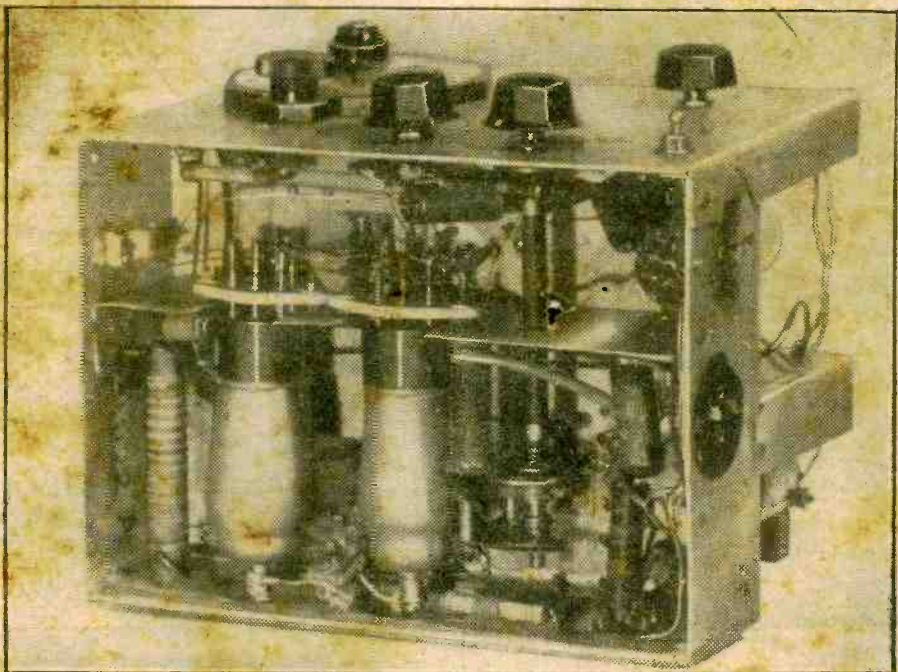
CATHODE FOLLOWER AMPLIFIER

Practical Wireless

9D EVERY MONTH

Vol. 23 No. 494 || Editor: F. J. CAMM || SEPTEMBER, 1947



A Short-wave Battery Three—See Page 358

PRINCIPAL CONTENTS

Practical Wireless
15th YEAR OF ISSUE
EVERY MONTH
VOL. XXIII. No. 494. SEPTEMBER, 1947.
and PRACTICAL TELEVISION
Editor F. J. CAMM

COMMENTS OF THE MONTH BY THE EDITOR

The Training of Electrical Engineers

THE Institution of Electrical Engineers has recently published a report recommending the further development of schemes of practical training for professional electrical engineers. This report has been prepared by a joint committee consisting of representatives of the British Electrical and Allied Manufacturers' Association, the Radio Industry Council, and the Institution of Electrical Engineers.

Two types of apprenticeship are recommended, graduate apprenticeship lasting two years, for those who obtain their technical education at the universities by means of full-time university courses, and student apprenticeships, lasting four years for those attending part-time courses at technical colleges.

Each type of apprenticeship is divided into three parts: basic mechanical training during which the apprentice obtains experience in the chief methods of manufacture, and comes into close contact with skilled craftsmen; basic electrical training designed to introduce the apprentice to the special problems connected with the manufacture and testing of a particular type of electrical equipment: and office training, which will give him insight into drawing office and planning department methods in preparation for an appointment as a junior engineer.

Operating organisations and other concerns which may be unable to provide all the phases of training recommended are advised to arrange for an exchange of apprentices with allied organisations.

The report also recommends that all apprentices who have not obtained qualifications equivalent to those required for election to the class of graduate of the Institution of Electrical Engineers should be released from the factory on one day in each week to enable them to attend part-time courses in electrical engineering at technical colleges, and satisfactory progress in those courses should be a condition for the continuance of the apprenticeship.

Those who obtain a Higher School Certificate in suitable subjects and intend to take a university course would be well advised to serve the first year of their apprenticeship before entry to the university, as this would help them to take greater advantage of the educational and cultural facilities afforded by the universities.

Those who have commenced a form of training as craftsmen or technicians and who show sufficient promise should be given an opportunity of transferring to student apprenticeships. Stress is laid upon the means of encouraging the apprentices to take part in and to organise social, athletic, and educational activities outside working hours.

An Apprenticeship Association should be formed, where this is practicable, and employers should encourage the technical colleges in their endeavours to develop a better co-operative life amongst the students.

A further recommendation is that the supervision of the apprentices should be undertaken by a special department concerned with all types of training, and that the individual responsible for the co-ordination of training should be a chartered electrical or mechanical engineer with direct access to the Executive Director concerned with long-term plans for the supervision of staff.

On the face of it the scheme seems sound. Every employer knows, however, that directly an apprentice attains a certain degree of efficiency he wants to leave and go somewhere else. An apprentice is always regarded as an apprentice in the firm from which he receives his training. Thus, the employer never gains any benefit from the training to which he has contributed so much. The scheme, therefore, is almost entirely for the benefit of the artisan and there are no safeguards for employers, except that when engaging a man who has been through the course there is some indication of his technical ability.

It is, of course, wise that industry should train its own personnel in the methods it adopts, and if it is generally adopted it may go far to get rid of the large numbers of quacks who operate as electrical and wireless engineers.

We think that all schemes to benefit workers should carry with them some safeguard for the employers. The latter are not in existence merely to make things easy for the new democracy.

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The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Wireless." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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.

ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended May 31st, 1947.

Region	*Number*
London Postal	2,019,000
Home Counties	1,421,000
Midland	1,538,000
North Eastern	1,655,000
North Western	1,427,000
South Western	920,000
Welsh and Border	614,000
Total England and Wales	9,594,000
Scotland	1,034,000
Northern Ireland	154,000
Grand Total	10,782,000

Visit to Mullard's

A THREE-DAY visit to the Mullard Wireless Service Co., Ltd., was paid by a group of officers of the Royal Corps of Signals recently.

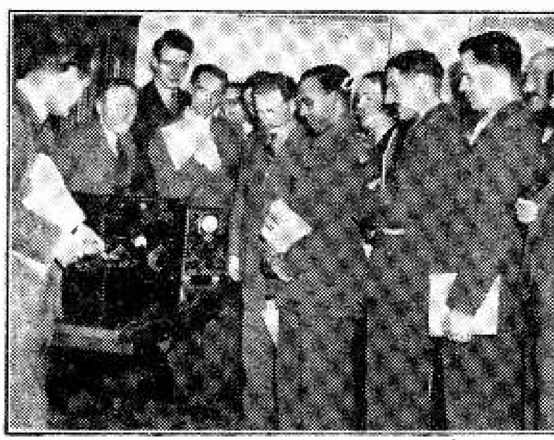
They came to get a first-hand knowledge of an industrial organisation, and visited the company's works at Mitcham, Wandsworth and Balham.

The illustration below shows Mr. H. Malleson (extreme left), head of the Government Valve Dept., explaining the working of a number of Mullard measuring instruments to an interested group.

Receivers for Malayan School Broadcast

TESTS have recently been carried out under the auspices of Radio Malaya, the Government-operated radio network for Singapore and the Malayan Union, in order that the organisation might be in a position to recommend receivers for use in schools. The broadcast coverage includes, incidentally, the surrounding islands and will, at a later date, also include Borneo. The sets were judged by a committee possessed of specialist knowledge of those requirements most essential for the purpose in hand. Appointed by Mr. Lloyd Williams, the Director of Education for Radio Malaya, this jury included the Musical Director and school inspectors, as well as Chinese, English and Indian schoolteachers.

After the final test (April 23rd, 1947) it was unanimously decided that the G.E.C. Overseas 7 receiver, BC.4672, was the most suitable and, in fact, this is the only receiver now being recommended by the broadcasting authorities. It is understood that further similar tests will be held from time to time.



Officers of the Royal Corps of Signals inspecting equipment at the Mullard works.

Freak Interference with B.B.C. Television from Danish Transmitter

A PERIOD of very unusual conditions in the upper atmosphere occurred recently, resulting in the reception over several hundred miles of transmission on the very short waves used for television and F.M. transmissions which normally have a range of perhaps 40 miles. During this period many B.B.C. television viewers experienced interference from a Danish transmission in Copenhagen, some 500 miles distant.

Such freak conditions occur only at long intervals and great importance is not attached to the recent experience. The effect was only noticeable to listeners at some distance from Alexandra Palace, in areas where the strength of the television transmission was low.

On the Radio Beam

ANOTHER step forward in 79 years of progress was recently taken when the Governor of Malta lifted a telephone receiver and talked to the Postmaster-General in London, 1,400 miles away, on the radio beam.

Malta was the second British colony to be provided with overseas telegraph connection. Three years after oceanic telegraphy had been proved practicable by the laying of a cable between Ireland and Newfoundland in 1866, Malta was connected with Italy; a year later, in 1870, cables were laid between Malta and Algeria, Gibraltar and Alexandria. Two years later the companies which had laid them were amalgamated with others as the Eastern Telegraph Company which, in 1929, joined the Empire's cable-wireless merger then known as Imperial and International Communications, Ltd., the name of which was changed in 1934 to Cable and Wireless, Ltd.

The Post Office in London and Malta will operate the new radiotelephone services, but Cable and Wireless, lineal descendant of the original Eastern Telegraph, will provide the circuit at Malta.

A "Mileage Millionaire" Radio Officer

RADIO OFFICER JOHN M. G. WILLIAMSON, of B.O.A.C., has recently completed 100 flights over the Atlantic, and during his 8,500 air hours has flown 1,250,000 miles.

Born in 1909 at Chingford, Essex, Mr. Williamson spent his early schooldays in South Africa. He completed his education at Daniel Stewart's College, Edinburgh, and the Caledonian Wireless College. His mother lives at Carlops, Peniequik, Midlothian.

R/O Williamson spent the early part of his career as a wireless operator at sea and travelled aboard ship six times round the world. He spent the winter of 1934-5 in the Antarctic as wireless operator aboard the Royal Research Ship *William Scoresby*.

In 1935 he became the first of the new Marconi Air Radio Officers and began a career in aviation during which he has flown over Europe, the Near East, India and the North Atlantic.

Among his most interesting appointments was when, in 1939-40 he was Air Radio Engineer to the Nizam of Hyderabad.

In 1940 he joined B.O.A.C. and took part in the early flying-boat journeys between the U.K. and North America. He was later posted for duty on the route which B.O.A.C. operate between Bermuda and Baltimore and at present lives in the latter city.

Guernsey F.M. Ambulance Network

THE resident population of Guernsey is about 45,000, and the island's ambulance service is provided entirely by the St. John Ambulance Brigade. In order to secure the greatest possible expedition in the handling of calls, the Corps Transport Officer experimented with the use of radio control for the ambulances, and the G.E.C. was asked to install a V.H.F. radio system. The frequency-modulated system now installed adds yet another to the G.E.C.'s long list of V.H.F. network installations, both A.M. and F.M., for police and similar public services at home as well as overseas.

In the Guernsey system the four ambulances have direct and continuous contact with the control station, and the service may be further extended in the near future as the addition of a sea-rescue launch for cliff accidents at points inaccessible from the land is contemplated.

Queen Mary 'Radiolympia' Patron

WE understand that H.M. Queen Mary has consented to be Patron of the 15th National Radio Exhibition ("Radiolympia"), and that she hopes to visit the Exhibition.

Listeners and Fidelity

TESTS were recently carried out by the R.C.A. with a view to ascertaining their preference for high-fidelity reproduction. As a result of these tests it was found that 75 per cent. of listeners between thirty and forty years of age preferred full frequency range; 59 per cent. between fourteen and twenty expressed an appreciation for the same range. It was stated that the latter group were probably influenced by listening to radio, "juke" boxes, gramophones, rather than "live" orchestras.

One of the G.E.C. experimental television mobile units used when trying out the London-Birmingham route. The unit differs considerably, of course, from the permanent automatic relay stations which are to be built in sites.

Transmitting Licences

WE understand that at the end of June the total number of amateur transmitting licences in force in Great Britain and Northern Ireland was just over 5,000.

More Traders to Visit Germany

THE Board of Trade have been informed that as the result of improved facilities in Germany it will be possible for an increased number of business men to visit the joint U.K./U.S. Zones of Germany to buy goods and services. In future all applications to visit the U.K./U.S. Zones of Germany should be sent to the German Division, Board of Trade, I.C. House, Millbank, London, S.W.1, giving full details of the proposed transaction and itinerary.

Firms are reminded that trading with Germany is subject to the normal import licensing and exchange control regulations. Business men who wish to sign contracts in Germany are therefore advised to make sure before departure that the necessary import licences will be forthcoming. A notice on the resumption of private trade with Germany, giving details of the procedure, appeared in the Board of Trade Journal for March 8th, 1947.

A Short-wave Battery Three

A Simple Receiver with Unusual Layout. By R. L. G.

WHILST the set about to be described is quite a conventional three-valve set, consisting of R.F. amplifier (tuned), followed by a screen grid detector, with throttle type reaction, followed by a transformer-coupled output pentode stage, there are several features incorporated which tend to give this set a performance superior to that obtained with a more stereotyped layout.

One of these main features, and it was, in fact, around this that the whole layout was designed, was the choice of the particular valves for the R.F. and detector positions. These two valves, VP2 and TH2, have anode and grid as their top cap connections respectively, whilst the same condition exists at their base ends, that is, grid of R.F. valve and anode of the TH2 or detector. It has, therefore, been possible to design round these valves in a kind of progressive "step-ladder" arrangement, and thus all leads carrying R.F. currents are very short indeed, a condition so essential when dealing with the higher frequencies.

If one follows in theory the path taken by the R.F. currents, we proceed as follows: At their entry from the dipole aerial, a few inches brings them to the coupling coil, where they pass to the R.F. amplifier via the grid coil. They then pass through V1 to the top cap (anode), across via C5 and C6 to grid of V2 (top cap grid), back through V2 to anode and throttle reaction. From here the rectified currents are amplified at audio frequency by means of the pentode valve V3.

In order to carry through this arrangement, it has been necessary to mount both V1 and V2 under the chassis, and to allow of the easy insertion and removal of these valves the back plywood panel has been arranged with suitable large holes.

The chassis has been made entirely of stout gauge aluminium, with the different stages carefully screened. Small copper rivets were used by the author, but these might preferably be of aluminium if obtainable, or small set screws might be substituted.

Fig. 1 shows the top of chassis layout whilst Fig. 3 shows the under chassis layout. It will be

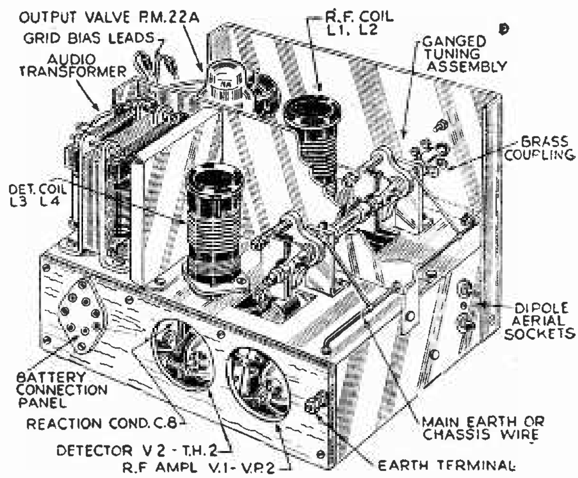


Fig. 1.—Pictorial view of the completed receiver. The photograph on the cover shows the under view of the set.

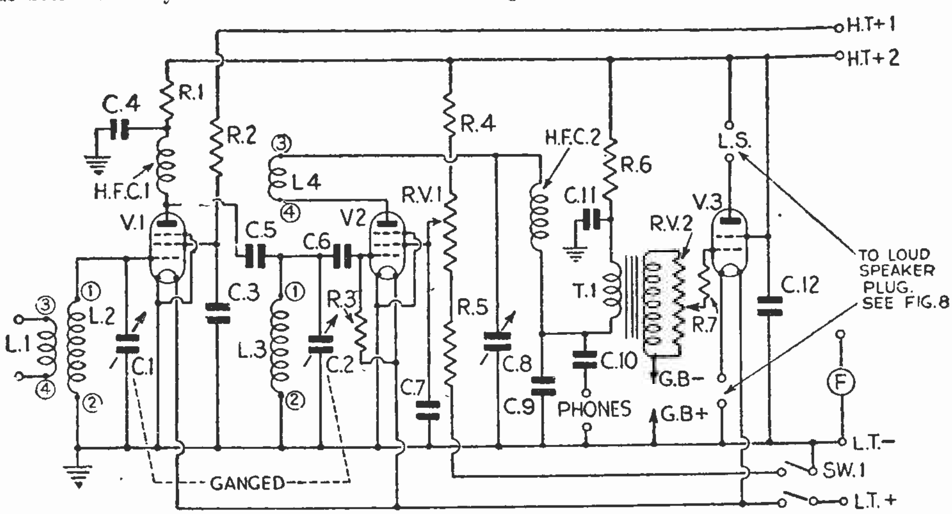


Fig. 2.—Circuit of the Short-wave Battery Three.

noted from Fig. 1 that very large clearance holes come directly under the tuning condensers of both R.F. and detector sections. This is to avoid any possible losses where the stout gauge connections from these tuning condensers pass through the chassis to the coil bases. Also, both the tuning condensers and the coils themselves have been positioned well clear from, and at similar distances from the chassis and screening panels. With such a careful layout quite an appreciable gain will be found possible from this R.F. stage.

The tuning condensers, which are, of course, S.W. low-loss type, having two fixed plates and one rotor plate, are ganged together by means of an extension spindle. This passes through a clearance hole in the central screen. A short brass coupling bush, together with a short length of ¼in. brass rod, serves to couple the ganged pair of condensers to the reduction gear dial. This latter is an old type of Ormond slow motion drive much in vogue some years ago. Other types of dial might be used, of course, or a similar epicyclic drive to that fitted for the reaction drive.

The condensers are mounted on the chassis by means of simply constructed aluminium brackets, and in actual fact the author used the same gauge metal as that used for chassis construction. However, these may be the commercial slotted type—the smallest size being chosen. The whole assembly must, of course, be very rigid, and the reader will do well to spend some time on the whole of this assembly making sure that perfect alignment is obtained and that the drive operates quite smoothly through the whole 180 degrees.

Circuit

The circuit diagram is given in Fig. 2. As has been previously stated this is a normal three-valve arrangement, consisting of a tuned R.F. stage with tuned-grid coupling to the detector stage. This stage is normal except that a TH2 (triode hexode) has been used with an adjusting voltage control for the screen. Although designed primarily as a frequency-changing valve for superheterodyne sets, this valve will be found to give a fine performance as a plain screened detector. The screen control, together with the throttle system of reaction adopted, gives perfect control of this stage, and exceedingly smooth reaction is obtained. The detector is followed by a transformer-coupled pentode output stage, and gives high gain at the sacrifice, perhaps, of some quality. A potentiometer, either 50,000 or 100,000 ohms, is included across the secondary of the audio transformer to act as volume control, RV2. R7 is a grid stopper. As the "bleeder" system has been adopted for the screen of the detector, the on-off switch includes a section to cut out this network when the set is switched off.

Fig. 1 shows a view of the top of the chassis as seen from the back, and in order to show the coils and tuning assembly clearly, the central screen has been shown cut away. The audio transformer, an R.I., is seen on the extreme left with its screening panel. The two holes for the primary connections to the underside of the chassis should be drilled before fixing the transformer. The pentode output valve can be seen also on the left (front), with the potentiometer volume control fixed to the panel just in front of it. The central tag, or moving arm, of this goes through the chassis, via the grid stopping resistance, to the grid of the pentode.

The grid-bias plugs are also seen at this end, and if a small 4½ volt bias battery is made up from three small cells, this will be found to go just nicely up against the screen. The normal 9 volt bias battery is a little too large to fit in comfortably, and if this is used, then suitable holes will have to be made in the cabinet, or the leads might be taken to the two unused sockets on the battery panel.

The R.F. and detector valves can just be seen through the large holes in the plywood back panel. The battery connecting panel is immediately to the left of these holes. A seven-pin chassis type valveholder has been used for this panel, although only five of the sockets are used.

The two sockets for the dipole aerial connection are seen on the right-hand side near to the front panel. This actually is a special Eddystone U.S.W. coil base, and has a central fixing hole. Large clearance holes have been drilled in the side of the chassis to give ample clearance for these two sockets. As these sockets, of course, project from the side, this should be taken into account when making a cabinet for the set.

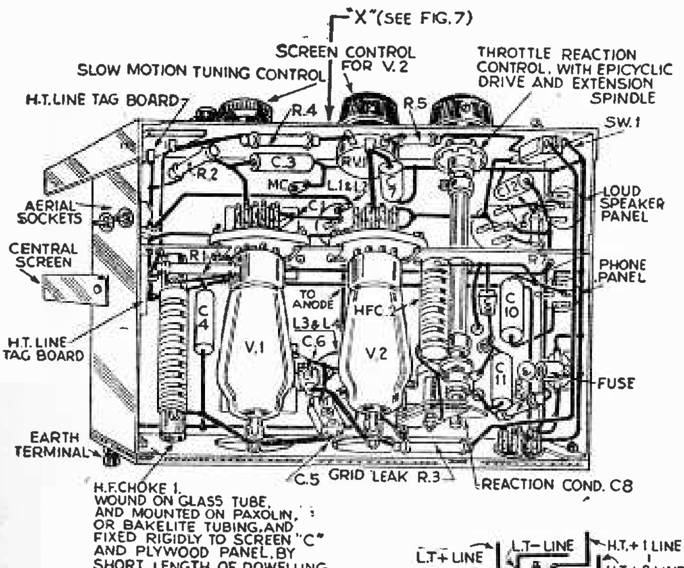
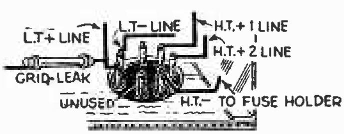


Fig. 3.—This illustration, in conjunction with Fig. 2, will assist in wiring the receiver.



PANEL FOR EXTERNAL BATTERY CONNECTIONS

It will be noticed (Fig. 1), that the detector coil holder is raised slightly above chassis level. This not only gives a little more clearance from the valve underneath, but also is a safeguard against any small particles of metal or dust lodging and causing leakage. This holder, as well as that for the R.F. coil, need be raised only about ⅛in. to ¼in. and small collars or nuts are quite suitable. It is preferable that the chassis type of valve-holder having a ceramic or frequentite base be used at least in the R.F. position. A normal low-loss type may be used for the detector position, and such has been fitted to the author's set. Some bases, by the way, have fixing holes opposite the filament legs, whilst other patterns have them opposite grid and anode legs. The dimensions for these fixing holes have, therefore, been omitted. Whatever pattern is used care should be taken to see that the correct connections go to the correct windings, particularly so, of course, as regards the reaction winding, as this carries the H.T. current.

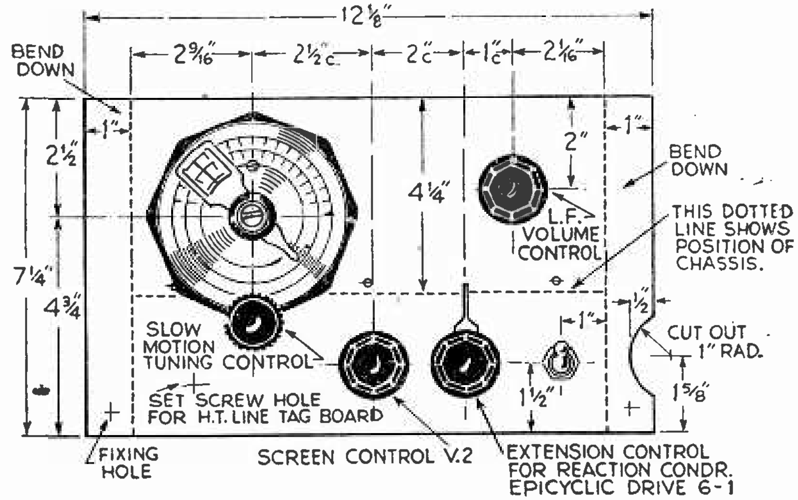


Fig. 5.—Drilling and layout details for the panel and controls.

The Wiring

The wiring and neat layout of components and valves under the chassis can be clearly seen in Fig. 3.

The extremely short and direct connections from the anode and grid caps of V1 and V2, respectively, can be studied in this view. The two small ceramic pre-set condensers, C5 and C6, come immediately between the two valves, and the throttle reaction condenser C8 is to the right of V2, close to the coil-holder legs.

As has been mentioned in regard to the main tuning assembly, care should be taken in assembling the reaction condenser with its extension drive and epicyclic drive. A large clearance hole may be necessary for the indicator of this drive, which on the pattern used by the author is fixed to a brass disc by means of two small grub screws. This disc has to pass through the panel for this purpose. The reaction condenser is a low-loss S.W. type also, of the same design as those for the tuning. All these three condensers have, in fact, been reduced in capacity by removing several plates, leaving only two fixed, with one rotor, as previously mentioned. The tuning will, however, be found to be quite sharp and quite a good range is covered by the coils.

It is important that the wire from the anode leg of V2 valveholder, which passes through a hole in screen "C," to the reaction coil connection, should be of stout gauge wire, and kept well clear of other wires and the metal of the chassis. This is not difficult, as ample room will be found for this. The wire referred to can just be seen, slightly to the left of V2 in Fig. 3.

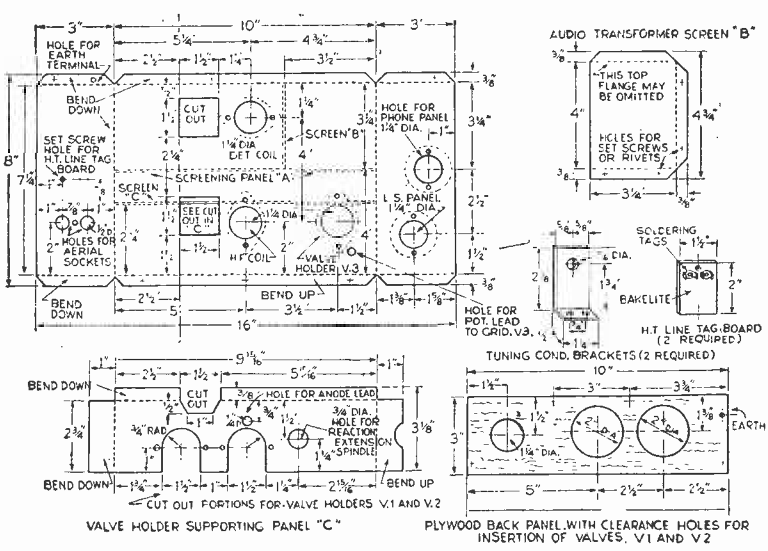


Fig. 4.—Cutting and drilling details for the chassis, screen, etc.

Actually, it has been shown slightly displaced, for illustrative purposes. In fact it comes directly under the valve.

Both the high-frequency chokes seen in this view are home-made. The choke for the R.F. stage is a 3in. long glass tube, ¾in. diameter and open at both ends. It is rigidly mounted between screen "C" and the plywood back panel by means of a length of bakelite or paxolin tubing, filed and sand-papered down to give a nice sliding fit for the glass tube. The winding is of 40 s.w.g. silk-covered wire, about 20 sections of 10/15 turns, each section being spaced about 1/16in., with the two ends soldered to short anchoring pieces of tinned copper wire, these latter being passed through holes in the paxolin tube and bent over inside.

The choke for throttle reaction purposes is similar but a shorter glass phial, 2in. long has been used, as this length just fits nicely between the reaction condenser and screen "C" to which it is attached by means of a small screw and a short length of dowelling. The cork of the phial could be utilised as an alternative.

The two main H.T.+ lines have been taken, from the battery panel, low down and parallel to screen "C." They are anchored to the first line tag board, and then both pass through clearance holes in panel "C" and are soldered to the two tags of the second tag board. This facilitates wiring quite a bit, and the several resistances and fixed by-pass condensers which go to H.T.+ are quite rigid. These two H.T.+ lines must, of course, be perfectly insulated from chassis, as also must the tags to which they are soldered.

The detector screen control resistance network R4, RV1 and R5 can be seen running parallel with the front panel. R4 goes to H.T.+2 line and to RV1. R5 also goes to the other side of RV1, whilst its other end goes to a section of the 4-point on-off switch. The other tag of this section of the switch goes to earth. This disconnects the screen resistance network, and prevents drain of the H.T. battery when the set is off. The other section of the on-off switch, of course, goes to the filament positive legs of the valveholders, and positive socket of the battery panel.

Chassis and Screening Panels

With the exception only of the back plywood panel, the entire chassis, together with the front panel, and sub-panels, have been constructed from stout gauge aluminium. On the gauge of the metal will depend certain allowances which have been given in dimensions for fitting, particularly as regards the front panel and the valveholder supporting screen "C" under the chassis. Therefore, it will be as well to measure, approximately, two thicknesses of the aluminium to be used, and check as to whether enough, or too much, allowance has been given, as gauges vary and one usually has to take what can be had in this material these days.

The author used small flat "pan" headed copper rivets in the chassis assembly, but aluminium ones would, of course, be preferable if obtainable, or the whole work could be done with small set-screws and nuts if preferred.

Full details and dimensions of the chassis and screens are given in Fig. 4.

It will be noted that in panel or screen "C," besides the cut-out portions for the valveholders, another smaller cut-out is arranged for just above and between them. This is where panel "C" crosses the large clearance hole in the chassis, and the section referred to is cut away, so that both the 1½in. square holes are quite clear.

(To be continued.)

LIST OF COMPONENTS.

C1, C2 and C8—25 μμF. short-wave tuning condensers. Ceramic insulation or equal.
L1, L2, L3, L4—Home wound on 8 ribbed formers 4 pin, 2¾in. long by 1⅜in. across ribs.
1 Slow motion tuning dial.
C3—Tubular fixed non-inductive condenser .1 μF.
C4—Tubular fixed non-inductive condenser .1 μF.
C5—100 μμF. pre-set fixed condenser, on frequentite base.
C6—50 μμF. pre-set fixed condenser on frequentite base.
C7—.25 μF. tubular condenser, paper type.
C9—.0001 μF. fixed type, mica.
C10—.25 μF. (minimum) tubular (blocking cond.).
C11—.1 μF. (decoupling).
C12—.1 μF. tubular.
R1—1,000 ohms (½ watt).
R2—1,500 ohms (½ watt).
R3—4/7 megohm grid leak.
R4—30,000 ohms (1 watt).
R5—20,000 ohms (1 watt).
R6—20,000 ohms (1 watt).
R7—5,000 ohms ¼ or ½ watt (grid stopper).
RV1—50,000 ohms potentiometer.
RV2—100,000 ohms potentiometer.
T1—Audio transformer 1-3 ratio. R.I.
One extension spindle control, Eddystone, 4in. long.
One extension spindle control, Eddystone, 2in. long.
One epicyclic drive—ratio 6 to 1.
Three adjustable type aluminium brackets, 2½in. max. height—*Can be home made.*
One brass coupling with 4 set screws.
Two 7-pin chassis mounting valveholders (ceramic or frequentite base).
One 7-pin chassis mounting valveholder, ordinary.
Two 4 or 5-pin valve holders (frequentite base).
One 5-pin ordinary base.
One 4-pin ordinary base.
Two small tag boards about 2in. x 1½in. having two soldering tags each.
Two glass tubes ¾in. diameter, 3in. and 2in. long respectively.
One fuse holder and fuse.
One U.S.W. coil base for aerial connections, Eddystone.
One four-point on-off switch (Bulgin).
VALVES
One Mullard VP2, 2 volt.
One Mullard TH2, 2 volt.
One Mullard PM22A, (or equal).
One 4-pin valve base for L.S. connection.
One H.T. battery 120 volt with tappings.
One grid-bias battery, 4½ or 9 volt.
One moving coil L.S. with matching transformer.
One reel 22 s.w.g. tinned copper wire for coils and wiring.
Slip-on sleeving.
One reel 26 or 28 s.w.g. enamelled wire.
Aluminium sheet, plywood, set screws, flex, battery wander plugs, etc.

"RADIOLYMPIA" 1947

The Following is a Provisional List of Exhibitors, as Received from the R.M.A. at the Time of Going to Press

A

Ace Radio, Ltd.
Acoustical Manufacturing Co., Ltd.
Aerodyne, Ltd.
Aerialite, Ltd.
Albion Elec. Stores
Allander Industries, Ltd.
Amplion (1932), Ltd.
Antiference, Ltd.
Ardente Acoustic Laboratories, Ltd.
Armstrong Manufacturing and Television Co., Ltd.
Associated Electronic Engineers, Ltd
Automatic Coil Winder and Electrical Equipment, Ltd.

B

Baird, J. L., Ltd.
Balcombe, A. J., Ltd.
Barclay Stuart (Plastics), Ltd.
Beethoven Electric Equipment, Ltd.
Bell, John and Croydon (Savory and Moore, Ltd.).
Belling and Lee, Ltd.
Ben Sless (Tools), Ltd.
Bernards Publishers, Ltd.
Bird, S. S. and Sons, Ltd.
Birmingham Sound Reproducers, Ltd.
British Centralab, Ltd.
British Insulated Callender Cables.
British Mechanical Productions, Ltd.
British Moulded Plastics, Ltd.
British Rola, Ltd.
British Thomson Houston Co., Ltd.
British Tungsram Radio Works, Ltd.
British Vacuum Cleaner and Engineering Co., Ltd.
Brown Brothers, Ltd.
Bulgin, A. F., and Co.
Burgoyne Eng. Co., Ltd.
Burndept, Ltd.
Bush Radio, Ltd.

C

Celestion, Ltd.
Champion Elec. Corporation, Ltd.
Cole, E. K., Ltd.
Collaro, Ltd.
Concordia Elec. Wire and Cable Co., Ltd.
Cossor, A. C., Ltd.
Cossor Radar, Ltd.
Coventry Factors, Ltd.
Crypton Equipment, Ltd.

D

Dallas, John E., and Sons.
Dawe Instruments, Ltd.
Decca Record Co., Ltd.
De La Rue Insulation, Ltd.
Dibben, Horace, Ltd.
Dubilier Condenser Co. (1925), Ltd.
Duratube and Wire, Ltd.
Dynaport Radio and Television, Ltd.
Dynatron Radio, Ltd.

E

Eastick, J. J., and Sons
Edison Swan Electric Co., Ltd.
Electrical and Radiological Instrument Co., Ltd.
Electrical Inst. Co. (Hillingdon), Ltd.
Electronic Manufacturers' Association.
Electrothermal Eng., Ltd.
E.M.I., Ltd.
Eric Resistor, Ltd.
Everett Edgcumbe and Co., Ltd.

F

Farnell, A.C., Ltd.
Felgate Radio, Ltd.
Ferguson Radio Corporation, Ltd.
Ferranti, Ltd.
Fidelity Radio.
Fitton, R. N., Ltd.
Franklin Elec. Co., Ltd.

G

Gamma Electronics, Ltd.
Garrard Engineering and Manufacturing Co., Ltd.
General Electric Co., Ltd.
General Electric Radio Co., Ltd.
Goldsman, J. L. (Dagole and Co., Ltd.).
Goodman's Industries, Ltd.
Gramophone Co., Ltd.
Grampian Reproducers, Ltd.

H

Hale Electric, Ltd.
Haynes Radio, Ltd.
Hobday Brothers, Ltd.
Hulton Press, Ltd.
Hunt, A. H., Ltd.

I

Imhof, Alfred, Ltd.
Invicta Radio, Ltd.

K

Kerry's, Ltd.
Kleergaze.
Kolster-Brandes, Ltd.

L

Lee Products (G.B.), Ltd.
L. E. S. Distributors, Ltd.
London Electrical Manufacturing Co., Ltd.
London and Provincial Factors, Ltd.
Long and Hambly, Ltd.
Lowther Manufacturing Co.
Lugton and Co., Ltd.

M

Marconiphone Co., Ltd.
Marconi Instruments, Ltd.
Marconi's Wireless Telegraph Co., Ltd.
Masteradio, Ltd.
McMichael Radio, Ltd.
McMurdo Inst. Co., Ltd.
Metropolitan Vickers Electric Co., Ltd.
Micramatic Electric Inst. Co., Ltd.
Mullard Radio Valve Co., Ltd.
Mullard Wireless Service Co.
Multicore Solders, Ltd.
Multitone Elec. Co., Ltd.
Murphy Radio, Ltd.
Music Trades Review.

N

New London Electron Works, Ltd.

O

Odhams Press, Ltd.
Ossicaide
Oage Engineering Co., Ltd.

P

Partridge Wilson and Co., Ltd.
Peerless Radio, Ltd.
Petter Radio and Electrical Supplies.
Peto Scott Elec. Inst., Ltd.
Philco Radio and Television Corp., Ltd.
Philips Lamps, Ltd.
Pilot Radio, Ltd.
Plessey Co., Ltd.
Portogram Radio Elec. Industries, Ltd.
Pye, Ltd.

Q

Q Max (Electronics), Ltd.
Qualrad Products, Ltd.

R

Radio Gramophone Development Co., Ltd.
Radio Instruments, Ltd.
Radiomobile, Ltd.
Radiospares, Ltd.
Radio and Television Retailers' Association
Radio Wholesalers' Federation.
Raimo Radio Products.
Regentone Products, Ltd.
Relay Services Association of Great Britain.
Reynolds Universal Manufacturing Co., Ltd.
Ripaults, Ltd.
R. M. Electric, Ltd.
Roberts Radio Co., Ltd.
Romac Radio Corp., Ltd.
R.S.C. Radio, Ltd.

S

Salford Elec. Inst., Ltd.
Scharf, Erwin.
Scott, George L., and Co.
Shannons and Bishop, Ltd.
Simon Sound Service.
Sinclair's Publications.
Sobell Industries, Ltd.
Standard Telephones and Cables, Ltd.
Static Condenser Co., Ltd.
Steatite and Porcelain Products, Ltd.
Sterling Cable Co., Ltd.
Stratton and Co., Ltd.

T

Tannoy Products.
Taylor Electrical Instruments, Ltd.
Telegraph Condenser Co., Ltd.
Telegraph Construction and Maintenance Co., Ltd.
Tenaplas, Ltd.
Trader Publishing Co.
Transradio, Ltd.
Trix Electrical Co.
Truvox Engineering Co., Ltd.
Truvox Manufacturing Co., Ltd.
Tucker, Geo. Eyelett Co., Ltd.

U

Ultra Electric, Ltd.
United Insulator Co., Ltd.

V

Varley Dry Accumulators, Ltd.
Vitavox, Ltd.
V.S.E. Construction Co., Ltd.

W

Webber, J. M., and Co.
Westinghouse Brake and Signal Co., Ltd.
Weymouth Radio Manufacturing Co., Ltd.
Wharfedale Wireless Works, Ltd.
Wingrove and Rogers, Ltd.
Winter Trading Co., Ltd.
Wright and Wearie, Ltd.

Electronics Section

The Electronics Section will include the following firms (already mentioned in the above alphabetical list):

Ardente Acoustic Laboratories, Ltd.
Birmingham Sound Reproducers, Ltd.
British Insulated Callendar Cables.
British Thomson Houston Co., Ltd.
Cossor Radar, Ltd.
Edison Swan Electric Co., Ltd.
Electrical and Radiological Instrument Co., Ltd.
E.M.L., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Marconi Instruments, Ltd.
Marconi's Wireless Telegraph Co., Ltd.
Metropolitan Vickers Electric Co., Ltd.
Mullard Wireless Service Co.
Murphy Radio, Ltd.
Ossicaide.
Philips Lamps, Ltd.
Pye, Ltd.
Q Max (Electronics), Ltd.
Static Condenser Co., Ltd.
Standard Telephones and Cables, Ltd.
Stratton and Co., Ltd.
Transradio, Ltd.

Non-commercial exhibitors will include the following:

British Broadcasting Corporation.
Board of Trade (Export).
Cable and Wireless.
General Post Office.
Ministry of Civil Aviation.
Ministry of Supply.
Scotland Yard.

A Remote Control System

For Switching Receiver and Speakers from Any Desired Room, with Full Range Control

By H. W. J. GUMBRELL

A REMOTE control system by means of which at the touch of a button, one of two permanently chosen stations or a third (previously tuned on a ganged condenser on the set) may be heard in the room desired and the correct loudspeaker switched in automatically is the subject of the following article. A circuit is drawn below which has given good results in the neighbourhood of Dartford, Kent, two pre-set condensers in each of the two tuned circuits being set to give the Home and Light programmes respectively, while normal tuning can be carried out at the central set to give a third alternative at two of the remote points, the Home and Light being available at a third point. The system is elastic and the ingenious reader can adapt it to his own ideas quite easily.

Modifying the Switches

The basis of the system is a four-bank switch of Yaxley type wafers, made to rotate continuously by means of a suitably geared small electric motor, being controlled by means of a bank of simply-made relays. Yaxley type wafers can be purchased quite cheaply and I have found it easy to adapt them for the job. If a reasonable amount of care be taken, the contact points can be taken out of one side of the wafer and then the centre portion can be removed and the small "omega" shaped contactors set in the positions required. Switches I and II, which select the tuning condensers, can be made from a single wafer of the double-pole type by putting four of the "omega" shaped contactors at right angles and arranging six contactor points in sets of three together diametrically opposite each other. Switch III, used for bringing in the desired loudspeaker, is adapted from a similar wafer. This time, however, four contact points are required at right-angles and three contactors close to each other. The mains switch must be such that at only one position must no contact be made, and economy in contact points is achieved by having two contactors five positions apart and five contact points set with one space between one and its neighbour. These arrangements are made clear in the diagrams. The fourth wafer, which controls the relays, is of the single-pole 12-way type. If, owing to the inertia of the motor, the switch tends to over-run the stopping points, it may be necessary to file

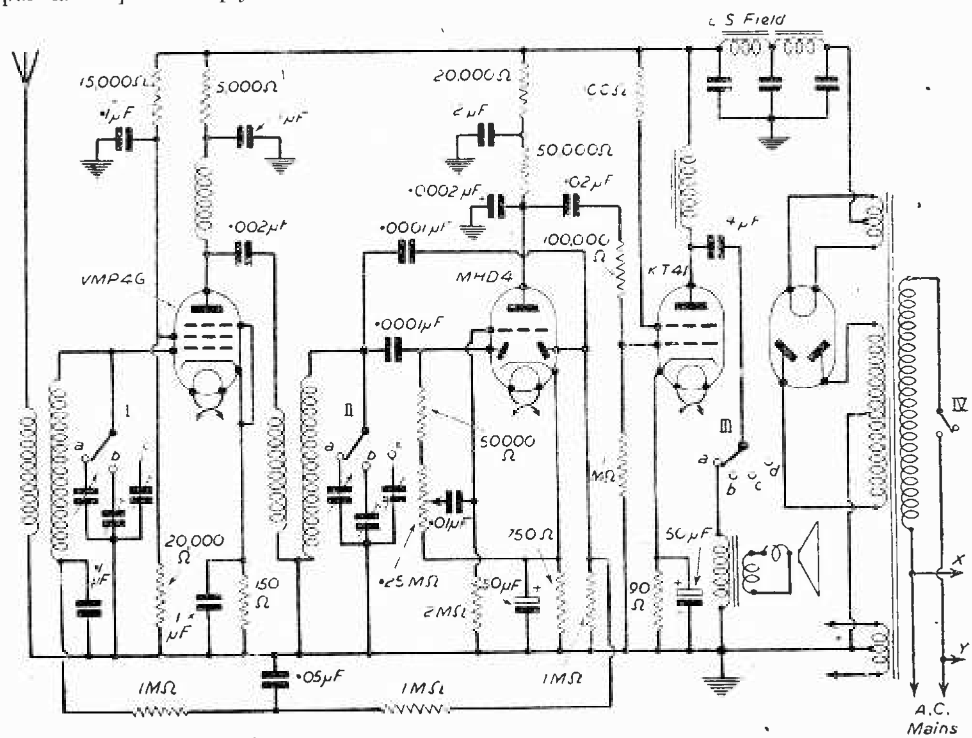


Fig. 1.—Circuit of the radio receiver, which follows more or less standard lines. The two points X and Y on the primary of the mains transformer are connected to similarly marked points on Fig. 2 opposite.

out the hole through which the driving spindle runs so that the other switches stop at the correct contact points. It is advisable to gear down the motor so that the switch rotates through 360 degs. in about 45 seconds. The "click stop" mechanism should be removed. The motor is powered by a 4-volt transformer, the primary of which is left connected to the mains. It takes very little current if the secondary is open-circuit.

The Relay Bank

For the relay bank take a piece of ebonite 5in. × 5in. × ⅜in. and drill a series of 13 holes just big enough for ¼in. bolts to be screwed tightly in (or tab if desired) in three lines of 5, 5 and 3, the lines being 1½in. apart and the holes 1in. apart. Screw on two pieces of wood 5in. × 1½in. × ¾in. between the lines, one piece 5in. × 1½in. × ½in. at one end and another 3in. × 1½in. × ½in. at the other. Now take a 2in. × ¼in. *iron* bolt threaded only half way up and roll fairly loosely round it a few inches of gummed paper 2in. wide, having first turned back 1in. of paper so that the gum does not come into contact with the bolt, sticking up the paper as you go. Cut two rings about ⅝in. diameter from a postcard and glue these on to the tube you have just made, 1¼in. apart, leaving about ½in. of tube at one end. At this end make two small holes in the ring to take the ends of wire. Replace the bolt and clamp with the projecting ½in. of tube into a wheel brace and wind about 150 turns of 28 s.w.g. enamelled copper wire on this former, bringing out a few inches of wire through the holes provided, for connection

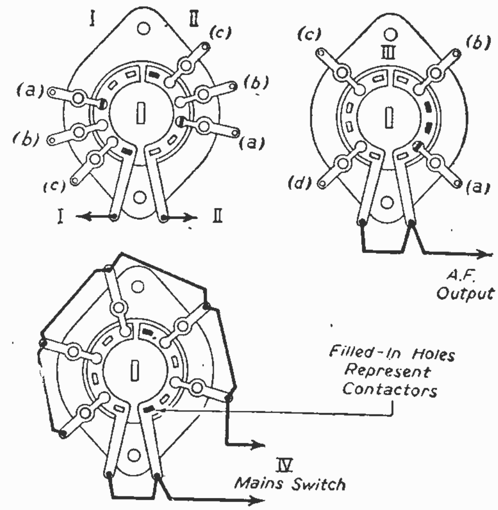


Fig. 3.—Connections of the switch wafers.

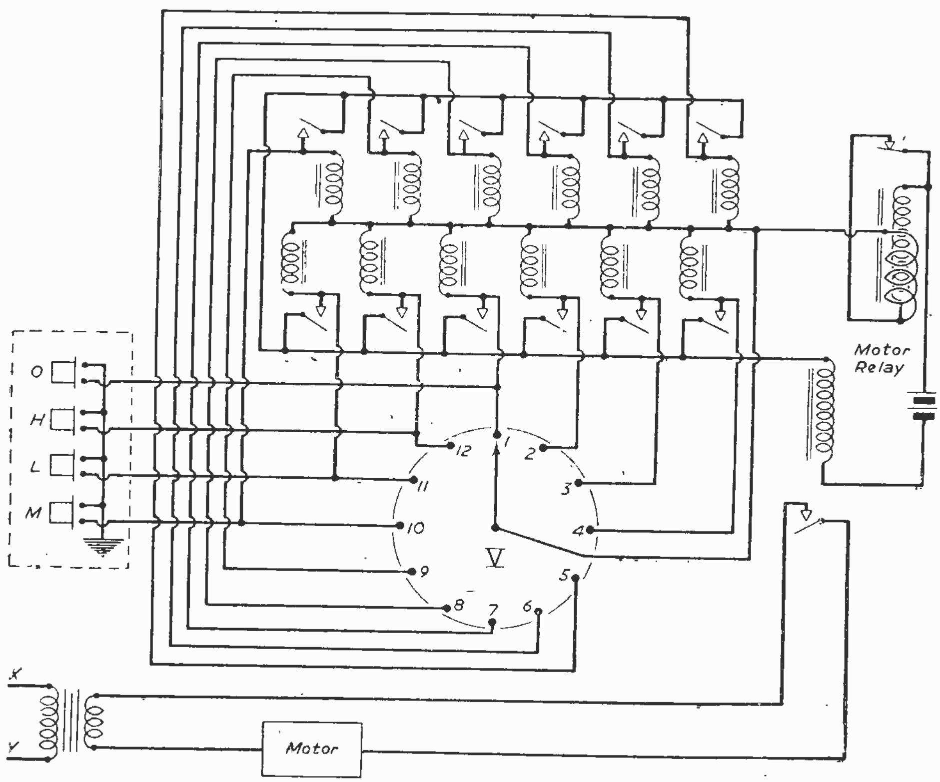


Fig. 2.—Circuit of the main switching mechanism. This is mains operated, and the input transformer at points X and Y is joined to the similarly marked points on Fig. 1 opposite.

purposes. Then trim up the tube close to the rings. Remove the bolt and saw it in half. Trim up both cut surfaces with a file and with a hot iron "tin" these ends and touch up again with the file. Cut a shallow slot to take a screwdriver in the tinned end of the lower half of the bolt and screw this into one of the 13 holes in the piece of ebonite. Place the solenoid you have just made over this half bolt, bringing the connections thereto out through another hole in the ebonite. Place an old razor blade (I found Gillette "thin" most suitable) over the solenoid, resting on the edges of the pieces of wood, and poke the top half of the bolt through the centre hole of the razor blade into the solenoid. The lower half should be adjusted with a screwdriver until the air gap between the two halves is about ⅛in. Panel pins through the other two holes in the razor blade into the wood will keep it in position. It is advisable to make small holes in the wood with a fretwork drill to avoid splitting it before inserting the pins.

One end of each solenoid, except that of the "motor relay," should be soldered to the lower end of the bolt and a lead taken to the rotary switch V; the other end goes via a common lead to the cut-out. A piece of thin coiled wire must be soldered to the top of the bolt and led through a common lead to one end of the motor relay, the other end of which goes to a 3-volt "cycle lamp" battery, the negative side of which is earthed. The contacts on the motor relay are used to operate the motor. Thirteen relays are required in all, and their construction is not so tedious as would appear. In practice, all the formers would be made, then the solenoids wound, then the plungers, and so on. The "cut-out" can be made from an old electric bell mechanism, 20 or so turns of 18 s.w.g. enamelled wire being wound round the existing coils which in turn are shorted out by the "make-break" of the bell arm. When the battery is shorted, as happens if a button is pressed when the set is already selected to that particular station and speaker, the arm of the relay is brought in by the low-resistance winding, contact is thereby broken and the relay held in by the high-resistance winding until the button is released, no damage to the battery resulting.

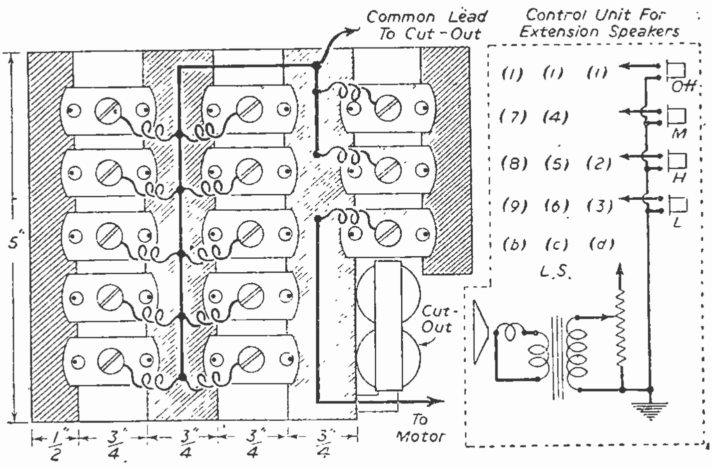


Fig. 5.—Details of assembly of the complete relay bank, and, on the right, the control unit wiring for the extension speakers.

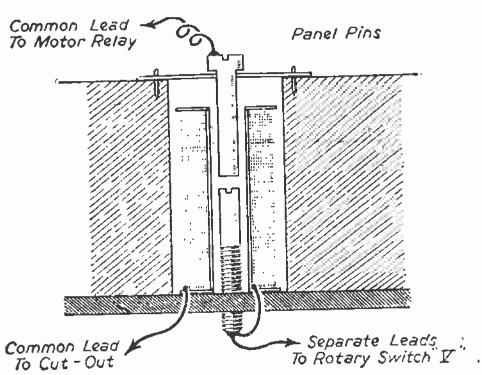


Fig. 4.—Details of the relay construction.

Operation

The operation of the system is as follows:

The diagrams show the switches at "off." If, for example, it is desired to select the Light programme in room (c), the appropriate button in that room is pressed. This will bring in No. 6 relay (connected to No. 6 on the rotary switch V) and the contact of the relay will be made. On the button being released, the negative return to the relay, instead of being completed through the button, now goes through the relay contact and via the solenoid of the motor relay. Thus relay No. 6 and the motor relay are in series, the contact on relay No. 6 is maintained and the motor relay comes in, starting up the motor. The rotary switch continues to revolve until it comes to position No. 6, when switch V shorts out No. 6 solenoid, which thus becomes de-energised. The "spring" of the razor blade opens the contact, thus cutting off supplies to the motor relay which in turn opens, stopping the motor. Meanwhile, the mains has been connected to the set by means of switch IV, switches I and II have selected the pre-sets (b), tuned to the Light programme, and switch III has selected the correct loudspeaker. None of the relays is now energised and the system is ready for the next selection.

ON YOUR WAVELENGTH

By THERMION

Definition of Crooning

AFTER all I have written against the reprehensible practice of crooning you can imagine my delight when I read the following definition in a new Dictionary of Music, by Eric Blom, recently published by Dent:

"A reprehensible form of singing that established itself in light entertainment music about the 1930s. It recommended itself at first to would-be singers without voices who were unable to acquire an adequate technique and later to a large public because anything, however inartistic, is likely to become popular if only it is done often enough by a large number of people. The principle of crooning is to use as little voice as possible and instead to make a sentimental appeal by prolonged moaning somewhere near the written notes, but preferably never actually on those notes. The smallest vocal equipment is sufficient for the purpose of crooning, one of its admirers' delusions being that it does not become wholly satisfactory until it is amplified by a microphone, a device capable of turning the squeak of a mouse into the howl of a factory siren."

The squeak of a mouse is good! Take the microphone away from crooners and no one will want to listen to them. I greatly deplore this modern tendency towards anything but music. I have even heard it said that the tap drum is a musical instrument and that enormous skill is required in order to tintinnabulate on this aboriginal and childish instrument.

It is even asserted that the tap drummer is the most important member of an orchestra. I have always regarded him as the most dispensable. In fact, most orchestras would be vastly improved if the tap drummer, who, when he is not tap drumming, clashes a few percussion instruments for good measure, were abolished.

As a humorous turn a dance band, I suppose, has its place. Fill the stage with a lot of highly polished instruments (bandsmen love a piece of brass to polish, rather like the gipsy who loves polishing the twisted brass pillars on a roundabout), have a few tired-eyed men in dinner jackets, put them under the charge of a man who cannot play an instrument and cannot read a note of music, call the band National Serenaders, or Al Nitwit and His Band, and success is assured among the howling, uneducated mob which constitutes the community of crooning fans. Malady makers please note!

I do not quite agree that crooning is "prolonged moaning somewhere near the written notes." It is prolonged moaning nowhere near the written notes. Also I do not think any vocal equipment is necessary at all, not even the smallest. However, now that a standard Musical Dictionary supports my views I consider that my campaign against crooning has had the desired effect. (Inspired correspondence will go to the salvage campaign.)

The Shinwell

YOU will by now have heard of the new electrical unit which this year will supersede the Watt, the Ampere, and the Coulomb. It is the Shinwell—the unit of negative electricity, and I understand upon reliable authority that we shall each be permitted a large number of these negative units this autumn. Large numbers of miners are working less and less for more and more so that there will be no shortage of Shinwells!

I have not yet experienced the result of heating a house by means of Shinwell, but I understand on equally reliable authority that the introduction of this new unit will be signalised by the B.B.C. in a series of broadcasts of creepy stories about ghosts and banshees, each calculated to make the flesh go goosey and to chill the spine.

This new electrical development shows what can be done when a responsible minister sticks his toes in and plants both feet firmly in the clouds!

I suppose we shall have reduced programmes to economise in electricity, and that members of the Coal Board will issue a large number of edicts making it an offence to light fires or to operate radio receivers after a certain time. If that does happen I think I shall take a well-deserved rest abroad, repose on the shores of some blue lagoon, and listen to the ululating waters, what time some native demoiselle demonstrates real crooning to me whilst she swishes her sarong. What a lovely peace!

Radiolympia

BY the time this issue is published we shall be on the eve of the opening of the first post-war Radiolympia.

At the moment of writing many firms have not yet disclosed their programmes and stand locations have not yet been finally settled. It is, as a fact, not yet decided where our own stand will be, if at all.

RADIOLYMPIA, 1947

Radiolympia! Once again
The good old "Show" returns.
And in our Brotherhood of Fans
Anticipation burns.
What shall we see? We cannot say;
We'll know that on the opening day.
But here a fact sticks out a mile—
Deny it no one can:
This show will prove,
As in the past,
Britain still leads the van!
We have the brains, we have the grit,
The craftsman's skill and art,
And if they're rightly fostered now
From us they won't depart
We've always led, we're leading now,
And still we mean to lead
In radio and in other things,
John Bull's victorious breed!
It's in our bones, it's in our blood,
When dead we won't lie down!
So Radiolympia—loud hurrahs!—
Once more returns to Town!

"TORCH."

Trade Notes

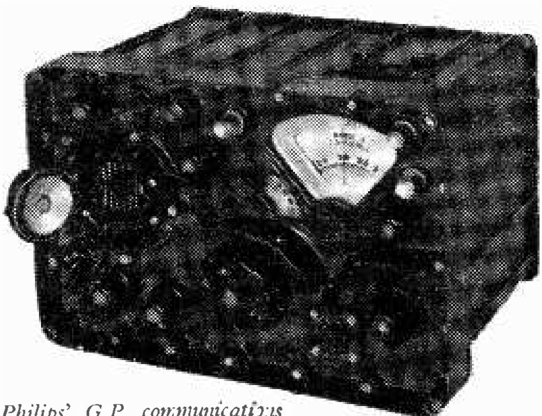
Ekco-Ensign Electric Ltd.

E. K. COLE, LTD., announce that as from April 1st, 1947, the whole of the activities of their lighting division, including Ensign Lamps, Ltd., were merged into one company, known as Ekco-Ensign Electric, Ltd. The company is a wholly owned subsidiary of E. K. Cole, Ltd.

The company, maintaining the two well-established trade names of Ekco and Ensign, manufactures tungsten filament lamps, fluorescent lamps, fittings, control gear, and other lighting equipment. Distribution will continue through the existing depots and sales organisation.

Philips' New General Purpose Communications Receiver Type F.O.509

DETAILS of a new general purpose receiver for communications work are released by Philips Transmission (Philips Lamps, Ltd.).



Philips' G.P. communications receiver in its water-tight cabinet.

The F.O.509 is suitable for the reception of A.M., F.M. or C.W. types of transmission, and is sturdily built to stand considerable rough usage without damage. It can be incorporated in a "man-pack" animal or vehicular station, and weighs just over 21lbs. Its sealed construction renders it waterproof and almost completely airtight, and for further protection a silica gel dessicator is inserted through the front panel, to absorb any moisture that may enter the set. The set will continue to operate even if totally immersed in water. A spare dessicator is provided, carried in a blind socket.

The F.O.509 is very simple to operate, and may be used either with the built-in loudspeaker, or with 150 ohms headphones. When headphones are used, a cover is available to fix over the loudspeaker to muffle sound from it.

The New G.E.C. Compact Radio

THE requirement for quality performance in a set of small dimensions is met in the new G.E.C. three-waveband A.C./D.C. superhet. Black and ivory plastic give the cabinet an attractive, discreet appearance, while the thermometer type tuning scale makes station finding a very straightforward business. An easily extended aerial enables full use to be made of the set's high performance on each waveband.

Efficient delayed A.V.C. and a speaker acoustically matched to the cabinet, are features in keeping with the very conservative rating applied to components throughout. Dependability and quality are, therefore, two main features of this small receiver. A third is the design for total mains voltage—*no mains resistance cord is employed.*

New Wearite Components Catalogue

MESSRS. WRIGHT & WEAIRE, of Great Peter House, Lord North Street, London, S.W.1, have just published their new Wearite Components Catalogue.

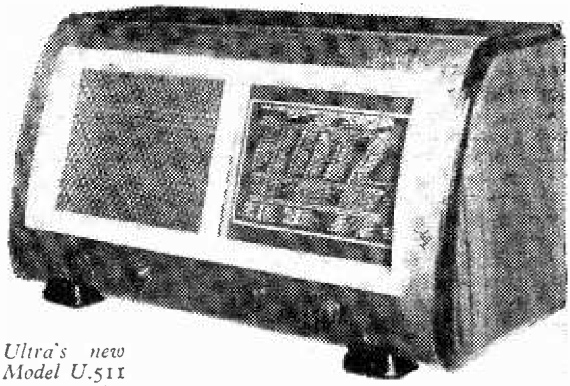
The catalogue comprises detailed descriptions, illustrated with circuit blueprints, of the various components—including the full range of "P" coils and I.F. transformers, now obtainable from stock.

Attractively printed and easy to read, the catalogues are sure to be in great demand. Every "Ham" will want to own one: every retailer will want one at hand for reference. Messrs. Wright & Weaire—the manufacturers of Wearite components—will be pleased to send you your copy on request.

Ultra Model U.511

THIS new receiver is a five valve (plus rectifier) superhet housed in an attractively designed cabinet in fine grain walnut finish and natural beech; with expanded bronze metal grille and illuminated coloured dial. The wavebands covered are short, medium and long or to suit the country of import. Push-pull output with negative feed back, delivers 6 watts to an 8in. permanent magnet loudspeaker. There is flywheel tuning, variable tone control and provision for both magnetic and crystal pick-ups and extension loudspeaker.

A mains filter is incorporated to suppress mains borne interference.



Ultra's new Model U.511

More Loudspeaker Experiments

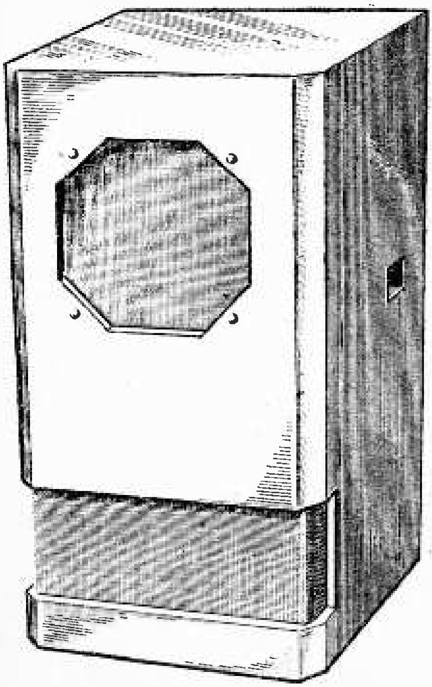
Some Further Ideas which can be Tried with Old Loudspeakers in an Endeavour to Obtain Very High Fidelity.

By W. J. DELANEY (G2FMY)

THE more one experiments with so-called "quality" circuits the more one realises that there is far more in the loudspeaker and its associated mounting than appears at first sight. For a considerable time now I have been carrying out experiments with a view to obtaining reproduction as near the original as possible, and in addition to my own judgment I have been in the fortunate position of being able to call upon a large number of musicians. Various circuits have been tried from time to time and a state of finality has apparently been reached, where any further changes are seemingly masked by the speaker and speaker assembly. Therefore, this has been the link which has been receiving attention for some time, and a number of very interesting facts have come to light.

Speaker Position

The majority of high-class receivers on the market or in use to-day take the form of a substantial radiogram. Whilst this is a very convenient form of housing for the domestic sound equipment, it is fundamentally unsound. The speaker in this type of cabinet is roughly about two feet from the floor. Now it is a well-known fact that the high frequencies from the moving-coil type of speaker are not radiated, but shoot out in a more or less narrow beam directly in front of the cone. It therefore follows that unless one sits on the floor directly in front of the cabinet a large amount of the high frequencies is lost. True, you appear to hear the harmonics and general high-note reproduction, but if you get down to the speaker you will notice a difference. Just what it is that one gets in this way I will not attempt to say. It may be a matter of transient response or overtones or some other obscure musical effect, but there is definitely something accompanying the reproduction which is not otherwise audible. This, then, brings us to the first point, namely, that the speaker is in the wrong position. Apart from this, however, is the question of the baffle or cabinet mounting. If a speaker is mounted in the centre of a large square baffle, one obtains quite a different result from that which is obtained if the speaker is mounted near the edge on the same size baffle.



An example of a modern labyrinth type speaker. This is the Acoustical Manufacturing Company's model.

Room Quality

Before, however, one can recommend any definite speaker mounting or circuit, it is most important to emphasise that apart from individual ideas as to what is "real music" there is the question of the room in which one listens. This plays the major part in the complicated chain, and whereas one listener may have a room full of soft furnishings, another may have a room with distempered walls and very little furniture, giving rise to much better high-note reflection or "hardness" to the music. Therefore, one must remember when trying new circuits and ideas that what sounds right in one room may sound wrong in another. However, when the "ideal speaker" and mounting has been found I am of opinion that the room will have little effect on results, and it is this "ideal" which I am aiming at. Having obtained an amplifier which may be considered good enough for a straight-line response from about 30 to 15,000 c.p.s. one may go ahead with the rest of the experiments. During the past 12 months various high-fidelity speakers and equipment have been tested. In the majority of cases the "high-fidelity" consisted merely of increased high-note response, which, heard under normal conditions, sounded quite good, but when under other conditions sounded unnatural and hard.

Speaker cones were tried in various shapes and with various mountings, and many interesting things were learned. Weakening the cone surround, either by removing material from the cone periphery or by replacing it with thin flannel, certainly gave greater freedom, but in the end was found unnecessary. Modifications in the spider were also made with a similar result.

Cabinet Lining

The radiogram cabinet in use is just over 3ft. in length, 2ft. deep and 2ft. 6in. in height. This was lined with various materials and at present carries a 1in. lining of compressed sawdust. The back is open and the "floor," which is raised 8in. from the room floor, has a large opening in it—all in an endeavour to remove cabinet resonance. Results have been stated by many to be perfect, but a search is still going on for something better. At the present time experiments are being carried out with acoustic labyrinths, and it is becoming increasingly apparent, in my opinion, that there is much less in the actual speaker design than one is at first led to suppose. As a matter of interest, it may be mentioned that the present stage of experiments is being carried out with a speaker of 1933 vintage (the makers renewed the cone in 1938) and I have so far found nothing to improve on it! The first important point which I think needs stressing is that the speaker must be mounted at ear level. Until this is done, the high frequencies (or whatever it is which gives the "realism" to the music) are definitely lost. The mere removing of the speaker from its usual low-down position will alone make quite a difference, provided, of course, that it is being fed from a reasonably good quality amplifier. As a matter of interest, it might be mentioned that in the writer's case a large 1in. thick bass-reflex chamber was constructed, and the speaker in question transferred from the radiogram cabinet to the new housing. The immediate effect was that the reproduction entirely lacked bass and was hard and brilliant to such an extent that one could not listen to it in comfort at more than half full-volume. The only reason for this was that the speaker was raised to ear level and cabinet resonance (at least all that was left of it) was completely removed. It is becoming increasingly clear, therefore, as stated in the opening part of this article, that we need to go more closely into the question of the speaker housing, provided that we have a reasonably well-designed amplifier and good speaker. At the present moment tests are being made with a half-wave acoustic cabinet of 1in. timber of the more or less standard vented type. The main defect of this type of reproducer is, of course, its size, and it is not a very neat object for the normal room. It can be suitably decorated, however, and made to be presentable, and would appear to have great possibilities. One of the most interesting points which has come to light so far is the fact that the volume control can be turned right back so that the sound on quiet passages is almost inaudible, but the reproduction still has a realism which is missing from orthodox reproducers. At full volume (25 watts) the low notes of items such as pedal organ notes, bass drum, etc., are felt rather than heard.

Cabinet Damping

Tests will be continued with cabinet linings, using felts and proprietary materials such as "Celotex," and with internal baffles to increase the length of the sound path, and in the meantime it would be interesting to hear from other readers who have carried out, or are carrying out, experiments on similar lines. For those who wish to carry out any tests on the same basis it may be mentioned that the cabinet in use at present is made from ex-Government folding trestle-type tables (1in. thick deal) and it measures just over 4ft. in height, 1ft. 6in. deep and nearly 2ft. wide. The speaker opening is at the upper edge about 4in. below the top and a large rectangular slot is cut at the lower edge, and is provided with an adjustable cover so that it may be varied in length and width. The back is totally enclosed by the same material, and all surfaces are provided with three cross battens of 1in. material to ensure that there are no resonances due to the framework vibrating. Also, as already mentioned, the speaker is a 1933 model which has been in constant use except for a short period during the war. The amplifier is a two-stage push-pull affair with PX25's in the output stage, and is fed from a two-station "quality" straight radio unit. For gramophone record reproduction, a moving-coil pick-up and pre-amplifier is employed.

Logarithmic Fading

Avoiding the "Click" on Switching Off

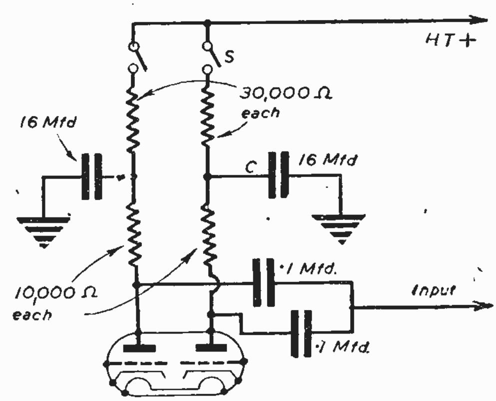
HERE is a hint which may prove useful to owners of public address equipment. It is a method for providing rapid fading of a smooth logarithmic nature.

A mixer and pre-amplifier were constructed separate from the main amplifier and fed from the latter via a length of five-way flex supplying H.T. and heater currents as well as a screened input.

The basic circuit is as shown. On switching off at S, instead of a sudden break and a loud click in the loudspeakers, the output gradually fades (time of fading about five seconds), due to the discharging of the electrolytic condenser C, which should be of a large value (16 μF was the one actually used).

Automatic Action

Since the time constant of a condenser is purely dependent on circuit constants, $t = -CR \log_e (I - E)$ the fading is regular and does away with slow rotation of the input potentiometer, which at the best of times is jerky and irregular.—J. L. JAMES Southgate, N.14).



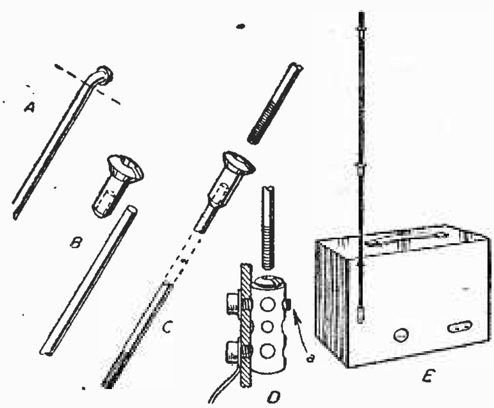
Circuit, with values, for the logarithmic fader.

Practical Hints

Portable Aerial

DURING the holidays I built myself a small portable wireless set and hunted around for an idea for a cheap and efficient sectional "stick-up" aerial. Eventually I thought of using converted bicycle spokes; this proves very satisfactory in use, besides being extremely cheap.

Four 12in. bicycle wheel spokes, complete with nipples, are required. Saw the head end from three of the spokes as shown in diagram A. It is now required to solder each of these ends part way into a nipple, leaving enough thread for the companion spoke to screw into it tightly (see diagram B). This is best done by screwing the companion spoke approximately ¼in. into the knobbed end of the nipple (where the threads usually grip tighter than at the opposite end), and then soldering the cleaned, sawn-off end into the open end of the nipple. When the soldering is complete remove the companion spoke—probably requiring the use of pliers—and there is one section of the aerial complete (C). Repeat with the other two sections. When those three and the unaltered spoke are screwed together you have a flexible 4ft. aerial.



Details of the portable aerial.

To attach the aerial to the set I used a Meccano part—an axle connector. A nipple just fits into the end, and can be secured by means of a grub screw (Da). The component is then attached to the back of the set, using two Meccano screws as shown (D). Connections can be made to the aerial where convenient.

In my own case I attached the aerial holder directly on to the metal back plate of my cabinet and incorporated this back plate with the aerial (E). It is best to provide a stay for the aerial about 3in. or 4in. above the holder, to keep it from swaying.—JAMES H. PERRY (Kingswood, Bristol).

THAT DODGE OF YOURS!

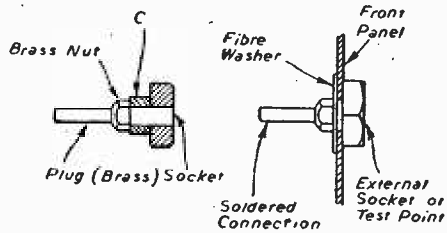
Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints."

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page iii of cover.

Insulated Sockets

RECENTLY I wished to fit a dozen insulated sockets to the front panel of some apparatus. Valve sockets are unsightly on a front panel, and I found that suitable sockets were quite expensive. As an alternative I bought ordinary plugs at the popular stores (2s. doz.). These I noticed had a well-finished coloured hexagonal plastic head, and also carried a socket as well as a plug. I filed down the cylindrical part ("C" in the diagram) to a thickness just less than that of the metal panel, and drilled a hole (diameter "C") in the panel. I then put a fibre washer under the brass nut, and screwed the plug home, finally tightening the brass nut with a 2 B.A. box spanner. Whilst making a soldered connection to the plug, it is advisable to remove the plastic head.—J. W. BARTON (Sheffield).



Method of making insulated sockets.

A Simple Key Switch

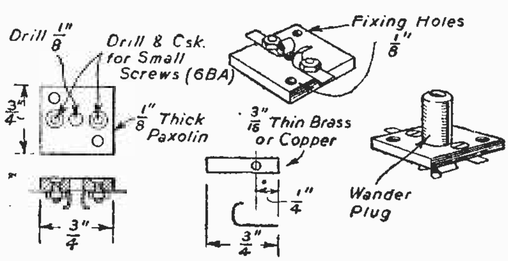
AS may be seen from the sketch, this switch can easily be constructed with oddments from the "Junk Box."

The screws and contact strips were from an old baseboard valve holder, the paxolin from a discarded panel.

The wander plug was purchased new.

Construction and operation is easily seen from the sketch.

I find this switch very useful for small portables as it takes less space than a toggle switch.—N. TURNER (Hanworth, Middlesex).



A simple key switch.

Making a S

Detailed Instructions on the Design and U

By A.

PEOPLE in all walks of life are becoming more and more interested in good record reproduction, and attention is being focused on high-fidelity pick-ups, amplifiers and speakers.

However, there is a drawback to be encountered by these enthusiasts, inasmuch as the better the reproducer, the more will it show up record defects, and the worst defect will be surface noise or needle-scratch; especially if the record has previously been used often with a heavy sound-box or pick-up.

By using a rejector circuit in the amplifier, say between the pre-amplifier stage and the phase-splitter (see Fig. 1), the surface noise is not eliminated but has its character so changed that it is no longer harsh and distracting during quiet passages of music.

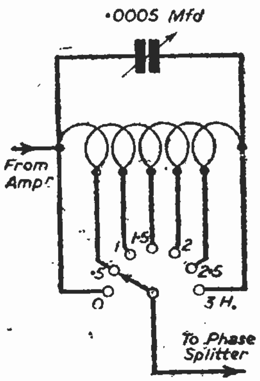


Fig. 1.—Shows the choke and condenser forming a tuned circuit between the pre-amplifier stage and the phase-splitting stage.

The type of rejector circuit we have in mind is often called a scratch filter, and consists of a 3 henry choke tuned with a .0005 mfd. condenser. The choke is tapped so that the amount of correction can be altered to suit individual records. In the choke to be described the first tap will give a dip of 18 dbs. in the response curve, while the last tap will give a dip of 42 dbs. (see Fig. 2), the other taps giving varying amounts of attenuation between this minimum and maximum.

The condenser is made variable so that the dip can be moved from 4 kc/s to 10 kc/s, the exact position being decided by ear when playing the record. The condenser may be purchased cheaply, but not so the choke, and therefore the construction of one at home becomes worth while.

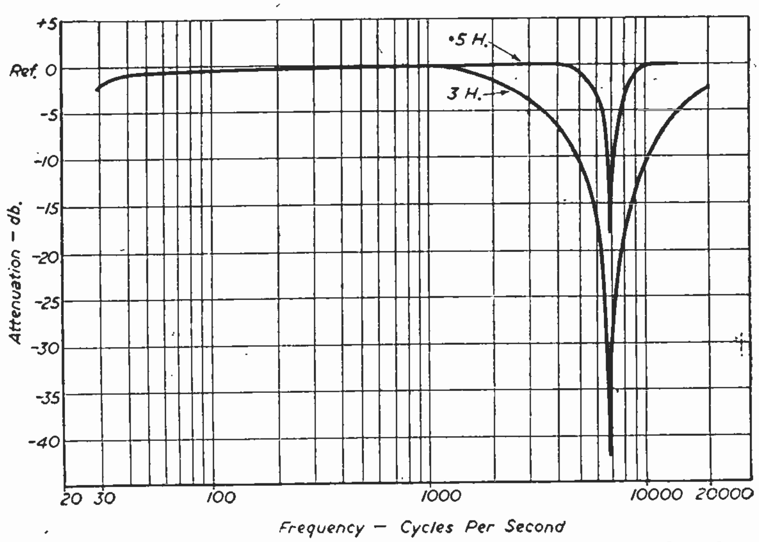


Fig. 2.—Showing the response curves obtained with a flat input when the .5 henry tap and the 3 henry tap are in use.

Constructional Data

There are two types of choke which can be considered, namely, the iron-cored choke and the air-cored choke. The main advantage of the iron-cored component is the small physical size, but seven leads from a small bobbin can take up a lot of the available winding space. Furthermore, at the moment, it would be impossible for everyone to obtain standard size laminations, thus making winding data useless.

The air-cored choke, however, while being larger, uses a bobbin which can be made by anyone, and wound to standard data, with the assurance that if all instructions are followed the inductance of the choke will be within reasonable limits without the need of having to measure it on an inductance bridge.

In order to reduce self-capacity the winding must be sectionalised, and four sections will be found convenient. The choke must also be fairly low loss, as it is in series with the signal line; this can be achieved by using No. 32 s.w.g. enamelled copper wire.

The Bobbin

The bobbin should be made first, and for this five discs, 4¼in. diameter and of 1/16in. bakelite or similar material, are required, in addition to four discs, 1in. diameter and ¼in. thick.

The large discs can be cut by first drilling a hole with a No. 43 drill where the centre is required. With a pair of engineer's dividers set at 2⅛in. a

Scratch Filter

...of a Special Filter for Record Reproduction

... SMALL

circle can be scored deeply into the bakelite using the No. 43 hole as a centre. This should now be repeated on the other side of the bakelite. If a few judicious radial cuts are made from the outside of the material to the scored circle, it will be found quite easy to break away the surplus bakelite with a pair of pliers leaving a nice clean edge to the disc.

The small discs can be of any insulating material and are probably best made as ¼in. slices from a 1in. diameter rod.

Every disc should now have a central hole drilled in it of about ¼in. diameter, with a 4 B.A. clearing hole on either side (see Fig. 3). The large and small discs should be assembled on a length of ¼in. studding and clamped tight, as shown in Fig. 4. The studding can now be held in the chuck of a wheel brace for the purpose of winding.

The Winding

For winding, 2 lbs. 2 ozs. of No. 32 s.w.g. enamelled copper wire is required, but in order not

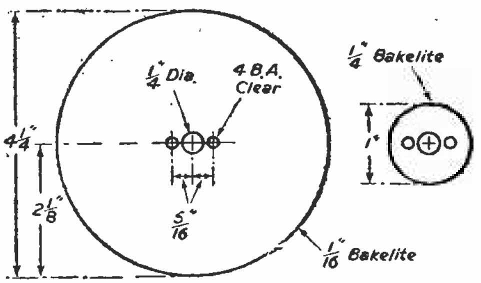


Fig. 3.—Details of the discs for the bobbin showing drilling dimensions.

to buy an odd amount, quite satisfactory results will be obtained with only 2 lbs. of wire. The beginning and ending of each tap should have a piece of 1 millimetre P.V.C. sleeving threaded on it, and the ends left long enough for connecting up.

The sections of the bobbin are numbered in Fig. 4, and these are referred to in the winding list given on the right.

It should be noted that the counting of turns starts from 1 in each section. Also, the whole of the first section is connected in series with the first tap on section two, to form the first tapping of .5 henries.

When the winding is completed, two lengths of 4 B.A. studding are threaded through the bobbing clamped tight with nuts, and the ¼in. rod is no longer required.

The two 4 B.A. rods, besides supporting the flanges of the choke, can be used for holding a small terminal board made of fibre and fitted with seven eyelet-type soldering tags to which the taps from the choke are taken, together with the leads to the multi-point switch. This makes a much more satisfactory job of connection than to take the choke leads direct to the switch.

Saving Space

By sub-chassis mounting the choke considerable space can be saved, and small brackets can be

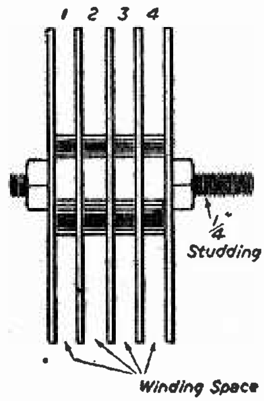


Fig. 4.—Bobbin assembled on ¼in. rod for holding in winding mechanism. This can be an ordinary geared drill brace or a specially built machine.

attached to the 4 B.A. rods in order to fix the choke securely to the chassis. The choke may be fitted with a cover which will serve both as a screen and as a protector against mechanical damage.

Finally, when using the filter for the first time, try all the settings of the switch and vary the adjustment of the condenser each time, when the possibilities of the filter will soon be appreciated. It will be found that there is an optimum position where the scratch is at a minimum with the least apparent effect on the range of reproduction. Its advantage over a normal top-cut circuit or "tone control" will be obvious when a direct comparison is made.

COIL DATA

Section No.	No. of Turns	Tap	Inductance
1	2,415	—	—
2	875	1st	.5 H.
2	1,330	2nd	1.0 H.
3	1,050	3rd	1.44 H.
3	1,975	4th	2.06 H.
4	1,190	5th	2.5 H.
4	2,000	6th	3.1 H.

Electronic Musical Instruments—3

This Month F. C. BLAKE Describes an Instrument of His Own Design—the "Solotron"

THIS article gives a description of the construction of a novel musical instrument which I designed for use as an auxiliary instrument in an orchestra, and which I call a "Solotron."

As its name implies, the Solotron is a solo and melodic instrument, and although there is a small manual of 25 keys, the actual pitch of these keys can be changed by a single switch, giving a working range of over four octaves.

By using the resonator circuit as described in the first article, or one similar as described in this issue, a number of tonal effects resembling flute, reed, and string instruments can be simulated.

The Solotron is constructed in two units for sake of portability, the keyboard, generators, tone circuits and swell control being in one portion, the amplifier and speaker occupying the other part.

Separate power supplies are needed for each unit to prevent interaction, which would occur with different settings of the swell control, causing unwanted frequency changes in the generator section. The supply for the generators need not be stabilised; a good idea is to connect a 5,000 ohm variable resistor—preferably wirewound—in series with the smoothing choke in the filter circuit. This control should be set halfway round its track, and should be used to set up the instrument before playing.

Fig. 1 shows the circuit of the generator section. V1-2 is a 6SN7 (two 6J5's may be used instead if so desired). The triodes are connected in a modified form of multivibrator circuit which operates at a frequency of 5-15 c.p.s., dependent on the setting of VR1-VR2. These variable resistors should be ganged together. The low-frequency oscillations of V1-V2 are used to produce a vibrato on the musical tones generated in another multivibrator circuit, V3-V4, which is also a 6SN7. The switch SS1 enables the vibrato to be switched in or out at will.

The tone generator V3-V4 is normally made inoperative by the bias developed across R11. When a key is depressed the grid of V4 is returned to the junction of R10, R11, allowing the multivibrator to oscillate at a frequency determined by the time-constant as selected by the octave range switches S1, S2, and the key depressed, which selects a tapping on a multi-resistor network R12-b, c, d, e, etc.

The switches S1-S2 select a condenser which gives the octave range desired, capacities C1, C2, C3 being proportionate to frequency, so that the highest octave capacity could be .005 μfd., the middle .01 μfd., and the lower .02 μfd. All the condensers should be highest quality mica insulation, and should each be padded by a preset of about .002 μfd.

The resistor network R12-b, c, d, e, etc., is made up as follows: R12 is first selected by trial and error, and should be round about 20,000 to 39,000 ohms. It forms the resistive part of the time constant used with C1-2-3 for the highest frequency on the keyboard. When a suitable value is found giving results nearest the frequency required, as checked against a piano, the padders should be adjusted to give octave notes when the range switch is rotated. The rest of the resistor network is made up of a number of low value resistors of 1,000 ohms each. Tappings are made along the network for each note, each tapping being found by experiment.

It may be found that exact tuning may not be

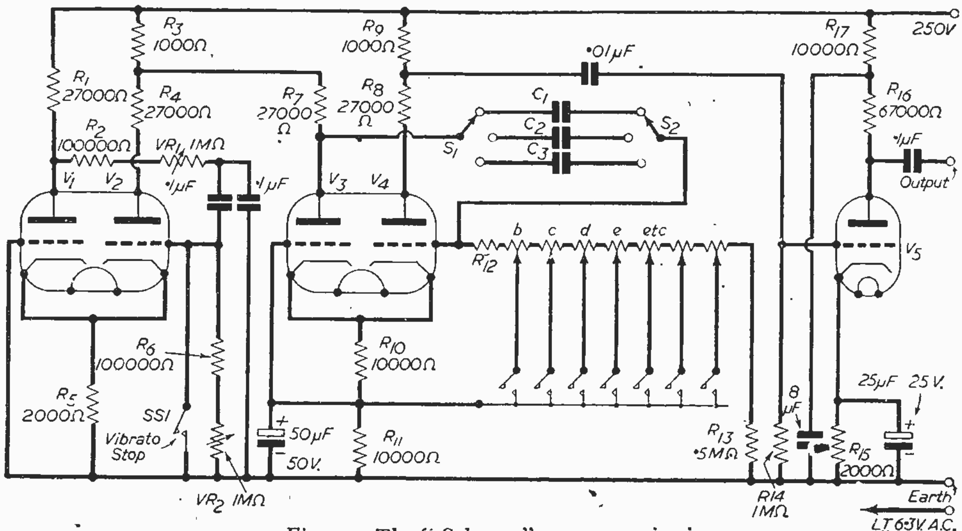


Fig. 1.—The "Solotron" generator circuit.

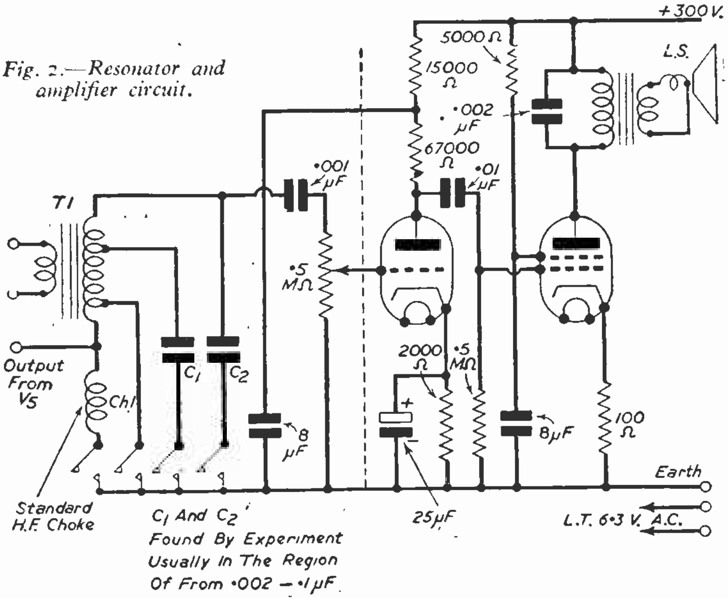
obtained in some cases, but may be effected by suitable padding with parallel resistors, or adding a small extra resistor in series. This must be done before going on to the next note, as if it is altered after a lower note has been set, it will throw it out of tune.

Thus it will be seen that a much larger number of resistors than the number of keys will be required. The resistors need only be of ¼ watt rating, and should be mounted on ebonite or bakelite strips to keep insulation to earth high. A suitable form of mounting would be an ex-G.P.O. terminal board as often advertised in this periodical.

V5, a 6J5 acts as a buffer amplifier, which is fed from a tap in the anode load of V4.

Fig. 2 shows the circuit of the resonator and amplifier.

Fig. 2.—Resonator and amplifier circuit.



A multi-ratio output transformer is used as a tapped choke in conjunction with condensers, and an H.F. choke, which can all be individually switched in or out by the stop-switches. I am using telephone "key" switches for the stops, as I find these are silent in action; ordinary toggle switches make far too much mechanical noise for my liking!

The amplifier circuit uses a 6J5 followed by a KT61. This gives sufficient volume for most medium-sized halls. A 12in. moving-coil speaker was fitted in an old radio cabinet, which also housed the amplifier and both power packs.

Fig. 3 gives some idea of the finished instrument. The left-hand end of the keyboard section contains the swell, resonator switches, range and vibrato switches. When playing, the left hand operates these controls, leaving the right hand to manipulate the keys. The contacts on the keys should be made of spring nickel-silver strip, mounted on ebonite or bakelite to ensure good insulation, and care should be taken to see that all contacts "make" with the same distance of depression of the keys, and also that the key tension or "touch" is uniform. The correct weight needed to depress a key is 2ozs.

When playing, if more than one key "makes" at the same time, the keyboard always selects the highest frequency-key depressed, so that a detached style of fingering is necessary. Full use should be made of the swell-control, especially when the "string" stop is used. The swell should be opened and closed for each phrase in a gradual manner.

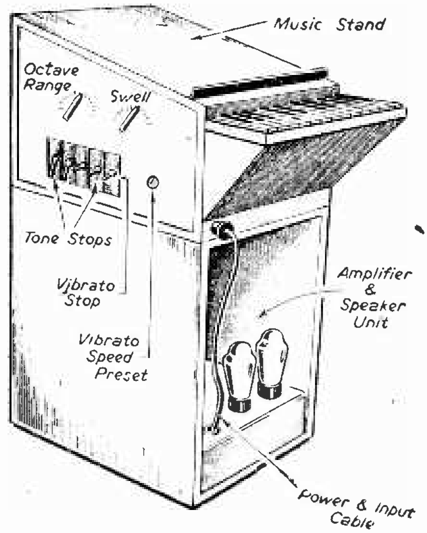


Fig. 3.—The completed instrument.

NEW PHILIPS TRANSMITTERS

A COMPREHENSIVE series of communications transmitters designed to provide A.1, A.2 or A.3 types of communication over a medium frequency range of 200 to 500 kc/s. and a high frequency range of 1.5 to 24 mc/s. with R.F. power outputs up to 400 watts, has recently been introduced by Philips Transmission (Philips Lamps Ltd.).

Known as the "M.Z.600" series, these transmitters may be used as fixed or mobile stations. They have been specially proofed against tropical and arctic conditions.

These transmitters have been developed together on the interchangeable unit principle. A standard range of units has been produced, selections from which are assembled into one, two or three cabinets to form the required transmitter. This feature of standardization allows many of the units to be used in more than one of the five transmitters. The smaller units containing the majority of stages are made easily accessible by mounting them on ball-bearing runners, so that they may be pulled out from the main cabinet and examined.

A Four-valve U.S.W. Receiver

High Sensitivity, Low Noise Level, Low Cost.

By C. SUMMERFORD

IN describing the design and construction of an efficient short-wave superhet in a recent article, the writer stressed the advantages to be derived from using one of these receivers. It was not suggested, however, that the T.R.F. receiver was obsoleto as an ordinary short-waver, but it was pointed out that it suffered from one very great fault—poor selectivity. By which it was meant to imply that it was not possible to obtain 10 kc/s separation of stations or anything like that figure with a receiver of this type.

This question of selectivity, however, is not of such paramount importance when we go down to the 5-10 metre range, and it is largely for this reason that the super-regenerative receiver has become so popular on these wavelengths. Notoriously unselective, besides being noisy in its reception of weak signals, the super-regen has easy construction and cheapness to commend it and little else.

Quality of reproduction is also decidedly poor when judged by normal standards. Nevertheless, it is the cheapest way to obtain an introduction to the ultra-short waves, and cheapness nearly always appeals to the amateur constructor.

The superhet receiver, if properly designed, is both sensitive and selective. All the same, the choice of a suitable intermediate frequency is rather difficult, because if it is low, say, 465 kc/s. second channel interference is very obtrusive, while if it is high there is a proneness for the I.F.s to pick up signals—C.W. and others—at and around their fundamental frequency. Gain and selectivity will also be much poorer when using a high I.F. The writer does not wish to convey the impression so much that these difficulties are insurmountable, as that they may not be overcome cheaply.

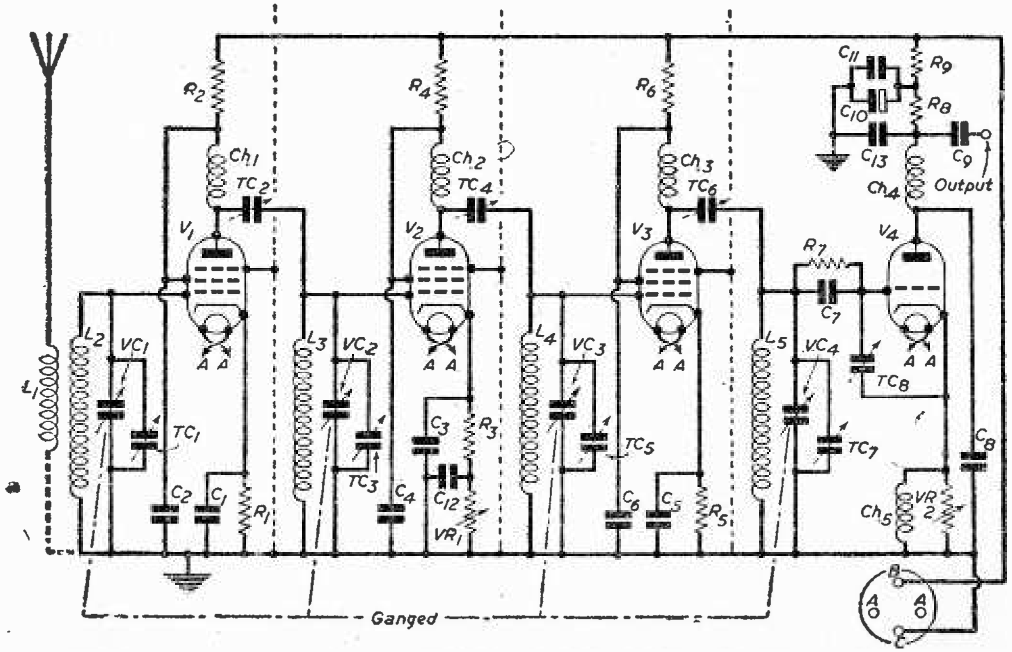
It would therefore seem that, as the super-regen has most definite faults, and the superhet is likely to be rather costly, if we are to eliminate all defects we must concentrate on the T.R.F. receiver.

The Circuit

The diagram below gives circuit details of a four-valve receiver of high efficiency, comprising three R.F. stages and a leaky-grid detector. V1 V2 and V3 (all type EF50) are the special ultra-short-wave radio-frequency amplifier valves having variable-mu characteristics made by Mullards, which, as mentioned when describing "The Three Guinea Television Sound Unit," may be obtained ex W.D. at the low price of 6s. from firms who regularly advertise in PRACTICAL WIRELESS.

V4 is an American type 6C5, or its English equivalent which is Marconi/Osram L63, either one of which costs 9s. 2d. Thus, the total cost of the four valves is only 27s. 2d.

With 250 volts on both anode and screen and a minimum bias of 1.6 volts. the EF50s have the exceedingly high mutual conductance of 6.5 ma/V, and as they are of "footless" construction, losses



Theoretical circuit of the 4-valve U.S.W. receiver, showing plug for connection to suitable amplifier.

that are usually incurred at the "pinch" are abolished. These valves are all provided with their correct minimum bias by cathode resistors R1, R3 and R5.

In series with the cathode resistor of V2, however, is an extra variable resistance (VR1) having a value of 5,000 ohms, which, because of the fairly heavy current (about 13 mA.) taken by this valve should be of the wire-wound type and should also be of reputable make. Its sole purpose is to reduce gain should there be any tendency to instability in the receiver.

Readers should not assume from this last remark that the receiver is bound to be inherently unstable; indeed, if wiring is properly carried out there should be no trouble at all in this respect. But at the same time, when using high-gain valves like the EF50, small changes in wiring, components or layout can cause big variations in performance. Of course, a little controllable instability in this second R.F. stage can be of definite advantage when receiving weak signals.

The common decoupling of the anodes and screens of the R.F. valves is a somewhat unusual procedure but a most essential one. Separate decoupling of the screens was tried at first but had to be discarded because of the bad instability experienced. One other item that is of great importance is the complete screening of each individual circuit from its associate circuits. The method adopted for doing this is similar to that used in "The Television Sound Unit" (March issue). It will be remembered that in this receiver both top deck and sub-chassis screens were used between each stage. Apart from these two very important points there is nothing particularly tricky about the R.F. stages.

Coupling between *all* stages is by the so called tuned-grid system. Layout, too, largely follows that used in the above-mentioned television unit, but in the new unit the ganged condenser should be mounted in a central position and the valves alternately staggered on either side of this. In this manner short leads are obtainable, while at the same time the individual coils can have adequate spacing.

Coils, which are of the "Eddystone" interchangeable type, should have their holders mounted, each at right-angles to its neighbour, on 1½in. "Eddystone" insulating pillars. The R.F. valves should be mounted in similar fashion. One soldering tag above and one below the chassis must be firmly bolted in a suitable position in each compartment so that earth returns can all be taken to a central point. This follows normal ultra-short-wave practice and is most important.

Trimmers TC1, TC3, TC5 and TC7 may all be soldered directly to their associate tuning condensers, but those used for inter-circuit coupling (TC2, TC4, TC6) should be inserted in and suspended by the wiring only. All five H.F. chokes can be "Eddystone" Cat. No. 1011, or other makes of similar type, although the writer always prefers to make his own. Readers who wish to do likewise should close wind 50 turns of 26 S.W.G. enamelled wire for each choke on a 3/16in. former, which should afterwards be slipped out, upon which a slight springing action will take place to give inter-turn spacing.

The Detector Stage

With the exception of the cathode controlled regeneration system, which was described in a recent article, the detector circuit is almost identical with that used in the Three Guinea Television Unit, and, therefore, needs little further comment.

Suffice to say that by a careful choice of grid leak and grid condenser values, together with an adequate anode voltage, the detector is capable of handling quite strong signals without introducing distortion.

Those readers, therefore, who wish to use this receiver for the reception of the television sound programmes radiated from Alexandra Palace may do so in the knowledge that full justice will be done to the high fidelity characteristics of this station. Furthermore, due to the high sensitivity of the

LIST OF COMPONENTS

One aluminium chassis, 16in. x 6in. x 2½in.
One aluminium panel, 8½in. x 6in.
Three aluminium screens, 6in. x 6in., with 1in. flange.
Three aluminium screens, 6in. x 2½in., with 1in. flange.
One utility dial, type W.181.

CONDENSERS
C1, 2, 3, 4, 5, 6, 9, 12—.01 mica, 350-volt working.
C7—.0001 mfd., mica.
C8, 13—.0005 mfd., mica.
C10—8 mfd. electrolytic, 350-volt working.
C11—.001 mfd., mica, 350-volt working.
VC1, 2, 3, 4—15 mmfd. variable condensers, with spindles extended for ganging purposes.
TC1, 2, 3, 4, 5, 6, 7—30 mmfd. postage stamp type trimmers.

COILS
L1, 2, 3, 4, 5—See text.

H.F. CHOKES
Ch. 1, 2, 3, 4, 5—Eddystone Cat. No. 1011, or home-made.

RESISTORS
R1, 3, 5—125 ohms, ½ watt.
R2, 4, 6—2,000 ohms, ½ watt.
R7—.25 megohm, ½ watt.
R8—15,000 ohms, 1 watt.
R9—10,000 ohms, 1 watt.

VARIABLE RESISTANCES
VR1—5,000 ohms wire wound pot. wired as variable resistance.
VR2—10,000 ohms carbon pot. wired as variable resistance.

VALVES
V1, 2, 3—Mullard EF50.
V4—Brimar 6C5 or Marconi-Osram L63.

MISCELLANEOUS ITEMS
One Eddystone extension control outfit.
Three Eddystone flexible couplers.
Three EF50 and one octal valveholders.
Two 1½in. knobs.
Quantity of nuts and bolts.
One four-pin plug.

receiver, this station may be received at long range.

Five-metre activity, although improving, has not as yet reached the pre-war level, but even so there is enough happening to stimulate the interest of the average "ham."

In order to tune to the five-metre band, four-turn "Eddystone" coils will be required, and the aerial coupling coil should also have four turns. Incidentally, this aerial coil need not be changed for any wavelength between 5 and 10 metres.

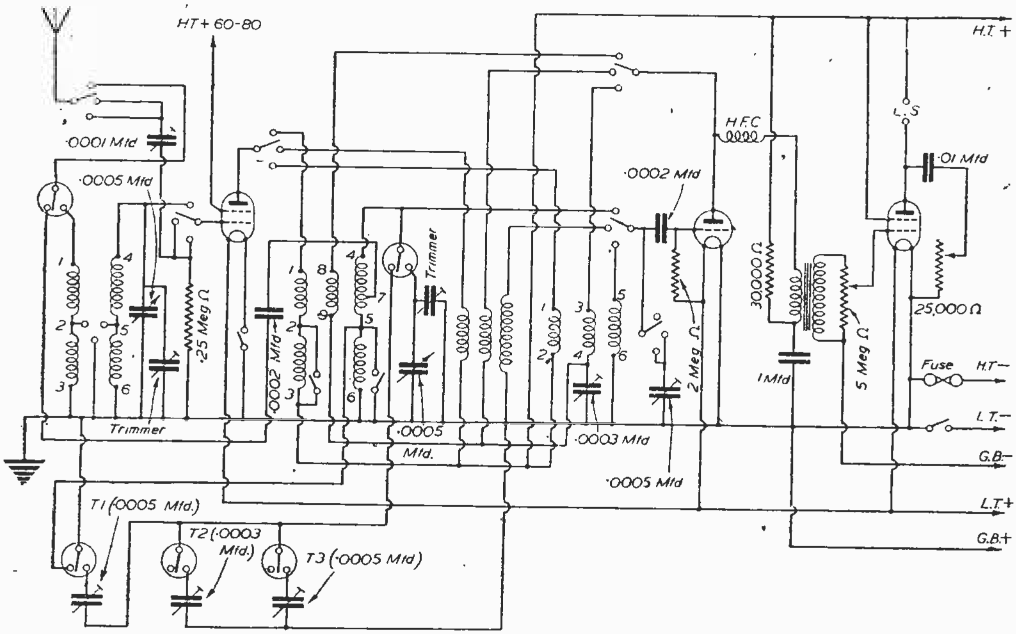
Both the sound and vision signals from Alexandra Palace can be tuned in by using six-turn grid coils, while eight-turn coils will enable the receiver to cover the 8 to 10-metre range, which includes the 8-9 metre police band and the 10-metre amateur band. It is, of course, hardly necessary to add that suitable di-pole aerials are an essential if the best possible results are to be obtained.

Selectivity and Sensitivity

When the design of this receiver was begun, selectivity was not considered to be of the greatest importance; however, it has proved to be much better in this respect than was anticipated, and quite good selectivity is obtainable with careful use of VR1 and VR2. Sensitivity is outstandingly good and background noise negligible, added to which complete freedom from the troubles one associates with superhet and super-regenerative receivers makes this receiver ideal for 5-10 metre use.

In conclusion, it should be pointed out that this receiver is intended for use with the "Ten Watt Quality Amplifier," but readers who either wish to use it as a headphone receiver or in conjunction with another amplifier, may do so provided that a suitable, well smoothed, well stabilised power supply is available.

Push-button All-wave Three



Owing to a draughtsman's error a mistake occurred in the theoretical circuit on page 330 of last month's issue. The corrected circuit is shown above.

COMPONENT LIST

- 0005 mfd. 3-gang tuning condenser with reduction drive.
- .0003 mfd. reaction condenser.
- Fixed condensers: two .0002 mfd.; .01 mfd.; 1 mfd.
- Resistors: 30,000 ohm; .25 megohm; 2 megohm.
- .5 megohm potentiometer. 25,000 ohm variable resistor.
- L.F. transformer for direct feed, ratio 1 : 3.
- All-wave H.F. choke.
- .0001 mfd. pre-set. Two .0005 mfd. pre-sets. One .0003 pre-set. (Trimmers 1, 3 and 2 respectively in text.)
- 6-pole 3-way rotary switch.
- 5-way push-button switch, single-pole double-throw action.
- 4-pole switch.
- On-off switch.
- Fuse and holder (60 mA). Component bracket.
- Extension spindle and coupling. Stand-off insulator.
- Plug-in coils and holder (3-winding types). One 4-pin, one 5-pin, and one octal valveholders.
- Valves: Screen grid or H.F. pentode for R.F. Mazda HL23 for detector. Low consumption pentode or tetrode for output.

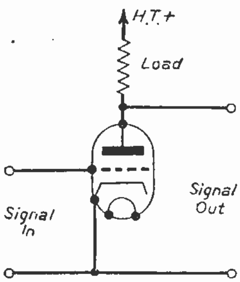
A Cathode Follower Amplifier

Details of a Quality Instrument on Unusual Lines

By W. G. SPARKE

BEFORE commencing to describe the amplifier, it might be as well briefly to run over the main differences between the normal circuit of a valve acting as a voltage amplifier and that circuit known as the cathode follower, which acts as a current amplifier.

In Fig. 1 the voltage amplification A is dependent upon the slope of the valve and the nature of the anode load.



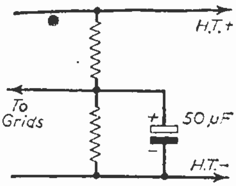


Fig. 1 (left).—The normal valve circuit. Fig. 2 (above).—Suggested circuit for providing bias when the transformer primary is too high.

The slope μ, voltage amplification A, and load R, are connected by the formula

$$A = \frac{\mu R}{R + Ra}$$

Ra being the A.C. resistance of the valve.

To substitute figures in the above formula:

$$A = \frac{33 \times 50{,}000}{(50{,}000 + 10{,}000)} =$$

a voltage amplification of 27.

Cathode Load

In comparison, Fig. 4 has no anode load, and the input voltage is in series with the output voltage. Therefore, as the output voltage adds to the input voltage the resultant input voltage must in all cases be greater than the output voltage.

Hence, the well-known fact that a cathode follower does not act as a voltage amplifier however much the valve itself may amplify. From this it follows that 10v. must be fed into such a circuit to get 9v. out of it, i.e., 9v. to neutralise the output volts which are being fed back into the input, and 1v. to drive the valve.

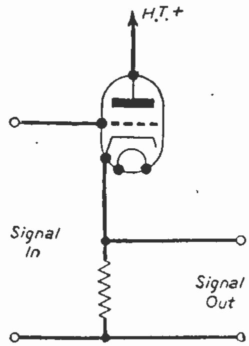


Fig. 4.—The cathode loaded valve stage.

Circuit of the Amplifier

VR1 is an input control to V1, which acts as a pre-amplifier to offset the loss of gain due to the bass lift circuit between the anode of V1 and the grid of V2, which consists of R6, R5 and C3, the amount of lift being mainly dependent on the value of C3. C5 is to give any necessary top lift by by-passing R6, its value depending on personal taste and the value of C3.

V2 acts as an ordinary voltage amplifier feeding into V3 which is the phase splitter, which in turn feeds the grids of the KT41s. In this stage, R11

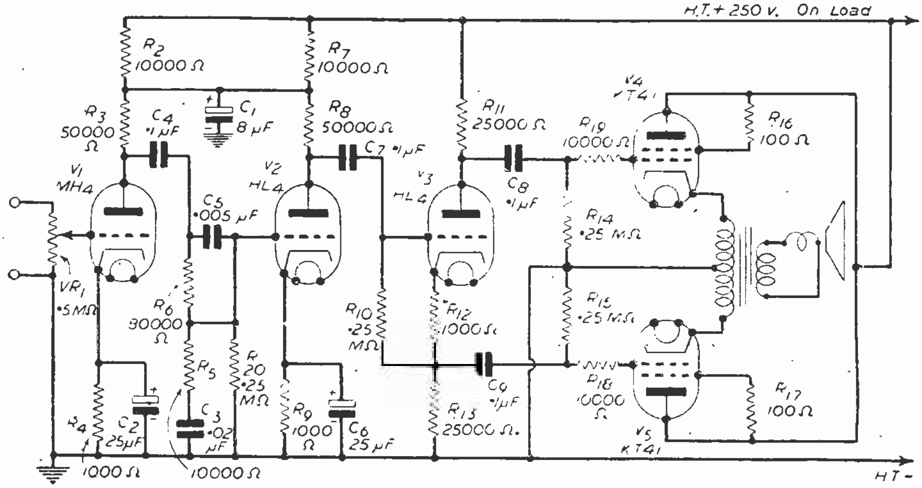


Fig. 3.—Circuit of the complete amplifier described here

is the anode load, R13 the cathode load, and R12 the bias resistor. No bias decoupling condenser is required and if included will tend to unbalance the output voltages from this valve.

It may be stated at this point that this is not a true cathode follower output as the grid is not returned to earth but to the junction of R12 and R13. This being so the grid is not influenced by the feedback, and the overall gain will be greater than unity.

The output voltages from V3 are fed to the grids of the KT41s via C8 and C9, R14 and R15 being their respective grid leaks, and R18 and R19 being grid stoppers.

As the output power is generated in the cathodes of the valves no anode loads are necessary and the anodes may be joined directly to HT+.

In this circuit the D.C. resistance of each half of the output transformer is equal to the values required for normal automatic bias resistors.

If this is not possible an external negative or positive bias voltage will have to be supplied to compensate for any divergence in the D.C. resistance of the output transformer primary relative to the value of the output resistor required.

A suggested circuit is shown in Fig. 2 for use when the transformer primary resistance is too high. If the transformer primary resistance is too low back bias could be applied.

Power Pack

The power pack may be of standard design, but it is suggested that sufficient output be provided so that it can supply a small radio unit.

With the valves mentioned no trouble has been experienced with heater-cathode leakage or breakdown due to the very high cathode voltages that are developed. It is suggested, however, that if greater power is required with larger valves a separate filament winding, well insulated, should be used for the output valves, and that bias should be developed by means of a separate valve.

The input to the amplifier, especially if mounted in a cabinet with a remote volume control, should be well screened or else hum will be troublesome.

The quality from this amplifier is good and the bass well maintained, speech crisp, and orchestral items have plenty of body, especially on transients.

News from the Clubs

THE RADIO SOCIETY OF HARROW

Hon. Sec. : J. F. A. Lavender (G2KA), 29, Crofts Road, Harrow.

AT recent meetings Mr. L. R. Vincent gave an interesting account and survey of the recent first postwar Annual Convention of the British Institution of Radio Engineers (held in Bournemouth), and gave a brief résumé of some of the main points of the principal papers read at the Convention.

Afterwards, the result of the Literary Competition for a paper on "My Interest in Radio" was announced. The trophy, presented by Messrs. Ritchie Vincent and Telford, Ltd., of Harrow, was handed to the winner, Mr. David L. George (G2UA), by Mr. L. R. Vincent on behalf of his company.

Judging the entries for the club's Constructional Competition produced a full house, with standing room only. One third of the club's membership contributed exhibits which ranged over the whole field of amateur radio from bug keys to complete transmitters. Judging was placed in the very capable hands of visitors from the Edgware club (Messrs. Philkin (G3BJT) and Hagren). Points were awarded for originality, design and neatness. No names were shown, exhibits being identified by numbers and entries by "juniors" were automatically awarded a bonus of 10 per cent. on the judges' allocation. The standard was so high that the judges had a most difficult job. In view of the high standard of the entries, the donors of the trophy (an electric clock), Messrs. Odeon Radio, Ltd., of Harrow, very generously provided two more prizes and also presented a large radio zone map to every competitor.

First prize was awarded to Mr. Cranfield for "The Flat-dwellers' Transmitter," a complete transmitter in miniature, covering all bands.

Second prize went to Mr. Hardy president of the club, for a "Q" Meter, and third prize to Mr. Ford for an amplifier and pretuned receiver.

CHELMSFORD RADIO CLUB (ISWL)

Temp. Sec. : W. C. Mills, 3, Elm Cottages, School Lane, Broomfield, Chelmsford, Essex.

THE inaugural meeting of this club will be held in early September. No definite date or place can be given at the moment, but if prospective members will contact the secretary he will send them particulars when available. All wireless amateurs, constructors, experimenters and listeners are invited to join, especially young people.

HOUNSLOW AND DISTRICT RADIO SOCIETY

Hon. Sec. : A. H. Pottle, 11, Abinger Gardens, Isleworth, Middlesex.

THE recent meetings of the society have been very well attended, and new members are still joining.

A recent debate, "Air-spaced coils v. Iron-cored coils," proved a success, and it is hoped that future debates will reach the same high standards and arouse the same enthusiasm. An auction of gear is to be held shortly.

THE WEST BROMWICH AND DISTRICT RADIO SOCIETY

Sec. : R. G. Cousens (G3BCS), 38, Collins Road, Wednesbury, Staffs.

THE society meets every Monday, 7.30 p.m., alternately at the Gough Arms Hotel, Jowetts Lane, for talks, etc. and at the Udall Engineering Co., Mill Street, Great Bridge, where more practical work is done.

Morse classes are being held at both addresses.

The club has now its own transmitter, built by members, the call being G3BWW. This will operate from the Udall Engineering address.

Active transmitting members are G5KS, G8NC, G2BJY, G2BXP, G3AGW, G3APZ, G3BCS, G3BYP.

Further particulars may be had from the secretary.

WIGAN AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec. : H. King, 2, Derby Street, Spring View, Wigan.

THE club has held a general meeting and is now on a firm basis. They can be heard transmitting on 'phone on the 40-metre band (call sign G3BPK), and would welcome any reports on reception, strength, etc.

THE BIRMINGHAM AND DISTRICT SHORT WAVE SOCIETY

Hon. Sec. : N. Shirley, 14, Manor Road, Stechford, Birmingham, 9

MEMBERSHIP has shown a steady increase during the last few months, and more interest is being shown in the morse classes which are held every Monday. At the July meeting, the June Log, given by one of the members, included some five-metre stations as well as DX on the other bands. There was also a short talk on aerial design which will be continued at a later meeting.

SLADE RADIO

Hon. Sec. : C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

ON Sunday, July 6th, the second of the D.F. Tests in this year's series for the Harcourt Trophy, was held, with ten competitors in the field.

Five of those taking part were successful in locating the transmitter, and they arrived in the following order:

Mr. C. N. Smart, at 3.23 p.m. Points awarded, 88.5.
Mr. L. A. Griffiths, at 3.25 p.m. Points awarded, 81.25.
Mr. J. Walley, at 3.35 p.m. Points awarded, 52.
Mr. N. B. Simmonds, at 4.31 p.m. Points awarded, 53.5.
Mr. R. Satchwell, at 4.45 p.m. Points awarded, 38.5.

Mr. Satchwell's performance gained him the Novice Cup, he being the first post-war winner of this trophy.

Further tests have been arranged for August 31st and September 28th, and anyone who cares to take part will be welcome. The tests are not merely races to reach the transmitter first, but are designed to develop members' knowledge of, and encourage them to make technical advances in, Radio Direction Finding.

Some A.C. Power Problems—2

More About Rectified Waveforms, continued from our August Issue

By "DYNATRON"

WHAT is the R.M.S. value of a series of half-waves, Fig. 1 (b)? We have seen that the mean-current value is 0.318 of the maximum. For 10A peak what would an A.C. instrument read in the circuit?

An easy mistake is to answer $\frac{1}{2}$ of 0.707 of the maximum! Always remember that the R.M.S. value is related to the mean power. In (b), this is evidently one-half of the mean power that would be developed in a given resistance by (c).

In (c), the average power is $\frac{1}{2}$ (peak power), as for a full sine-wave. Therefore, in (b) it is $\frac{1}{2}$ of $\frac{1}{2}$ (peak power) $= \frac{1}{4}$ (peak power). "Energy" and "power" are simply proportional to the total

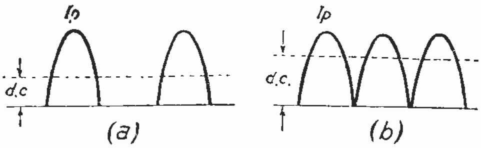


Fig. 4.—Half and full-wave pulsating currents—again!

area of a curve. Over time T, the area in (b) is half of (c), hence the mean power in (b) is $\frac{1}{4}$ of the peak power, as stated.

The R.M.S. value then follows immediately. It is $\sqrt{\frac{1}{4}} = \frac{1}{2}$, or 0.5 instead of 0·707 of the peak value. At 10A peak an A.C. ammeter would read $0.5 \times 10 = 5$A. The form-factor is now $5/3.18 = 1.57$—the R.M.S. instrument will read 57 per cent. higher than a moving-coil, with half-wave rectification.

Actually, from a wave-analysis point of view, Fig. 1 (b) and (c) are highly distorted, complex waveforms, containing: (i) a D.C. component of steady value; (ii) a *fundamental-frequency*, sine-wave A.C. component, of the same frequency as the A.C. supply; and (iii) higher *even* harmonic sine-waves, of 2, 4, 6 times, etc., the frequency of the A.C. supply. The "complex power" produced in a resistance will consist of all three components.

If, however, the "load" was an A.C. resistance, i.e., if its D.C. resistance was negligible, as often happens in amplifier circuits, the power would consist of the fundamental and even harmonic A.C. components only, when the effective, or R.M.S. value would be less than 0.5 deduced above. This figure of 0.5 takes account of the steady D.C. power due to the mean current of 0.318I—if D.C. resistance is non-existent, obviously (i) cannot give rise to "power."

A single-valve working in Class B, with an untuned, transformer-coupled load, Fig. 2, would correspond approximately to this case of small D.C. resistance. The load transferred from the output transformer secondary would be an *A.C. resistance*, but an *aperiodic* one which would absorb power at harmonic and fundamental-frequencies, i.e., the A.C. output waveform would be badly distorted.

But if two such valves are employed in push-pull, it is possible by careful adjustments to get a close approximation to a sine-wave *voltage*, at *the fundamental-frequency*. The even harmonics will be eliminated by push-pull action, and, then, we have a third case where *the mean power output is entirely at fundamental-frequency.*

With a *tuned-circuit* load, Fig. 3, a *single*-valve in Class B will supply a nearly sine-wave output voltage, when the same argument applies—the mean power will be that due to the fundamental component only.

Earlier I stressed an important "power rule" for a sine-wave current or voltage, i.e.:

Mean power averaged over a complete A.C. cycle $= \frac{1}{2} \times$ peak instantaneous power, from which:

Effective or R.M.S. voltage or current $= \sqrt{\frac{1}{2}} = 0.707 \times$ peak value.

I made mention of an instance proving the degree of confusion which does exist about simple A.C. values—even among some people who would not readily admit they have not grasped "fundamentals." You will have to take my word for it,

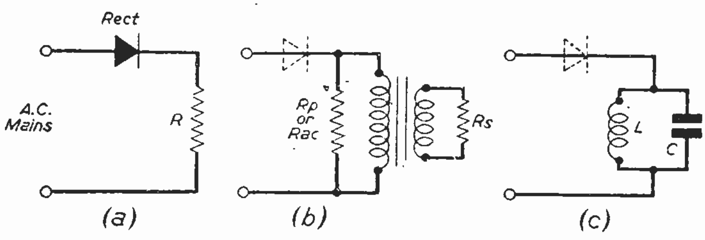


Fig. 5.—Three types of "load." (a) An ordinary D.C. resistance; (b) an "A.C." aperiodic, or non-resonant resistance; (c) resonant load, or dynamic resistance of a tuned-circuit. What effects would occur in each case if the current was of the form shown in Fig. 1(a) last month?

because I cannot quote any direct references.

It does not matter. I am concerned with basic principles, so any figures will do for illustration. We will use those given in the first instalment. If two valves in Class B give 20 watts output, it was seriously suggested that *each valve* is also supplying 20 watts over the *half*-cycle it operates!

Since the average A.C. power from each valve reckoned over a full-cycle is obviously 10 watts, it sounds pretty preposterous to assert that there is also another "average" of 20-*watts* supplied by each side!

Don't blame me if all this reads like a bit of transparent nonsense! If the writer who made the statements really knew his A.C. stuff, he would have taken jolly good care to use another word than "*average*." Obviously, each valve is supplying an average A.C. power of 10 watts. But, as for every sinusoidal A.C. wave the peak instantaneous power is twice this, the writer has to reconcile another pair of figures, namely, 20 watts *instantaneous maximum* on each side, with 20 watts "average" (over a half-cycle)!

Mind you, he may have some sort of "average" in mind which totally escapes my naive intelligence. When I questioned the figure, I was advised to try to adapt my thinking along lines set by "engineers" who live and have their being in a world of "pulse techniques"! It seems pretty certain, however, that someone has dropped a brick, and he is going to find a little difficulty in reconciling 20 watts "average," with 20 watts "peak."

More About Rectified Currents

To return to our main theme: it was seen in the previous article, that sine-wave ideas may be employed to find the mean power and R.M.S. values of half-wave and full-wave pulses. Fig. 4 (a) and (b)—as long as it is right to assume these retain the shape of half sine-waves.

If passed through a resistance, the average power developed by (b) would be exactly the same as by a full sine-wave of the same amplitude, i.e., $\frac{1}{2}$ (peak power). Hence, the R.M.S. value is 0.707 of the peak.

But, *averaged over a full-cycle,* (a) would develop half the power of (b), or: $\frac{1}{2}$ of $\frac{1}{2}$ (peak power) = $\frac{1}{4}$ (peak power). The R.M.S. value will be $\sqrt{\frac{1}{4}} = \frac{1}{2}$ of the peak value.

One more point from the previous article: if we used these rectified currents to charge batteries, the R.M.S. values would be of no importance. What matters in electrolytic action is the *average current* passing, not average *power*. In (a), this is $1/\pi = 0.318$ of the peak current, and in (b), $2 \times 1/\pi = 0.637$ of the peak. A moving-coil instrument would indicate these mean values. An R.M.S. meter would indicate in (a), a current 57 per cent. higher than the true charging current; in (b) the reading would be 11 per cent. high.

The 57 per cent. "error" may be shown as follows:

Denoting the peak current by I_p, we have:

Reading of moving-coil meter, $I_{mean} = I_p/\pi$.

Reading of A.C. instrument, $I_{rms} = I_p/2$.

Therefore,

$$\frac{\text{R.M.S. reading}}{\text{Moving-coil reading}} = \frac{I_p/2}{I_p/\pi} = \pi/2, \text{ or } \tfrac{1}{2}\pi = 1.571,$$

i.e., the R.M.S. meter will read a current 57 per cent. higher than shown by the moving-coil type.

The R.M.S. value would be the correct one to take if we wanted to find the *power* developed in a resistance, or the heat generated.

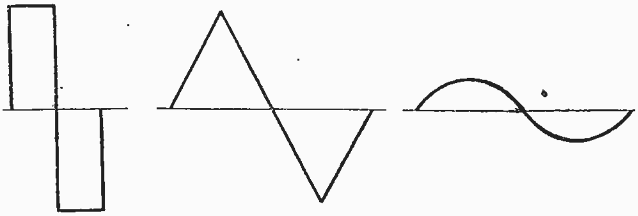
Three Types of "Load"

A question which then arises is: what kind of "resistance"?

Suppose we passed the pulsating-current of Fig. 4 (a) through an ordinary wire-wound resistance, or, let us say, a piece of thin resistance wire of ohmic value R. We shall call this a "*D.C. resistance*," because it offers about the same opposition in "ohms" to D.C. and A.C. (Fig. 5 (a))

The half-wave current will develop a voltage-drop, *of the same waveform*, across R. Thus, the peak voltage will be I_pR, or the instantaneous value at any point in the pulse, iR, where "i" is the current-value at the instant in question. The average power will be (R.M.S. current)$^2 \times$ R = $(\frac{1}{2}I_p)^2R = \frac{1}{4}I_p{}^2R$, as already explained. Alternatively, average power = R.M.S. volts $\times$ R.M.S. current. The answer will again work out to $\frac{1}{4}$ of the peak power.

What does this power consist of? One part will be "D.C.," since a moving-coil instrument will register a steady D.C. component in the circuit,



(a) (b) (c)

Fig. 6.—None of these look very much like "sine-waves," but each is made up of a number of pure sine-waves of different frequencies, i.e., each contains a number of "harmonics."

and this (current)$^2 \times$ R gives a D.C. power. In all rectification circuits there is a "D.C. component." From the above formulæ you should know how to estimate it, and the power.

But the heat generated in our thin filament or resistor will be greater than can be accounted for from D.C. alone. In fact, the total power dissipated as heat will be 2.5 *times* the D.C. power!

How are we to explain this? You may answer that we must now use the R.M.S. value of current, which is 57 per cent. greater than the D.C. component. Quite right, but there is little more to it than quoting bare figures. Incidentally, note that a current 57 per cent. high gives 2.5 *times* the power approx.

What we are interested in is what power exists other than D.C. Well, the "pulsating power," which is a rather vague answer. In using an "R.M.S. value," we have in mind some sort of *A.C. power,* though it may sound odd to talk of "A.C." in connection with an alternating-current which has just been rectified!

I don't know if you have heard of a mathematical technique called "*Fourier Analysis.*"

By this famous theorem any wave-shape—square topped or "rectangular" or "triangular" or "circular," etc., Fig. 6, can be "resolved" into a number of *pure sine-waves,* called *harmonics.* It is rather a laborious job doing so by Fourier's method, but the fact is interesting.

(To be Continued)

Underneath the Dipole

Television Pick-ups and Reflections. By "THE SCANNER"

MANY years ago, professional photographers of the more advanced school astonished their colleagues by taking measurements of the intensity of the light illuminating outdoor scenes before setting the exposure of their plates. These enterprising fellows laboriously watched a sensitised paper in their "exposure meters" discolour under the rays of the light, until its colour had darkened to the same density as a standardised fixed density strip alongside it. These meters, early types of which were made by Watkins of Hereford and by Wynne, required anything up to a minute to register the requisite darkness, and the time was carefully checked with a watch.

Mr. Watkins was a practical man, and fitted his meter with a small chain having a little weight at the end, for use as a pendulum. The swinging of this pendulum, while the meter was held in the hand checking the fading of the sensitised paper, enabled the seconds to be counted. With this information, and reference to various scales on the meter, our old-time photographer worked out the shutter speed and lens aperture to give him a nice full-bodied negative.

Rectifier Photocells

Since that time, light measuring meters and exposure meters of various kinds have appeared, the most accurate—and expensive—being of the photo-electric cell type. Photo-electric cells of the rectifier type produce a measurable amount of current when light falls upon them, without the assistance of an external battery. Since the cells are of extremely low internal resistance, they will not generate sufficient potential for valve amplification; otherwise they would be in general use for sound film reproduction and other general purposes. But in conjunction with a sensitive ammeter—or rather, a micro-ammeter, they measure the amount of light with all the speed and accuracy of a voltmeter measuring volts. Light intensity is measured in "foot-candles," the photographer's unit of light.

Reduced Lighting

The use of light-intensity meters has now become practically standard procedure. Film stock and plates are more sensitive, and lens apertures wider, thus permitting snapshots or movies to be taken in very unfavourable light. At the same time, development has become more delicate and, with the increased use of miniature cameras, slow developers to reduce grain have been introduced.

Light meters of the rectifier type are in regular use in television studios, film studios, and by pressmen and commercial photographers. At one time the general light intensity necessary for the Emitron cameras at the Alexandra Palace was of the order of 450 foot-candles, but this has now been reduced to a light value of rather less than 300 foot-candles. This compares with film studio light intensities of about 200 foot-candles for black-and-white photography and 800 for Technicolor. Of course, if for any special reason great depth of focus or definition is required, the lens aperture has to be closed down and the exposure brought up with more and still more light. Thus the special style of black-and-white photography being carried out on Sir Laurence Olivier's "Hamlet" requires about 1,000 to 1,200 foot-candles average intensity, and this requires a tremendous amount of light and electricity. For the purpose of comparison, a 500 watt pearl bulb gives a light reading of 20 foot-candles at about 15 feet from the lamp. A large film set illuminated at 1,000 foot-candles might necessitate the consumption of about 15,000 amps. at 110 volts. Enough to light a large town!

Sensitive Television Cameras

Television cameras have been developed to give good results at extremely low light intensities, and I recently had the opportunity of seeing an instrument of this kind which had been developed by one of our big radio firms, which had hitherto not touched the "transmitting" end of television. It was a beautiful compact job, with a turret of lenses of various focal lengths. The principal lens, I believe, was a 3in. one, and this gives some idea of the small dimensions of the pick-up area to be illuminated by the lens. I was not let into this part of the secret, but it could scarcely be very much wider than 1½in., judging by the range of lenses on the turret. The turret, by the way, permitted the lenses to be changed rapidly, thus allowing a camera to take long shots, medium or close shots without being moved. Very wide angle short-focus lenses can make a small room appear to have the dimensions of a skating rink. This is a most useful advance in technique.

Hepworth's Jubilee

This new television camera was exhibited at a function held at the Nettlefold Studios, Walton-on-Thames, to mark the fiftieth anniversary of the Walton Studios, at one time the headquarters of Cecil Hepworth, the first big British film production chief. Apart from an interesting collection of motion picture cameras, dating from the earliest types down to present-day apparatus and to television cameras, there was a fine show of lighting equipment. The progress of studio lighting could be easily traced from the enclosed Westminster arc light, giving a bluish-violet light of strong actinic value, to the mercury vapour tubes (alas, rich in violet rays!), the open white low-intensity arc light and the modern high-intensity arc with rotating positive carbon. The compact light source, the modern colour-corrected version of the mercury-vapour lamp, was also shown. This last type of lamp is possibly the most suited for television studios. Apart from their coolness of running over long periods, the B.B.C. engineers are enthusiastic about the clear-cut results as compared with incandescent lighting. This type of lamp has now passed from its experimental stage to its production model, and it may not be long before all television interior scenes are illuminated with them.

Programme Pointers

In This Article MAURICE REEVE Goes Into the Question of "Popular" Masters

AT a recent press conference Sir Thomas Beecham was supposed to be going to express the opinion that the musical taste of this country had never stood higher than it did at the present moment. But on looking over these alleged views, with astonishment, he actually gave expression to the exact contrary: never, in his opinion, had musical taste stood lower. Then he added (and here I quote the gist of Sir Thomas's remarks from memory and in my own words) "that for thousands of people to flock to hear standard classics, repeated *ad nauseum* and almost regardless of the quality of the performances given, was not necessarily good taste."

All honour to Sir Thomas, whose individual performances not only stand unrivalled in their sphere, but whose programmes, by their shrewd combination of standard classics and lesser-known masterpieces of the classic writers, cater to and attract the most eclectic and catholic tastes.

"Good taste"; "A musical nation"; "The public is always right." What crimes are committed in thy names and other similarly hollow and meaningless shibboleths. But what a thorny question. Sir Thomas Beecham seems to balance himself perfectly between the two extremes, both equally unwise and undesirable, of a constant and nauseating repetition of the hackneyed classics and a penchant for the "new" in music, primarily because it is new, i.e., modern and irrespective, more or less, of its intrinsic musical value.

What We Have Missed

His performances, for example, of more or less unknown symphonies of Tschaikowsky, Dvořák, Saint-Saens, Baliakirew, etc., have been revelations of what we have been missing, whilst the better known works of the same masters have been flogged to death. And not that Sir Thomas has neglected these, either, for his readings of almost all of them are justly famous. But in showing us that, for example, Dvořák did write fine music other than the New World, or that Baliakirew was a great Russian master as well as Tschaikowsky or Rimsky, he has, in effect, given us new music.

After the 1914-18 war the spate of "new" music which thundered from our concert halls and made our ear-drums rattle and our nerves vibrate was the other extreme from the present policy. Most of it was considered "great" at the time, but the ravings lavished on the extravagances of "Les Six" in France or on Scriabin's Symphonic Poems make pathetic and amusing reading to-day. But, believe it or not, the "Poeme de l'Extace" drew as many people then as Tschaikowsky's piano concerto does to-day.

"A New Task for the B.B.C."

As I write these notes Mr. Ernest Newman is engaged on one of his incomparable series of articles which he has entitled "A New Task for the B.B.C." He is not only appealing to them to give programmes of new and old music—by "old" he refers to the very roots of musical composition as we know it, Palestrina, Monteverdi, Byrd, etc., and beyond, music which it would be impossible for commercial reasons to put on under private enterprise—but to educate the public in their components and construction before doing so.

There have been innumerable educational broadcasts on every facet of the classical repertory from Bach to Brahms. The outstanding exponent was, of course, the much lamented Sir Walford Davies. And almost every public performance of these standard works given by the B.B.C. is invariably preceded by an illustrated lecture from the studio. The music-lover who doesn't know by now about the second subject of the "Eroica" or the Passacaglia in Brahms's Fourth, cannot complain that he hasn't been given the chance of acquiring a very good musical grounding in such matters. He has, in fact, had it to excess.

But it is Mr. Newman's contention—and who can dispute the correctness of his assumption?—that it is no good giving audiences surfeited with second subjects, recapitulations, scherzos, etc., works by masters who in some cases wrote before such things were ever thought of, and in others by writers who have scrapped such things as redundant or old-fashioned, unless you first of all explain it to them with equal lucidity and insistence.

Concert-givers have for far too long imagined that because they like and, sometimes, understand the works they are giving, that their audiences must, in the very nature of things, be equally enthusiastic and erudite. The lamentable frequency with which one sits in half-empty concert halls is largely a proof of whether or not this is so.

Chopin Anniversary

It is less than two years to the centenary of the death of he who is still the biggest magnet in the pianistic world, Chopin. I well remember the spate of "Chopin recitals" with which the anniversary of the master's birth in 1910 was honoured, and in not a few cases dishonoured. And that was in the golden age of great pianists. To-day they are again two a penny. I haven't been to any of them so cannot pronounce on either their quality or their popularity (one gentleman, in response to "insistent public clamour," gave a second at which he performed the whole book of fifteen valses!

There is no more delightful experience, just as there is no more certain a commercial winner, in the concert world than to hear this incomparable music played by someone such as Horowitz, who knows so well both how to distil the last drop of its exciting poetry and romance as well as to impart the individuality of a fresh and commanding genius. But, alas, how many "Chopin players" can do this? And when they cannot, we realise more quickly than with any other composer that there are two Chopins, and not one.

By the way, why do we persist in "giving" concerts and recitals? Surely, the American way of announcing that "so-and-so will 'play' a recital on Saturday next at 3" is a much more objective and realistic way of approaching the event!

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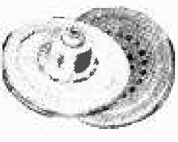

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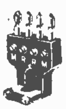

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Impressions on the Wax

Review of the Latest Gramophone Records

ONE of the highlights of the releases this month is a recording of Brahms "Concerto in D Major for Violin and Orchestra" on five 12in. Columbia records, played by the Philadelphia Orchestra, conducted by Eugene Ormandy, with Joseph Szigeti playing the violin.

The work was first played on January 1st, 1879, at Leipzig, with Joachim, who was Brahms' lifelong friend, as soloist, and its success promised well for a happy new year. This success was not easy to obtain, even with Joachim as protagonist, since the work was not planned to emphasise the virtuosity of the soloist. Its merits, however, have gradually been revealed to the general public, thanks to the persistence of Joachim, and afterwards of other violinists, including Brodsky, Kreisler and Szigeti. The numbers of the records are *Columbia LX983-7.*

Music from the Films

AN interesting recording this month is that of the incidental music from the Ealing Studios film "The Loves of Joanna Godden," played by the Philharmonia Orchestra, conducted by Ernest Irving on *Columbia DX1377.* The record introduces "Romney Marsh," "Joanna Godden," "Sheep-shearing," "Work on the Farm," "The Fair," "Martin Drowned at Dungeness," "Ellen and Harry Trevor," "Adoption of Motherless Lamb," "Burning of the Sheep" and "Reunion." Two popular favourites which make a welcome reappearance are Sullivan's "Iolanthe—Overture Part I and II," which has been recorded by the Liverpool Philharmonic Orchestra, conducted by Dr. Malcolm Sargent, on *Columbia DX1378* and "Madam Butterfly (Act I)," sung by James Johnston (tenor) and Joyce Gartside (soprano), on *Columbia DX1376.*

Andre Kostelanetz forsakes his own band and conducts the Robin Hood Dell Orchestra, of Philadelphia, in his latest recording of two of Tschaikovsky's most popular works—"The Waltz of the Flowers" from the popular "Nutcracker Suite" and "Melodie in E Flat Major" on *Columbia DX1373.* "The Waltz of the Flowers," which is the final number of the "Nutcracker Suite," stands among the best waltzes Tchaikovsky ever wrote. Woodwind delivers an introduction from which the chief theme is developed. The harp executes a brilliant cadenza, and with the horns giving the melody the dance gets under way. Half-way through, a new melody is given to the violins, and a climax is reached in a development of the original tune. Andre Kostelanetz is of Russian extraction, and a flair for the interpretation of Russian music is a characteristic of his style.

"Merrie England"

OPINIONS differ as to whether the England of the sixteenth and seventeenth centuries was quite as merry as the antiquarians like to think. Sir Edward German based his dances for "Merrie England" on the flavour communicated by the old music, and if to some the flavour is Elizabethan with a grain of salt, it cannot be denied that melody and attractive rhythms are there. Rawicz and Landauer have provided a spirited arrangement of "Merrie England" on *Columbia DB2305.*

First Recording

THE first of an exclusive series of recordings that Victor de Sabata will make for "His Master's Voice" appears in the latest releases. He is 53 years of age, and is acknowledged to be one of the world's finest orchestral conductors. In November, 1946, he took the Orchestra of the Teatro Augusteo on a tour of Switzerland and Italy, and at the conclusion of the tour these records were made in Rome, at the Argentina Theatre. "The Sicilian Vespers," the overture which Victor de Sabata has chosen for his first H.M.V. record—*H.M.V. DB6444,* was Verdi's nineteenth opera, and was produced in Paris in 1855. It followed "Traviata" and had a lurid story of the massacre of the French invaders, at Vespers, in Sicily, on Easter Monday, 1282.

The George Melachrino Orchestra, which specialises in the symphonic treatment of popular dance numbers and light classics, is already widely known for its many B.B.C. Saturday night broadcasts. Recordings by his popular strings (of which there are 26, and which is a part of the full orchestra), are enjoying a huge popularity. The latest recording by the Melachrino Strings is "Poème" and "Masquerade," on *H.M.V. B9554.*

Parlophone

THE arrangement of Lehar's "Gipsy Love," played by Sidney Torch and his Orchestra on *Parlophone R3026,* is in the form of a selection of the operetta's waltz tunes, specially adapted to make full use of Sidney Torch's 50-piece orchestra. This organisation is laid out on symphonic lines, with a generous complement of strings and woodwind and brass in proportion; in no sense a salon orchestra, its equipment could easily deal with a Beethoven symphony. Extensive experience in arranging works for the cinema orchestras has given him valuable insight into the art.

A newcomer to Parlophone is Oscar Rabin and his Band, who has been entertaining the public with their dance music for over 20 years. The arranger of the Glenn Miller Band made them a present of the score of "Moonlight Serenade," which forms one of their debut titles on Parlophone. This new record is dedicated by Oscar Rabin to the memory of Glenn Miller. The number of the record is *Parlophone F2215.*

Dance Music

ALL the latest hit tunes of the moment have been recorded by tip top bands, including "Gotta Get Me Somebody to Love," from the film "Duel in the Sun," and "Harriett," played by Geraldo and His Orchestra, on *Parlophone F2222.* "People Will Say We're in Love" and "Oh, What a Beautiful Morning," played by Joe Loss and his Orchestra on *H.M.V. BD5974* and "Opus No. 1" and "Swing High," played by Tommy Dorsey and his Orchestra on *H.M.V. BD5884.*

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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).

Cossor S.130 Neon Stabiliser Valve

SIR,—With reference to the article by J. Willis, of Alton, stating that he had difficulty in obtaining the above valve, I have managed to obtain a supply and am pleased to pass on the information to him or anyone who may be interested.—WALTER BINNING (13, Oakfield Close, Alderley Edge, Manchester).

Service Equipment

SIR,—I am an ex-R.A.F. wireless-mechanic, and have considerable information regarding R.A.F. equipment now being sold to the public.

Re the R.1155. I have modified one as follows. All the D.F. equipment has been removed and a small output stage included. The output transformer in the set being replaced by a 50,000Ω resistance and a 0.1 μF condenser for coupling to the output stage. A 10,000Ω variable resistance in the R.F. amplifier cathode circuit provides R.F. volume-control. A 5,000Ω variable resistance in the I.F. cathode provides I.F. volume, and the A.F. volume-control is left in circuit. A 300Ω resistance and a 0.1 μF condenser provide auto bias for the frequency-changer. The original fixed bias has been disconnected from the tags on I.F. transformer 3.

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My log includes VR5s, LUs, Ws from east to west coast; VKs, FO8, etc.—all at good loudspeaker volume and either 'phone or broadcast. I do not log C.W. or M.C.W. stations.

If anyone wants circuit diagrams of ex-R.A.F. wireless (*not* radar) equipment, I will be only too pleased to oblige—A. JAMES (3, Entwistle Place, Bolton, Lancs).

PN Calls

SIR,—Some time ago I heard PNOPM calling PNFD on the 40-metre band. On that night I was led to believe that their location was Mexico, yet looking back in the May-June, 1947, issue of your periodical, I find that the call-sign allocated to Mexico is preceded by XE. Can anyone clear this matter up for me, please?—JOHN GREENWOOD (Hebden Bridge).

Valve Vectors

SIR,—I regret that I inadvertently took E_g as positive at the instant shown, in my reference to Mr. Hatch's Fig. 2, instead of the conventional negative, but in any case this makes no difference to the constant angular relationship of these revolving vectors, which is the point at issue. Deliberately putting conventions aside, there is an actual physical reality in the respective relations of E_g and μE_g to the common point, the cathode. They are in the most real sense in opposite phase; the working of the well-known multivibrator, in fact, depends on this truth. So much for voltage relations; now for voltage-current relations and "provable fact."

(1) When a particular terminal of an alternator is negative, electrons are flowing from it into the external circuit. When it is positive, electrons are flowing into it from the circuit and, with a resistive load, we say that voltage and current are in-phase. This is elementary.

(2) When the anode of a valve having a resistive load is on its negative half-cycle (grid positive), electrons are flowing away from it, the proof being increase of anode current. Conversely, when the anode becomes positive (grid negative), the electrons of the alternating I_a are, relatively of course, flowing in towards it, decreasing the total anode current.

(3) The unavoidable conclusion from (1) and (2) is that the valve, taken as an imaginary generator, is working exactly the same as the alternator of (1), that μE_g and the actual "true" alternating I_a are in-phase with one another, not in opposite phase as often shown. The alternating I_a is, in fact, being propelled in the direction in which a real generator in the valve would drive it at any instant, and there is no necessity for diagrams with two puzzling I_a vectors equal and opposite to one another.

(4) If inductive reactance, as well as resistance, exists in the anode circuit, the current lags on the voltage, as in any alternator load circuit. This is precisely why I disagree with Mr. Hatch's Fig. 2, which shows the "true" direction of I_a as actually leading on the generator voltage by more than 90 deg. with a partly inductive load.—A. O. GRIFFITHS (Wrexham).

German Army Tx-Rx

SIR,—I have recently obtained a German Army transmitter-receiver, and I would be glad if any reader could give me any information on it. It is inside a grey case, some 10in. × 8in. × 6in., and has provision for operation on 24 volts D.C. supply or 110/220 volts A.C. supply. The transformer serves a dual purpose, i.e., for mains or as a vibrator transformer. Two neon stabilisers marked GR150 are used in the power supply, and the rectifier is an EZ12 and has a continental base. A 24 volts vibrator is also included. The radio side of it is a three-valve transmitter-receiver and has a frequency range of 3.5 to 14.8 Mc/s in three wavebands. On the front of it is a switch in the bottom right-hand corner: this has four positions. The first position is marked Tg, second Empf, third Tf, and fourth Tg.ton. Tg means telegraphy, Empf means receive, Tf means telephony, and I do not know what Tg-ton means. Above this is a switch which is marked Ant. Koppl. This selects tappings on the aerial-coupling coil. On the left-hand side of the transmit-receive switch is a tuning control marked Ant. Abst.; this is for antenna tuning. Approximately in the centre of the front panel is a tiny meter. In the top right-hand corner is a door which opens, and inside are the valve sockets and tuning controls. Tuning is by means of a soft iron core geared to the tuning control. Please. could anybody supply valves, or valve data for it? Two of the valves have Loktal-type sockets, and the third has a ceramic socket similar to the octal base, only larger.

I do not know any of the valve types, since specimens are not available, but if anybody has a similar piece of equipment complete or knows anything about it, will they please let me know more about it? I can provide a photograph and further details of positions of components, etc., if required. —G. S. DRURY (65, Queen's Road, Newbury, Berks).

"Valve Types and Prices"

SIR,—In reply to your correspondent Mr. E. T. R. Bellas, of Penrith, whose article on valves appears in the August issue of PRACTICAL WIRELESS, I would like to query some of the points he mentions.

He says from the American coding one understands immediately the voltage, position and type of tube. How does he explain, say, a type 43 valve or a 78, or a 6L8? Also he says one needs a table to understand British valves. Well, how about a Mullard TDD4, which is what it implies, namely a double-diode triode, 4 volts; or a Cossor 42MP Pen, which again is an output pentode, 4 volt 2 amp.? I could quote many, many more.

Thirdly, he says he knows of a set eight years old that is still as good as ever. Well, I know from experience and also from articles that have appeared from time to time in "P.W." that that is impossible, and suggest that if he were to fit a new set of valves in the receiver he would be amazed at the performance of same.

In conclusion, whilst I am aware of the fact that the majority of the new post-war receivers are using the 6.3 volt .3 amp. American type valves, I would like to inform Mr. Bellas that one firm, namely R.G.D., have just put on the market an all-wave superhet auto radiogram priced at £196 6s. 6d. This is a 10-valve job and employs *antique* (?) 4-volt valves. I think the only point I can agree with Mr. Bellas is the one about the spacing of pins on octal valves, and in this case not only are the pins different but also the size of the locating key.—L. KEEN (Hornchurch).

SIR,—In the August PRACTICAL WIRELESS Mr. Bellas makes a restrained protest against the insane fandango of the English valve manufacturers' incredible labyrinth of types and numbers.

But it seems to me that the time is long overdue for putting things much more bluntly.

I lived for 15 years on the Continent, up to 1940, and the result of all this crazy muddle is that there is no market for English valves there.

To look through the lists of English valves, with their "equivalent tables," one would suppose that the type had been set up in a lunatic asylum.

Do you suppose anyone outside England is going to waste his time with such gems as 41MXP, PM1HL, KTW74M or MSG/HA?

On the top of this there is the most variegated assortment of valve bases from 4- to 9-pin, and, as Mr. Bellas points out, one maker produces valves which have all the appearance of having octal bases, but he has artfully arranged them so that they will not fit octal sockets.

To make all this incomprehensible mess more complicated, another manufacturer makes a series of American type valves—6K7, 6Q7, etc., but gives them the usual meaningless English type numbers, while another produces a well-known series (with actually simple and widely recognised type numbers) but appears to give them entirely different numbers according to the wireless sets in which they are used!

When one lives out of England and is asked to do something to an English radio set that its misguided owner has innocently taken abroad, the first thing is to find out whether it has English valves. If so, and it is suffering from valve trouble, it may as well be thrown on the junk heap unless the sockets can be changed to octals.

Some English valve makers have had the brains to make standard octal type valves, and some English set makers have had the sense to fit octal valves to export models.

The final effect of all this crazy English valve hotchpotch is that American valves are universally obtainable throughout the world; because no one is going to get involved trying to find out how he can discover an English valve to correspond with one that has passed out, in the hope that, when he has tracked it down, it will have the right base.

I long ago made it a rule always to use American valves and never English ones. I am thus certain of being able to obtain replacements anywhere on this planet without the risk of being carried off to the madhouse drooling that I have been appointed chief valve chart decipherer-in-lunacy to the B.V.M.A.—G. P. H. DE FREVILLE (B.A.O.R.).

"The Vector Problem"

SIR,—I read with interest Dynatron's letter on voltages in valve anode circuits. He brings up the matter of back voltages, as does the Admiralty Handbook (Vol. 2, Section K6). It is all very confusing: some writers, as does Dynatron, insist that it is essential to bring in the D.C. aspect, while others, as a well-known writer did a month or two ago, consider this unnecessary and a positive encumbrance. The effect of these rises and falls of total anode current passing through the resistance load is precisely the same as a pure alternating voltage, as far as the grid of the following valve is concerned. So the valve is treated simply as an alternator, the phasing of voltages and currents being the same as with a real alternator.

Would an oscilloscope with the Y plates connected between anode and H.T. negative, with an alternating voltage fed to the valve, show a reversal of phase if H.T. positive could be instantaneously substituted for H.T. negative, the necessary precautions being taken?—A. O. GRIFFITHS (Wrexham).

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