and germanium crystals on Stand No. 78 and in Demonstration Room D.6. Under the trade name Osram the range of valves is already widely known and covers types for all purposes. [Stands Nos. 26 & 78]

Goodmans Industries, Ltd.

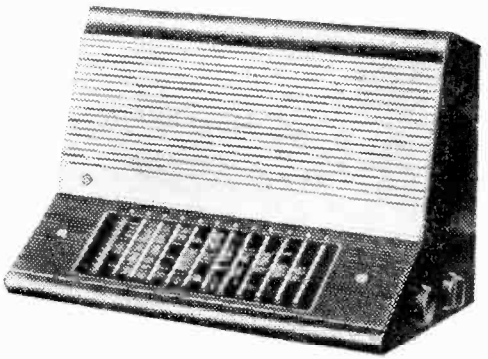
THE Axiom speakers were prominently displayed here and were demonstrated in room D.7. Newly introduced were the elliptical speakers for which special claims have been made and to these were added special P.A. equipment in which one model had a special replaceable self-centring diaphragm that can be changed in three minutes without removal from the horn attachment. [Stand No. 41]

Gramophone Co., Ltd.

UNDER the well-known H.M.V. trademark a wide range of television and broadcast equipment was shown here. Some elaborate radio-gramophones were seen, together with some interesting table models, and one model, at least, included an elliptical loudspeaker and separately illuminated tuning scales for each of the four wavebands covered. Push-button tuning was a feature of some of the models shown, and gramophone records and a range of useful accessories designed to give greater enjoyment to the record collector were also featured.
[Stand No. 89]

A. H. Hunt (Capacitors), Ltd.

AMONG the new developments in condensers seen here were the "Thermetic" midget metalised capacitors with a temperature range of −100 deg. to + 120 deg. : "Moldseal" metalised

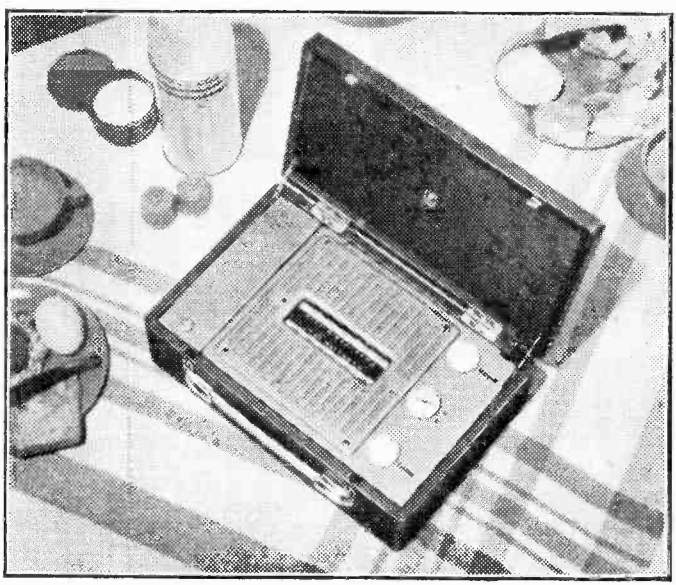


An unusual cabinet style providing full view tuning scales and a neat and clean layout. This is one of the new Pye Models.

moulded-cased condensers, and dry electrolytics designed for operation up to 85 deg. C at 450 v. working.
[Stand No. 56]

Invicta Radio, Ltd.

IN addition to television receivers the exhibit here featured the Twinvicta mains/battery portable in several colours and tartans. Other items were an A.C. mains transportable available in a special fabric finish wooden cabinet in three colours. Conventional models included a number of export models and the Stationmaster, which has already been released.
[Stand No. 71]



A clean layout and modern appearance in the Model 825 Ferranti Battery Portable.

Lee Products (Gt. Britain), Ltd.

IN addition to the recently-introduced television colour screen the exhibits here included car radio aerials, amplifiers, coil packs, chokes, crystal kits, mains and car dropping resistors, tuning dials, drives and accessories, drive cords, gramophone motors and players, extension speakers, sapphire gramophone needles, line cords, toggle switches, etc.
[Stand No. 77]

Marconiphone Co., Ltd.

WHILST the new television receivers formed the principal attraction some interesting radio receivers were to be seen, and a feature was made of the "second set" which has a self-contained aerial and is available in various attractive finishes. In addition to

the receivers were various accessories, including a selection of Marconi valves and "Emiscope" C.R. tubes. [Stand No. 87]

Masteradio, Ltd.

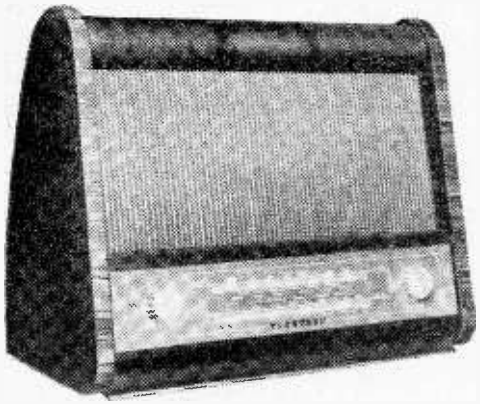
PRINCIPAL exhibit was the Masteradio Television and Radio listening aid—a device consisting of a control unit with volume and tone controls and incorporating a lightweight headphone. This unit may be connected to any radio or television receiver and enables a deaf person to listen in, using the normal volume required for the household from the loudspeaker. It has been tested by the National Institute for the Deaf and other authorities and found satisfactory. [Stand No. 63]

Mullard, Ltd.

THE centrepiece here was an illuminated display symbolising the Mullard contribution to the progress of electronics. The products depicted in the display have all been developed and engineered during the past few years and include special valves and the well-known Valve Tester. Specialised electronic devices used industrially were also featured and showed the wide range of investigation covered by modern electronics. On a nearby part of the stand were a demonstration of subminiature valve assembly as carried out at the Mullard factories, and a cut-away model of a large television receiver, three times actual size. [Stand No. 17]

Multicore Solders, Ltd.

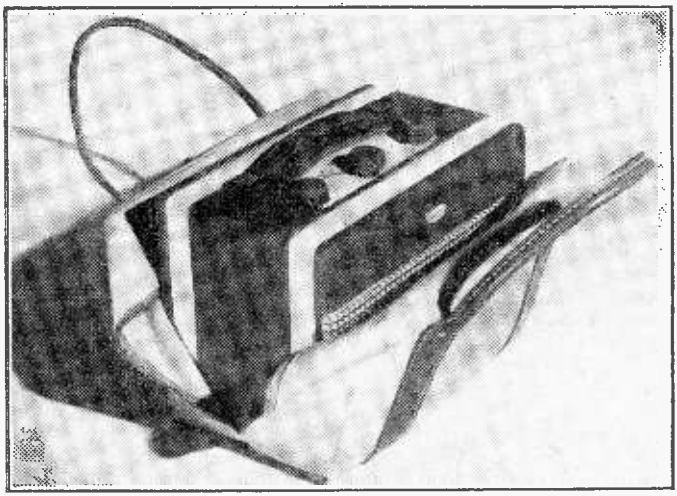
ONCE again Multicore made a feature of an actual factory department in which their solder is ordinarily employed, and this year the section was a replica of part of the Pye factory and the mechanics were constructing television cameras. It is estimated that there were more then 10,000 soldered joints made during the show. Other parts of the stand were devoted to a display of the various types of Multicore solder and the commercial packs and reels in which it is supplied. [Stand No. 32]



Ferguson have produced this new style table cabinet, which is a departure from the usual 'box' arrangement.

Murphy Radio, Ltd.

SEVERAL new models were to be seen on the Murphy stand, and they included portables as well as console models. In the latter group was the 8-valve radiogram for standard and L.P. records, with various circuit refinements and a high-power push-pull output with twin loudspeakers. [Stand No. 15]



Roberts Radio are responsible for this portable and its waterproof carrying case.

Pilot Radio, Ltd.

THIS display was claimed to be the largest which Pilot have yet shown and included portable and table models, radiogram and television receivers. The Little Maestro appeared in its latest form with attractive-coloured cabinet, whilst the Pilot 75, the latest release, presented a very modern appearance and incorporates a three-waveband superhet with 8in. speaker. [Stand No. 58]

Plessey Company, Ltd.

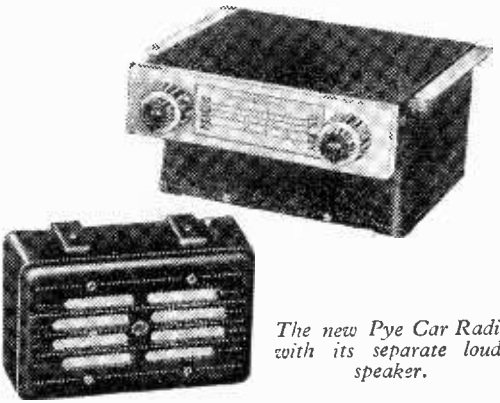
HERE were a wide range of components available exclusively for the manufacturer, those items which are available to the home-constructor being handled and shown by Edison Swan. The range included automatic changers, coils, loudspeakers, vibrators and many other items. [Stand No. 80]

Pye, Ltd.

ALTHOUGH television formed the main exhibit here, there was also a wide range of radio receivers and a separate stand devoted to electronics. Again the novel cabinet designs were to be noted, and particular attention was paid to Model P43, a low-priced two-waveband transportable in moulded cabinet costing only £17 10s. Other models included a three-speed portable radiogram, a 6- and 12-volt car radio and a luxury table receiver in a cabinet of the latest contemporary design. [Stands Nos. 36 and 84]

Regentone Products, Ltd.

HERE on Stand No. 13 were the usual range of Regentone receivers with some new models seen for the first time. Among the interesting features noted were the inclusion of dual speakers in a table receiver, and the "push-pull" 97/3 automatic radiogram. The popular Auto "99" series were displayed, together with various television and export models. [Stand No. 13]



The new Pye Car Radio with its separate loudspeaker.

Roberts Radio Co., Ltd.

HERE were the popular portable receivers complete with their waterproof carrying cases. This was a colourful display, and, unlike many firms, pamphlets were available on the stand which included the circuit drawings of the receivers, together with other interesting service data. [Stand No. 39]

Rola Celestion, Ltd.

BOTH the Rola and Celestion trademarks are well known in connection with loudspeakers, and the range of models shown here included instruments from 3in. square to 18in. in diameter. There was also an elliptical model 4½in. by 6½in., and for the first time Rola Celestion were showing a complete range of P.A. speakers marketed under the well-known name of "Truvox." A three-watt re-entrant model was seen for the first time, and the exhibit also included a new tape deck recorder with push-button control. [Stand No. 73]

Sali, Ltd.

SOMETHING entirely new in loudspeaker cabinets formed the exhibit here and under the registered trademark "Sculptured Sound" were shown some very advanced moulded designs. The largest of the cabinets has a capacity of some 12 cubic feet resulting in splendid bass response. The Doric cabinet may be used as a radiogram, television receiver, equipment piece or as a bass reflex cabinet. [Stand No. 121]

Selmer & Co., Ltd.

ON this stand for the first time an electronic musical instrument held pride of place. This is the Clavioline, a French design of instrument, providing more than 30 musical instrument tones and is intended for use with a piano or in an orchestra. [Stand No. 10]

Sobell Industries, Ltd.

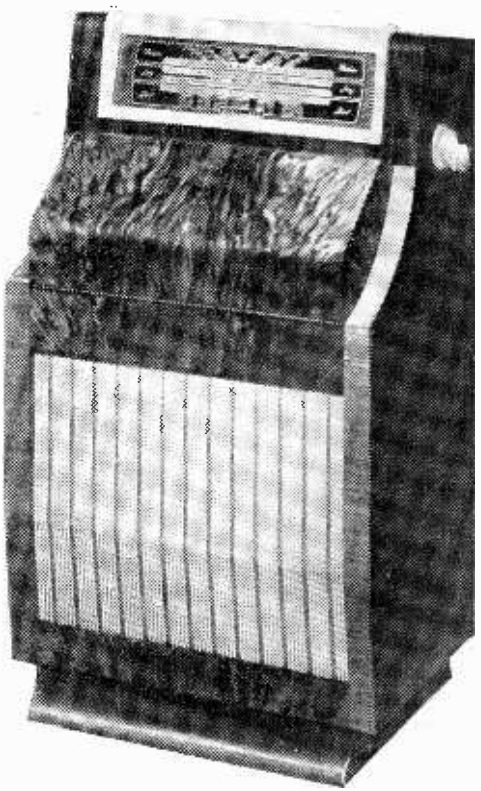
IN addition to the television receivers which are dealt with separately in our companion paper, *Practical Television*, here were seen a wide range of table and console radio receivers. All the receivers cover three wavebands and have selective feedback for high fidelity. The smallest is a five-valve table model and the largest a six-valve de-luxe radiogram with magic-eye and record storage space. [Stand No. 34]

Standard Telephones & Cables, Ltd.

IN addition to the already well-known rectifiers here were seen many new and industrial rectifiers which have been developed during recent months. The SenTerCel selenium rectifiers cover small models such as are used in battery charging, model railways, etc., and larger models such as are used in electronic photoflash and similar equipment. Spindle-mounted rectifiers for industrial use and special items for service use were also shown, together with special power units for telegraph signalling and as supplied for the special television link between Manchester and Kirk o' Shotts. The wide range of Brimar valves were also included, among which were many new miniatures. [Stand No. 6]

Stratton & Co., Ltd.

THE popular Eddystone receivers and specialised short-wave components were seen here, and of particular interest is the die-cast chassis which forms such a valuable feature in making a stable and rigid



A new type of cabinet in the Regentone range. This is model Auto 99/3.

assembly which will stand up to almost any conditions. The special communications receivers interested those who find their main pleasure is in seeking out long-distance transmitters, especially for amateur use, and constructors building short-wave equipment have for years relied upon the various components which Messrs. Stratton have made famous in this field. [Stand No. 124]

Taylor Electrical Instruments, Ltd.

TEST sets for all purposes formed the exhibit here, and no new models were introduced this year. Slight improvements were noted on certain existing models, such as the carrying handle on Model 77A, but most of the items are already well known and include valve testers as well as signal generator and multirange meter. [Stand No. 53]

Telegraph Condenser Co., Ltd.

THE T.C.C. range of condensers is familiar to all constructors, and a most interesting display of all the ranges was seen on this stand. The main feature was undoubtedly the novel test machine which is used by the makers for sorting the condensers and rejecting those which do not come up to specification. There were five machines actually in operation throughout the show, and it was a revelation to many to see how rapidly and accurately these machines carried out their function. [Stand No. 72]

Telegraph Construction & Maintenance Co., Ltd.

CABLES were the main exhibit here and included not only the specialised television types used for reception, but also those used in the actual transmitters. [Stand No. 42]

Telerection, Ltd.

HERE were a range of aerials from the simple single dipole to the multiple array used in fringe areas. [Stand No. 11]

Valradio, Ltd.

AS specialists in the design and supply of mains units for use with D.C. lighting supplies Valradio were showing their range of units in conjunction with television projection equipment. Special units were shown which enable the use of standard A.C. television and radio receivers with low and high-voltage D.C. power supplies. [Stand No. 122]

Vidor, Ltd.

IN addition to television receivers Messrs. Vidor were showing the "Gala," an A.C./D.C. battery portable of the "table" type finished in silver-grey leatherette with bands of green and an eight-band battery bandspread model. In addition, all the current range of receivers were shown, with the many types of battery, including some new types seen for the first time. [Stand No. 90]

Another attractive Battery/Mains Portable. This is the new GEC Model BC 4444.

Westinghouse Brake & Signal Co., Ltd.

THE wide range of rectifiers shown here covered every practical use from the small instrument type units used for A.C. measurements up to large charging and power supply units. The "Trans-booster," for instance, is a constant potential rectifier capable of holding a set D.C. output voltage to within limits of plus or minus 1 per cent. irrespective of load, even with a mains input voltage fluctuation of plus 6 to minus 10 per cent. [Stand No. 49]

This is the Taylor Valve Tester model 45B which costs £25 10s.

Whiteley Electrical Radio, Ltd.

UNDER the trade mark W/B the wide range of Stentorian speakers formed the centre of this exhibit. Some new models were seen, including three popular-priced models of an entirely new design. For extension use and for home-constructor designs the range is most extensive and covered models from 2½in. to 18in. in diameter. [Stand No. 95]

THE PW Electronic Organ

MAKING THE KEYS AND KEYBOARD FOR THIS NEW MONOPHONIC 4-OCTAVE INSTRUMENT

By W. J. Delaney (G2FMY)

(*Continued from page* 414, *September issue*).

BOTH V3 and V4 are used without bias by-pass condensers, and the output from V4 is taken from the volume control by means of a coaxial cable to the amplifier. Up to this point the four stages are mounted on a single chassis which is attached to the keyboard so that it may be tested and adjusted before being placed in the cabinet.

Amplifier

The amplifier for domestic or home use consists of a simple single-stage utilising an EL33, and the power pack is standard, incorporating a 250-0-250 mains transformer used with a 5Z4 type of rectifier. For a speaker I used a W.B. dual-concentric 10in. unit, as I found this gave to some instrumental effects the necessary "brassiness" due to the tweeter fitted to the speaker, but an ordinary speaker could be used but should not be smaller than 10in., and should be a really good unit, as the lowest notes when used with vibrato at slow speeds result in considerable movement of the cone, and a good speaker is required to stand up to considerable use in the low ranges. If the "professional" or larger amplifier is built I would definitely advise the use of the 12in. W.B. Duplex, as this will not only enhance the tone of the various instrumental effects but will stand up to large amplitude movements without damage.

Cabinet

The cabinet was simply constructed of 1in. by 1in. timber for the framework and covered with sheets of high-quality hardboard, of the type having a cream glossy surface and, as a result, needed no paint or enamel. But the constructor may use any desired form of construction, splitting the overall assembly into two parts if desired for portability, the amplifier and speaker being in one section and the keyboard and associated circuitry in the other, and in use the two standing on top of each other.

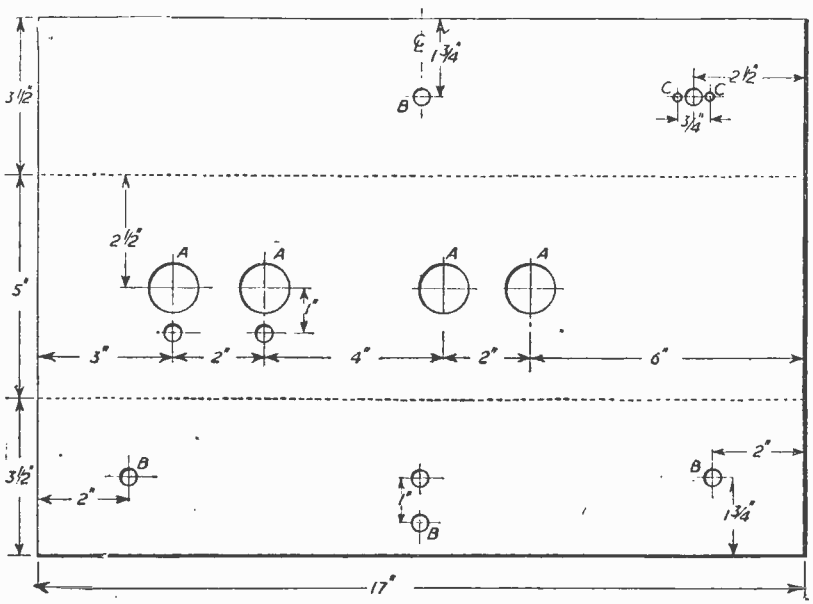


Fig. 3.—Drilling and cutting details of the main chassis.

List of Components

A complete list of components was given last month, and in certain cases the source of supply or maker has been given. Standard or ex-Service parts may be used, and all resistors except R19 are standard ½ watt type of normal tolerance, and the only special items about which any difficulty might be experienced in supply are the tone switches. As indicated, these were ex-Service and obtained from Smith's Radio, of Lisle Street, but they are similar to the type "TG" oak switches, although these are not normally available to the home-constructor.

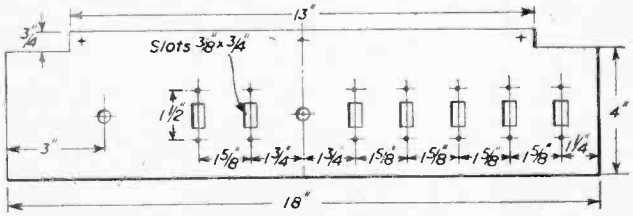


Fig. 4.—Drilling and cutting details of the control panel.

Keyboard

The first part to be constructed should be the keyboard and, as mentioned last month, standard piano or organ keys may be employed if they can be obtained. In the prototype the keys were made from one of the modern soft-hardwoods of the type having no grain. These were cut into two sets of four, and one of six for the white notes, and a set of 10 for the black notes and full data for these is given in Fig. 5. The small hole ⅛in. from the end is for the return spring which may be a very fine steel component or, as in the original, a simple rubber band. Packets of rubber bands are available at good stationers and measure about 1½in. across. The method of fixing will be described later. A piece of stout ply, ¾in. thick should next be obtained, measuring 13in. by 9in. From similar material to that used for the keys cut two strips 1⅛in. by ⅜in. by 13in. and two shaped end-pieces as shown in Fig. 7. To complete the keyboard you need a 12in. length of ⅛in. diameter silver steel rod and a length of thin phosphor bronze 2in. by 12in. Clamp the phosphor bronze strip between the two strips of wood and attach these to the two shaped end-pieces, as shown in Fig. 7. Make sure they are really firm, and then on the underside of the long strip place a piece of thin sponge rubber

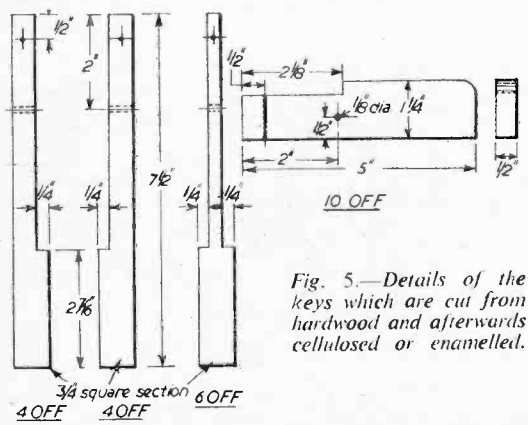


Fig. 5.—Details of the keys which are cut from hardwood and afterwards cellulosed or enamelled.

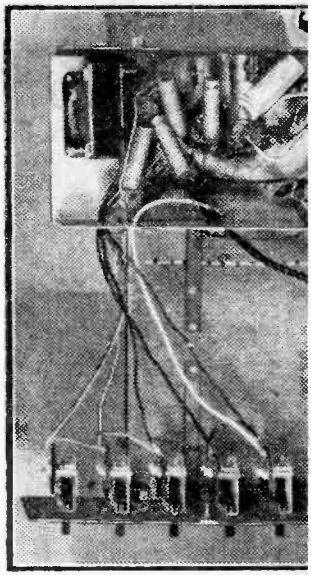


Fig. 9.—Underview o

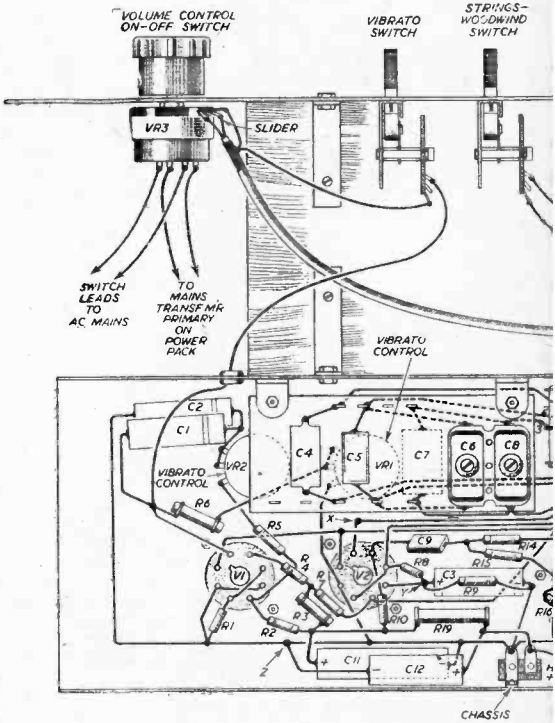
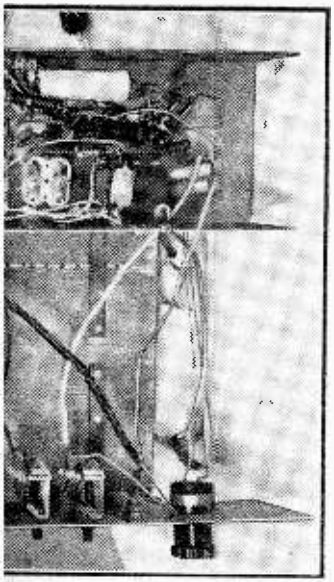


Fig. 6.—Wiring details of the main chassis



ıssis and control panel.

or good quality felt. Next pass the silver steel rod through one of the end-pieces and thread on the keys in their correct order, placing a thin metal washer between each key to provide sufficient spacing, and make certain that the keys move freely but do not have any side movement.

Next, place the assembled unit on the baseboard with the front of the keys level with the front edge of the baseboard and screw down the two side blocks of Fig. 7, placing a thin sheet of felt across beneath the keys to deaden the sound of the key fronts when a key is depressed.

Return Springs

The keys should now all be resting with the fronts down and should have a movement of only about ⅛in. to 3/16in. If there is more than this, it may be taken up by putting a thicker piece of felt or rubber under the fronts of the keys but the final adjustment may be left until the instrument is tested and there may be some personal preference in the final design. Now place a strip of thin wood, cardboard or other material under the key fronts to bring them all truly

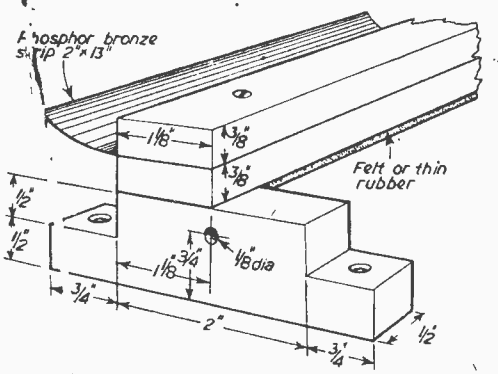
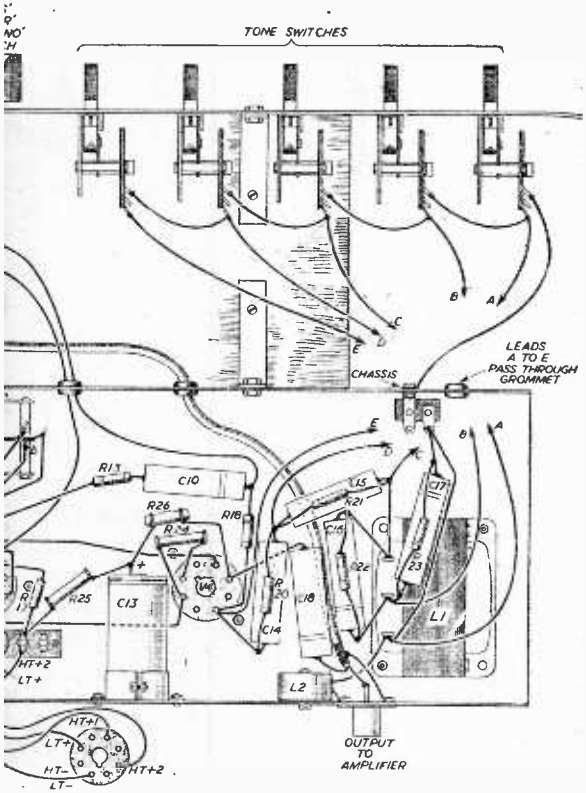


Fig. 7.—The keys are mounted on a steel rod supported on the shaped piece shown here.

horizontal and with a fine drill make the holes ⅛in. from the ends of the keys, taking the drill right down through the baseboard. Across the tops of the holes on the keys place the edge of a ⅛in. screwdriver and press it into the wood to make a fairly well-marked depression and then take a crochet hook or similar implement and pass this up from under the baseboard through the key and hook the rubber band under the hook, drawing it back carefully. When the end of the band is nearly down to the key slip a short brass brad or length of brass wire through the band and then draw the latter down so that the wire is embedded in the depression in the key. Pull the hook out through the baseboard and pass one end of a long, stout wire through it, continuing to the next key and so on. The wire and the ends of the rubber bands may be seen in the photograph in the centre of this page



control panel. See also Fig. 9 on next page.

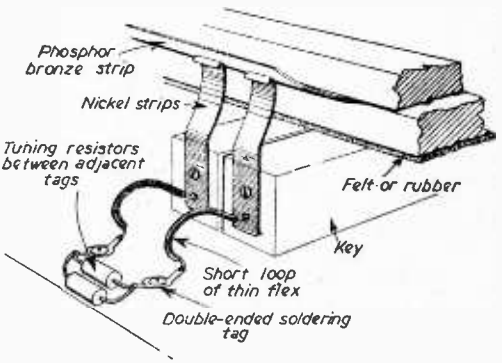


Fig. 8.—Key contact details.

and it will be found that this arrangement will give a very good action to the keyboard, the keys being easily depressed and the small movement permitting rapid "nail glissandos" to be easily accomplished.

Key Contacts

Contacts have now to be attached to the ends of each key and they are shown in Fig. 8. Again, ex-Service pieces were utilised and were also obtained from Smith's Radio. They can, however, easily be made from stout brass if necessary, but should have the tops

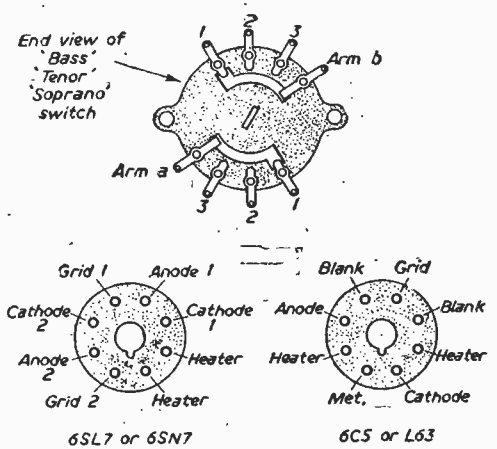


Fig. 10.—Details of octave switch and valve pins.

turned to provide a rubbing action on the phosphor bronze strip and thus avoid bad contacts. The lower corners of the strips are nipped over so that when the fixing screw is tightened the points dig into the end of the key and prevent rotation. Two-inch lengths of thin covered flex are soldered to each contact before attaching to the keys, and before fitting the screws they should be placed in position and held whilst the key is operated to make certain that they make contact the moment the key moves. The springiness of the phosphor bronze will act further as a return spring and the result should be a rapid-action keyboard with very little noise and good, clean contact. This is really the only difficult part of the construction.

Electrical Work

To complete the keyboard, which was shown on page 411 of last month's issue, 24 double-ended soldering tags should be screwed to the baseboard about 1in. beyond the key ends, bending up the ends for subsequent connection. Again refer to Fig. 8. Solder the short lengths of flex from each key to its appropriate tag, screw another double-ended tag to the left-hand block (looking at the keys from the rear) and solder a 12in. length of flex to the right-hand edge of the phosphor bronze strip and the keyboard is ready for the resistors, which are wired on as shown in Fig. 11. These cannot be fitted until the amplifier and main sections are constructed so that is the next part of the work.

Main Chassis

The main chassis is cut out and drilled as shown in Fig. 3, and should be made from stout aluminium. In addition to the holes shown, further holes will be required in the front to accommodate bolts holding brackets, their spacing and position depending upon the brackets used. They may be purchased or simply bent up from brass strip. They may be seen in the photograph on the centre pages, and two similar brackets are mounted on the underside of the keyboard to hold the front panel as shown. The reason for using two brackets is so as to isolate the front metal panel and prevent it from being in metallic contact with the main chassis which, it will be remembered, is "live" to one side of the mains unless a separate mains transformer is used. In the latter case a single "U" of brass strip may be used to attach the keyboard to the chassis and panel.

Wiring

Full wiring details are given in Fig. 6. Note that a screened lead should be used between the volume control and output socket. No other screened leads are necessary and Fig. 10 shows separately the wiring to the octave switch. The power cable to the main plug should be about 2ft. 6in. in length to reach comfortably to the power pack in the cabinet bottom. For convenience it is preferable to use multi-coloured flex or insulated sleeving for the leads lettered A, B, C, etc., as this will facilitate connections to the tone switches.

Control Panel

A piece of stout aluminium or brass is required for the control panel and is cut as shown in Fig. 4. In the original plain aluminium was used and left in its natural state, but brass could be used and afterwards painted or cellulosed either to match the cabinet finish or in a contrasting colour. Again, on this strip bracket fixing holes will have to be drilled as required, and the three holes on the projecting upper portion are used to attach the top of the panel to the edge of the keyboard.

(To be continued)

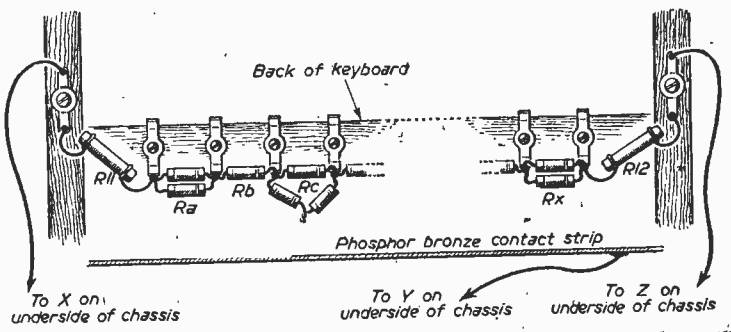


Fig. 11.—How the resistors are wired to the contacts. Details of the values will be given next month. See also Fig. 6.

"SAFE" UNIVERSAL CIRCUITS

USEFUL HINTS FOR BUILDERS OF A.C./D.C. RECEIVERS

By F. G. Rayer

THE A.C./D.C. type of receiver and amplifier is quite popular, especially in the smaller types, because no mains transformer is required, with a consequent reduction in both cost and size. Such circuits have been described in these pages upon many occasions and a large number of such receivers are undoubtedly in use. The ordinary A.C./D.C. circuit has one great disadvantage—the H.T. negative line (and therefore the chassis and all parts bolted to it, including tuning dials, etc.) is common to one mains supply lead. Furthermore, the chassis cannot be earthed, since this would earth one mains supply point, and some danger of shocks *does* exist, as a result.

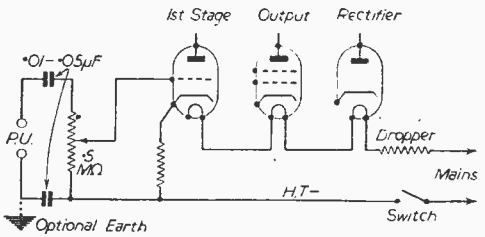


Fig. 1.—Addition of condensers to isolate pick-up.

A severe shock can be received if the user is standing upon a concrete or other conductive floor, especially if some metal tool already in the hand is brought into contact with the chassis or other metal part, possibly for adjustment purposes. Slight shocks may be experienced by touching grub-screws which are insufficiently recessed, or by touching a tuning dial escutcheon, if the latter is of metal and the circuit to the chassis completed by fixing bolts, etc. When using a microphone or pick-up, possible causes of trouble are increased. With some types of pick-up, shocks can be felt when changing the needle. With microphones, again, the leads, or other parts, may be alive.

When the user is upon a dry wooden floor, or other insulating medium, no shocks whatever may be experienced. Nevertheless, the feeling does exist that extra care needs to be taken with A.C./D.C. apparatus, and this is certainly so. Many things can be done to render such equipment more safe—indeed, *all* danger of serious shocks can be removed. Before setting these out, it should be noted that the type of shock referred to is that peculiar to such A.C./D.C. apparatus; namely, when the circuit is completed *via* the operator to earth.

Mains Polarity

One mains supply point, marked "N" (Neutral) is usually at fairly low potential in relation to earth, and this lead should be the one which is taken to the chassis. There is then less likelihood of the chassis being "live." However, tests with a meter will often show that this point has a potential above earth. In addition, the type of switching shown in Fig. 1 is usual. Here, the switch is included between mains and chassis. When the receiver or amplifier is switched off the circuit to the *second* mains supply lead is still complete, *via* valve heaters and dropper. As a result, the voltage between chassis and earth may increase when the set is "off" and the danger of shocks still exists.

This danger in handling A.C./D.C. equipment can be overcome by using a double-pole mains switch, thereby completely isolating the receiver from the mains when the switch is in the off position. By using such a switch, and taking the low-potential main to chassis line, maximum safety is obtained for this type of circuit. A non-reversible type of power plug is desirable.

Isolating Input Points

Fig. 1 also shows how mains potentials may be kept from the pick-up. The value of the condensers is not critical, but values under .01 μF will cause an excessive reduction in bass reproduction. Both condensers should be of good quality, of 350 to 500 v. working. If a sound earth return is added no potential can arise between pick-up and earth.

If this arrangement is added to an existing receiver or amplifier it must be assured that a D.C. path is provided from valve grid to chassis. If the volume control is already built in the pick-up arm pillar, as with some models, this can be retained. A fixed resistor of about .5 megohm should then be wired in place of the .5 megohm volume control in Fig. 1.

This circuit can also be employed with microphone input points. The condensers may be wired in the receiver or amplifier itself, close against the input sockets.

A transformer may be used for a similar purpose. Fig. 2 shows this, the connections here being those for a carbon microphone, which is a popular type where maximum output is required and high quality

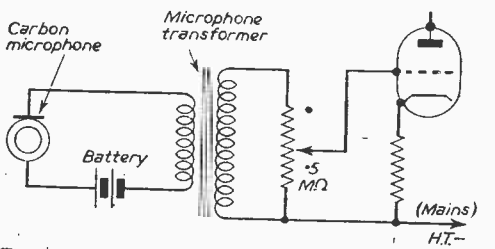


Fig. 2.—A circuit employing a matching transformer.

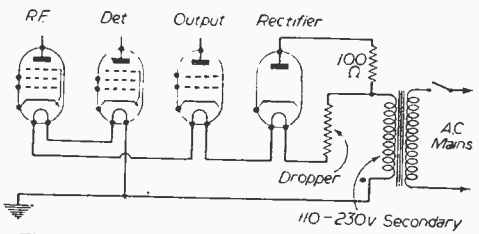


Fig. 3.—Modification for A.C. operation.

reproduction unnecessary. A step-up transformer of about 1 : 50 ratio is used, primary going to microphone and battery. The battery must be disconnected (or switched from the circuit) when the microphone is not in use. The same method can be used with moving-coil microphones, the battery being omitted.

If this system is used with the usual pick-up of moderately high impedance the transformer should have a ratio of about 1 : 1. It is also possible to use an intervalve coupling type of transformer, though a ratio exceeding 1 : 5 is undesirable. Quality of reproduction will depend upon the characteristics of the transformer. If a type of poor quality only is available, the circuit in Fig. 1 had best be retained for pick-up use.

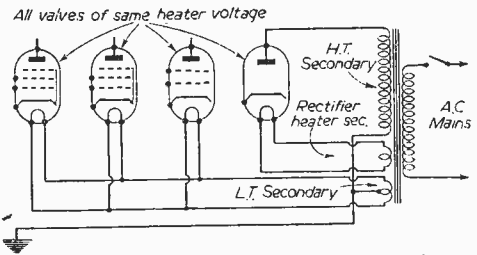


Fig. 4.—Heaters in parallel for A.C. operation.

Further Points

The above changes will go a long way to making A.C./D.C. equipment safe to handle. Such equipment should be enclosed in a bakelite or other insulated cabinet. Metal cabinets are most undesirable. Any tuning dial or similar parts on the *exterior* of the cabinet should be isolated from the receiver chassis. A condenser of about .1 to .5 μF should be wired in series with the "earth" socket, and one of about .0002 to .0005 μF in series with the "aerial" socket, inside the receiver. These components should be of good quality and 350 to 500 volts working, and will ensure that no mains potentials reach the aerial and earth lead-in connections.

If a separate speaker is used with an amplifier of this kind the speaker-matching transformer should be included on the amplifier chassis. The secondary leads to the speaker, with associated plugs, etc., will then be isolated from the mains. This also applies to extension speakers used with universal mains sets.

It should not be possible to touch any fixing-bush nuts, or other metal parts which are in contact with the chassis. If a toggle switch is used for on-off purposes, the fixing bush should not be in contact with the chassis, and such a switch may best be mounted on the insulated cabinet itself.

A.C. Conversions

Many A.C./D.C. receivers are used exclusively on A.C. mains. When this is so, the owner may consider changing to an A.C. type circuit, with its consequent advantages. The simplest modification is shown in Fig. 3, and no changes may be required in the receiver. Current is derived from a transformer and the receiver chassis may now be directly earthed, thus removing chances of shocks in this direction. The transformer will require to be of fairly large wattage, but such transformers are cheaply available from various ex-Service equipment stockists. Many A.C./D.C. receivers function well with a supply of about 110 volts, and transformers with a 110 volt secondary are particularly cheap. For a receiver employing a .3 amp. heater chain a 45-watt transformer will normally be amply large. If the voltage now supplied to the set is changed, the mains dropper resistor will require to be set to a value suitable for the new voltage. A receiver or amplifier operating from a 110 volts secondary in this way is particularly safe.

Fig. 4 shows a conversion which can be undertaken where it is known that D.C. operation will never be required. The valves used in the previous stages of the receiver will probably all have the same heater voltage, though this may not be so with the output and rectifier valves. Some of the valves most frequently found in early stages (in T.R.F. and superhet circuits and also amplifiers) are the 6K8, 6K7, 6Q7 and 6C5 range, all with 6.3 volt heaters. These can be wired in parallel and operated from a 6.3 volt secondary.

Such A.C./D.C. receivers frequently have a 43, 25A6, or similar output valve. This would require a 25 volt secondary. It is best to replace such a valve by one with a 6.3 volt heater; the 6V6 is a suitable type here. (With a 6V6, a bias resistor of 240 ohms will be required, as against the 440 used with the 43 and 25A6.)

The rectifier will probably be of the 25Y5 or 25Z4 type, and is conveniently replaced by a 5Z4 or similar valve, which has a 5 volt 2 amp. heater compared with the 25 volt .3 amp. heaters of the previous types. It is assumed that the half-wave rectification will be retained for simplicity. If so, and a rectifier with two anodes and cathodes (or two anodes and single cathode) is used, then the anodes (and cathodes, if present) may be wired in parallel. If full-wave rectification is to be used, the H.T. secondary will have a centre-tap, which becomes H.T. negative. Each rectifier anode is then wired to one end of the secondary. A 250 volt secondary will be ample for A.C./D.C. type circuits. The rating of the L.T. secondary feeding the previous valves can be found by adding together the total current consumption of the valves, plus any dial-lights which may be used, which have to be operated.

Circuits employing a mains transformer cannot be used with D.C. mains. The modification in Fig. 3, however, is particularly straightforward. The transformer might be situated outside the receiver, suitably housed, and removed when not required.

Setting Up a Tape-deck Amplifier

DETAILS OF WIRING AND ADJUSTMENT WITH SPECIAL REFERENCE TO THE AMPLIFIER DESCRIBED IN OUR AUGUST ISSUE

By C. J. White

AS many enthusiasts are now well aware, it is a big step between the completion of a tape deck and the satisfactory reproduction of the recorded material.

The chief difficulty is the lack of suitable test equipment, and here it might be well to point out that, in effect, the constructor is attempting to build a complete transmitting station, make his own "ether", put in all studio equalisation, and then supply his own receiver. And it is not surprising that many find it rather difficult. To those whose theoretical knowledge is slight, whilst sufficient to give them that urge to know more that all enthusiasts enjoy, I would say buy your tape deck complete with amplifiers ready to work. Failing this, purchase your tape deck and amplifiers as a kit of parts, keep exactly to the blueprint with absolutely no substitution, and on completion try to get extra technical help to aid you in setting up. To those of us, the great majority, who say to themselves "I'll do it even if it breaks me," the following notes have been compiled. They were made during the designing of the "Quality Tape Deck Amplifier," PRACTICAL WIRELESS, August, 1952, and more are due to the very many queries which have since been received.

Using Other Decks

First and foremost among these queries is: "Can I use your amplifiers and bias unit with X, Y or Z tape decks?" Unfortunately, there is no straight answer to this; certainly not one that will go on a postcard. For comparison there are given on the right the characteristics of some of the heads available to the constructor. As will be seen there are some marked differences; some designers prefer low-impedance playback heads and then use step-up transformers, others use high-impedance, the higher gain doing away with the necessity for a transformer. But even in this there is much to consider. Can the high-impedance head, with its higher self-capacity, its liability to higher hum level, compare in performance with the other type where the transformer can be placed out of the strong magnetic fields found in tape decks? Can the transformer be made so that there is less distortion, harmonic and frequency than using the high impedance head? Though the questions posed here are really outside the scope of this article, they do have to be borne in mind when attempting to transpose one designer's work on to another.

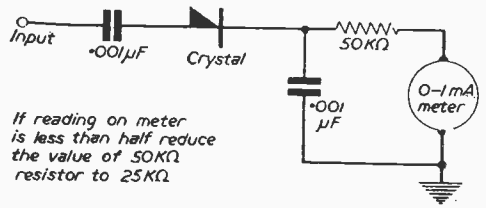


Fig. 1.—A simple voltmeter may be made up as shown here.

Recording Amplifier

Taking the recording amplifier with volume indicator first, it can be used complete, with any recording head, or the two parts, dividing up at the junction of C12, C13, R21, R22 can be used separately. Now the considerations in the design of this unit was to get the maximum amount of top lift without distortion because the design of the supersonic bias supply unit was such as to reduce the "tape" distortion to the very minimum, and in doing this the high-frequency response of the tape is reduced. Another most important reason for the high top-lift is that generally speaking the more top that can be got on to the tape the better is the signal/noise ratio. Putting the foregoing into practice, if the constructor uses the writer's quality recording amplifier and uses the quality playback amplifier or one with similar equalisation and then finds that the reproduction is very shrill or "all top" and accompanied by some distortion, then the chances are that the trouble is in the bias supply, in that insufficient supersonic bias is being fed to the tape. The trouble here is how to find out how it is working, its output and waveform, without the tools a designer thinks are so necessary.

WRIGHT AND WEAIRE	
Record/Playback Head	12 KΩ at 10.000 cps. plus 1 : 5 transformer on playback.
Erase Head	350Ω at 45 kc/s.
LANE	
Record/Playback Head	27 KΩ at 10,000 cps.
Erase Head	Not quoted.
QUALTAPE PRINCIPLE	
Record/Playback Head	15Ω Freq. not quoted.
Erase head	Not quoted.
BRADMATIC	
Record/Playback (6RP) (5RP)	26 KΩ at 10,000 cps.
Erase Head 5E	8 KΩ at 45 Kc/s.
DIAMOND	
Record/Playback (Studio)	High. Impedance not quoted.
Erase Head (Studio)	Low. Impedance not quoted.
BURGOYNE	
Record/Playback	1 K at 1,000 cps.
Erase Head	Not quoted.

Bias Supply (Fig. 2)

If it is decided to build the bias supply as shown, it is fairly certain that the waveform is as good as can be obtained from such a simple source. But here we are faced with the proposition " can it be used with a different tape deck ? " The answer again is " yes " —but. The but concerns C36, the bias transformer W. & W. type 579 and R53. In the W. & W. tape deck the erase head is of low impedance and so the transformer type 579 is a step-down transformer. If the alternative tape deck has a high impedance erase head then the transformer or coil used should be the one recommended for that head and it can be substituted for the transformer type 579 shown.

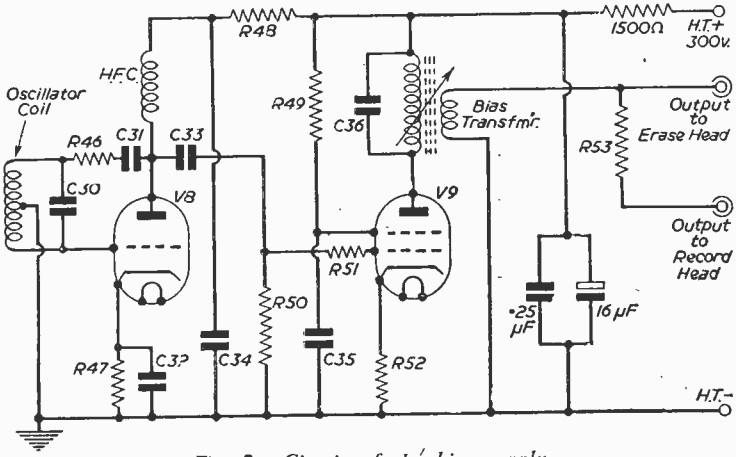


Fig. 2.—Circuit of the bias supply.

In order to tune the coil to maximum or, more essential still, to have some idea of what is going on to the tape a recommended piece of apparatus is a V.T. voltmeter. This may sound rather technical, but for our own purpose it need consist of no more than the 0-1mA meter we already have for the volume indicator, plus a B.T.H. or G.E.C. Germanium crystal price approximately 4s. If this is made up, as in Fig. 1, it will be found most useful, though, of course, a separate meter is a convenience. Connect the meter across the output of the coil, and tune the iron core to give maximum reading on the meter (the exact reading does not matter). If on tuning the iron core the meter does not go through a maximum, increase or decrease slightly the value of C36 until it does, then use some fixative to prevent the coil from moving.

If the constructor is setting up a different bias supply unit, one criteria he can use in estimating the waveform of the oscillator in the absence of an oscilloscope, is that the waveform is more close to a sine wave when the oscillator is only just oscillating. Applying that to the bias supply unit shown, increasing R46 or R47, or decreasing C31, would have the effect of decreasing the amplitude of oscillation (the constructor here is warned against the actual alteration of these components, they are only being used to illustrate the methods that can be used). If the amplitude of oscillation is reduced until it ceases altogether and then steps are taken such as to cause the oscillator to work with slightly above the minimum reading on the V.T. meter, then the constructor has done as much as he can to the oscillator proper to ensure good waveform. If, in addition, the following valve V9 is working within its capacity and a small amount of negative feedback is used (by not by-passing R52) a reliable high output, good waveform, bias supply unit can be made up.

One point here not properly shown on the original drawings was that it is essential to prevent semi-permanent magnetisation of the record/playback head when switching off the bias unit. This is done quite simply by ensuring that there is an 8 or 16 mfd. electrolytic condenser across the H.T. supply to the unit on the unit side of the H.T. switch in addition to the .25 mfd. condenser mentioned in the last line of the paragraph entitled " Economical H.T." Still using X.Y.Z. tape deck, the new bias transformer, and with the supply to the recording head as recommended by the makers, we have to supply sufficient bias current to erase, and the correct bias current for minimum distortion.

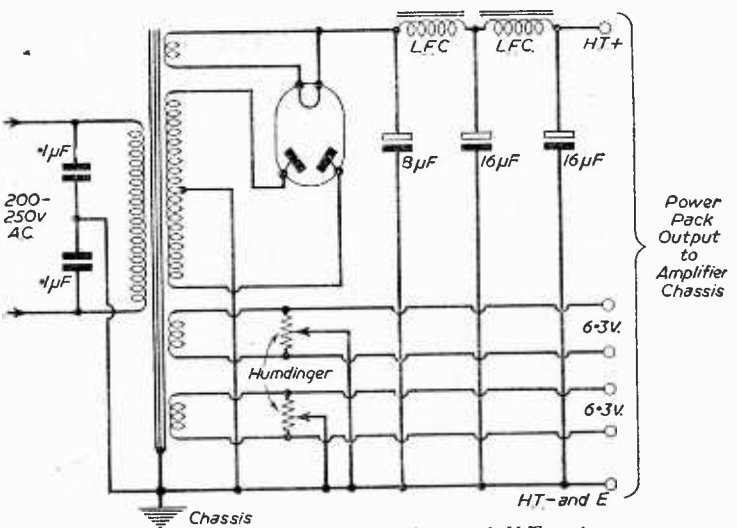


Fig. 3.—Circuit of a typical normal H.T. unit.

First, record some material at maximum modula-

(*Continued on page* 481)

(*Continued from page* 478)

tion on the meter and then erase. Check that it is really a complete erase. Then record the BBC tuning signal at maximum amplitude on the volume indicator making sure its amplitude does not vary. Remember that the Third programme tuning note goes out at a much more reasonable hour than the others ; better than that still, would be the purchase of a frequency test record, to make one's own test signal. Connect the V.T. meter across the bias supply to the record head, i.e., in the writer's supersonic bias supply unit connect at the terminals marked " output to record head " and earth. Play back at medium volume to ensure against overloading of the playback amplifier and check that there is not that well-defined " crack " or harshness of the note that indicates distortion. If distortion is evident, increase the bias to the head, noting the reading on the V.T. meter, by decreasing the feed resistor or equivalent in this case R53 (again the warning, this is to illustrate only, do not alter R53 if a W. & W. tape deck and the amplifiers shown are used). Then record the tuning note as before and check for distortion ; repeat until the note heard is satisfactory.

At this point the distortion is not at a minimum, but is where further reduction is not so noticeable, at least on a single note. The next step is to record a programme which is reliable, in that quality is consistently good and contains an assortment of instruments. One much used by the writer has been Stanley Black's half-hour programme, 12 to 12.30 on Friday lunchtime. Recording again, this time using 90 per cent. modulation indication on the volume indicator, and noting the bias volts. On playing back it will probably be found that the sibilants are overstressed and the top generally overpowering. If this is so again decrease the feed resistor noting the bias volts and continue again and again until entirely satisfied with the reproduction.

Those fortunate people who have access to oscilloscopes, R.C. oscillators, output meters and thermocouples, will know how much is involved in this slow, wearing down method, even assuming that both the recording and playback amplifiers with their associated heads are without fault, for with all this test equipment, the process is long and involved. Difficulties caused by lack of equipment can be overcome with consistent patience, but only at the cost of a great deal of time.

Playback Amplifier

It is here that most hum troubles occur. To get 23/26 D.B. gain at 50 cycles relative to 1,000 cycles without hum is a feat of some magnitude. As a general rule, as no bass lift is used in recording and as the tape is comparatively insensitive at this frequency, very little hum trouble occurs when recording, provided one uses normal amplifier practice, i.e., single-point earthing, short leads, good H.T. smoothing, humdingers on the heater supply and good layout. This practice also applies with even more force in regard to the playback amplifier where the slightest deviation from it shows up as a bad hum.

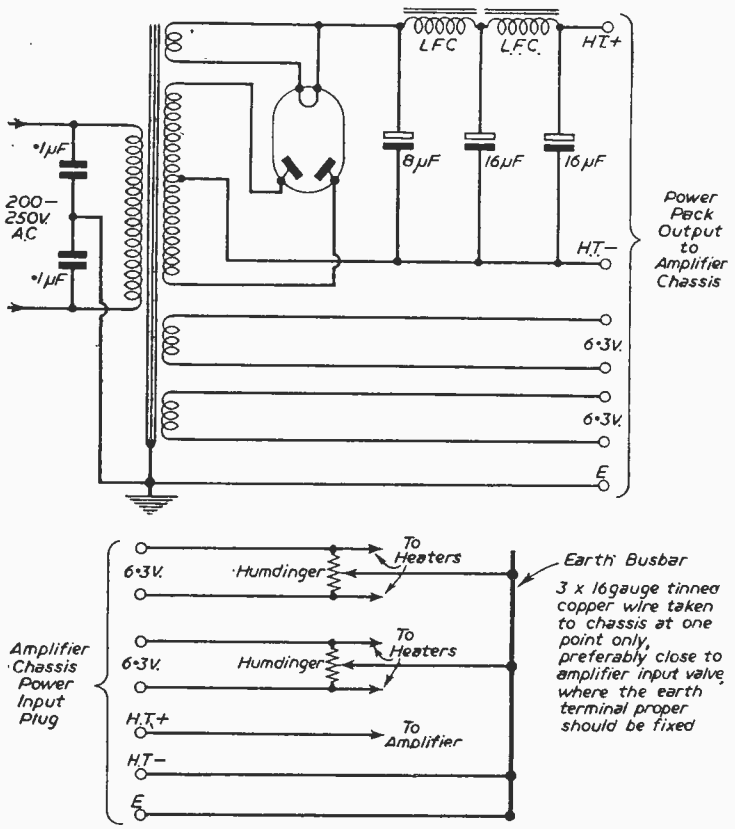


Fig. 4.—Recommended modification to a circuit of the type shown in Fig. 3.

There is no doubt that to use a separate power pack is the surest method to avoid hum caused by the fields of the mains transformer and chokes. It is the most difficult feat imaginable to orientate a mains transformer with the mains connected, for to be correct it has to be done in three planes ; it has to be done with the deck in the exact position it will take up relative to the power pack when completely assembled and it must be right for both record and playback. But a separate power pack does not *ipso facto* end all hum troubles and one very commonly forgotten requirement is that single-point earthing still applies. In the normal schematic of a power supply unit, see Fig. 4, it is very rare to see H.T.— separated from earth, yet this is just what

should be done to avoid earth currents circulating; and this is one of the most prolific causes of hum; hum left when every other precaution against it has been taken. Actually, if care is not taken, it can make matters worse, for if, in Fig. 5, H.T.— is by accident taken to chassis, the hum will quite probably be far worse than that obtained when the circuit of Fig. 4 is used for now we have a loop formed by H.T.— and earth, a sort of one turn inductance earthed at two different points and if any sensitive portion of the amplifier is earthed within those two points, the P.D. is then applied between grid and cathode, unless grid and cathode returns are rigorously tied to each other.

Another point which is commonly disregarded is that, with the tape deck motors within inches of the input valve V5, not only do the leads require screening but the physical size of the valve is of some importance. Valves with top cap grid which bring the grid very close indeed to the field of the motor and are screened by a metalised finish on the glass, may be insufficiently screened to prevent the valve itself being affected by the field even when proper screened leads and valve caps are used.

In the case of the writer's playback amplifier, if this is used with a different recording amplifier and bias supply, then two effects are likely, either together or separately. It may be that there seems to be insufficient top response, but apart from that the quality is good. This will mean that the bias supply is correct for minimum distortion but there is insufficient top lift in the recording amplifier. On the other hand if the top response is too much and distortion is evident then an increase in the bias volts will effect the double cure. When using the quality amplifier with alternative head, no very great difference should be heard provided that the alternative is correctly matched or loaded, or used with the correct transformer if low impedance, in other words, use it as advised by the makers.

It is hoped that these notes will help those who have already started on this most fascinating facet of radio and will encourage those others who have been holding off—being a little affrighted by its complexity and worried by the lack of proper testing equipment.

TRANSMITTING TOPICS

(*Continued from page* 454)

suitable for 80-metre fundamental operation are given. By doubling all the lengths, fundamental operation in the top band of 1.7 Mc/s. can be obtained, while by halving all the lengths, the lowest fundamental becomes the 40 metre (7.0 Mc/s. band). As shown by the cases considered earlier, aerial and feeder systems designed for a specific band can often be used on lower ones. The case of the 40-metre aerial with quarter-wave feeders, and the case of the 20-metre dipole with three-quarter-wave feeders is a case in point. Both these will operate with a fundamental of 80 metres in addition to 40- and 20-metre operation. The cases of interest, however, are where the top radiating portion is not a resonant length by itself. This provides the means of accommodating as much wire as possible in a restricted garden area.

A further point. As is well known, the usual resonant top aerial systems can often be accommodated in a restricted space by bending the ends downwards. That is by letting the excess lengths of wire hang vertically. By combining this feature with the fact that it is possible within limits to adjust the top length by making up for it in the length of feeder used, the maximum length of radiating wire can be squeezed into a very restricted length of garden (Fig. 2).

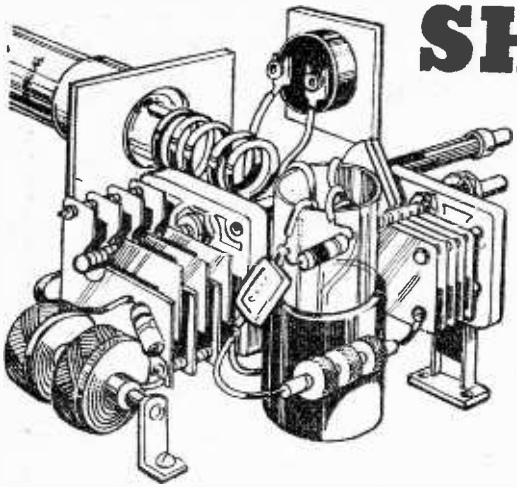
Another Type

Finally, in Table II is presented the case of a slightly more subtle aerial having an overall length less than the length for fundamental operation at 1.7 Mc/s., and greater than that for fundamental operation at 80 metres—if we include the length of feeders. This aerial can be loaded up efficiently on all bands from top band to 10 metres. Despite this "all-band" operation, it is only 100ft. long, and takes up less room than the conventional 80-metre dipole. Due to the unusual length involved, the tuning circuit requirements are not immediately obvious from first principles. Accordingly the type of tuned circuit for each band has been indicated in a separate table. Readers will notice also that in accordance with the recent release of the new 21 Mc/s. amateur band, tuning circuit requirements for this band have been included for the aerials discussed. The writer has had transmitting experience with these types of aerial, and in view of the advantages for operation in restricted spaces, has been an enthusiastic supporter of these types ever since. Certainly it is not immediately obvious that the familiar centre-fed 40-metre dipole is actually a perfectly good aerial for 80-metre operation. Having successfully used this feature, it was only a short step to approve the designs involving any convenient length of top that could be accommodated! They are confidently recommended to all who wish to secure efficient operation under difficulties of space for aerial erection. Certainly few city dwellers can accommodate a clear run of 132 feet!

Show Novelties

TWO interesting ideas seen at the Show were the self-priming accumulator and an electronic stencil cutter. The first (by Chloride) was based on the fact that in 1942, at the height of the German submarine campaign, batteries were urgently needed to operate wireless transmitters in ships' lifeboats of the Merchant Navy. Batteries that could give immediate service were essential. To meet the need the self-priming battery was produced—its plates dry-charged and sealed in a compartment separated by a thin diaphragm from another compartment containing acid. When the diaphragm is pierced, the battery is in a few minutes working at full strength, even after two years or more of inactivity.

The stencil cutter by Roneo enables stencils to be made in a few minutes from practically any original—photograph, line drawing, pulls from line or halftone, pencil sketches or water colours. The stencil is made direct from the original without any intermediate photographic work. When the machine is set in motion a photo-electric eye, traversing from side to side, scans the original and simultaneously an electric spark cuts a facsimile design on the stencil. The darker the subject, the more intense the spark. The process is, in principle, similar to the sending of photographs by wireless. The processed stencil is duplicated in the usual way.



SHORT-WAVE SECTION

THIS SYSTEM OFFERS SEVERAL ADVANTAGES IN LOCATIONS WHERE LACK OF SPACE RULES OUT TEXT BOOK AND OTHER RECOMMENDED TYPES

By A. W. Mann

IN the writer's opinion the ideal location from the short-wave listeners point of view, would be one situated within a moorland parish, high above sea level and open to the winds, with sufficient space to erect two stout 60ft. masts.

Recently we discovered an ideal location so situated, which brought to mind that portable short-wave receiver I intend to build if and when time permits. The fact that two miles away the tall masts of a radar station could be seen tends to prove that there is something in the idea.

Pipe dreams aside, however, we are numbered among those who have no choice other than to erect our aerials within a very limited space. Our own assets, when aerial experiments are contemplated, are a 27ft. run, a 20ft. pole already supporting a vertical, a coil of stranded copper, insulated aerial wire and a few ideas.

Such limited space ruled out text book aerials, the procedure being to devise a reasonably long wire aerial for erection within the space available.

While the aerial is intended in the main for use in conjunction with an R1155A, it is a mistake simply to couple it to a receiver of this type or for that matter any communications superheterodyne, and because well-known short-wave broadcast transmissions are received at terrific volume on the loudspeaker regard the aerial used as a good one. Such receivers will provide very satisfactory results when coupled to an ex-service whip-type aerial.

The better way, in the author's opinion, is to check on the weak, and usually hard-to-get, transmissions with an eye to possible improvement in sensitivity and signal-to-noise ratio, after which the more consistent transmissions can be checked.

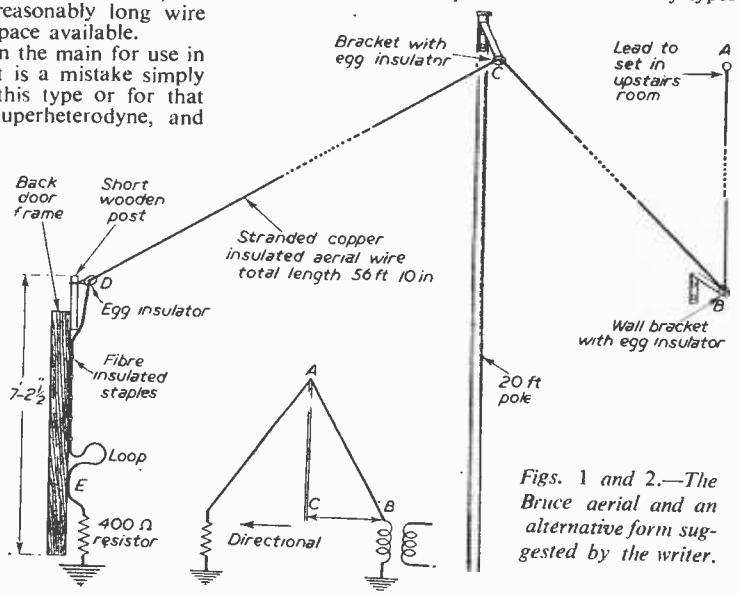
The most suitable receivers to use in checking such important features are those of the TRF and O-V-Pen types. With those types which are considerably less sensitive when compared with communications receivers such improvements are more clearly defined.

Overseas Listeners

Overseas listeners in pre-war years, with less efficient receivers and dependent on lower-powered transmissions than those of today, were far more aerial conscious than were listeners at home in this country. Their object in listening was not DX, but to keep in touch with home and world affairs. A different type of aerial which it was considered might further improve the results obtained on the most consistent and reliable frequency available to them was regarded as worth trying.

The writer can claim first-hand experience of the problems met and to be solved in this respect, and in a considerable number of instances of providing in a practical manner a satisfactory solution in India, Africa, Ceylon, the West Indies and several other distant places.

About this time overseas radio publications used to receive and answer queries relative to many types



Figs. 1 and 2.—The Bruce aerial and an alternative form suggested by the writer.

of aerial, one in particular being the Bruce. Fig. 1 shows the Bruce aerial in theoretical form. Here we have inverted V aerial of the long-wire type coupled to the receiver at B, while the opposite end is terminated by a resistor of 400 ohms, the opposite end of the resistor being earthed. According to the band for which this aerial was required, the dimensions had to be worked out and strictly adhered to in order to achieve the desired results.

The length A to B had to be one-half wavelength greater than that between B and C. This being the case, and the use of the terminating resistance of 400 ohms which made the aerial system aperiodic, marked directional properties in the direction shown in the sketch were claimed.

While the Bruce aerial was used in large numbers its use was not universal, because of the fact that a high mast and a fair amount of space was required. So far as we also are concerned whatever the advantages of such aerials are we must rule them out because of space considerations.

A Limited Space Idea

Let us now pass to Fig. 2. This it should be understood is not a Bruce aerial, neither is it a modified one of a Bruce type. It is simply the best aerial of a reasonably long wire, end coupled type we could devise to fit the 27ft. run available.

Before going further I would remind readers that no two locations are alike, some having more space available than others. It is for this reason that specific measurements are not given. Some may have a suitable pole others may not.

In this article I am describing a rather unusual type of aerial. It remains for the reader to note the principle, and, while adhering to it, dimension it according to individual circumstances.

The total length of stranded copper insulated aerial wire used is 56ft. 10in. Where space allows, this I think could be increased to 75ft. with advantage so far as pick-up is concerned.

The total length of unbroken wire as quoted is from A to E. Now let us examine the general arrangement. At A we have the receiver aerial input terminal. From it one continuous length of insulated aerial wire passing through egg type insulators at B, C and D.

As shown at Fig. 2 it continues down the side of the doorpost to the top end of the 400 ohms resistor. The other end of the resistor is taken to earth via a short, soldered lead and a copper spike or other suitable and recognised earthing medium.

The resistor is clipped to the door post and wrapped with black insulation tape in the interests of weather protection.

Adjustment

It will be noted that the terminating section of the wire is fastened to the doorpost with fibre insulated staples. This may appear to be a retrograde step so far as damping is concerned. Suitable wooden blocks, however, are to be fitted, but at present it is desired to determine what effect changing weather conditions have relative to tautness and slackness.

In order to check this, apart from one staple, all are driven in so that the insulated wire is a sliding fit. The odd one is fairly tight and will hold the wire taut. Should the pole sway slightly in a high wind, the wire will slide through the staples, the 6in. loop shown in Fig. 2 allowing for this.

All that is necessary when slackness is noticed is to pull the wire back through the staples. In the same manner slackness due to stretching can also be rectified.

The brackets used by the writer and which were to hand are of mild steel. Wooden ones could be used, of course, but should be so dimensioned that the aerial is at least 1ft. from the wall, while the terminating section of the aerial could be stood off from wall or doorpost by means of 1in. thickness spacing blocks, if desired.

The pole utilised is fastened to the end wall of the outbuilding and due to this the sides CB and CD are run at different angles.

Another point to note is the uplead A to B. This is necessary in order to use the wide inverted V formation, and to provide extra length. When the receiver to be used is located in a downstairs room this lead is reversed and becomes the down lead.

Although it is my intention to use this aerial almost exclusively with the R1155A, it has, however, been tested with the R1116A, a six-valve battery superhet, an O-V-Pen and a six-valve mains type TRF.

During the few weeks it has been erected and tested I have been favourably impressed. I do not propose to comment at present as to any directive properties which it may possess, as long period tests and some modest but special apparatus will have to be built to determine that. In addition modifications may be carried out at a later date if thought desirable.

Signal to Noise

One noticeable feature when this aerial is used with an R1155A is an improvement in the signal-to-noise ratio, also a slight reduction in electrical QRM. Brief experiments in tuning the system have been carried out, but with the series tuner which was used it appears to peak the signal and at the same time slightly increase the background. This will be further investigated.

Duplicated

This type of aerial is at present being tried by a friend of the writer in somewhat slightly modified form and is used in conjunction with a high-class all-wave receiver. To date he is well satisfied with the results on all bands, including short, medium and long waves.

Where a suitable pole is not available, four metal brackets including one fastened to the chimney would enable this type of aerial to start at the earthy end, run parallel with the house wall on one side, continue over the roof and down the opposite wall to the lead in position.

In this case the clearance should be as great as possible and certainly not less than 1ft.

Should readers who try out an aerial of this type here and overseas care to let me know as to the results obtained, via P.W., the information will be appreciated.

Programme Pointers

By MAURICE REEVE

'Smoking'

RICHARD GORDON'S programme on smoking, produced by Nesta Pair, was good and interesting. Rather too non-controversial and perhaps lacking in humour, it nevertheless presented the facts and circumstances of this second worst of our habits in a calm and objective manner.

It is, perhaps, the saddest of the many paradoxes which go to make up the "British Way of Life" that, whilst knowing "the dollar problem" is our chief economic headache, we derive, with one hand, an enormous proportion of our national revenue, probably unprocurable any other way, by purchasing, at crippling exchange rates, for dollars, enormous quantities of this delectable and fragrant weed with the other. Unlike the French, we refuse to smoke what we grow ourselves or, as the Americans have done with coffee, turning themselves into a coffee-drinking rather than a tea-drinking nation for financial reasons. The abandonment of the use of Virginia tobacco in our pipes and cigarettes might completely solve the dollar problem overnight. But, wisely or unwisely, the programme didn't deal with this side of the question.

German Rearmament

Following this came Wynford Vaughan-Thomas' report on German rearmament, which vastly important and controversial subject he dealt with in a much more frank and fearless manner. Many types of people, German, were brought to the microphone and asked for their opinion. Both questions and answers seemed forthright and well worth listening to.

Rogues' Gallery

Of Rogues' Gallery, the new Naunton Wayne—Basil Radford series of Woolcot and Spencer activities, it is difficult to speak calmly. I thought the first one feeble in the extreme. Both humour and excitement seem on the lowest plane. A fair specimen of the former was one of the two characters—I forget which—asking the other where No. 264 was likely to be. To which the reply was "somewhere between 263 and 265 I should think!" Oh dear! I felt I had been allowed to sit up far too long past my bedtime.

Shakespeare

"Twelfth Night" was a good Shakespearian production, as suitable to blind radio as most. Joan Hart, as Viola, the messenger of love from the man who, as a woman, she loves herself, was charming as masculine page and love-sick maiden. Norman Shelley belched adequately stomatically as Sir Toby, whilst Leo McKern was as "yellow stockinged and cross gartered" as could well be imagined. Many others, including the adapter and producer, Peter Watts, contributed to our pleasure.

I suppose the greatest difficulty the producer of radio Shakespeare has to fill is the enormous void left by the absence of all the colour and pageantry of the scenery, costumes and characters. They actually are, of course, irreplaceable *in toto*. Apart from a few "effects" to convey suggestion and create the illusion of the absent elements, there is only the human voice to fill the bill. And it must be terrific, indeed, if it is going to complete a satisfactory production.

"The Gambler"

I liked Norman Ginsburg's play based on Dostoieffsky's novel "The Gambler" even better. I won't step in where angels feared to tread and try to condense the story; even the *Radio Times* fought shy of this for once. But the production powerfully compared the hazards taken at the tables at Monte Carlo, or somewhere, with those taken in real life. As few people seem to visit the casino without some system or other, however, foolish or naïve, there would seem to be less risks run there than in life itself where no vestige of system can ever be discerned.

Austin Trevor, Gill Balcon, Norman Shelley, Violet Gould and the joint adaptors for radio, the author and Donald McWhinnie, and producer E. J. King Bull, were the chief contributors.

"Letter from America"

Friday evening at 9.15 has long been devoted to an item for which most of us command the silence of others, and all of us, when we have to miss it, do so with regret. I refer, of course, to Alistair Cooke's "Letter from America." I have often wondered, seeing that he originally hailed from these shores, how Mr. Cooke cultivated such a charming and natural American accent. Most Englishmen enjoying long residence in the States either cultivate none at all—which sounds rather like Sam Goldwyn's "include me out"—such as Ronald Colman, Clive Brook or Charles Laughton, who would seem rather to emphasise their native culture than otherwise. Or, no names no pack drill, they annex unto themselves the strongest flavour of the stockyards or the Bowery.

But not so Mr. Cooke. Not only might he pose as the brother of William Powell or the late John Barrymore, but he has absolutely mastered the most idiomatic language in the world. Its idioms positively flow from his lips with the easy nonchalance of the native. He can report on the party conventions in Chicago or the hill-billies of Kentucky, the dreamy South of New Orleans or the aggressive mid-west of Kansas with equal flair and aplomb

OPEN TO DISCUSSION

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Tape Recording

SIR,—The article in the July issue, page 298, has been brought to my attention and as a result I should like to make the following comments.

In paragraph 1, the statement that "if the tape travels at a fast pace past the playback head it is possible to lose some of the effects of the lower frequencies," is incorrect. Clearly it is the higher frequencies which will suffer as the speed is raised.

In paragraph 2, the statement that "for quality reproduction, therefore, a slow speed is the first requirement" is quite obviously wrong. Over a wide speed range the higher speed will give higher quality.

In paragraph 3, the statement regarding the erase qualities of permanent magnets is misleading. Strong permanent magnets will completely erase any signal, but the erased tape must inevitably be left in a state of saturation, of either one polarity or the other. This will always result in a higher noise level on subsequent recording than when A.C. erasure at H.F. is used, a technique which leaves the tape not only completely erased but also completely de-magnetised.

At the end of the same paragraph, it is suggested that a piece of cellophane tape is placed across the head so as to separate the latter from the recording tape. Such a procedure cannot be contemplated seriously because of the excessive fall in signal level, particularly at the shorter wave-lengths, which would result. It is well established that the best results on recording and playback are obtained when the most intimate contact possible between head and tape is achieved.—H. G. M. SPRATT (Magnetic Tapes Division, Minnesota Mining and Manufacturing Co., Ltd.).

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

SIR,—As a consistent reader of your paper I am glad to see a further article on magnet recording, and that you intend to publish details of a recording amplifier.

I have been conducting experiments with a tape deck and home-built amplifier for the past nine months or more.

The deck—a Qualatape Recording Deck, which I have found performs very well after some adjustment of the tension springs to the motors.

This deck, using a low-impedance head, has the added advantage of recording directly off the low-impedance secondary winding of a domestic broadcast receiver o.p. transformer.

Using E.M.I. tape type 65, low coercivity grade, the quality of reproduction of radio programmes has proved on the whole pleasant to the ear. Whilst top up to 6,000 c/ps is reproduced, there is a slight deficiency of bass.

It has been found inadvisable to record with any bass lift on radio, or amplifier, and to compensate as much as possible for same on playback.

As much top as can be squeezed from your recording amplifier, improves realism, otherwise the reproduction becomes boxey.

My main difficulty was the bias oscillator.

Whilst this unit was simple to construct, I found, after many hours of experiment, that separate power supply and a separate chassis were necessary in order to remove the annoying interference created by the oscillator coil and components.

I enclosed the coil in an old microphone mu-metal can, but found that most of the interference, a loud hiss, was being picked up by the input stage of my recording amp., off the oscillator wiring.

Possibly had I enclosed the whole oscillator unit in a specially-designed screening box the interference would have been removed.

I would mention that the oscillator valve was a 6V6, and the coil as supplied by the manufacturers of the deck aforementioned.

Finally, I have omitted to mention recordings of speech—these are simple, and little correction to the recording amplifier was found necessary, providing a good moving coil, or crystal microphone is used. I employed a S.T. ball and biscuit instrument.

I hope my experiences will prove of interest.—J. SUNDERLAND, Jnr. (Hounsdown, Nr. Southampton).

Amateur v. Professional

SIR,—In this existence of ours we have persons who carry out a certain occupation with no thought of monetary gain and others who carry out that occupation for a living; the former are "amateurs" and the latter "professionals." The question of ability or knowledge is not connected with the definition of either terms and, for example, a professional "half-miler" might easily be out-run by an amateur who can shift his bones at a faster pace!

An article in the August issue mentions the word "amateur" six times in a disparaging manner, as if to suggest that a full-time occupation automatically brings more knowledge than the part-time hobby;

(*Continued on page* 493)

VALVES.—6J6, 6SN7GT, 6K8GT, 6V6GT, 5Y3GT, 6BW6, 6BE6, 6BA6, 12BE6, 12BA6, 9/6 ; 717A, ML6, 6SL7, VS70, VU508, 8/6 ; 6AM6 (EF91, 6F12), 6AT6, 6AC7, 6N7GT, PEN43, 1T4, 1U5, 3V4, 3A4, 8012, VT60, OC3 VR105, 7/6 ; 6AL5, EB91, ATP4, ARP12, VR136, 12SL7, 12J5, 12SH7, 12SC7, 12SG7, 6K7GT, RK72, JAN-CRP-72, 6/6 ; 1A5GT, VGT128, 1299A, 12H6, VT501, 1625, VR137, VR56, CV189, VR66, 9003, 5/- ; VR65, 7193, 3/6 ; VR92, 2/6 ; EF92, 10/- ; CV57, 15/- ; 7F8, 20/-.

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(*Continued from page* 490)

as a professional may hate his job and an amateur only participates in a hobby to which he has a leaning, such a suggestion is psychologically incorrect. The position as I see it is that there is nothing to stop anyone buying a shop and setting himself up as a radio repairman (or "electrical engineer"!) even though he may not know one end of a soldering-iron from the other, and until legislation is passed to force repairmen and the like to publicise their qualifications (as in any other profession) no radio "amateur" should be considered inferior to them.

What rather amused me in the article was the fact that most of the valves listed are those which an amateur would find in his trips round the "junk" shops and the professional would seldom come across!—K. G. HARVEY (N.13).

Correspondent Wanted

SIR,—I would like, through your excellent journal PRACTICAL WIRELESS, of which I am a regular reader, to get in touch with a boy of my own age (16) who is interested in the technique of radio and who would like to correspond with someone.

I have a fair knowledge of magnetism and radio and have built several sets. I am also studying to become a "Ham" with a full licence.—G. BETTS (19, Orchard Close, Ruislip).

Versatile High-gain Amplifier

SIR,—May I reply to the letter from Mr. C. E. Latsky in the June issue.

I am sorry that Mr. Latsky and his friends were unable to obtain satisfactory results using the values that I suggested for the SP41 stage. I regret that I cannot suggest some factor that Mr. Latsky has overlooked, since we are not told exactly under what conditions their tests were performed. It seems fairly clear that they did not build the complete amplifier as described.

The SP61 is, of course, apart from the heater voltage, identical with the SP41. The possible amplification of these types is, as I stated, very high, and is certainly much higher than that obtainable from triodes like the L63 or the 6J5. The amplifier described not only did, but does, give full output from a low-level moving-coil (Vitavox) microphone, connected through a matching transformer.

Mr. Latsky's theory about the AC2PEN is, as he suggests, fantastic. According to the maker's data, and as quoted in my article, an AC2PEN requires a voltage input of 3.2 volts R.M.S. for full loading, so that although this valve is efficient in the sense of giving a reasonable output for a comparatively small input swing (which is why it was chosen) it cannot be said to provide most of the voltage amplification.

For an SP41 stage as described, a screen by-pass capacitor of 0.25 μF is suitable; this is not essential and was not specified in the article. A 1K cathode resistor is satisfactory.—K. KEMSEY-BOURNE (Cheshire).

Accumulator Maintenance Panel

SIR,—With regard to Fig. 3 in the article by W. Nimmons, "An Accumulator Maintenance Panel," I would like to point out one fact. Surely a short-circuit in the accumulator would cause more current to flow, therefore giving a high reading on the ammeter. This being so, "short-circuit" should be written at the high end of the scale. "Open circuit" giving the opposite effect, that is, less current flowing, should then be placed at the lower end of the scale. —TOM TURNER (Driffield).

Recording the Violin

SIR,—Using a 1950 model commercial tape recorder portable, I have a problem concerning recording music, particularly the violin. This instrument, when recorded "off the air" through the radio input jack, is very good, but the minute I try to record a "live" solo by this instrument the results are indescribable. Speech and music in general are very good as recorded *from the studio*. After hundreds of attempts on E.M.I. tape, Scotch Boy, Sound Mirror and various paper and plastic tapes, I simply cannot get even passable results.

I am using a ball type crystal mike (as supplied with set) and have used it for these test recordings in the following manner:—

(1) In a large room, small room, furnished and unfurnished.
(2) In distances from 6in. to 10ft.
(3) I have had the mike high, low, shielded and on a stand.
(4) I have tried the violin muted, played by a first-class musician, still the playback was horrible.
(5) Thinking it was my machine, I tried another make, using a moving coil mike—still no good. Then we tried from the acoustic end. We damped the room, as a studio, and insulated the mike on felt pads, away from reflecting surfaces and the playback was literally awful.

I made inquiries from a firm that deals in tape recorder accessories and they informed me violin music *was* a difficult job to record, but no advice as to the solution. I have tried modulating over and under—and even gone to the extent of isolating the machine itself. It is a curious problem to us, that a violin solo "off the air" records perfectly and yet a live one does not—even a little bit decent.

There are about ten of us in this district interested in tape recording—and if any readers would like to get in touch with me I'll be glad to meet them to discuss problems arising among us. It is extremely disappointing to have a machine worth £60 to £80 that will not record a musical instrument.—L. C. PHILLIPPS (Manchester).

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