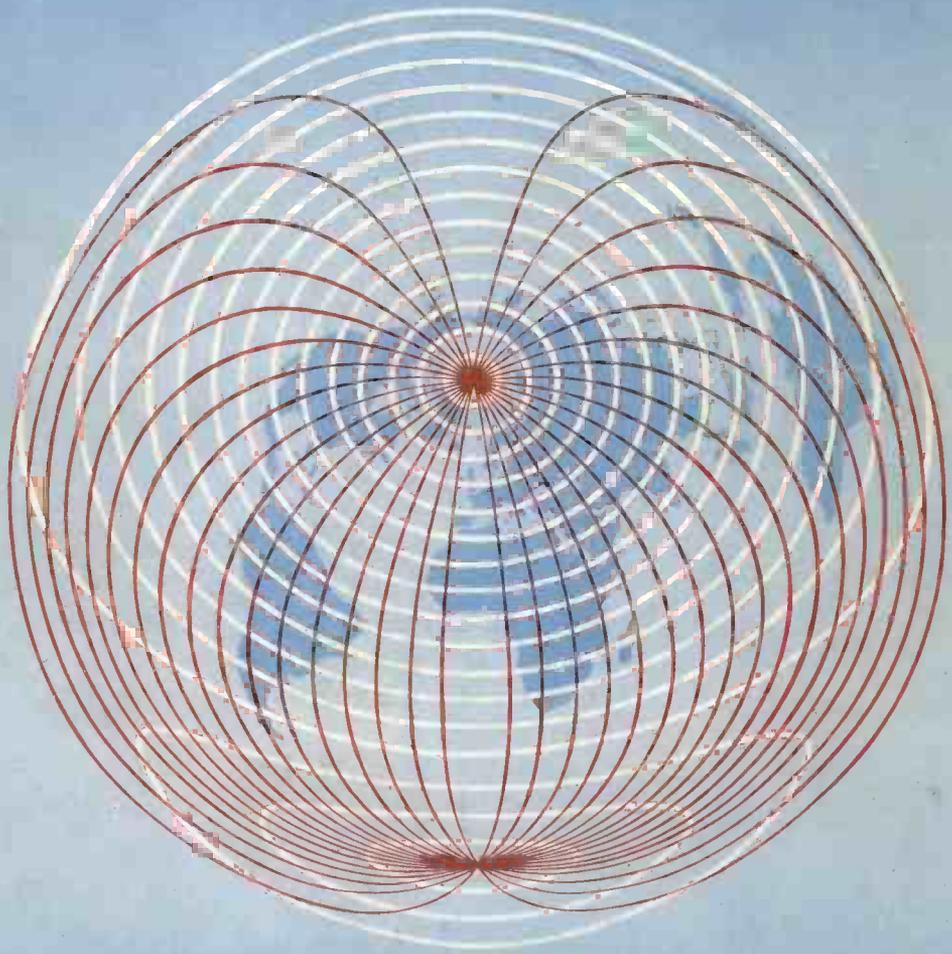


Wireless World

AUGUST 1953 · TWO SHILLINGS



RADIO. TELEVISION AND ELECTRONICS

minus 75°C
to plus **250°C**

For Radio Frequency
at Extreme Temperatures

BICC are now producing radio frequency cables insulated with P.T.F.E. (Polytetrafluoroethylene) capable of withstanding temperatures from minus 75°C up to 250°C. Inner and outer conductors are of silver-plated copper wire, while overall protection is provided by an impregnated glass braid.

Due to limited supplies we regret that this cable is only available against approved contracts.

BI
Callender's

P. T. F. E. R. F. CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21, BLOOMSBURY STREET, LONDON, W.C.1

Wireless World

RADIO, TELEVISION
AND ELECTRONICS

43rd YEAR OF PUBLICATION

Managing Editor: HUGH S. POCOCK, M.I.E.E.

Editor: H. F. SMITH

AUGUST 1953

In This Issue

EDITORIAL COMMENT	343
REACTIVATING THE DRY CELL. By <i>R. W. Hallows</i> ..	344
A.C./D.C. COMMUNICATIONS RECEIVER	348
TRENDS IN ELECTRO-ACOUSTICS	352
WIRELESS FIFTY YEARS AGO. By <i>Maurice Child</i> ..	355
TRANSISTORS—7. By <i>Thomas Roddam</i>	359
RE-DEFINING "ELECTRONICS" By <i>B. E. Noltingk</i> ..	361
BRAIN WAVES BY RADIO	362
LETTERS TO THE EDITOR	363
T.A.C. REPORT	365
WORLD OF WIRELESS	367
TRANSISTOR CIRCUITS AND APPLICATIONS	369
RADIO INTERFERENCE	369
NARROW-BEAM RADIO TELESCOPE	371
MOBILE TELEVISION TRANSMITTERS. By <i>E. W. Hayes</i> ..	372
A.F. COIL WINDER. By <i>B. V. Northall</i>	376
BRITISH INSTRUMENT EXHIBITION	379
RADIO RESCUE BEACON	381
OHM'S LAW. By "Cathode Ray"	383
MANUFACTURERS' PRODUCTS	387
RANDOM RADIATIONS. By "Diallist"	388
UNBIASED. By "Free Grid"	390

PUBLISHED MONTHLY (last Tuesday of preceding month) by HIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1. Telephone: Waterloo 3333 (60 lines). Telegrams: "Ethaworld, Sedist, London." Annual Subscription: Home and Overseas. £1 7s. 0d. U.S.A. \$4.50. Canada \$4.00. BRANCH OFFICES: Birmingham: King Edward House, New Street, 2. Coventry: 8-10 Corporation Street. Glasgow: 26B Renfield Street, C.2. Manchester: 260 Deansgate, 3.



AUGUST 1953

VOL. LIX No. 8

Orderly Development of Television

AS an exercise in fact-finding, the Report recently issued by the Television Advisory Committee (with, no doubt, a great deal of assistance from its technical sub-committee) is an admirable piece of work. A summary of the Report, published elsewhere in this issue, shows that it deals in detail with the various frequency bands available for extension of our national television service, surveying their characteristics and the uses to which they might be put. But the Report is much more factual than advisory. It leaves many open questions, the most important of which can only be answered by the G.P.O. In a word, we are no nearer an alternative television service—and probably farther away from a competitive service—than we were when the question was, most regrettably, opened as an acutely political issue over a year ago.

The one dissentient member of the Committee, C. O. Stanley, does not exaggerate when he says, in his reservation to the Report, that the limited conclusion reached does not form “an adequate basis on which to plan alternative television services.” Mr. Stanley’s colleagues on the T.A.C. may be right in saying that his reservations are irrelevant to its terms of reference, but, nevertheless, he has done a useful public service in drawing attention to the unsatisfactory situation brought about by the way in which frequency channels in Band 3 (174-216 Mc/s) have been allocated during the past few years. Under the monopolistic powers conferred by the Wireless Telegraph Acts, the G.P.O. has long been the supreme arbiter in these matters, but there is an implication in the body of the Report that the Postmaster-General was wrong in allocating Band 3 channels to mobile radio services. Be that as it may, Mr. Stanley’s protest will bring home to a wide circle that the Post Office is unduly secretive about matters of frequency allocation. It is not only in television that we have to plan ahead. Designers and potential users of radio equipment of every kind should know what is being done, and what it is proposed to do. Mr. Stanley’s plea for the early establishment for a “B.C.C.”, on the lines of the Federal Communica-

tions Commission of the U.S.A., will certainly have some support.

Even if the Report settles nothing, it at least provides the data for useful discussion, which is bound to centre on the uses to which Band 3 should be put. This band contains eight 5-Mc/s television channels, but is so largely occupied at present by business radio, navigational aids and other services that only two channels can be freed for television. What is to be done with this band? Potentially it is the most valuable for television in the existing state of the art.

Majority opinion in radio circles inclines to the opinion that Band 3 should be given exclusively to the B.B.C., if only in the interests of orderly development. This would allow the Corporation to complete its initial plan for virtually complete coverage of the country with a single programme by using the two channels immediately available. If the remaining six channels are freed, the B.B.C. could then carry through its published second-programme plan (*Wireless World*, June issue).

But is there any real hope that Band 3 will ever be freed for television in its entirety, as the T.A.C. has specifically recommended? Only the G.P.O. can give the proper answer to that question. *Wireless World*, without wishing to usurp the functions of the T.A.C., suggests it might be better to by-pass Band 3 entirely, and to plan straight away for use of the higher frequencies; we must come to them sooner or later anyway. It would complicate receiver design and commercial distribution if it became necessary to provide for the reception of a few Band 3 stations giving much less than full national coverage. We cannot accept the objection to this idea, made in the Report, to the effect that a home market in Band 3 receivers is desirable in the interests of export. That is not a valid reason for upsetting orderly development. So long as Britain adheres to the 405-line standard, there will be no export outlet for sets designed primarily for home use, but the industry has already proved it can make equipment for any foreign standards.

Reactivating the Dry Cell

Effects of a Reverse "Charging" Current

By R. W. HALLOWS, M.A. (Cantab), M.I.E.E.

THE main reaction during the discharge of a Leclanché cell described in the previous article* is, when one comes to think of it, simply electrolysis in reverse. In electrolysis, electrical energy is converted into chemical energy, while in the discharge of a primary cell there is a conversion of chemical into electrical energy. So long as discharge is in progress zinc is removed from the negative element and passes into the electrolyte to form zinc-chloride. Thus when the cell is in a partly discharged state conditions appear to be all in favour of the occurrence of electrolysis, should a reverse current be made to flow through it: the zinc is immersed in a solution of its own salts; the passage of the reverse current should lead to the removal of zinc ions from the solution and their deposition as metallic zinc on the negative electrode of the cell.

It is not, of course, quite so simple as that; for, as we have seen, the Leclanché cell is really a two-part device, whose overall e.m.f. is the sum of two e.m.f.s in series. The electrolysis just mentioned involves only one part of the cell, that consisting of the zinc and the electrolyte. If the cell is to be reactivated, or restored to its original condition, the passage of the reverse current must also produce profound chemical changes in the part consisting of the manganese-dioxide element and the electrolyte. It must cause complete depolarization by removing hydrogen from the surface of the carbon and send it on its way through the cell in the form of positive ions. It must also dissociate the molecules of water, formed in the original process of partial depolarization, into positive hydrogen ions and negative oxygen ions, and cause each of the latter to combine with a molecule of Mn_2O_3 in such a way

as to form two molecules of MnO_2 , or manganese-dioxide.

Complex though it may appear, that is a very much simplified account of the reactions required, if a cell is to be restored by passing reverse current through it. Yet, given certain essential conditions, to which we shall come in a moment, a dry cell can be discharged and reactivated again and again. It can, in fact, be made to behave as a secondary cell. But no one has yet been able to give a completely satisfactory account of the reactions involved. No one, for that matter, has yet fully explained the discharge process. For instance, though no text-book reactions show any free chlorine, one has only to break open a partly-discharged (but, of course, unperforated) dry cell to detect its unmistakable smell. It has been my privilege to be able to discuss both discharge and reactivation with some of the most eminent authorities on the dry cell. Each of these has said modestly that, though the text-books might claim to have everything tidily wrapped up and labelled, he himself was, frankly, by no means certain of all the answers.

Perhaps, then, it is best to realize that we have as yet no more than a rather general picture of the way in which such an apparently simple device as the familiar dry cell works, whether it is discharging or undergoing the process of restoration by electrical recharging.

The essential conditions for the successful reactivation of a dry cell are these:

- (1) It must be a "fresh" cell. Little or nothing can be done with an unused cell near the end of its shelf-life.
- (2) A cell whose e.m.f. has declined as a result of long use cannot as a rule be reactivated.
- (3) The best results are obtained from cells sub-

* "Improving the Dry Cell," June, 1953.

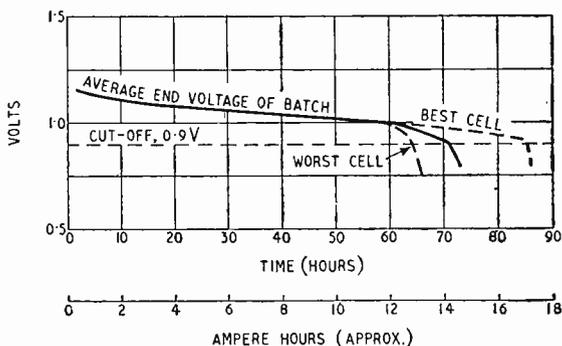


Fig. 1. Batch A. 6 cells of same make discharged 3 hours daily through 6 ohms and recharged at 0.1A for 8 hours. All cells came to an end through perforation of the cans.

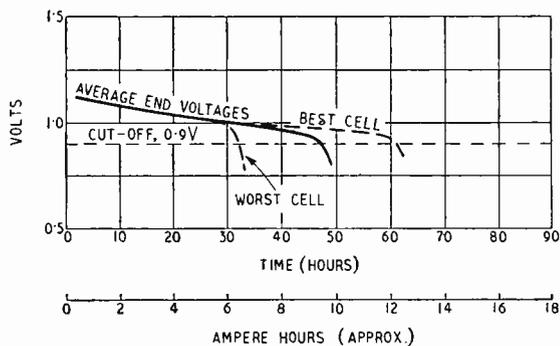


Fig. 2. Cells of another make discharged and reactivated under the same conditions. Worst cell perforated under discharge when e.m.f. was 1.05V.

jected to a heavy rate of discharge for comparatively short periods. Reactivation is not nearly so effective if reverse current is applied after a long period under a light load.

(4) The can must be unpunctured. It follows from this that cells liable to perforation of the can for reasons given in the previous article will not stand up satisfactorily to a series of discharges and recharges.

(5) Electrical recharging must take place as soon as possible after each discharge period.

(6) The applied reverse current must be carefully controlled.

The classic work on the reactivation of dry cells was done as long ago as 1936 by Kenneth A. Kobe and Robert P. Graham of the University of Washington.* They showed that dry cells $2\frac{1}{16}$ in diameter by 6 in in height, whose cans contained an average of 120 grams of zinc could, by periodic reactivation, be made to deliver more than four-and-a-half times the amount of current theoretically obtainable from their entire metal content. From the discussion in the previous article of the electro-chemical equivalent of zinc it will be seen that the maximum amount of current theoretically obtainable in the ordinary way from such cells is 120/1.2, or 100 Ah, and that the useful current, with the e.m.f. not below 0.9 V, to be expected from cells of the highest quality is rather less than 40 per cent of this, say 36-38 ampere-hours.

Kobe and Graham continued their experiments until the batch of cells, discharged at 1.25 A and reactivated by what had been found to be the optimum charging e.m.f. and current, had achieved an average of 466 Ah—the equivalent of 4.66 times the zinc in their cans. With the cells still nearly as good as new by every test, the experiments were discontinued. There was no point in going on with them, for they had given conclusive answers to the question: Can dry cells be reactivated? The reverse charging current clearly brought about a redeposition of the zinc, for the original amount of metal was still there, even though sufficient current had been delivered by the cells to account for the removal from the cans of more than four-and-a-half times its weight. It is worth noting that there was no pitting of the inner surface of the cans.

Unfortunately, the experiments of Kobe and Graham were not very realistic. They contrived a rotary switch which put the cells on discharge for

so many seconds then immediately on charge for so many more. Their best results were obtained by discharging cells at 1.25 A for a few seconds and then charging them at 0.2 A for seven times as many. A high-grade dry cell used for ringing an electric bell might thus be kept in good condition for an indefinite period. All that is required is a device which switches in a charger and keeps it in action for, say, 30-40 seconds whenever the bell-push has been pressed. It would, however, be simpler and far cheaper to operate the bell through a mains transformer. Proof that dry-cell reactivation is a practical proposition and that it can pay was given a year or two before the war by the Commonwealth Edison Electric Company of Chicago. This company employs a considerable number of meter-readers, each of whom is provided with a flashlamp. When he returns to headquarters after the day's work each reader hands in the battery of his flashlamp, which is placed in a large charging rack. Next morning he is given a recharged battery. The fact that the system is still in regular use is proof positive of its efficacy.

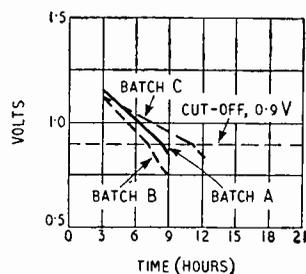
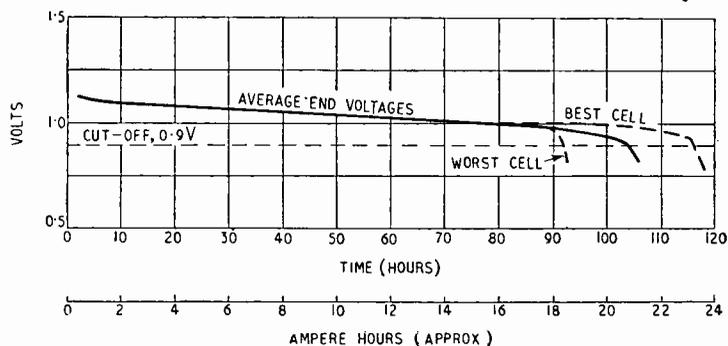
Simple Experiments

Any reader who is attracted by the problem will find experiments in reactivation most interesting to carry out. The only equipment needed is a 2-volt charger, an ammeter with a 0-1 A range, a high-resistance voltmeter and a rheostat for controlling the charging rate. For my own experiments I used batches of six cells of the "U2" size, each batch being of a different make. The average weight of zinc in the cans was 19 grams, theoretically capable of producing 15.8 Ah of current.

The cells were discharged for 3 hours a day through 6-ohm loads. The average current over the day's run was found to be so close to 0.2 A that a figure of 0.6 Ah was assumed as the average for each 3-hour discharge period. Charging began as soon as the day's run was finished and lasted for 8 hours, the rate being kept as near as possible to 0.1 A. The cells were rested overnight and put on discharge again the next morning.

Readers who make experiments should be careful not to let the charging rate for cells of this size rise much above 0.1 A; more rapid charging at higher rates causes the cells to become too hot—and may even lead to their blowing up, with rather devastating effects! I have a feeling that better results than those

* "The Effect of Applying a Counter E.M.F. to a Leclanché Cell." Paper read before the Electro-chemical Society, U.S.A., 30th April 1938.



Left: Fig. 3. Batch C. Even the worst performer in this group produced current corresponding to a much greater weight of zinc than was originally contained in the entire can. Right: Fig. 4. Cells discharged under the conditions of Figs. 1, 2 and 3, but not reactivated. Voltages at the end of each 3-hours run are shown.

shown in the accompanying graphs might have been obtained, had it been possible to charge at 0.05 A for 15-16 hours.

The graphs of Figs. 1, 2 and 3 are the lumped end voltages under load for three batches of different make. The individual batch figures are:

Batch A			
Average service .. ..	..	..	70½ hours
Best performance .. ..	..	..	86 hours
Worst performance .. ..	..	..	64 hours
Average output .. ..	..	..	14.1 Ah.
Equivalent weight of zinc ..	..	..	16.92 grams

Batch B			
Average service .. ..	..	..	47 hours
Best performance .. ..	..	..	61 hours
Worst performance .. ..	..	..	34 hours
Average output .. ..	..	..	9.4 Ah
Zinc equivalent .. ..	..	..	11.28 grams

Batch C			
Average service .. ..	..	..	104 hours
Best performance .. ..	..	..	116 hours
Worst performance .. ..	..	..	92 hours
Average output .. ..	..	..	20.8 Ah
Zinc equivalent .. ..	..	..	24.96 grams

Every test of the series was brought to an end by the same cause, perforation of the zinc cans. Unlike those used by Kobe and Graham, the cells available could not, therefore, be made to behave exactly as secondary cells. Kobe and Graham make no mention of creeping and the absence of pitting recorded by them is evidence that most, if not all, of the zinc was redeposited on charge in the places from which it had been removed during discharge.

External Zinc Erosion

Every one of the perforated cells which I broke open showed signs of creeping: erosion of the zinc had taken place through local action in places outside the electrolyte, where redeposition could not be brought about by the passage of the reverse current. Given cells free from creeping, I have no doubt that reactivation could be made to extend service lives to scores, if not hundreds of ampere-hours for "U2" sized cells intermittently discharged at the very heavy average rate of 0.2 ampere.

Even with the cells now generally available reactivation pays handsomely, as will be seen by comparing the discharge curves of Fig. 4 with those of Figs. 1, 2 and 3. Three cells of the same makes as those of the batches whose respective performances are illustrated by Figs. 1, 2 and 3 were put through the same tests, except that they received no reactivation. They were discharged each day for 3 hours through 6 ohms and rested for 21 hours.

Some very interesting points were noted in the course of the charge-discharge tests. One of these is that the e.m.f. of a cell at the end of a charging period may be as high as 2.3 volts, or even a little more. If the cell is left on open circuit for an hour or two the e.m.f. usually falls to the neighbourhood of 1.8-1.9 V. With some makes of cell the decline is rather more marked; but even after 5 or 6 hours the e.m.f. may be well above the normal Leclanché 1.5 volts.

The high e.m.f. that may be found immediately after reactivation leads one to wonder how the filaments of miniature and subminiature valves would fare if they were heated by cells which were reactivated

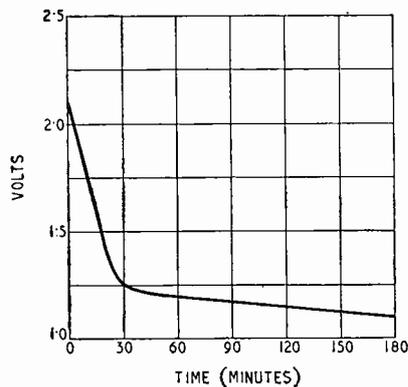


Fig. 5. E.m.fs of a typical reactivated cell during a 3-hours discharge through 6 ohms.

daily. One knows that they can stand up for short periods to e.m.fs of the order of 1.48 V when new l.t. batteries are fitted; but what would be the effects of a daily dose of filament voltage starting at 2.15 V and taking 10 good minutes or more to fall to 1.5 V? As Fig. 5 indicates this is what happened when cells of one type were switched straight from "charge" to "discharge." When these cells were given two hours rest after reactivation, the closed-circuit e.m.f. was 1.64 V and this fell to 1.5 V in less than 10 minutes.

To be on the safe side, then, it would seem wisest to rest cells used for filament heating for at least an hour after reactivation is finished.

The service-life graphs of Figs. 1, 2 and 3 leave no doubt that one effect of reactivation is to reverse in Part I of the cell (zinc and electrolyte) the discharge reactions:



Redeposition of metallic zinc must occur. The best performer of Batch A had a current output which corresponds to the removal of 20.64 grams of zinc from the can, or more than it contained to begin with. For Batch C the average zinc equivalent was 24.96 grams and that of the star performer 27.84 grams.

What happens in Part II of the cell, consisting of the carbon, the depolarizer and the electrolyte, is much more difficult to follow. There must be significant chemical changes, for (a) complete depolarization takes place, (b) the e.m.f. rises far above its original value and (c) the internal resistance becomes lower than in a new cell.

Temperature Effects

One cannot help feeling that thermal effects play an important part in producing these results, for during the reactivation process cells become warm to the touch—they must not be allowed to get hot. Temperature has a marked influence on the rapidity and effectiveness of depolarization. Some years ago I conducted an extensive series of tests for an American battery company, some of their own products being included as a check on my results. To our mutual mystification my tests, though conducted strictly according to instructions at living-room temperature, showed service lives for their cells about 10 per cent shorter than those obtained in their own laboratories. My thermostats had been set at 63°F; when they were

reset at the 70°F of American living rooms there were no more discrepancies. Old hands will recall, too, that it was discovered in the early days of wireless that expiring h.t. batteries could be given a short new lease of life by a spell in the airing cupboard, or even the oven!

The lowering of internal resistance that occurs is quite remarkable. The cell whose performance is shown in Fig. 5 showed when new an open-circuit e.m.f. of 1.51 V, which fell instantly to 1.48 V when the 6-ohm load was switched in. After reactivation the open-circuit e.m.f. was 2.18 V and that on closed circuit 2.15 V. From these readings the internal resistance when new and that after reactivation are readily obtained. It is, by the way, very important that the voltmeter should be a high-resistance instrument; otherwise the readings will be misleading. That used throughout these tests has a resistance of 2,000 ohms per volt.

Calling the open-circuit voltage E and the closed-circuit voltage V, we have for the internal current of the cell

$$I_{int} = \frac{E - V}{R_{int}}$$

where R_{int} is the internal resistance.

$$\therefore R_{int} = \frac{E - V}{I_{int}}$$

But $I_{int} = I = \frac{V}{R_L}$

where I is the current through the load resistance R_L .

$$\therefore R_{int} = \frac{(E - V) \times R_L}{V}$$

In the case under discussion the internal resistance of the new cell was

$$\frac{(1.51 - 1.48) \times 6}{1.48} \approx 0.12 \Omega$$

and that after reactivation

$$\frac{(2.18 - 2.15) \times 6}{2.15} \approx 0.08 \Omega$$

It was suggested in the previous article that the redesigning of the dry Leclanché cell with a view to making its discharge less wasteful of valuable materials might be a profitable field for research and development. There seems, too, to be another promising opportunity: the production of a dry Leclanché cell specially designed to stand up to a long series of discharges and reactivations. That this could be done I have no doubt at all.

GERMAN RADIO JUBILEE

Telefunken's Fiftieth Birthday

AT the opening of the present century, two groups were striving in Germany to develop wireless telegraphy: Braun-Siemens and Slaby-Arco-A.E.G. After some disputes about patent rights and other questions, the two groups amalgamated in May, 1903, to become the Telefunken Company.

Telefunken's first great achievement was in 1906 when the quenched spark transmitter was introduced. Up to the time of the first World War—indeed, until the valve became commonplace—this proved a highly successful

system, and was installed at stations all over the world. To historians of the early days of radio, the name of Telefunken will always be associated with the quenched spark method. Its operation depended on the rapid extinction of oscillations in the closed primary circuit and the production of oscillation trains of relatively low damping in the open aerial circuit. But real continuous waves were still to come; to quote the Jubilee issue (May, 1953) of *Telefunken-Zeitung*, this was "the era when men not only looked yearningly into the promised land of undamped oscillations, but set about entering it in diverse ways."

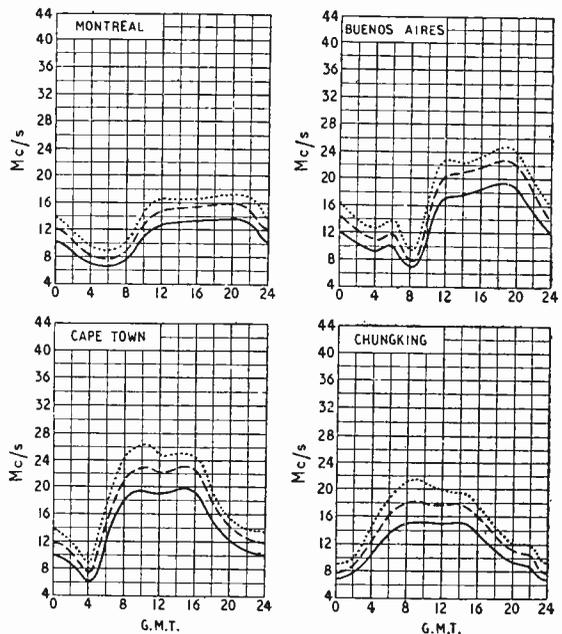
One of the ways explored by Telefunken in the early days for producing undamped oscillations was by means of the radio-frequency alternator, which provided a neat engineering solution of the problem, but one that proved in the end to be of limited application. Nevertheless, the Nauen "machine sender," near Berlin, achieved direct communication with the United States in 1914—no mean feat at that time. But, although several r.f. alternator stations were later installed, the centre of interest soon shifted to the higher frequencies, with which the machine generator could not cope. The day of the valve had arrived, and Telefunken has played a distinguished part in developing this and other devices of the present radio age. These developments are surveyed in detail in the Jubilee issue of *Telefunken-Zeitung*.

Short-wave Conditions

Predictions for August

THE full-line curves given here indicate the highest frequencies likely to be usable at any time of the day or night for reliable communications over four long-distance paths from this country during August.

Broken-line curves give the highest frequencies that will sustain a partial service throughout the same period.



- FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE ON ALL UNOBSERVED DAYS
- - - PREDICTED AVERAGE MAXIMUM USABLE FREQUENCY
- FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE FOR 25% OF THE TOTAL TIME

A.C./D.C. Communications

Receiver

Eddystone Model 840 Seven-valve Superheterodyne Covering 30 Mc/s to 484 kc/s with Flywheel Tuning and Station Logging Scale

THE introduction by Stratton of an a.c./d.c. communications receiver should go some way to dispel any notion that an a.c. supply is really necessary for the satisfactory operation of sets of this type. Communications sets are used in many parts of the world for one purpose or another and flexibility in the mains supply required is an undoubted advantage.

TABLE 1

Circuit Position	Valve Type	Heater Volts	Function
V ₁	UAF42	12.6	Tuned r.f. amplifier.
V ₂	UCH42	14	Combined mixer and oscillator (frequency changer).
V ₃	UAF42	12.6	I.F. amplifier at 450 kc/s.
V ₄	UAF42	12.6	Combined detector and 1st a.f. amp.
V ₅	UL41	45	Power output pentode.
V ₆	UAF42	12.6	Beat frequency oscillator (B.F.O.).
V ₇	UY41	31	Half-wave mains rectifier.

TABLE 2

Range	Coverage	Amateur Bands	Broadcast Bands
1	30.6 to 10.5 Mc/s	28, 21 and 14 Mc/s	11, 13, 16, 19 and 25 metres.
2	10.6 to 3.7 Mc/s	7 Mc/s	31, 41, 50, 60 and 76 metres
3	3.8 to 1.4 Mc/s	3.5 and 1.7 Mc/s	90, 125 metres and lower part of medium wave broadcast.
4	205 to 620 metres (14,600 to 484 kc/s)	None	Major portion of medium wave broadcast

(Note. The broadcast bands in the last column are given only in metres as the majority of short-wave listeners are better able to identify them in this form.)

Known as the Eddystone Model 840, the set is intended for general-purpose reception and is suitable for both amateur and professional purposes. It employs seven miniature valves in a reasonably orthodox superheterodyne circuit, the function of each valve, its type and position in the circuit, being given in Table 1.

The adoption of the a.c./d.c. technique has enabled a worthwhile saving in weight to be effected as there is no need for a mains transformer, and this is generally one of the heaviest items in a mains receiver.

Four switched tuning ranges are provided and together they cover 30.6 Mc/s to 484 kc/s. Individual coverages are given in Table 2, which also includes details of the specially marked sections of each range. These take the form of coloured bars embracing small bands of frequency and show at a glance where the broadcast and amateur bands lie. Blue is used for amateur and red for broadcast.

It has been said that the circuit is reasonably orthodox, by which is implied that the main circuitry—r.f., mixer, i.f., a.f. and BFO stages do not depart much from orthodox practice, but there are a number of features which are exclusive to the Eddystone 840. For example, it is usual a.c./d.c. practice to connect all valve heaters in series, using valves of the same current consumption throughout. In this set a combination of series and parallel connections is adopted and details of the arrangement are given in Fig. 1.

Of course, there is a very good reason for this choice. If all valve heaters were joined in series their combined voltages would add up to 140 V and it would then be impossible to operate the set on 100/110 V. Against each valve in Table 1 is marked its voltage requirements, and this will enable the rather unusual arrangement of valves V₂, V₅ and V₇ to be appreciated. The heater voltages of V₂ and V₇ add up to that of V₅, so that these two are connected in series and the pair joined in parallel with the third (V₅). Incidentally, all valve heaters take 0.1 A, but by this method of connection the filament consumption is 0.2 A and the total set consumption amounts to 0.275 A at any voltage.

The component marked T in Fig. 1 is an anti-surge thermistor to keep the current to a safe value at the moment of switching on, while L represents the dial light. The other components are readily identifiable.

One of the requirements of a communications receiver is the facility to monitor the transmitter when one is used at the same station. As in some cases the

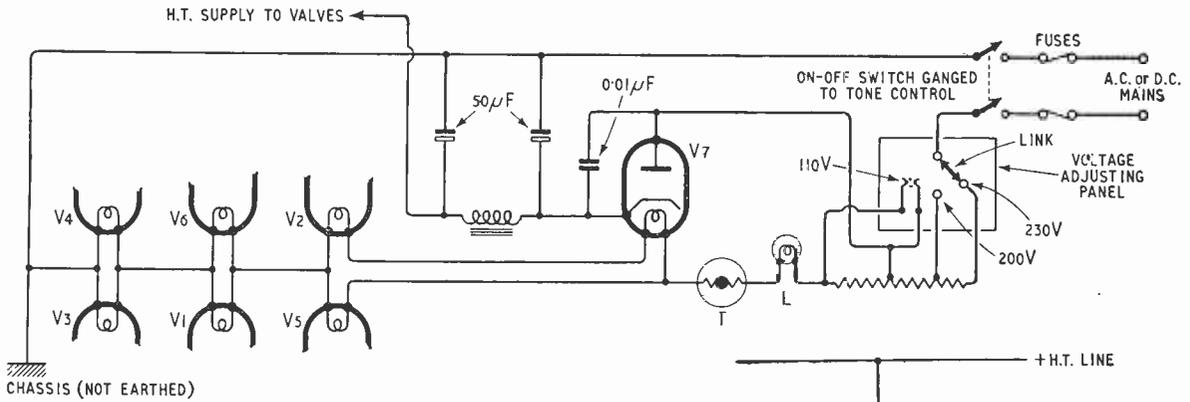


Fig. 1. Series-parallel arrangement of the valve heaters in the Eddystone Model 840 communications receiver.

receiver will be tuned somewhere near the transmitting frequency, it will either have to be switched out entirely, or adequately de-sensitized when transmitting. It is generally more convenient to de-sensitize the receiver and use it as a monitor.

All Eddystone communications receivers include this "stand-by" feature, and in the Model 840 de-sensitizing is effected by applying a rather large negative bias to the r.f. and i.f. stages (V_1 and V_3) by making the cathodes of these two valves more positive than normal. A simple on-off switch suffices and the arrangement employed is shown in Fig. 2. With S_2 closed valves V_2 and V_3 have the normal fixed bias derived from their respective cathode resistors and the r.f. gain control, which is augmented when receiving a signal by the a.g.c. negative voltage provided by a diode in V_3 (the UAF42 r.f. pentodes all contain a single diode). With S_2 open an additional 47-k Ω resistor is inserted in this circuit and as some current is "bled" through the network R_{33} , R_{32} , R_{31} from the h.t. positive line the point of connection of the cathode resistors becomes some 18 V positive and the grids of these valves take up about

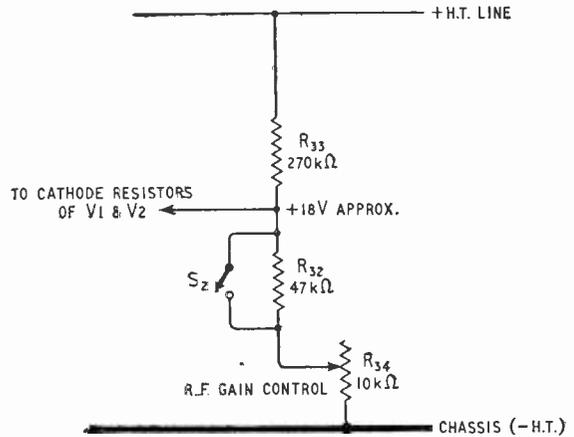
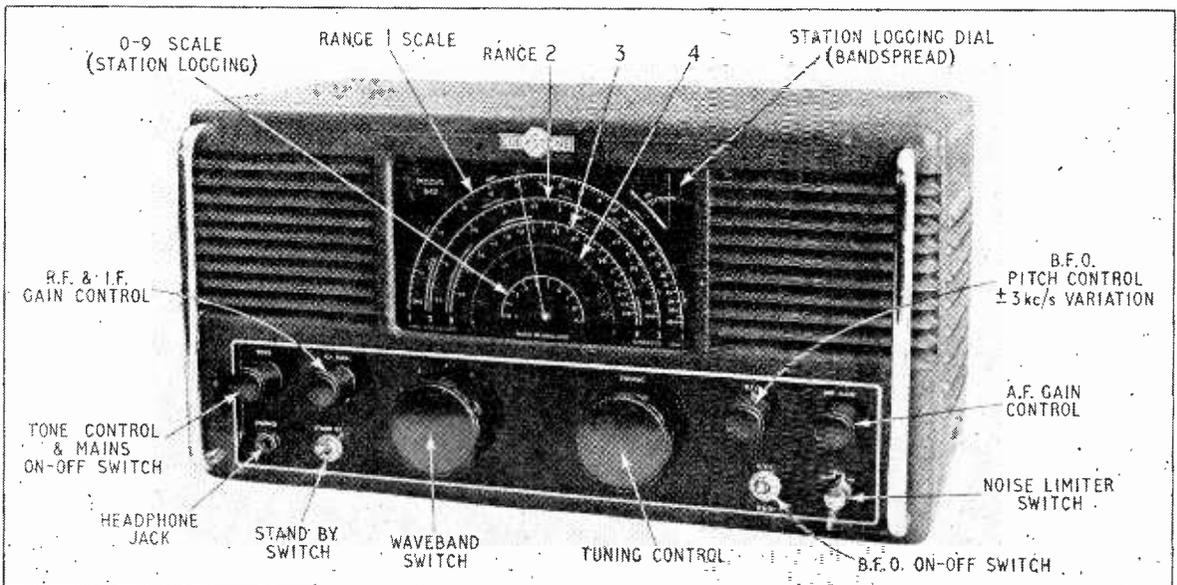


Fig. 2. The stand-by switch raises the cathode of the r.f. and i.f. valves about 18 V positive, the resulting negative grid potentials de-sensitize the set sufficiently for monitoring a local transmitter.

Front view of the Eddystone Model 840 a.c./d.c. communications receiver with the controls annotated.



the same negative potential. This de-sensitizes the set sufficiently (or if it does not the a.f. gain control can be backed off) to enable the local transmitter to be monitored either for modulation or, with the BFO on, for c.w. telegraphy operation.

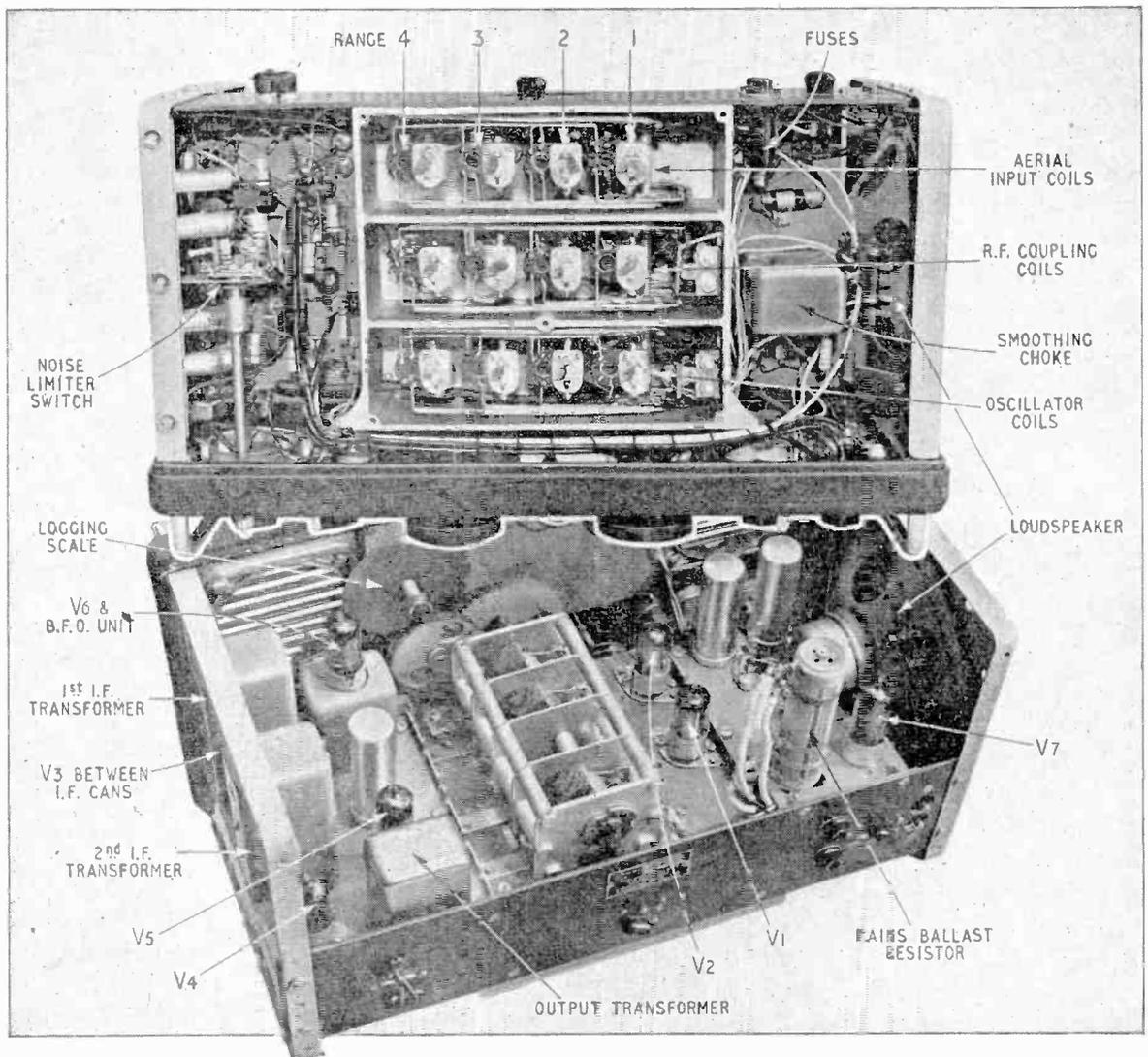
The BFO is a normal electron-coupled oscillator, the only interesting feature from the circuit angle being that its "on-off" switch is ganged with another which in its "on" position short-circuits the a.g.c. line to earth (chassis of the set, not the real earth). A.g.c. can be a nuisance when receiving c.w. telegraphy unless a particularly long time-constant is used and then this may become a nuisance for telephony reception as it will not respond to fast fading. So unless suitable time-constants can be selected for each type of service it is better to dispense altogether with a.g.c. for telegraphy work.

One other circuit feature of interest is that a crystal diode is employed for the noise limiter. This is switched in when required and is of the series type,

being rendered non-conductive by a strong impulse of noise such as arises from motor car ignition systems. It is included in the circuit between the signal detector diode load and the grid of the audio amplifier (between valves V_3 and V_4). It limits the interference to a tolerable amount but we have handled better examples of the series type. However, the makers say it is intended to have only a limited range of control over the interference and as such can be accepted. In any case this type of interference, which is only really troublesome above about 10 Mc/s, will become less and less as more motor cars are fitted with suppressors.

The 840 is designed to provide communications receiver facilities without the high cost usually associated with this class of set and it is not possible therefore to have all the refinements of a high-priced set in one costing only £45 (U.K. price). The user must be satisfied with a little less effective noise limiter, no variable selectivity and no crystal i.f. filter. However,

The underside of the chassis showing the massive die-cast three-section coil box with cover plate removed. The neat layout of the top section is shown in the lower photograph.



these do not make or mar a set; they only enhance the pleasure of operating it. Just as a good performance can be obtained from relatively inexpensive sports cars, so an equally high performance is possible with an inexpensive communications receiver. If any doubt exists on this point half an hour with the Model 840 will quickly dispel it.

Its performance is unquestionably praiseworthy; sometimes there is a little more interference from adjacent channels and image signals than would be accepted with a more expensive receiver, but here again the price limitation applies. Taken by and large, the 840 will satisfy a large number of people requiring a receiver above the average. Its tuning mechanism is a joy to handle and is entirely devoid of backlash and exact precision in tuning is possible.

The four tuning scales are calibrated either in megacycles or metres and checks of the calibration against a quartz-crystal controlled frequency meter show the calibration to be substantially accurate throughout. In addition there is a small logging scale—some may call it a bandspread feature as it lengthens the readable scale considerably—which enables stations to be logged accurately and, what is most important in a set of this class, to return unerringly to that station, or tune the set to that station if it may not be working at the time with the assurance that when it does come up the set will be tuned to it. This logging dial is in the top right-hand corner of the scale and is used in conjunction with a 0-9 calibrated scale which is the innermost of the five on the face of the main dial.

Good C.W. Reception

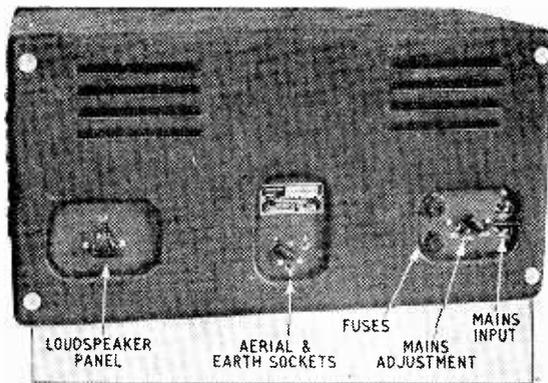
The BFO and the mixer oscillator were found to possess very good frequency stability and when listening to c.w. transmissions only very occasional re-adjustment of the BFO tuning control was required. Even this may not indicate drift in the receiver, the distant transmitter may quite well suffer a little frequency instability.

With both r.f. and a.f. gain controls turned up fully the background noise of the set is surprisingly low. It compares most favourably with other sets we have tested having comparable sensitivity and may even surpass them, but this could be verified only by a side-by-side comparison.

The model 840 is entirely self-contained, even to the inclusion of a loudspeaker. Provision is made for using headphones, the insertion of the 'phone jack automatically disconnects the speaker. The connections from the internal loudspeaker are brought out to a plug and socket panel on the back of the set and if desired an external speaker (3 ohms impedance) can be substituted.

Either a single-wire random length aerial or a dipole with balanced or unbalanced feeders may be used; with either kind the aerial is isolated from the chassis by capacitors. The cabinet is isolated from the chassis also by means of a capacitor and the actual earth connection is made to the cabinet not to the chassis. Good insulation is therefore necessary between chassis and all chassis fittings and the cabinet, and this fact must be borne in mind whenever the set is taken down for servicing.

The set is very robustly built, light alloy die-castings being employed wherever practicable. The cabinet is of rustproofed steel and well ventilated, and tropically tested components are used throughout. The tuning mechanism gives a reduction ratio of approx-



At the rear of the set are the voltage control panel, aerial-earth connections and loudspeaker panel. These are marked for identification.

imately 140 to 1 and works on the loaded flywheel principle, one or two spins of the knob sufficing to carry the pointer from one end of the scale to the other.

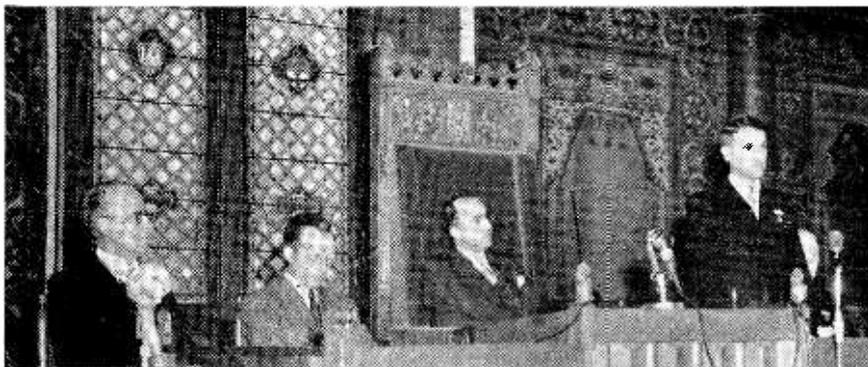
In conclusion, the performance of a receiver is no better than its aerial, a point very often ignored and the Eddystone 840 gives of its best when used with a really good aerial. This does not mean that a long, high aerial is essential for receiving as we picked up signals from all parts with only a short indoor wire, but the signal-to-noise ratio was inevitably poor. Changing over to the outdoor aerial, only 50ft of wire in this case but well in the clear, the improvement in signals had to be heard to be believed. This is not an exclusive characteristic of the "840" but applies to any receiver. Too many sets are criticized adversely solely because they are expected to accomplish the impossible and give good reception but denied the means whereby those results can be achieved.

The makers are Stratton and Co., Ltd., Eddystone Works, Alvechurch Road, West Heath, Birmingham, 31.

LICENCE DISTRIBUTION

THE regional distribution of sound and vision licences at the end of May, when the respective totals were 10,629,228 and 2,316,600, are given in the following table. The bracketed figures give the percentage of the total number of licences in each region. When giving these figures in reply to a question in the House, the Assistant P.M.G. pointed out that they refer to Post Office Regions and not the B.B.C. Regions.

	Sound only	TV and Sound
London	1,728,457 (70%)	751,452 (30%)
Home Counties ..	1,461,820 (85%)	262,336 (15%)
Midlands	1,319,044 (73%)	489,325 (27%)
North Eastern ..	1,734,433 (86%)	269,308 (14%)
North Western ..	1,348,767 (82%)	301,306 (18%)
South Western ..	1,034,778 (93%)	76,089 (7%)
Wales	671,332 (88%)	88,550 (12%)
Scotland	1,115,353 (94%)	75,854 (6%)
Northern Ireland ..	215,244 (99%)	2,380 (1%)
	10,629,228 (82%)	2,316,600 (18%)



At the opening session in the Ridderzaal, The Hague. (Left to right) R. Vermeulen (Netherlands, Vice-chairman of the Organizing Committee), Prof. R. H. Bolt (U.S.A.), J. M. L. Th. Cals (Netherlands Minister of Education, Arts and Sciences) and Prof. C. W. Kosten (President of the Congress).

Trends in Electro-Acoustics

Pointers from the Recent International Congress in the Netherlands

DURING the past two or three decades the science of acoustics has been dominated by the influence of electrical and electronic methods, not only in the recording and reproduction of sound, but in all the fundamental physical measurements necessary for its proper application in communications, industry, medicine and numerous other spheres of human activity. This emphasis on physical measurement, resulting from the elegance and precision of modern electronic equipment, has tended in recent years to obscure the fact that acoustics, by definition, deals with those manifestations of vibration *which can be heard*. The boundaries of the field of physical measurement are in sight or have already been reached at many points, and there are already signs in many quarters of a shift of interest to the characteristics of man himself, and his reactions to his acoustical environment.

Structure of Acoustics

In his opening address to the International Electro-acoustics Congress, held in the Netherlands from 16th to 24th June, Prof. R. H. Bolt (Chairman of the International Commission of Acoustics) took for his theme the structure and organization of the "new acoustics" and showed how the techniques of electro-acoustics could assist in integrating its diverse parts. In the days of Pythagoras it was possible for one man to have all the available knowledge of the subject, and customary to view problems as a whole, in their subjective as well as their objective aspects. Nowadays, with the vast increase in extent of knowledge and the need for specialization, a recognition of the organizational character of the subject was essential for the better co-ordination of effort, and to facilitate communication between teams working in allied fields. The nucleus of acoustics was formed by two equally important parts—physical acoustics (the study of vibration, "mass systematized by force"), and bio-acoustics (man's interaction with his acoustical environment). The

interplay of these main elements through the medium of electro-acoustics had resulted in four main branches of activity:

(1) *Communication*. Telephony, broadcasting, speech reinforcement and innumerable special applications in intercommunication.

(2) *Health, safety and comfort*. Noise abatement, protection from high ambient noise levels, medical diagnosis and therapy, hearing aids.

(3) *The musical arts*. The science of musical sounds, acoustical environment for the hearing of music, psychology of æsthetic reactions.

(4) *Tools for science and industry*. Techniques for studying the properties of materials, analysis and routine testing, treatment of materials during production.

These four branches of acoustics had themselves been enriched and their scope broadened by contact with other fields of science and technology such as physics, electrical engineering, architecture, building, chemistry, metallurgy, psychology, medicine and public health.

With so many affiliations, and the prospect of more to come, it would be premature, in Prof. Bolt's opinion, to attempt a rigid classification at the present juncture. After all, it had taken centuries to reach the present state of the art, and some years might reasonably be allowed to elapse, after the initial impact of electronics, before considering what form the organization might finally take. He was content that it should remain for the time being in close relationship with physics.

Topics Discussed

The scope of the Congress was commensurate with the breadth of Prof. Bolt's theme. It was divided into seven main sections presided over by acknowledged authorities, who opened the proceedings by general reviews of the chosen subjects, as follows: I, Sound Recording (R. Vermeulen, Netherlands); II, Public

Address Systems (E. Meyer, Germany); III, Acoustic Measurements (L. L. Beranek, U.S.A.); IV, Hearing Aids and Audiometers (P. Chavasse, France); V, Electro-acoustics in Ultrasonics (G. Bradfield, Gt. Britain); VI, Electro-acoustics Applied to Musical Instruments (E. G. Richardson, Gt. Britain); VII, Sound Insulation of Lightweight Structures (C. W. Kosten, Netherlands). Over eighty lectures and discussions were scheduled for the five working days, and in order to get through the programme it became necessary to run four sections concurrently. Even so, only specialists could hear all that was said (in three languages) on any particular subject, and those with wide general interests had to do much heart searching in making a choice from so much promising material. Not until the late autumn, when the full proceedings are to be published, will a complete assessment of the Congress be possible, but it may be useful at this stage to give some indication of current thought and work in the acoustical world.

Subjective Judgments

In the sphere of high-quality recording and reproduction of sound, the recalcitrant residual distortions of wide-frequency-range, single-channel systems, and the demand of the three-dimensional cinema for comparable phenomena in the accompanying sound have revived interest in, and called for a clarification of ideas on the aims and objects of "stereophonic" "binaural," "pseudo-stereophonic" or "spatially distorted" sound. There are those who are satisfied that their work is done when two or more loudspeakers, spaced to correspond with microphones are fed through amplifiers which are free from frequency, amplitude and phase distortion; others who claim that the only true stereophony is by headphones coupled to microphones in an artificial head; and a third and growing group who contend that neither of these systems can deceive the human hearing faculty, as exercised naturally under binaural conditions in a free field of sound. Stereophony is based on the properties of the mind, as much as on the physical effects at present capable of measurement by electro-acoustic methods; and until more is known it must be left to the artist to produce the best subjective effect with any means at his disposal.

Another topic much discussed at the present time is information theory. Here again it was felt that present analytical treatment, although of value in increasing the efficiency of transmission of intelligence by speech, was of little value for the better reproduction of music. As Vermeulen put it, a reproducing system for music is not just a "book for the blind" for those who lack the knowledge and skill to read a musical score. It must reproduce the tonal and temporal "redundancies" which distinguish an interpretation of genius from a mere recital of the basic information conveyed by the score.

Subjective assessment of the quality of reproduction must take precedence until correlation with objective measurements can be placed on a surer footing. The choice of monitoring equipment, and particularly of a suitable loudspeaker, is of prime importance to a broadcasting organization, and T. Somerville gave some experiences of the B.B.C. in this connection. On the choice of acoustic environment for the monitoring, he was in favour of a room with a reverberation time of about 0.5sec, furnished like an average living room, rather than, as some people had argued, a "dead" room

with little or no reverberation. In choosing a suitable monitoring loudspeaker the decision could be influenced by the nature of the programme material used in the eliminating tests. More consistent results could be obtained by surreptitiously changing the loudspeaker unit in the monitoring cabinet and then observing the reactions of those responsible for "balance and control" in the matter of microphone placings. An unsatisfactory loudspeaker invariably stimulated activity in this department at rehearsals, with much moving of microphone positions. A word of warning was given about attempts to identify individual qualities in the loudspeaker, such as intermodulation distortion; bad intonation by players at rehearsal bore a strong resemblance to the roughness characteristic of intermodulation. One of the most searching tests for a loudspeaker was to listen to a person, known to the listener, speaking in non-reverberant surroundings over a direct line. To an experienced listener any resonances could be detected with as much certainty as those revealed by the method of successive "dubbing" for checking recording systems.

Investigations into basic physical principles are at present very much to the fore in the minds of those occupied with the problems of magnetic tape recording, and the progress so far reported indicates that we may soon be in a position to segregate the many interdependent variables involved in what is an eminently successful, though incompletely understood, process. On the practical side, the use of ferrite cores for recording heads holds promise not only of reduced losses at high frequencies, but also of negligible wear from tape abrasion.

In the sphere of disc recording increasing support was given to the idea of a standardized characteristic for reproducing equipment as an alternative to trying to standardize a recording characteristic—or even to define what it is. This would firmly place the onus of making a pleasant sound on the record manufacturer, and would reduce the cost of high-grade record reproducers, which at present included anything up to half a dozen different equalizing circuits. Prof. F. V. Hunt read an important paper in which his earlier work, in conjunction with J. A. Pierce, on the analysis of tracing distortion in lateral-cut discs has been extended, in conjunction with F. G. Miller, to take into account the deformation of the groove wall—an important factor in modern plastic pressings. In practice intermodulation distortion products arising from this factor are limited at high frequencies by the scanning loss function, which has been evaluated and found to give results in agreement with measurement.

Sound Reinforcement

With the exception of the "Ionophone" (already described in the Jan., 1952, issue of *Wireless World*) and an electrostatic loudspeaker for high frequencies (described by W. Kuhl), in which a foil diaphragm is supported on the projecting irregularities of a fixed dielectric, discussion of loudspeakers was confined principally to the detail design of conventional moving-coil cone units, and to intermodulation methods of assessing non-linearity distortion.

Prof. Erwin Meyer in his co-ordinating paper on public address systems gave an account of the development of line-source loudspeaker arrays and their important influence, together with the discovery of the effect of time delays of echoes on the subjective directional properties of the ear, on the design of modern

p.a. systems. In high-level sound reinforcement systems out-of-doors, echoes from surrounding buildings and other objects often cause trouble, and P. Arni described how at the 1952 Olympic Games at Helsinki an echo from the scoreboard was eliminated by perforating it with holes, 5 mm in diameter, spaced 2 cm apart; a building echo was deflected to the ground before reaching the audience by the simple expedient of altering the height of the directional column-type loudspeakers.

Much work has been done in architectural acoustics, and in particular on the qualities of studios and concert halls. The acoustical environment is determined by many factors other than the reverberation time. The dispersion and diffusion of sounds reflected from the boundaries of the auditorium is important, and controversy continues on the merits of different geometrical forms for the reflecting surfaces. Measurement of this quantity in terms of the ratio of the mean difference between maximum and minimum peaks to the frequency range covered has been proposed by Roop and Bolt and is termed the "frequency irregularity" of the space. The calculation of this factor is laborious, but it can be obtained automatically in two types of apparatus described by P. V. Brüel, one involving the use of two special level recorders, and the other a level recorder employing a 100-element contact strip operated by a single level recorder, which measures in conjunction with an electronic scaler, the total "length" of the response curve in db. By reading the scaler at intervals of, say, 10 c/s, the "frequency irregularity" in db per c/s can be easily plotted. According to W. Furrer, even closer agreement with subjective assessment is obtained if, in addition to the total length of the curve, the number of peaks is taken into account; the correlation holds over a range of volumes from 30 to 20,000 cubic metres.

Musical Instruments

The application of electro-acoustic techniques to the study of traditional musical instruments and the evolution of new sources of musical sound is a fruitful field of study. J. M. A. Lenihan and S. McNeill described experiments to determine the nature of the scale used in the Highland bagpipes and found (not surprisingly) that it varies from one instrument to another and, more markedly, from one player to another. The use of electronic equipment has introduced a scientific element into the "voicing" of organ pipes, and D. M. A. Mercer showed how the measurements could be correlated with the observed sounds, and gave some support for early "air reed" theories for the excitation of the pipe and the generation of edge tones. G. Pasqualini reported similar studies on bowed instruments, and R. W. Young on the vibration of pianoforte strings. Discussion of electronic organs centred more on their relation to traditional instruments in the matter of tone quality rather than on the details of construction. The facility with which tuning can be varied over a small but accurately calibrated range has been exploited in a special instrument described by W. Kok in which the qualities of equal temperament can be compared with other systems of tuning. A visit was also made to hear the 31-note Fokker's organ in the Teylers Museum at Haarlem which incorporates Huygens' principle of equal temperament.

In the section dealing with electro-acoustic measurements the principal topics were the standardization of

laboratory microphones, and the measurement of acoustic impedance. It was pointed out by L. L. Beranek that many of the problems would be solved if a microphone could be evolved which measured pressure and velocity at the same place and time. Problems of noise in jet engines and high-speed aircraft are assuming high priority and two papers dealt with the measurement of acoustic pressures in moving air streams by means of streamlined microphones and by optical methods. O. K. Mawardj described an acoustic pulse method of measuring wind velocity.

Hearing Aids

The section on hearing aids dealt with problems of audiometry, performance criteria and measurements on hearing aids and standardization. A notable paper by H. Mol emphasized the difficulties of applying a hearing aid in cases of deafness arising from deficiencies in the cochlea. He explained how the axis of rotation of the stapes bone is under muscular control in a manner which modifies the mechanical coupling between the eardrum and the oval window, and that control is effected by a feedback loop from the brain to keep the excitation of the basilar membrane within its dynamic range of 30 db above threshold. The control has a long time constant and operates on average rather than peak values. With deterioration of the basilar membrane the hearing aid cannot be expected to confer the benefits obtained in cases of conductive deafness, since it is outside the feedback loop which affords protection for the cochlea.

The introduction of barium titanate and the ferrites has brought about a revolution in the field of ultrasonics. Transducers in an infinite variety of shapes for different purposes can now be moulded from these stable substances, which are made from cheap and plentiful raw materials. With ferrites mechanical Q factors of the order of 1,000 have been achieved, though for some purposes the ultimate strength of the material places it at a disadvantage compared with nickel-iron alloys.

In the symposium on lightweight structures, as used in aircraft, railway carriages, etc., it was shown how the law of proportionality between mass per unit area and sound absorption can be circumvented by the use of double walls. The problems of design are bound up with the production of flexural waves which are induced by sound impinging at other than normal incidence. Interference with waves reflected from the boundaries of the wall can give the effect of resonance and the transmission is suddenly increased when the motion of the two partitions is in resonant opposition with the compliance of the enclosed air. An interesting consequence of the theories which have been developed is that with white noise at random incidence the transmitted sound will be directionally "coloured," high frequencies emerging normal to the panel and lower frequencies fanning out at progressively smaller angles to the surface.

The Congress was attended by 303 members from 19 countries, and visits were organized to the Philips factory at Eindhoven, the research laboratories of the Netherlands Radio Union at Hilversum, and the Philips gramophone record factory at Baarn. The organization throughout was faultless, for which chief credit must go to Prof. C. W. Kosten and Mr. P. A. de Lange of Delft Technical University and their colleagues from other participating bodies in the Netherlands.

Anarchy into Order

50th Anniversary of the First International Radio Conference

FIFTY years ago, such little wireless communication as existed was ruled by the law of the jungle. Indeed, anarchy did not finally give way to international regulation until 1912, when the United States (the last of the Great Powers to do so) ratified the Convention of 1906. In the early days, everyone used the wavelength that seemed good to him, or rather, the wavelength at which his aerial would radiate most effectively. Not only did the various competing "systems" refuse to exchange telegrams but deliberate jamming of competitors' signals was a common practice. There were no rules to enforce secrecy, and the story goes that cable companies, anxious to discredit their new rival, issued advertisements disclosing the texts of private radio-telegrams they had intercepted, thus seeking to show there was no secrecy in wireless communication. Similarly, the cable interests, making use of information obtained by interception, drew attention to long delays that occurred when the transatlantic wireless service first started.

G.P.O. Monopoly

Inside the United Kingdom, the Postmaster-General had, almost from the start, swept wireless telegraphy into his monopoly net, ruling, as a matter of expediency, that the new method of communication was covered by the existing Telegraph Acts. But he specifically disclaimed responsibility for control outside territorial waters. The P.M.G.'s position was regularized by the Wireless Telegraphy Act of 1904.

The story of international control starts with Kaiser Wilhelm II of Germany, who was perturbed because a wireless telegram from his nephew, Prince Henry of Prussia, travelling in a German ship, was refused by a British coast station. The Kaiser, with support from the President of the United States, accordingly convened a preliminary international conference to be held in Berlin in August, 1905.

The agenda of this first conference was simple enough. The main objective was to make obligatory the exchange of telegrams between coast stations and ships, irrespective of the system used. Problems concerned with wavelength were to be discussed, as were telegraphic charges, which should be "reasonable," and equally allocated between coast and ship stations. It was also hoped to formulate "service regulations" governing the interchange of traffic.

Most of the nine countries represented chose as their delegates officials of the post and telegraph services, together with army and navy officers. The subject was clearly regarded by most as of insufficient importance to warrant the sending of "top brass." The Spanish delegation, for instance, was headed by a mere Major in the Squadron of Military Aerostation (what was the supposed connection between ballooning and wireless?). The Russian group, led by a naval captain, included Professor Popov. Great Britain had

a rather more imposing delegation headed by J. C. Lamb, Second Secretary of the Post Office, supported by the Engineer-in-Chief of the G.P.O. and naval and military officers. Herr Kraetke, Secretary of State for the postal department of the German Empire, was chairman. His opening address, in which he surveyed the development of the art, is of some incidental interest in throwing light on one of the vexed question of priority of invention. According to the Minutes of the Conference (which had been approved by all the delegations) he said it was to Popov that "we owe the first radiograph (*sic*) apparatus" but Marconi "first employed an antenna."

Most of the proceedings, as recorded in the Minutes, make dull and tedious reading. Everyone was floundering for lack of real knowledge and more than one delegate had an axe to grind. Some were clearly in genuine doubt as to whether all the "systems" would in fact work together, and others took advantage of this uncertainty to fog the issue. The general tone of the conference was one of difficulty in reconciling jealousies between the supporters of the different systems. The conference was further handicapped by difficulties in obtaining technical details of all the methods employed.

Clearly, the better-informed delegates saw little hope, in the existing state of the art, of obtaining relief from interference by "syntonization," and saw more possibilities in time-sharing. Attempts to agree on international wavelengths did not get much farther than the proposal that they should be standardized in round hundreds of metres. It was agreed that stipulations to minimize interference should be adopted as a matter of principle. The idea was accepted that countries could exercise their national sovereignty in choosing wavelengths for all except international traffic.

Limited Agreement

The main conclusion of the conference, included in the final protocol, was that most of the delegation undertook to recommend their governments to agree to the interchange of telegrams between coast and ship stations irrespective of the systems used. The British and Italian delegations, while agreeing to pass on the recommendations, accepted the protocol with reservations. Thus the stage was set for the conference of 1906, which succeeded in producing a useful and workable set of regulations for the exchange of international traffic.

One of the delegates present, the Marchese Solari, who represented Italy, recently gave *Wireless World* some personal recollections of the conference. A German delegate had proposed that range of ship-to-shore communication should be limited to 100 miles. Marchese Solari, who had been closely associated with Marconi, objected emphatically to this, and after lively exchanges undertook to produce documentary

evidence of communication at much greater distances.

In some respects the advertisements appearing in the book in which the Minutes of the 1903 conference were printed are, to the modern reader, more interesting than the text. The Marconi Company gave a list of its coast stations in the British Isles, Italy, Canada, Labrador, U.S.A. and Germany—in that order. There was also a list of 47 ship stations of various nationalities. Telegrams could be accepted only at the Company's offices or stations.

The National Electric Signal Company of Washington, U.S.A., exploiting the Fessenden system, offered

standardized transmitters "off the peg" for working up to 150 miles over land or to 350 miles over sea; equipment for longer ranges could be supplied "at short notice." It was claimed "no expert knowledge needed, as any telegraph operator can handle after a week's practice."

How was wireless communication carried out during the chaotic period that existed before stereotyped procedures for dealing with traffic had been evolved? What kind of gear did they use? The author of the article printed below gives a picture of the conditions ruling in those days.

Wireless Fifty Years Ago

Reminiscences of the Pre-control

Radio Era: Apparatus of the Period

By MAURICE CHILD*

SHORTLY after Marconi had publicly demonstrated the practicability of sending and receiving telegraphic messages in the morse code by the hertzian wave method, a considerable number of scientific people claimed inventions of "systems" based on the fundamental discoveries of Hertz and Sir Oliver Lodge. Thus in the year 1903 a study of early literature shows that something like twenty of these "systems" were in what might be termed the embryonic stage. Most of them never developed commercially. In Europe, most of the principal countries adopted the "system" of one or more of its nationals. Of the various systems little need be said, since they only differed from one another in respect of some of the instruments used either for transmitting or receiving or both. All of them generated the waves by discharging high-voltage capacitors through spark gaps and employed aerials at both sending and receiving ends. The basic principles of tuning—or syntony, a prettier term—were published in detail and first demonstrated in the Lecture Hall of the Royal Institution in 1894 by Sir Oliver Lodge. But it is not the purpose of this article to deal with the early researches and achievements of those who contributed to the science of the production and detection of hertzian waves. It is rather to recount a few personal episodes in my early associations with commercial wireless communication from 1903 onwards.

Earliest Experiences

In the summer of 1903 I joined the Marconi International Marine Communication Company. This company had recently erected a station on the sands at Seaforth, Liverpool, on the estuary of the Mersey. A part of the building was set apart as a school for the purpose of teaching telegraphist probationers the

art of adjusting, working and maintaining the apparatus as installed in ships.

My first commission was to install a set of equipment in the s.s. *Empress Queen* (call sign EQ). This ship was said to be the largest paddle-steamer afloat and made the round trip to Douglas, Isle of Man, from Liverpool daily. Temporary accommodation for the wireless gear was provided aft by enclosing a space between a part of the top deck overhanging the main deck. A small sliding ground-glass window was fitted for ventilation. The work of installing had to be carried out during two round trips but was much delayed owing to rough weather and the usual human discomfort associated with it.

The aerial, a twin vertical, was suspended from the end of a 24ft bamboo sprit supported from the truck of the main mast by a halyard attached at a point one-third of the sprits' length and kept in an upright position by a "tail" rope. All ships at that period had sprits for increasing the height of the aerial, and these gave them a distinctive appearance.

On Saturday, August 22, 1903, an assistant and myself were instructed to accept telegrams from passengers travelling from Liverpool to Douglas. The minimum charge was 2s per telegram of 12 words (address free), of which half was intended for the company and the balance for the G.P.O.

By the time the Bar Lightship was reached we had collected some 30 telegrams and I decided not to accept any more. A preliminary test on the previous day had proved that once the ship rounded the headland near Douglas we would be screened by the land from Seaforth and communication in consequence was interrupted both ways. Unless, therefore, the accepted messages were sent before reaching the headland, those remaining would be much delayed and would have to be held over until the return trip.

The normal maximum speed of working was about six words per minute under favourable conditions, and

*The London Telegraph Training College.

Seaforth was pressed very severely to receive the 30 messages in the 3½ hours available. Acknowledgement of the last message came through as signals began to fail.

With the early Marconi coherer receivers, signals were normally recorded on a morse printer and subsequently deciphered from the paper slip. For "calling-up," a bell could be switched on as an alternative to the printer, and those trained to read by sound could use the bell method of reception. This last method was often preferred as extra "dots" due to atmospheric, etc., could usually be "read out." If the dots were recorded the slip was very difficult to read and could lead to errors. The bell, together with the noisy blue 1-cm sparks of the transmitter, provided good public entertainment but from the point of view of secrecy there were serious objections.

The story now reverts to Seaforth (LV) and was unfolded to me the next day by the staff on duty. In 1903 there were no facilities for forwarding telegrams by telephone, and there was no land line linking LV with the G.P.O. telegraph system. The disposal of paid public telegrams received by wireless was a problem which had not arisen and, if an occasional odd one arrived, it was taken by hand to the post office.

The nearest post office to LV was at the village of Waterloo, about ¼ mile distant, and formed a small part of the premises of a grocery business kept by an elderly lady who was, I believe, single-handed. The telegraphic instrument, an A.B.C. machine, already very much out of date, was incapable of handling traffic expeditiously.

As the telegrams from EQ were received a probationer from the school went out, with at first batches of three and later five at a time. With the first consignment the lady at the shop expressed surprise; between one or two a day was her average. Before she had time to count the words, take the money and attend waiting customers another batch arrived and long before these had been accepted another and yet

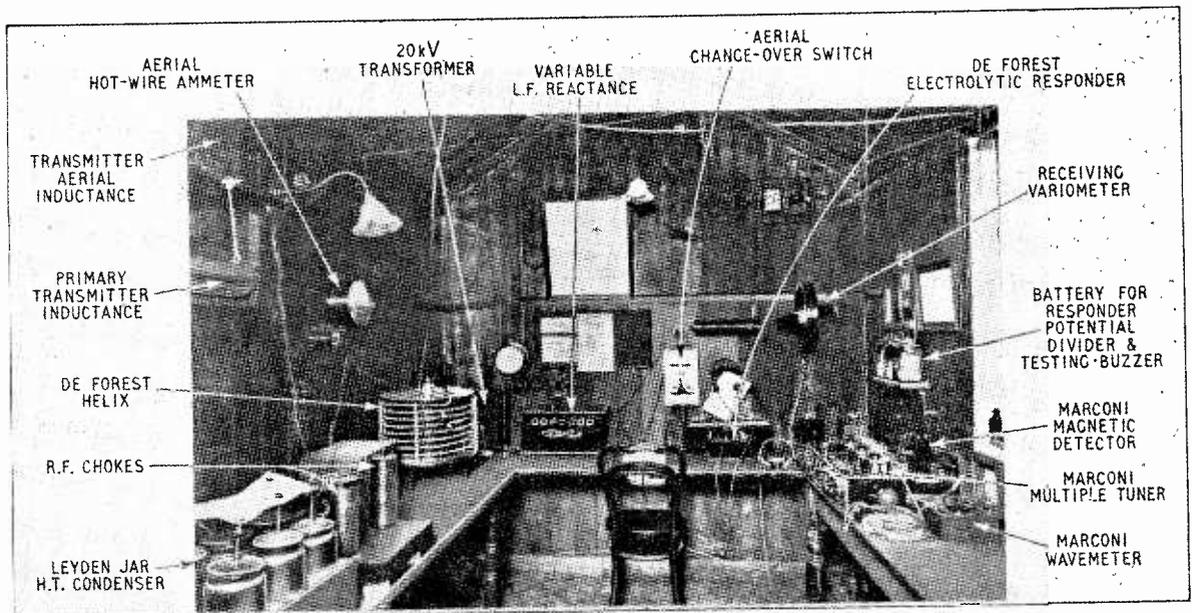
another and so on throughout the morning. I was told, in effect, that our efforts to swell the revenue of the Post Office were not appreciated. Tears gave way to rage and hysteria, culminating in an SOS or its P.O. equivalent being sent to the Head Office at Liverpool. From there representations were made to London, where it seems the solution to the problem was referred to the Legal Department. Apparently, the provisions of the Telegraph Acts were considered to have been infringed by the sending of telegrams from EQ and penalties were threatened. This accounted for the "Urgent Service" message I received on board on the return trip: "Cease accepting any more public messages." Exactly what happened in London was never disclosed, and it is unlikely any record now exists, but the fact remains that no more EQ telegrams were taken and the ship installation was dismantled shortly afterwards.

Operating Early Transmitters

From my early experience with the Marconi Company and later as chief technician and instructor to the staff of Lloyds, who took over from the Marconi Company most of their coast W/T Stations, it became clear that, as the marine services developed, a new type of telegraphist would be needed. Apart from proficiency in telegraphy, he would need special training in the actual operation of various types of transmitting and receiving equipment.

Until about 1908 practically all ships and a number of coast stations in this country were fitted with large induction coils worked from batteries or ship's mains. These coils were the essential part of the transmitter and were fitted with very slow-acting contact breakers giving from 10 to 16 sparks per second. Their primary circuit took from 8 to 12 amperes, depending on adjustment, and this current had to be carried by heavy ¼in diameter platinum contacts on the key. The keys were essentially of heavy construction and

Early apparatus at the Earls Court station of the London Telegraph Training College. Though units of various systems were used, the station is typical of the period when wireless first came into practical use.



needed what was called a "heavy" style of manipulation.

The contacts used frequently to stick or partially weld together and the telegraphist needed to be ready at any instant to "lift" the key. This required considerable practice. When a.c. 50 μ or 100-c/s rotary converters and h.t. transformers replaced the induction coil, the heavy type of key had still to be used on account of the large currents in the primary circuits.

About 1910 the Telefunken Company in Germany and Siemens in England began installing ships with 500-c/s motor generators. The sending difficulty was thereby almost solved but the keys, whilst much lighter and improved, were still not well adapted for high-speed manual operation. Apart from the apparatus, which of course varied much in design and type, there were important items such as emergency batteries which needed periodical testing, charging, etc.

Specialized Training

The radio officer was a law unto himself. If any fault or damage occurred in his equipment it was he who would have to locate and repair it. A highly specialized training was therefore indicated and in 1905 I was instrumental in starting a telegraph school at Earls Court and organizing wireless technical and telegraphic training. Commercial wireless equipment was difficult to obtain and in any case far too costly. A workshop was opened and students were shown the construction and use of different types of detectors, capacitors, inductors, etc. They also had lectures on fundamental electrical principles.

Between 1905 and 1912, in addition to the stations operated by the G.P.O. employing chiefly Marconi apparatus, experimental stations were operated by the United Wireless Company of U.S.A. (De Forest and Fessenden systems), Amalgamated Wireless Telegraph Co. (Poulsen arc system), British Radio Telegraph and Telephone Company (Balsillie system) and the Lodge Muirhead Syndicate. With the exception of the last-named, which specialized in the military sphere, all the above-mentioned Companies employed staff who had been trained at the London Telegraph Training College (call sign ECX).

One of the most important features of the training was to accustom students to read signals transmitted from commercial land and ship stations. The signals as received in London with the detectors available in those days were what would be now called dead weak (R_1 to R_2) but it was surprising how with prac-

tice the hearing improved and with what exactitude they could be deciphered.

Of the detectors used for these practices, I found the best which combined the qualities of sensitiveness and reliability to be the perikon (zincite-bornite); Schlo-milch electrolytic (used by De Forest); carborundum (United Wireless Company), in the order given. The first two needed very careful protection from the strong r.f. voltages which could be applied from the spark transmitters when these were used and open-circuiting *both* leads to the detector was necessary, the leads being no more than 1 inch long.

A favourite circuit for the electrolytic detector is shown in the Figure. It was used by the De Forest Company of U.S.A. The detector itself consisted of a platinum wire 0.0001in diameter just touching the surface of a sulphuric acid solution contained in a lead cup. A positive polarizing voltage, to balance out the voltage generated by the detector acting as a primary cell, was applied through a potential divider to the platinum point.

Composite System

The photograph on the previous page shows the ECX wireless cabin as it was in the early days. Two types of aerial coupling to the closed oscillatory circuits could be used alternately if desired. In one case the Marconi method of inductive coupling on the extreme left was employed and what was called the direct or galvanic coupling by a single helix could be equally well used. Provided both were correctly adjusted as regards the percentage of coupling used, there was nothing much to choose in the results obtained.

The power employed was usually about 200 watts and the working frequency could be varied between 660 kc/s and 1,000 kc/s. The College also had another station (MHX) at Acton to which senior students were sent for telegraphic practice to ECX.

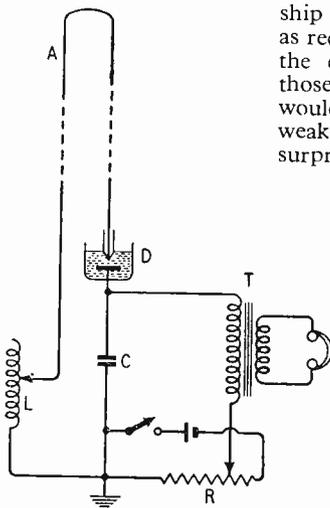
With the advent of the first World War, the stations were compelled to cease transmissions and, after the war, with the enormous increase in the number of stations and technical developments of the thermionic valve, it was decided by the G.P.O. that such practice transmissions as had been authorized previously were no longer essential, a dictum with which I personally felt I must reluctantly agree.

In concluding this account of some of the early experiences of wireless communication I have tried, in recounting them, to present a picture of the conditions appertaining to the commercial development of this science. Consequently, I have omitted the more fascinating experimental work with which I, from time to time, was associated.

Transistor Coupling Transformer

WHAT must be one of the smallest transformers ever made has just become available in the form of an inter-stage coupling for transistor circuits. It has a Mumetal core and measures only $\frac{3}{8}$ in \times $\frac{3}{8}$ in \times $\frac{1}{4}$ in. The step-down ratio is 4.5:1, with a d.c. resistance of 870 ohms for the primary and 170 ohms for the secondary. The inductance of the primary over the a.f. band is 4H with a direct current of 0.4 mA through the winding.

Another midjet transformer produced by the same firm (John Bell & Croyden) is designed for matching a high-gain pentode to a transistor. This has a step-down ratio of 30:1, with a primary resistance of 6,000 ohms and a secondary resistance of 80 ohms. The primary inductance is 125H with 50 μ A d.c. through the winding.



Electrolytic detector circuit. A, twin aerial looped at top end; L, tuning inductance; C, 0.001 μ F; R, potential divider, 1000 Ω ; T, telephone transformer (ignition coil reversed); D, electrolytic detector.

TRANSISTORS

By THOMAS RODDAM

7.—The Principle of Duality

IN an earlier article of this series, I touched briefly on the use of duality in converting the familiar valve circuits into the corresponding transistor circuits. This process is of great value in determining the form taken by the transistor circuit, and in this article and the next I propose to consider in some detail the idea of duality and its application to circuits using point transistors and combinations of point transistors and valves or junction transistors.

The basic idea of dual circuits is discussed only sketchily, if at all, in most textbooks. The life of the student is made even more complicated by a terminological confusion, because Bode, and some other writers who approach duality from the purely analytical point of view have used the term *inverse* instead of *dual*. I propose to adopt a verb, to dualize, seldom used in this work, in order to avoid the linguistic trap of saying that "on inversion, we obtain the dual."

Conversion of an electrical system to its dual is carried out by replacing all currents by voltages, and all voltages by currents in the network equations. To effect this change, a scale resistance must be used, so that the dimensions are kept under control. Let us look at the equation usually called the general form of Ohm's Law, $V = ZI$. With a scale resistance R we can express V as $I'R$ and I as V'/R where I' , V' are the duals of V and I respectively. Then $V = ZI$ becomes $I'R = ZV'/R$ or $V' = (R^2/Z) I'$. The impedance R^2/Z is the dual of Z .

When Z is a pure resistance r , we have as the dual another pure resistance $r' = R^2/r$.

When Z is a capacitance, $1/j\omega C$, we have as the dual an inductance, $Z' = j\omega CR^2 = j\omega L'$, with $L' = CR^2$.

When Z is an inductance, $j\omega L$, we have as the dual a capacitance, $Z' = R^2/j\omega L = 1/j\omega C'$, with $C' = L/R^2$.

More complicated impedances can be calculated by the student, using the basic equation $ZZ' = R^2$. Fortunately this is not the way in which we set about dealing with more complicated systems, however. Let us look at the dual of a pair of impedances connected in series. Take $Z = Z_1 + Z_2$. Then $Z' = R^2/(Z_1 + Z_2)$. The dual admittance is, obviously, $\frac{1}{Z'} = (Z_1 + Z_2)/R^2 = Z_1/R^2 + Z_2/R^2$. The

admittances of the duals of the individual impedances are Z_1/R^2 and Z_2/R^2 , so that the admittance of the dual of two impedances in series is equal to the admittance of the separate duals in parallel. In fact we have the conversion shown in Fig. 1.

This is the first step towards developing a way of drawing the dual of any ladder network. Let us take, for example, the T-network shown in Fig 2(a). The first arm, looking in from the left, is in series with an impedance, the rest of the network, which can be boxed off by itself, as shown in Fig 2(b). Dualizing,

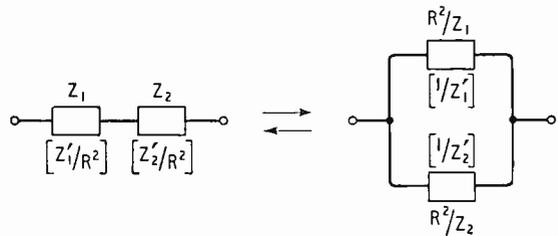


Fig. 1. The dual relationship between series impedances and shunt admittances is a symmetrical one.

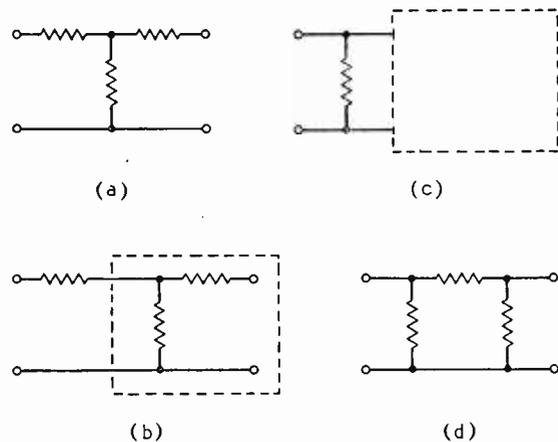


Fig. 2. In developing one dual of a ladder network (a) we take the first arm and the "rest of the network" (b), dualize the first arm (c), and then proceed to operate in the same way on each succeeding element (d).

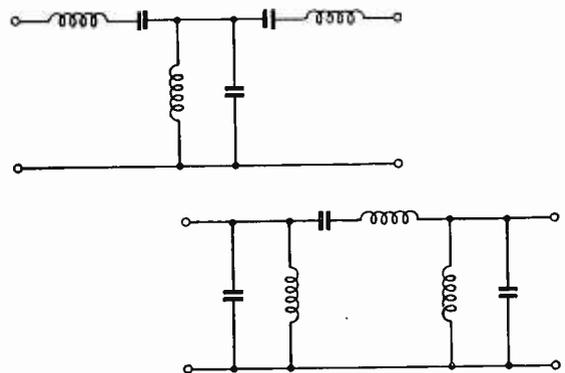


Fig. 3. These two bandpass filters are duals.

this series arm is converted to the shunt arm shown in parallel with the dual of the boxed impedance in Fig 2(c). Repeating the process with the first element, a shunt arm, inside the box we obtain a series element. Step-by-step we go from T-network to π -network. Each arm may be complex, but the same process of converting two elements in series to their duals in parallel is allowed. As long as the network is of this straightforward ladder type we have no difficulties. As an example, the two bandpass filters in Fig 3 are duals. This inter-conversion of T-sections to π -sections is well known for filters, and we usually take the characteristic impedance of the filter as the scale resistance without thinking about it at all.

There is a rather interesting connection between the idea of dual networks and the idea of analogue networks. Suppose we write down the familiar law of motion:

$$\text{Force} = \text{mass} \times \text{acceleration}$$

This can be written symbolically as $F = m \frac{dv}{dt}$, or

preferably, for our purposes, $F = \frac{d}{dt} (mv)$. For a

sinusoidal movement we have the equation $x = a e^{j\omega t}$ and we thus have

$$\frac{dx}{dt} = j\omega \cdot a e^{j\omega t} \quad \text{or} \quad \frac{d}{dt} \cdot x = j\omega \cdot x.$$

This means that we can write $F = j\omega mv$ or $v = F/j\omega m$. There are two schools of thought about what to do next. One school writes $F = j\omega mv$ and $V = j\omega L \cdot I$, the other school writes $v = F/j\omega m$ and $V = I/j\omega C$. As a result, one school decides that Force and Voltage can be taken as analogous, while the other school associates Force and Current. It seems to me perfectly clear that, as we can always do a duality conversion, the simplest thing to do is to draw, not the simple diagram of Fig 4(a), but the signpost diagram of Fig 4(b), and let the analogue user twist round clockwise or anti-clockwise as he likes. But it is interesting to notice that an ideal electromagnetic loudspeaker driving an ideal crystal pickup will give an output voltage proportional to input current, and thus acts as a duality converter. This, by the way, is often called a gyrator, because in mechanical systems a gyroscope will perform this dualization operation.

A table of basic duals is given on pages 388 and 389 of the *Bell System Technical Journal*, Vol. 30, April 1951, in a paper by R. L. Wallace, Jr., and G. Raisbeck. This table, with suitable extensions, is extremely useful in transistor circuit design.

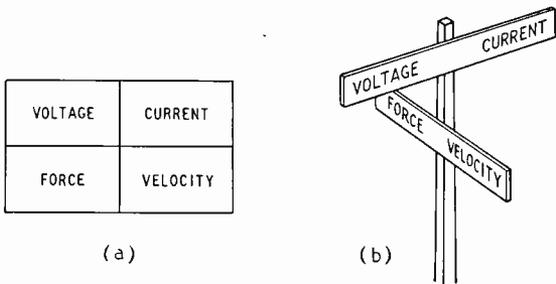
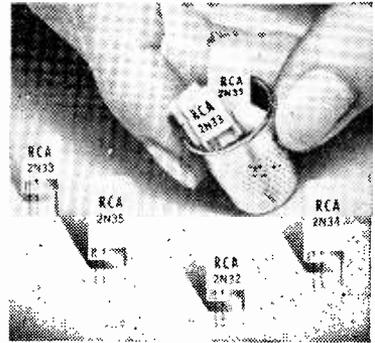


Fig. 4. The usual analogue diagram (a) is more circumscribing than the diagram (b) which gives a choice of two analogues.

New Transistors

THE latest transistors to appear on the market are from RCA and details of them are now available from RCA Photophone of 36, Woodstock Grove, London, W.12. The 2N32 is a point transistor intended for use in pulse or switching circuits. It operates with a collector voltage of -25 V and an emitter current of 0.5 mA, and has a current amplification factor of 2.2 and a power gain of 21db. The other point type, the 2N33, is designed for use as an oscillator at frequencies in the region of 50 Mc/s. In a typical circuit it operates with -8 V on the collector and 0.3 mA emitter current and gives a power output of about 1 mW.

Types 2N34, and 2N35, on the other hand, are junction transistors (the first being *p-n-p* and the second *n-p-n*) and are intended for use as a.f. amplifiers. They both operate at the very low supply voltage of 6 V (although with opposite polarities), and in a suitable circuit will give a power gain of 40db. All four types are mounted in small plastic cases and have projecting base pins, for which sockets are available.



A group of the new RCA transistors showing their size relative to a thimble.

V.H.F. Amateur Band Planning

AT a meeting convened by the Radio Society of Great Britain and attended by representatives of the principal amateur organizations interested in v.h.f. work, plans were drawn up and approved for general usage within the 2-metre and 70-cm amateur wavebands.

A zoning scheme has been in operation on the 2-metre band for a few years now and as it works so well and is so widely used it was agreed to adopt it *in toto* and the R.S.G.B. has undertaken to circularize all European amateur organizations with the view to getting it adopted throughout the Continent.

Briefly the scheme consists of allotting bands of frequencies to different zones (so far only in the British Isles) and arranged so that adjacent zones use widely separated bands. This plan has led to a big reduction in local interference among amateur stations on this band and its extension to other v.h.f. bands before they become overcrowded is definitely worth while.

The advent of amateur television in the 70-cm band makes band planning all the more desirable here and it was agreed to recommend the following allocations:—

- 420 to 425 Mc/s—SEO (self-excited oscillator) communications.
- 425 to 432 Mc/s—Amateur television.
- 432 to 438 Mc/s—Frequency-stabilized communications in zones harmonically related to those in the 2-metre band.
- 438 to 445 Mc/s—amateur television.
- 445 to 455 Mc/s—future amateur development.
- 455 to 460 Mc/s—SEO communications.

Re-defining "Electronics"

Extending the Meaning: A New Word Wanted

By B. E. NOLTINGK, Ph.D., F.Inst.P.

In last month's issue *Wireless World* drew attention to the increasing confusion caused by the different connotations of *electronics*. The author of the following article has already protested against suggestions to broaden unduly the present academic definition of the word, though he admits it might be widened to embrace all those devices in which electrons travel, not only through gases or a vacuum, but through anything except normal conductors.

IN any attempt to build up a comprehensive philosophical system, the importance of attaching a precise meaning to each phrase used can scarcely be exaggerated; but it is true also in other fields that words must be carefully defined if confusion is to be avoided. How much time, for instance, has been wasted at international conferences because *democratic* carries at least a different shade of meaning according as the speaker comes from across one frontier or another?

The whole history of science and technology is based on increasing precision and carefulness, and there is no excuse for engineers and scientists to be inexact in their use of words any more than in their use of meters or mathematics. Unfortunately, they are sometimes guilty of such inexcusable lapses. Discussions have recently been going on (we might almost say "waged"!) about the meaning of the word *electronics*, in which enthusiasm has sometimes been more apparent than calm consideration. It is open to anyone to coin new words, which may achieve general acceptance if they are found to fill a need, but when defining—making more definite—a word that is already in circulation, it is legitimate only to clarify boundaries that have already a vague existence. It is not permissible to mark out a new frontier which involves the annexation to that word of territory which was formerly quite independent. This tendency to broaden and cheapen words is all too common in schoolboys—e.g., *wizard* and *super* (was "superlative" contracted to "super" to be re-expanded to "super-sonic"?)—but maturity of expression should guard jealously against it. It is the more regrettable that two recent definitions of *electronics* should transgress so flagrantly in this way. One¹ has already been argued against.² The other³ seems to err even more widely; for in saying that "electronics is the science . . . of the transfer of information . . . by . . . electro-magnetic radiation . . ." it includes within the definition at least the whole field of optics.

If we examine current usage of the word *electronics*

we find that it is actually employed in two senses. These merge into one another, but can generally be distinguished. The first, and more correct, concerns phenomena occurring when electricity is conducted by free electrons moving through gas or in a vacuum. The "electronic" device, in this sense, which has played by far the largest part in technological development, is, of course, the thermionic valve, and the second sense of the word *electronics* has been stretched to include any techniques and instruments in which such valves are used. Since it is convenient to group together techniques dealing with valves, with transistors, transducers and other non-linear circuit elements, and even with some other, simpler components (such as inductance-type strain gauges, which may well be used without valve oscillators or amplifiers), *electronics* is already occasionally used to embrace this wider field.

It would therefore be possible to make out quite a strong case for a re-definition of the word to cover such usage, or at least some of it. We would have to be careful that *electronics* did not become synonymous with *electricity*. An alternative, however, which appears to have considerable attractions, is to restrict the word to its original subject—what we have called its first sense—and to use some new expression for the field covered by the second sense. The difficulty is to propose a suitable word. In our present-day vocabulary, there is a distinct dearth of terms touching on this territory, and on this side of the Atlantic we seem to have a decent reticence about assisting in the birth of a brand new, ready-made word. In any case, verbal habits only change slowly and even if there were agreement in principle, it would probably be several years before any newly created expression was accepted at all widely.

Word-coining

Perhaps the only constructive suggestion that can be made at the moment is to encourage the wider use of the word *circuitry*, which at present is still on the wrong side of the boundary between jargon and respectability, but which can prove most useful in

¹ W. L. Everitt, *Proc. I.R.E.*, August, 1952, p. 899.

² B. E. Noltingk, *ibid.*, May, 1953, p. 668.

³ *Electronic Engineering*, May, 1953, p. 177.

expressing an idea not covered by any other word. Admittedly, there is as yet no adjective derived from *circuitry* which would be acceptable as a replacement for *electronic* (for instance, in R.E.C.M.F.). Perhaps such an adjective could be evolved.

While considering etymological invention, mention may be made of another word that is still completely missing from our vocabulary, and whose absence can prove a definite embarrassment. This is one to describe the actual physical object which is the embodiment of the "circuitry." Sometimes the object can be called an "instrument," but if, as is often the case, it is desired to distinguish between the "pick-up element" (which may be, say, a strain gauge or the temperature-sensitive resistor of an "electronic" temperature controller) and that part of the equipment which its connecting wires lead back to, there is just no word to describe the latter. "Electronic unit" can sometimes be used, yet it is certainly not correct.

But here let the would-be coiner beware. If he follows the convenient American precedent set by *Spam*, he will find that he has telescoped a "circuit house" into a *circus*!

Brain Waves by Radio



(Courtesy The Lancet)

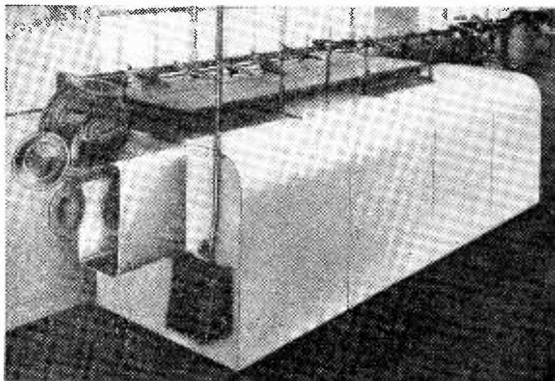
The apparatus in position on the patient.

Drying Loudspeaker Cones

Use of Infra-red Projectors for Moisture Extraction

IN the normal process of manufacturing loudspeaker cones a suspension of fibres in a water solution containing a suitable binder is drawn through a wire mesh mould until a layer of the required thickness has been deposited. The mould is then withdrawn from the bath and after a period of drying and curing the diaphragm can be easily stripped from the wire foundation—provided that the drying process has been properly controlled.

At the works of Acoustic Products, Ltd., an infra-red drying plant has recently been installed by Metropolitan Vickers in which eight infra-red projector elements with a total loading of 30kW are controlled, in conjunction with the conveyor belt speed, to give a wide range of drying times suitable for cones of different types. The emission spectrum of the radiating elements has a peak at 2.8×10^4 Angstrom units which nearly coincides with the peak selective absorption wavelength of water at 3×10^4 A.U.



"Metrovick" infra-red drying equipment for use in loudspeaker cone manufacture.

RECORDINGS of the electrical activity of the brain—or electro-encephalograms—are very useful to psychiatrists because they provide definite physical evidence of a patient's mental condition. The scope of the technique is limited, however, by the fact that the patient has to stay more or less inactive while the electrodes of the electro-encephalograph are attached to his head. More valuable information would be gained if he were able to move about freely and engage in everyday activities. Writing in *The Lancet* for 27th June, C. S. Parker, C. C. Breakell and F. Christopherson explain how they have overcome this difficulty by providing the patient with what might be described as a "walkie-thinkie"—portable f.m. transmitter which transmits the varying potentials obtained from electrodes on his head to a distant electro-encephalograph.

The transmitter uses frequency modulation because the patient's movements tend to produce variations in signal strength, and with amplitude modulation these would affect the amplitude of the received brain waves. Moreover, a crystal-controlled oscillator has to be used since the temperature rise in the apparatus would cause a free-running oscillator to drift and this would upset the recording base line.

The oscillator, however, is not frequency modulated directly by the 10-c/s brain waves, because with the crystal control there would be a considerable loss of gain at such a slow rate of deviation. It is actually deviated by a 5-kc/s a.f. tone, and the slowly-fluctuating brain waves are applied to this as amplitude modulation. Thus, with no incoming brain signals the carrier frequency (158.75 Mc/s) is deviated a fixed amount at a rate of 5 kc/s. The arrival of a brain signal then causes a change in the extent of this deviation. At the receiving end the signal is reproduced as a 5-kc/s tone with the brain waveform superimposed on it, so it is then only a matter of demodulating to remove the tone and recover the brain waves for recording purposes.

As the transmitter was only built for experimental purposes no attempt was made at miniaturization. Power is supplied by a lightweight silver-zinc accumulator hung on the patient's chest, and h.t. for the valves is obtained from this by means of a small rotary converter.

LETTERS TO THE EDITOR

The Editor does not necessarily endorse the opinions expressed by his correspondents

Two-band Television Reception

LESS technical readers of your Journal should be on their guard when considering speculative opinion expressed in your correspondence columns regarding the difficulties to be faced in enabling present set owners to receive programmes which may be transmitted in the future on higher-frequency bands. A destructive or defeatist attitude on this subject, if accepted by those who are not fully versed in the technicalities involved, could prove a serious obstacle to progress.

W. T. Cocking (your June issue) does well to point out the difficulties in the design of suitable v.h.f. and u.h.f. TV converters, but it must be realized that manufacturers in this field are well aware of these problems. It is clearly out of the question to produce a universal converter which will deal with all existing receivers and conditions of use, and the aim of the designers is to achieve the best compromise between the cost of the converter and the number of set users whom it can satisfy. This may result in the production of one or more relatively simple and inexpensive converters which will cater for most needs. When this has been done, more elaborate arrangements will be necessary to deal with more difficult cases, and there will undoubtedly be a residue of cases in which the use of a converter is not applicable at all.

Unfortunately the development and proving work which is required, though this can in part be carried out in the laboratory, is handicapped by the lack of any facility for the extensive field testing which will be necessary before designs can be completed and put into production with confidence. This is the main reason for the apparent unwillingness of designers and manufacturers to discuss these converters in any but the broadest terms.

What is required is the earliest possible commissioning of a high-power v.h.f. transmitter in the London area to enable the engineers concerned to be completely satisfied that the conclusions reached in the laboratory are borne out in practice in the field. Such a transmitter could be experimental in character, in the first place at least, and need only radiate a test pattern.

Cambridge.

J. W. DALGLEISH,
Chief Engineer, Pye, Ltd.

Broadcast Transmitter Distortion

YOUR correspondent, T. S. Marshall (July issue) may be assured that the possibility of distortion from all sources in the receiver was not overlooked. I have tried a number of arrangements, there being no significant difference in results from the several best; the detector at present in use is a diode working into a *minimum* a.c.:d.c. load ratio of 98.9 per cent (at full volume control setting). The B.B.C. have not, however, attempted to deny that they do transmit distorted signals. It is not claimed that the severe distortion that is the subject of this correspondence is or was constantly present, but it was extremely common throughout the winter. The considerations set out by the B.B.C.'s Deputy Chief Engineer (in the June issue) would apply to any system, and he appeared to describe only the process of limiting, which is normally only a precautionary measure and is by no means the same thing as automatic compression, to which the B.B.C. had previously confessed. The distortion introduced by the latter would not be confined to the rare transient peaks which reach overload level, and the effects in fact observed would appear consistent with those expected when this technique is used.

It is too early for a listener to draw definite conclusions, but there appears to have been just recently a marked improvement in this respect, not confined to the daylight

hours when interference is slight. If automatic compression has been abandoned, may it be for good.

As A. A. Cotterell says (July issue), programme quality in the widest sense is so variable as to indicate that not all the links in the audio chain are faultless. Direct broadcast programmes originating in London studios and transmitted by the London Home Service transmitter are sometimes inferior to comparable programmes relayed from distant regions by landline. In this respect, however, the maintenance of the highest standards is not to be secured by the adoption or rejection of any particular techniques, but simply by continual vigilance on the part of the individual programme engineers.

London, N.10.

IAN LESLIE.

IN support of T. S. Marshall's remarks on the subject of the quality of B.B.C. transmissions, I would like to add that the detector circuit of the "No-Compromise R.F. Tuner" (*W.W.*, Oct., 1952), is the best I have tried, and the type of distortion complained about by other readers is not noticeable.

The B.B.C. quality is a variable factor, but in general the best quality seems to be obtained from concerts of a symphonic nature or from chamber groups, but in my experience one can *never* guarantee a high-quality transmission, even though a previous concert, by the same player combination, from the same studio, may have been first class.

A simple t.r.f. receiver seems to be essential for best results, but this necessitates being near to the wanted transmitter.

Stone, Staffs.

H. BARKER.

Technical Qualifications

IN these days of severe shortage of technical staff, it is regrettable that employers have such an outdated view of the qualifications offered by a holder of the City and Guilds full technical certificate, and, to a lesser degree, of the final certificate.

The holder of a full technological certificate in telecommunication engineering is in as strong a position as any holder of better-known qualifications.

I have attended a "full-time" course for the above qualifications; some of my colleagues in the final year have been physics and engineering graduates wishing to obtain more advanced knowledge of communication theory not covered in degree syllabuses.

The mathematics syllabus covered in our final year was well up to standard required by any engineering degree of any British University, and much more relevant to communication engineering problems.

When the syllabuses, lecture and laboratory notes have been shown to employers by candidates being interviewed for a position, they have frequently been agreeably surprised at the high standard required.

It is deplorable that candidates should have to do this, when a few words from recognized authorities in the radio industry could instil general confidence in the City and Guilds qualifications in the minds of employers.

London, W.9.

J. S. A.

"Some Aerial Queries"

I HAVE read with interest "Cathode Ray's" well-written article in your May issue. His remarks on the relative inefficiency of short radiators are deserving of clarification. The reader receives the impression that the inefficient operation of short antennæ is inherent in their

length. Actually, there is little difference in the radiation efficiency of dipoles a half-wave or less in length. In practice, the apparent inefficiency of the shorter antenna is caused by the difficulty of properly feeding its comparatively low radiation resistance. In most cases it is either impractical or impossible to devise a coupling network whose ohmic losses are low enough to suit. When one considers the efficiency of the radiating system alone, the familiar relationship of power out/power in to the antenna proper holds. This, referred to an isotropic radiator, gives 1.5/1.64 for the relative efficiency of the limiting case; a dipole of infinitesimal length compared to a half-wave radiator. The difference is insignificant.

Riverside, Calif., U.S.A.

ALBERT WEISS (W6UGA).

"Cathode Ray" writes: I am much obliged to Mr. Weiss for removing any wrong impression that may have been made by my remarks on the relative ineffectiveness of aerials that are very short compared with half a wavelength. As the length is reduced, the radiation resistance falls—at something like the square of the rate—and if nothing is done about it the radiated or received power falls steeply. But, as he points out, if by ideal coupling and tuning arrangements the load and loss resistances could be reduced in the same proportion, the fall in radiation resistance would be offset by rise in current, and the power thereby kept constant.

This interesting theoretical possibility, however, bears very little relationship to what is practicable, otherwise the B.B.C. might have been able to save a lot of money by radiating their medium- and long-wave programmes from a few inches of aerial!

Ear Training

AS a commercial wireless operator with eight years' experience I should like to add a footnote to the comments on the apparent difference in sensitivity of the ear to sounds originating in headphones or from a loudspeaker ("An Aural Anomaly," p. 239, May issue). In my opinion any discrepancy which may be found will be influenced by the degree and circumstance of the previous training which the listener may have received.

I learned telegraphy exclusively with earphones, and when I had to use a loudspeaker it was necessary to run it well nigh full bore in order to get signals down. One of my favourite parlour tricks was to let a visitor listen to some phones with the signal level too low for him to detect sound; after that, to copy traffic from them without altering the signal level. My ears are not exceptionally sensitive, but just well-trained to the use of phones.

To hear well one must "relax" the ears, and this is not achieved with five minutes' practice. It didn't happen to me for thousands of operating hours. With ears covered, head noises are magnified, and these distract the attention of the inexperienced. Head noises include pulse, creaking muscles and bone, breathing and saliva noises. Two conditions must be met without conscious effort: (1) Controlled breathing to stop "waterfall" noise. (2) Breath free enough to stop blood pumping noises.

Blocking the ears has a slight hypnotic effect like wearing spectacles or a broad-rimmed hat. It brings a sense of security and a fancied isolation from the realities of life—so you go to sleep!

In two words, the anomaly is explained by "inexperienced listening."

Arborfield, Berks.

J. WORTON.

"Stereoscopic Television"

REFERRING to your article in the July issue, the B.B.C. could start showing stereoscopic images to-morrow if it cared. No alteration to existing transmitters or alteration or attachments to existing receivers would be needed; only a few minutes' practice by the viewer.

The method has been known for decades to photographers, the Ordnance Survey, range-finding instructors, and the like. The right-hand image of the stereo pair is displayed on the left of the screen, the left-hand component on the right. The spectator converges his eyes on an intermediate spot, such as the finger of his extended

hand, and then transfers his attention to the screen. A solid image will then appear, nearer than the screen but apparently smaller, flanked by two satellite flat images which are mentally invisible. The extended hand and similar aids are unnecessary after a trial or so.

With current screens the stereograms thus displayed would be of "upright" format, or, if not, would have to be rather small. Against this they would have the advantage of needing no apparatus, other than that needed to form the original stereo pair, and of giving far better quality (without any loss of illumination) than any system that interposes optical equipment between screen and eye.

Farnborough, Hants.

R. A. FAIRTHORNE.

Lamp Interference

REFERRING to the letter by A. P. Hale in your June issue, it is scarcely true to say that the use of vacuum lamps is confined to the special applications he mentions; in fact, a large proportion of the lamps used in domestic installations are of this type.

Nor is the gas-filled lamp so innocent as he believes; a number of these have been found to cause interference. It may be that the interference from the gas-filled lamp is not so strong as that from vacuum lamps, and in a TV reception area enjoying such a high field strength as does Enfield its interference is not noticed.

It is found that lamps of different wattages have different frequencies on which their peak interference output is produced. I am to believe that manufacturers are aware of this trouble and that research is being conducted with the aim of producing lamps which would be free from this fault.

Tenby, Pemsb.

W. B. MANSELL.

Function of the Valve

"DIALLIST" contends (June issue, p. 292) that the thermionic valve is a power amplifier rather than a voltage amplifier. Strictly speaking, it is neither.

By mechanical analogy, no system of gears, levers or controls can itself increase the power (rate of doing work) of an engine. Additional power can be obtained only by a corresponding increase in fuel expenditure, assuming the efficiency is unaltered.

The thermionic valve can perform only as a valve, or, if preferred, a form of electronic relay actuated by the incoming signal. It controls power that is derived solely from the supply mains or battery.

Radlett.

O. M. BRUCE PAYNE.

"Meter Shunts"

THE article in your July issue wisely calls attention to the possible danger to the meter during adjustment of the shunt.

I suggest that a safer and simpler method is to use the so-called constant current circuit. In this a resistor of the order of a thousand times the instrument resistance is connected in series with a battery of sufficient voltage to produce full-scale deflection, an additional variable resistance being used for fine adjustment. If now a variable resistance is connected across the meter and adjusted so that the deflection is exactly halved, its value when separately measured will be equal to that of the instrument.

Without actually ascertaining the value of this resistance various shunts may be set up by adjusting the meter deflection to the required fraction of the full-scale value. Accuracy in this case will be limited by the ability to read small deflections and it may not be possible to extend the range by more than a factor of 10. However, by repeating the process one may extend the range further but unless extreme care is taken accuracy will tend to suffer.

Chipstead, Surrey.

E. G. DANN.

T.A.C. REPORT

Summary of the Considerations and Recommendations

THE long-awaited report—or at least the first of a series of reports—of the Television Advisory Committee was published on July 7th. When appointing the committee² in October, 1952, “To advise the Postmaster General on the development of television and sound broadcasting at frequencies above 30 Mc/s and related matters, including competitive television services and television for public showing in cinemas and elsewhere,” the P.M.G. asked the members to give priority to the consideration of domestic television both by the B.B.C. and competitive organizations; the present report is confined to this subject. Subsequent reports will cover v.h.f. sound broadcasting and cinema television.

The report is primarily concerned with the technical considerations involved, particularly the question of frequency allocations, and does not go into the politics of sponsored television. As already recorded in *Wireless World* a technical sub-committee³ was set

BAND 1

Channel	Station	E.R.P. (kW)	Polar'n	Limit of Service Area
1	London	500	V	----
	N. Ireland	50	H	----
2	Holme Moss	500	V	----
	S. Devon	50	V	----
3	Isle of Wight	50	V	----
	Kirk o'Shotts	500	V	----
4	Aberdeen	50	H	----
	Isle of Man	25	H	----
	Sutton Coldfield	500	V	----
	Channel Islands	5	H	----
5	Pontop Pike	50	H	xxxx
	Wenvoe	500	V	xxxx

BAND 3

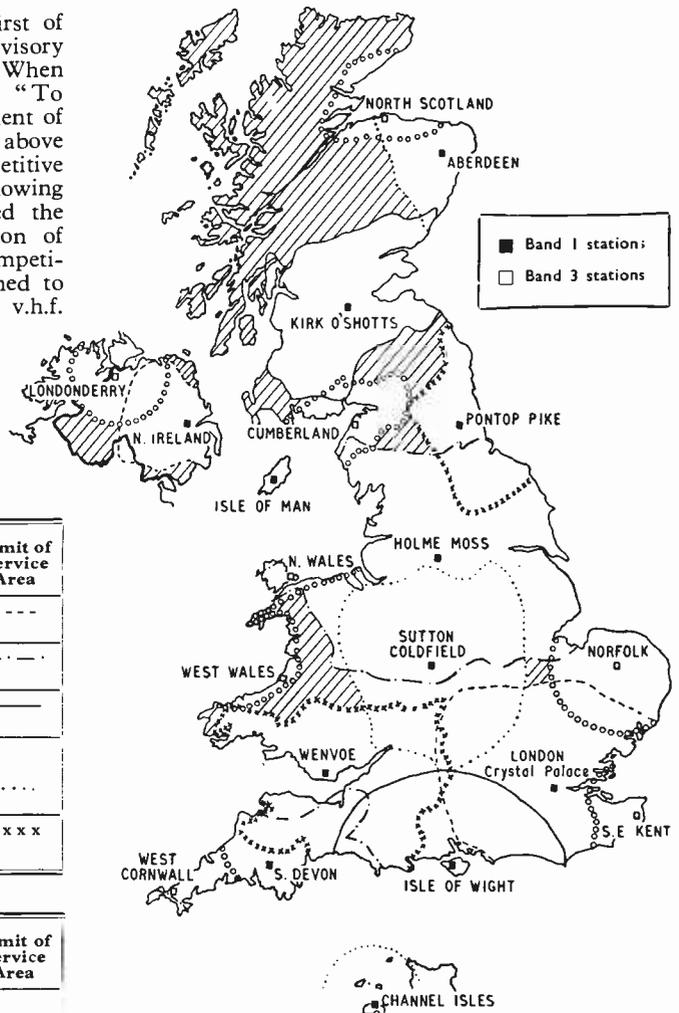
Channel	Station	E.R.P. (kW)	Polar'n	Limit of Service Area
7	Cumberland	50	H	oooo
	S.E. Kent	5	V	
	W. Wales	50	H	
8	Londonderry	50	H	oooo
	Norfolk	50	V	
	N. Scotland	50	H	
	N. Wales	50	H	
	W. Cornwall	50	V	

E.R.P.—Effective Radiated Power.

up by the T.A.C. to study the bands available for television and v.h.f. sound broadcasting which also comes within the purview of the T.A.C. The internationally allocated bands for broadcasting above 30 Mc/s are:—

- | | |
|-------------------|----------|
| (1) 41 — 68 Mc/s | } v.h.f. |
| (2) 87.5—100 Mc/s | |
| (3) 174 —216 Mc/s | |
| (4) 470 —585 Mc/s | } u.h.f. |
| (5) 610 —960 Mc/s | |

It should be stressed at the outset of this summary that the report is based on the assumption that



Estimated coverage of the stations planned by the B.B.C. for a single-programme service using the whole of Band 1 and two channels (205.5 and 215.5 Mc/s) in Band 3. Shaded areas will receive a median field strength of less than 225 $\mu\text{V/m}$ from Band 1 stations and less than 500 $\mu\text{V/m}$ from Band 3 stations. It will be noted that the estimated service area of the London station is based on the new high-power transmitter being erected at the Crystal Palace.

the present 405-line system will continue to be used for future services. However, by the recommended initial allocation of only every third 5-Mc/s channel in Bands 4 and 5 provision is made for the introduction of a higher-definition system if desired.

So far as Band 1 is concerned it will be virtually fully utilized on the completion of the B.B.C.'s plans for 12 stations—the existing 5 high-power stations, 5 medium-power transmitters (Belfast, Newcastle, Aberdeen, Plymouth and Isle of Wight), and 2 low-power stations in the Channel Islands and Isle of

Man. The committee does, however, recommend that "every effort should be made to allocate a Band 1 frequency to any user [presumably competitive] when the location and power of the proposed station makes this possible."

Band 2 is considered to be too narrow to be of much use for television and is left—as agreed at Stockholm—for sound broadcasting. The committee does, however, take cognizance of the possibility of the future integration of the television and v.h.f. sound services.

The crux of the whole situation is undoubtedly Band 3. This would provide eight 5-Mc/s television channels, but at Atlantic City (1947) the U.K. asked for and obtained permission to use the upper 16 Mc/s in this band for air navigational aids and the lower 26 Mc/s for both broadcasting and fixed services. As is well known, the band between 174 and 184 Mc/s is being used in this country for mobile services and many business radio users and public services are now working in it. The complete clearance of the band at the expense of the other services—which would have to be found other places in the spectrum—is regarded by the T.A.C. "only as a future possibility," but it has been advised that two channels (between 184 and 195 Mc/s) could readily be made available for television. The committee recommends that a third channel should be cleared quickly either in the band or adjacent to it and that the whole of Band 3 should be eventually made available for television. The committee envisages the possibility of widening this band.

A map is incorporated in the report showing the possible disposition of four high-power stations (London, S. Wales, N. Midlands and Central Scotland) and six low-power transmitters (S.E. Kent, Norfolk, W. Wales, Cumberland, Londonderry and Inverness) using the two channels readily available in Band 3.

In the light of our present knowledge of propagation at u.h.f. and of the development of valves for use at the higher frequencies, it is considered that by comparison with Band 3 twice as many stations would be required to give substantial coverage of the whole country using Bands 4 and 5. Allowing 5 Mc/s bandwidth, 93 channels could be provided in Bands 4 and 5, but, as already stated, it is proposed that only every third channel should initially be allocated.

It is stressed in the report that whatever use is eventually made of Band 3, whether by the B.B.C. or competitive stations, any extensive development of television will demand the starting of transmissions in Bands 4 and 5.

The B.B.C.'s plans for a two-programme service for the whole country using the whole of Band 1 and the eight channels in Band 3 allocated at Stockholm are

given in the report. A list of the proposed stations was published in our June issue, page 291.

An analysis of the applications so far received for licences for competitive stations gives the approximate number of transmitters required as 88.

A short statement on the present position of the development of colour television is given as an appendix to the report with the recommendation that any colour system to be adopted in this country must be compatible.

A reservation by C. O. Stanley is appended to the report as he was "unable to agree that the limited conclusion which the Television Advisory Committee has reached forms an adequate basis on which to plan alternative television services." He draws attention to "the unsound basis of frequency allocation in this country" and proposes the establishment of a system of collaboration between the licensing authority and industry in order to prevent a recurrence of the present chaotic condition, or, alternatively, the setting up of an independent commission on the lines of the American Federal Communications Commission to control all frequency allocations.

References

- ¹ "First Report of the Television Advisory Committee, 1952," H.M.S.O., price 1s 6d.
- ² Members of reconstituted T.A.C.: Admiral Sir Charles Daniel (Chairman); E. W. Playfair (Treasurer), F. C. Musgrave (Min. of Supply); Sir Ben Barnett (Post Office); Sir Ian Jacob (B.B.C.); G. Darnley Smith and C. O. Stanley (R.I.C.); Sir Edward Herbert; Lord Aberconway; E. M. Fraser, and R. J. Broadbent (Secretary).
- ³ Members of technical sub-committee: Dr. W. G. Radley (Engineer-in-Chief, G.P.O., Chairman); H. Bishop and R. T. B. Wynn (B.B.C.); H. Faulkner (Post Office); G. E. Condliffe (E.M.I.); B. J. Edwards (Pye); K. I. Jones (Cossor); Professor Willis Jackson (Imperial College, now Metro-Vick); Dr. R. L. Smith-Rose (D.S.I.R.), and C. W. Sowton (Secretary).

Experimental TV on U.H.F.

G3CTS/T is the call sign of the 405-line experimental television transmitter which has been built by the Television Society and will operate on 427 Mc/s with a peak power of 12W. The equipment has been installed at the Norwood Technical College, where it was recently seen at the "Open Day," and, in addition to providing a test signal for members of the Society interested in u.h.f. reception, it will serve as a demonstration for the students.

The Society is also considering the design of a 625-line transmitter which will be operated in collaboration with the radio industry to enable receivers built to the continental standard to be tested under working conditions.

It is stressed by the Society that neither transmitter will be operated as a commercial station as has been rumoured in some quarters. The construction of the station is being undertaken as part of the Society's policy of aiding the development of television technique.

Educational Filmstrips

WHAT are believed to be the first filmstrips to be produced covering a specific course of study have been prepared by Mullard, Ltd., as part of its educational service. It consists of a series of 20 strips covering the two final years in the Ordinary National Certificate course in electrical engineering.

Although prepared primarily for the assistance of lecturers and teachers in technical training establishments, many of the strips will undoubtedly be found useful for senior science classes in grammar schools and for staff and apprenticeship training.

In producing this series of filmstrips Mullard's have

had the assistance of an advisory panel composed largely of teachers in technical colleges.

In selecting the diagrams the tendency has been to concentrate on those that would normally involve laborious blackboard work and a greater degree of accuracy than can be generally obtained by freehand drawing.

Details and prices of the filmstrips in the series, which were made and will be distributed by Unicorn Head, Visual Aids, Ltd., are obtainable from Mullard, Ltd., Educational Service, Century House, Shaftesbury Avenue, London, W.C.2.

WORLD OF WIRELESS

Organizational, Personal and Industrial Notes and News

Radio Show Plans

MANY of our readers overseas will have received the booklet "British Radio Leads the World," which has been circulated abroad by the Radio Industry Council. It includes an invitation to the National Radio Show at Earls Court, London, which opens to the public on September 2 for ten days. The booklet consists almost entirely of photographs with captions in English, French and Spanish telling the story of British achievements in radio and electronics.

The technical training display which was introduced at last year's show is being enlarged this year. The B.B.C. Engineering Training Establishment; King's College, London; Borough Polytechnic; E.M.I. Institutes; Marconi College and Norwood Technical College are participating in the display which will be devoted to "careers in radio." S. N. Ray, of the Borough Polytechnic, will be in charge of the stand.

There will be some 80 manufacturers exhibiting at the show, plus Government Departments, the B.B.C., banks and publishers. A considerable amount of space will be devoted to combined displays of electronic gear.

Admission to the exhibition, which will be open daily (except Sunday) from 11 to 10, will be price 2s 6d (children under 16 years of age 1s).

In our next issue we shall include an illustrated, tabulated guide to the main exhibits at the show.

Stereoscopic Television

A DEMONSTRATION of stereoscopic television was given recently by the American Broadcasting Company in Hollywood. According to our contemporary, *Radio-Electronics*, the system used a synchronized mirror rotating 30 times per second in front of the television camera to produce two images with an apparent spacing equivalent to that of the human eyes. These were reproduced on separate c.r. tubes at the receiver and projected on to a screen 3ft by 4ft. Viewers had to wear polarized glasses. After some initial confusion caused by the picture coming in upside down, the audience found the results strikingly effective.

According to *Electronics*, the Radio Corporation of America are working on a "three-dimensional" television system using a wide-angle camera lens, giving a 142-degree field of view, and a spherical-screen projection receiver. This is presumably the television equivalent of the film industry's "Cinerama" or "Cinemascop."

PERSONALITIES

Harold Bishop, C.B.E., B.Sc., is to be president of the I.E.E. for the coming session. A year ago he succeeded Sir Noel Ashbridge as Director of Technical Services in the B.B.C., which he joined in 1923. He was previously with Marconi's and was associated with the installation and operation of the original 2LO transmitter in Marconi House, London. Mr. Bishop is now serving on the T.A.C. Technical Sub-Committee.

J. A. Smale, C.B.E., B.Sc., the new chairman of the Radio Section of the I.E.E., has been engineer-in-chief of Cable & Wireless since 1948. He received his apprenticeship with B.T.-H., and after service in the Royal Naval Air Service in the 1914-18 war joined Marconi's W.T. Co. in 1919. He transferred to Cable & Wireless in 1929. Mr. Smale was largely responsible for the introduction of the system of frequency shift keying. He was appointed a C.B.E. in the New Year Honours this year, and has been a member of the Radio Research Board since 1951.

G. S. C. Lucas, O.B.E., M.I.E.E., who has succeeded **Hugh McC. Jack**, B.Sc., as chief electrical engineer of the British

Thomson-Houston Co., joined the company in 1915 but left to continue his studies. He rejoined as an assistant to the head of the B.T.-H. Research Laboratory in 1925. He became head of the Electrical and Development Section of the laboratory in 1932 and for his contribution to the development of centimetric fire-control equipment was appointed an O.B.E. In 1945 he was appointed manager of the newly-formed Electronics Engineering Department and subsequently became assistant chief electrical engineer.

P. E. Trier, M.A., who joined the Mullard Research Laboratories in 1950 as head of the Communications and Radar Division, and **G. Knott**, M.A., A.M.I.E.E., who joined the Mullard organization in 1940, have been appointed joint-managers of the Mullard Research Laboratories. Mr. Trier,



P. E. TRIER, M.A.

G. KNOTT, M.A.

who graduated as a wrangler in the mathematical tripos at Cambridge, was at the Admiralty Signal and Radar Establishment from 1941 to 1950. He was head of the V.H.F. Communications Group when he left. In his new position he will direct the Electronics Laboratory. Mr. Knott, who was at Clare College, Cambridge, and was subsequently engaged in research on X-ray crystallography at the University, was appointed a development engineer with the Mullard Radio Valve Company in 1940. He took charge of the Mullard Vacuum Physics Laboratory when it was formed in 1946, and in his new position will continue to direct its activities.

Hugo Gernsback, editor and publisher of our New York contemporary *Radio-Electronics*, was recently presented with a trophy by the American radio industry "in grateful appreciation of his 50 years of pioneering and inspiring leadership in the spectacular development of the radio-electronic art." The trophy, which is a silver globe mounted on a base on which are inscribed graphical radio symbols, the names of radio pioneers and of the donors, is to be established as an annual industry award "for outstanding accomplishments in the field of radio-electronics."

E. W. Hayes, M.I.E.E., author of the article in this issue on mobile television stations, joined the B.B.C. from Siemens Bros. in 1933 and became engineer-in-charge at the Rampham short-wave station in 1945. For three years from 1948 he was in Malaya as senior planning engineer for the British Far Eastern Broadcasting Service. On his return to the United Kingdom in 1951 he was appointed head of the Transmitter Equipment Section of the Corporation's Planning and Installation Department.

The Marconi International Marine Communication Co. announces the appointment of **J. R. C. Johnson** as manager of its Contracts Division. He joined the company as a sea-going radio officer in 1917.

T. F. Hargreaves, B.Sc. (Eng.), A.M.I.E.E., has left Standard Telephones & Cables, Ltd., where he started in 1938 in the Development Department, and has joined the Equipment Division of Mullard, Ltd. He will be concerned

with the overall planning of radio and telephone communication systems. While with S.T.C. he was engaged on the development of multi-channel carrier equipment.

W. A. Penkman, the new manager of the Service Division of the Marconi International Marine Communication Co., Chelmsford, was a sea-going radio operator from 1918 until 1926 when he returned to shore duties. Two years later he transferred to the Marconi Marine Service Division in London and became assistant service manager in 1948. With the reorganization of the company's divisions in 1951 he was appointed deputy manager of the division of which he is now manager.



C. E. Skerrey, M.Brit.I.R.E., Assoc. I.E.E., communications engineer with the Basrah Petroleum Co., Ltd., Iraq, is on leave in this country. He asks us to mention this as there may be members of the radio industry who would like to discuss with him the question of the behaviour of equipment in the tropics. His postal address while in London is BCM/Travel, London, W.C.1.

OBITUARY

Charles Le Maistre, C.B.E., M.I.E.E., who was well known in the field of international standardization and was the first director of the British Standards Institution (1929-1942), died on July 5th in his eightieth year. He was also general secretary of the International Electro-Technical Commission from its formation in 1904 until his death.

Charles Francis Phillips, M.I.E.E., died suddenly at Blackheath on July 1st at the age of 67. Shortly after the first world war, in which he served as a Lt.-Cdr. in the Royal Navy, he collaborated with W. W. Burnham in founding Burndept, Ltd., one of the first companies to manufacture receiving apparatus specifically for broadcasting. In 1921-22 he was a member of the G.P.O. Committee which considered the formation of the B.B.C. In 1928 he transferred to Graham-Amplion, Ltd., as chief engineer and director.

Charles Pinkham, who retired from the G.E.C. in 1950 after 37 years service, died on July 12th at the age of 64. He joined the company as personal assistant to the late Lord Hirst and was for 23 years manager of the publicity organization of the G.E.C.

Stanley G. Rattee, A.M.I.E.E., who joined the editorial staff of *The Electrician* (now *The Electrical Journal*) in 1927, and since 1948 had been editor, died on June 27th. He was for some years in the Marconi Co. and from 1920 to 1923 was assistant editor of the publications issued by the company which then included *Wireless World*.

IN BRIEF

Receiving Licences.—12,945,828 broadcast receiving licences, including 2,316,600 for television and 188,501 for sets fitted in cars, were current in the U.K. at the end of May. During the month, the number of television licences increased by 113,257.

Welsh Transmitter.—The new B.B.C. Home-Service transmitting station at Towyn, Merioneth, on June 21st took over the service on 881 kc/s from the temporary transmitter which had been operating from a caravan on the site since September last year. The 5-kW transmitter is designed for unattended operation with remote control from another B.B.C. centre. Both the main transmitter and the 2-kW stand-by equipment were manufactured by Marconi's.

Aberdeen TV.—The site of the television station for Aberdeen, which is one of the five medium-power transmitters to be erected by the B.B.C., is to be Core Hill. It lies mid-way between Buckie on the Banff coast and Aberdeen.

Aero-Electronics.—The first students specializing in electrical engineering have just passed out of the College of Aeronautics, Cranfield. The course, which is at graduate level, is against a general background of aircraft engineering, and naturally the emphasis of the electrical section is heavily on radio and electronics.

Daventry's Reduced Power.—A fault in the aerial system of the Third Programme transmitter at Daventry (464 metres) has made it necessary to bring the reserve aerial into operation and to reduce the power to approximately 60 kW until the fault has been rectified; this may take some weeks. Some fading after nightfall may possibly be experienced by listeners living at considerable distances from the transmitter as the stand-by aerial is not of the most modern anti-fading type.

Radio Banquet.—The annual banquet of the Radio Industry Council will be held at the Savoy Hotel, London, on November 18th. It will be at this function that Sir Noel Ashbridge will be presented with the portrait painted by Frank O. Salisbury which was reproduced in our June issue. It bears the inscription "Presented to Sir Noel Ashbridge, M.I.C.E., M.I.E.E., by the Radio Industry Council in recognition of his contribution to the growth of British broadcasting, January 5, 1926, to July 31, 1952."

I.E.E. Council.—In addition to the election of H. Bishop as president of the I.E.E. (referred to earlier) the six vacancies for ordinary members of the Council for the coming session have been filled by members of the Radio Section. They are: Dr. Willis Jackson, F.R.S. (Metro-Vick); G. S. C. Lucas, O.B.E. (B.T.-H.); Dr. R. L. Smith-Rose, C.B.E. (D.S.I.R.); G. O. Watson ("Lloyd's Register of Shipping"); R. T. B. Wynn, C.B.E. (B.B.C.); and A. T. Crawford (Reyrolle).

Radio Section, I.E.E.—The new members of the Radio Section Committee of the I.E.E. elected to fill the vacancies occurring on September 30th are: chairman, J. A. Smale, C.B.E. (see "Personalities"); vice-chairman, H. Stanesby (P.O. Research Station); ordinary members: Professor H. E. M. Barlow (University College, London); Dr. C. G. Macfarlane (T.R.E., Malvern); H. Page (B.B.C.); and Dr. R. C. G. Phillips (Philips).

Radio Control is to be a major feature of the All Britain Model Aircraft Rally to be held at the Handley Page Aerodrome, Radlett, Herts, on September 20th instead of August 23rd as originally announced. Admission is by programme obtainable, price 9d, from J. J. Greening, 25, Mandeville Drive, St. Albans, Herts.

Army Wireless Reserve.—The first 15-day annual camp of the recently-formed Army Wireless Reserve Squadron, of which Major D. W. J. Haylock (G3ADZ) is in command, was held near Chester in June.

Italy's National Radio and Television Exhibition is to be held in Milan at the Palazzo dello Sport from September 12th to 21st.

Pen Pal.—A reader in France, Monsieur René Coué, aged 23, of Radio St. Maurice, Le Girard (Vendée), France, would like to correspond with somebody interested in radio in this country.

BUSINESS NOTES

Kelvin & Hughes, Ltd., supplied the four echo sounders to be fitted in the floating fish factory "Fairfree II" which was launched a few weeks ago. Two of the sounders have been specially developed for fish detection over a wide range. The basic scale is from 40-400 fathoms, but this can be extended to 2,250 fathoms. The frequency used is 15 kc/s.

Marconi's have received the contract from the Government of Burma for the supply of more than a quarter of a million pounds' worth of radio equipment for the linking of 12 main centres in Burma. The system will not only link these main centres, but they in turn will be connected to a large number of smaller centres. The equipment will provide a completely new system of radio inter-communication for the country.

Coaxial Switches, relays and waveguide sections are among the products of the new firm of Besson & Robinson, Ltd., manufacturers of electro-mechanical apparatus, whose address is 6, Government Buildings, Kidbrooke Park Road, London, S.E.3.

The Du Bois Co., Ltd., have produced a new non-corrosive cored solder called "33 Tri-Sol," which complies with both the M.O.S. specification DTD599 and the G.P.O. specification M44/D.

Mullards have opened a Valve Service Depot at Renfrew Chambers, 20, Renfrew Street, Glasgow, C.2 (Tel.: Douglas 7772). The Depot manager is A. H. Adie.

Forzehill Laboratories, Ltd., announce that they have appointed Hawnt & Co., Ltd., of 59, Moor Street, Birmingham, 4, to be their exclusive agents for eleven Midland counties.

Transistor Circuits and Applications

Recent Developments from R.C.A. Research Laboratories

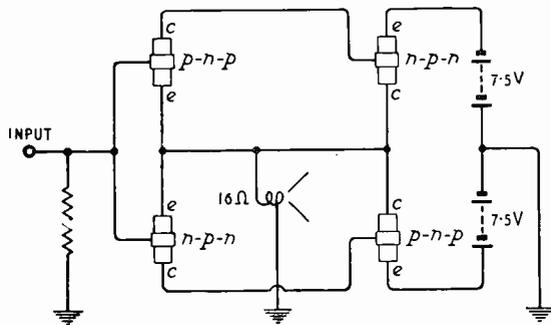
THIS is the season of visiting experts, and inevitably the transistor has been taken by many as the subject for the lectures which it is customary to expect of them.

The latest missionary was Mr. G. C. Sziklai, of the Radio Corporation of America, who delivered a lecture at the Royal Society of Arts on July 1. There was an audience of over 250, and an unknown number were turned away after the gangways were filled. Dr. Smith-Rose was in the chair.

Transistors are semi-conductor systems, and it is now normal to define a semi-conductor by its resistivity, of the order of 10^6 ohm-cm, compared with the conductors, 10^{-6} ohm-cm and the insulators,

It was clear that R.C.A. are particularly interested in high-frequency applications, and the circuit of a bridge for measuring the input impedance of earthed-emitter transistors was notable for the use of square waves. A description of this bridge technique has appeared in *Wireless World**, and in the transistor case a satisfactory representation up to 12 Mc/s is obtained by the use of a resistor in series with a parallel RC circuit. A new R.C.A. "beam-deflection" system for high frequencies was described, for which advantages were claimed over transistors using the unipolar field effect, in which drift velocities even higher than those of the point transistor are encountered. The new arrangement, which was sketched, showed a single emitter spot between two gold deflector plates on one face of the germanium, while the opposite face carried two collector spots. Push-pull input to the deflector plates provided a push-pull output at the collectors.

Mr. Sziklai showed a photograph of a number of transistorized units of popular appeal, including a transistorized ukelele, with acoustic feedback, and a transistorized television receiver. This latter uses 37 transistors and a 5-inch cathode ray tube, and it has a total power consumption, from batteries, of 13 watts. The circuits have already appeared in the June, 1953, issue of *Proc. I.R.E.* The chief interest lies probably in the complementary symmetrical systems, described in a separate paper by Mr. Sziklai in the same issue of *Proc. I.R.E.* Those are used for waveform generation and for Class-B amplification, and a typical circuit, which gives 500mW or audio power at 2 per cent distortion with a gain of 28db is shown in the accompanying figure.



Class-B push-pull amplifier with complementary symmetry, using n-p-n and p-n-p junction transistors.

10^6 ohm-cm. Elements in Group IV of the periodic table are our present typical semi-conductors, but a considerable amount of research is being conducted into the properties of the compounds of Group III and Group V elements. These form similar crystal lattices, but offer a much wider choice of electron energy levels and carrier mobilities. Furthermore, it is hoped that temperature effects will be less pronounced than with germanium, so that inefficient biasing circuits can be avoided. Mr. Sziklai showed a graph relating resistivity to impurity content for germanium, on which the types TA153 and TA163 were indicated as having about 1 part in 10^{-8} of impurity, the same order as that used for high-voltage diodes and several orders purer than the ordinary germanium diode.

R.C.A. and their licensees use the alloying technique for the production of junction transistors, and Mr. Sziklai claimed that it provided better mechanical and electrical conditions at the contact than the grown crystal technique. In reply to a question by Mr. G. M. Wright he said that R.C.A. hoped the transistor would ultimately have more reliable life figures than conventional valves, and that the price would fall below a dollar within two years. Among the types of which photographs were shown, was a liquid-cooled 1-watt unit.

* "New Bridge Technique," by Thomas Roddam, Jan., 1950, p. 8.

RADIO INTERFERENCE

*Analysis of Complaints Investigated
by the G.P.O.*

VERY nearly 100,000 complaints of interference to sound broadcasting and to television reception were investigated by the G.P.O. during 1952 and a study of the analysis of these brings to light some very interesting facts. Complaints of interference to television reception were slightly in the lead.

The cases investigated are summarized in various tables, but the two most interesting are those reproduced on the following page. The first column gives the most frequent causes of the interference, the second the number of complaints and the third the percentage this represents of the total number investigated, identified and disposed of.

In both tables unknown causes head the list. This is perhaps inevitable as much of the interference commonly encountered is of a transitory kind and owing to its capri-

ciousness never occurs when the investigating team is on hand.

Modern broadcast receivers being so sensitive the thought of using a good outdoor aerial rarely crosses the listener's mind and often sales appeal emphasizes the ability of the set to operate without one. Thus it is not surprising that 17.3 per cent of the complaints conclusively investigated were due to inefficient aerial and earth systems. As it is generally realized that "something on the chimney stack" is needed for television reception

TELEVISION

Cause	Number of Cases	Percentage of Cases
Unknown; not observed by P.O. staff	13,972	26.5
Sewing machine motors	9,936	18.9
Faulty receivers	4,273	8.1
Hair dryers	4,155	7.9
Inefficient aerial-earth systems	1,827	3.5
Motor car ignition	1,778	3.4
Motors, miscellaneous	1,647	3.1
Drills	1,521	2.9
Vacuum cleaners	1,452	2.7
Lamps (filament type)	1,193	2.3
Fan motors	1,069	2.0
Overhead power lines	1,062	2.0
Refrigerators	937	1.8
Bed-warmers	766	1.5
Thermostats, miscellaneous	755	1.4
Radio transmitters	698	1.3
Radiation from super-het local oscillator	650	1.2
Neon sign tubes	645	1.2
Medical apparatus (valve)	439	0.8
Mis-operation of receivers	410	0.8
Hair clippers	361	0.7
Faulty wiring of buildings	301	0.6
Electric toys	281	0.5
Dental motors	254	0.5
Bells	241	0.5
Fluorescent tubes	176	0.3
Rotary convertors	163	0.3

SOUND BROADCASTING

Cause	Number of Cases	Percentage of Cases
Unknown; not observed by P.O. staff	10,528	22.4
Inefficient aerial-earth systems	8,140	17.3
Radiation from TV receiver time bases	5,697	12.1
Faulty receivers	5,284	11.2
Faulty wiring of buildings	2,408	5.1
Sewing machine motors	1,641	3.5
Fluorescent tubes	1,559	3.4
Refrigerators	1,110	2.4
Drills	996	2.1
Motors, miscellaneous	946	2.0
Bed-warmers	800	1.7
Vacuum cleaners	647	1.4
Overhead power lines	539	1.2
Radio transmitters	524	1.2
Hair dryers	471	1.0
Smoothing irons	436	0.9
Neon sign tubes	362	0.8
External cross modulation	305	0.6
Sodium lamps, street lighting	282	0.6
Fan motors	252	0.5
Calculating machines	238	0.5
Generators	192	0.4
Dental motors	150	0.3
Lamp flashers	148	0.3
Washing machines	144	0.3

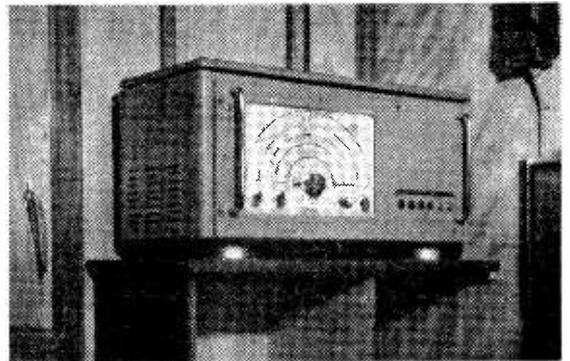
aerial deficiencies amounted to 3.5 per cent only in this section.

Radiation from television receiver time bases proved a nuisance to sound reception in 12.1 per cent of the completed investigations and this seems unduly high. However, the report says television set makers are alive to the nuisance and as time goes on the interference from this source should subside.

Radio transmitters, professional and amateur combined, accounted for 1.2 per cent of the cases investigated of interference to sound broadcasting and 1.3 per cent to television. This should go some way towards vindicating the amateur transmitter especially as hair dryers were proved to be responsible for over 6 times the amount of television interference and sewing machines nearly 15 times.

Surprisingly enough, motor car ignition systems only produced 1,778 complaints from television viewers; this may be accounted for by the fact that most viewers recognize the interference when it appears, and so do not report it.

MARINE BROADCAST RECEIVER



The Mimco all-wave marine broadcast receiver.

A RECEIVER designed specially for use in all classes of sea-going vessels, from passenger liners to trawlers, so that broadcast programmes may be received and relayed to different parts of the ship, has been introduced by The Marconi International Marine Communication Company, Marconi House, Chelmsford, Essex.

The receiver, which is known as the Mimco, consists of a sensitive 9-valve superheterodyne receiver and an audio power amplifier. The receiver unit is common to all installations, but the power amplifier is chosen according to the number of loudspeakers to be employed. A 10-watt unit suffices for small installations with up to 10 extension speakers and these and the receiver can be housed in a single cabinet measuring 25½ × 19 × 13½ in and weighing 90 lb.

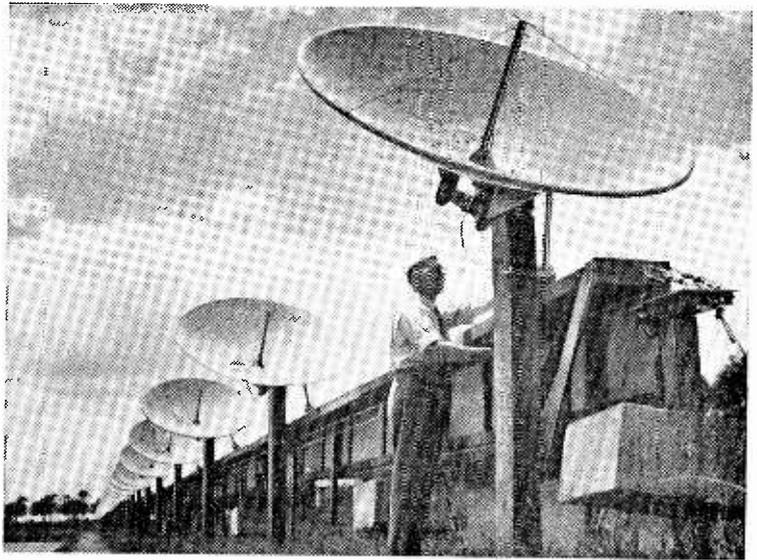
Short, medium and long waves are covered in four bands, their respective tuning ranges being 10 to 32 metres, 30 to 85 metres, 180 to 570 metres and 800 to 2,000 metres.

A tuned r.f. stage is employed, also variable bandwidth in the i.f. amplifier, the five switch positions corresponding to 5-, 10-, 15- and 20-kc/s bandwidth. There is a tone control.

The receiver takes 95 watts from a.c. mains of either 115 V or 230 V of 40 to 80 c/s. A converter can be supplied for operation on 110 or 220 V d.c. if required.

Narrow-Beam Radio Telescope

*Decimetre-Wave Aerial
System for Radio
Astronomy*



View from one end of the aerial system at its site near Sydney. Although it is a fixed radio telescope the paraboloids can be steered individually.

FOR studying localized sources of radiation on the sun, an Australian radio astronomer, W. N. Christiansen,* has designed a highly directional aerial system with a beam width of only one-twentieth of a degree. This extremely narrow beam is necessary because of the small angular width and spacing of the radio sources. The angular width of the sun itself is only about half a degree, so obviously the beam must be

* Radiophysics Laboratory, Commonwealth Scientific and Industrial Research Organisation, Sydney University.

considerably less than this if the aerial is to respond to the radio sources separately and not receive them all at once.

The system is actually a kind of interferometer, and operates on a wavelength of 21 cm. It consists of 32 paraboloid elements, each 5ft 6in in diameter, spaced out in a straight line for about 700ft in an east-west direction—all of them being connected in phase to the same receiver. This arrangement produces a family of thin flat lobes or beams rather like a group of opened-out fans, spaced apart by about 1.7° ; and as the earth rotates each beam is swept in turn flatwise across the disc of the sun. When a beam encounters a localized source of radiation there is a sudden increase in the received noise signal (see Fig. 4) and by noting the time at which this occurs it is possible

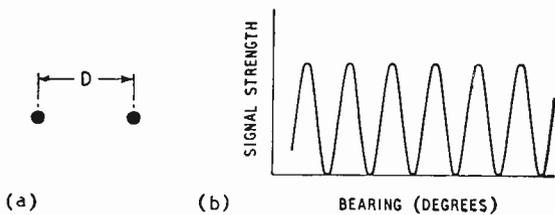


Fig. 1. At (a) is an interferometer aerial system consisting of two elements with spacing D , while (b) shows the type of directional radiation pattern it produces. The received signal has maxima and minima depending on the angle of incidence of the incoming waves.

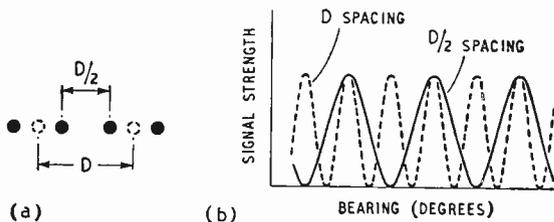


Fig. 2. At (a) the two elements in Fig. 1 have each been split into two, producing in effect two interference patterns (b), with the result shown in (c).

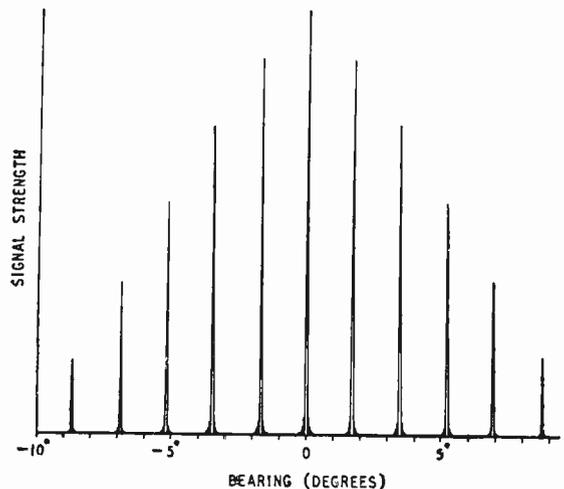
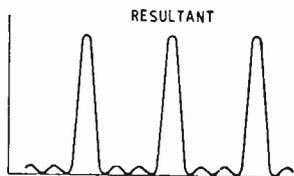
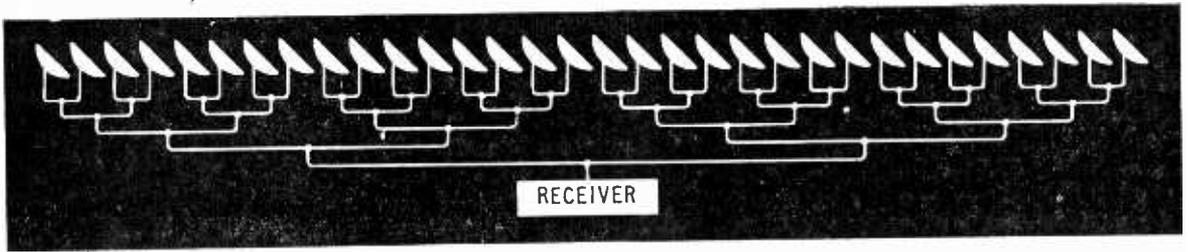


Fig. 3. Directional radiation pattern of the radio telescope, showing the extremely narrow width of the beams. The lower intensity of the beams off centre is due to the directivity of the individual paraboloid elements.



Branching system of lines connecting the paraboloids to the receiver is arranged so that the length of line from each element to the receiver is the same. Changes in line length due to temperature variations affect all elements equally and so do not disturb the phase relationships.

to calculate that the radio source lies along a certain line on the solar disc.

The thin widely spaced beams of the aerial system are produced, roughly speaking, by the interaction of a number of interference patterns. If there were only two spaced aerial elements connected to the receiver the interference pattern would be as shown in Fig. 1 (b). (This type of pattern is produced by the differences in path length to the two elements for waves coming from different directions. From some directions the waves arrive in phase and so combine to produce maxima, while from other directions they arrive in opposite phase and cancel out to produce minima.) If each of the two elements were now split into two others as shown in Fig 2 (a) there would be, in effect, one interference pattern corresponding to the original spacing, D , and another corresponding to the new spacing, $D/2$. These would combine as shown in Fig. 2 (b) to produce the resultant pattern (c). If this splitting process were continued, each

doubling of the number of elements would suppress half the lobes, until eventually there would be 32 elements, giving the resultant shown in Fig. 3—which is, in fact, the radiation pattern of the actual system.

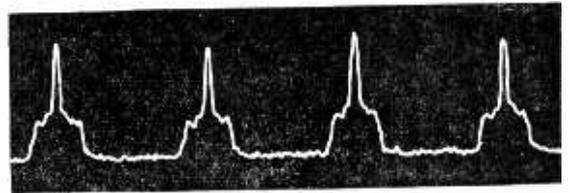


Fig. 4. Typical record of the received noise signal as the sun is scanned by several beams in succession. On each beam response the shoulder indicates the level of the general "background" radiation from the sun while the peak on top shows when the beam passes through a concentrated source.

Mobile Television Transmitters

Description of the B.B.C.'s Temporary Stations

By E. W. HAYES, M.I.E.E.*

AS is well known, mobile television transmitters have been used as radio links at outside broadcasts for several years but their use in maintaining daily broadcast transmissions for public reception is new.

The use of mobile transmitters in this way permitted the introduction of a television service for N.E. England, Northern Ireland and in the Brighton area much more quickly than would have been possible by the construction of permanent stations. The equipment used at each of these stations (Pontop Pike, Belfast and Brighton) conforms to the general plan to be described in this article with adaptation and modification as necessary to take advantage of any local features at each site or to overcome any difficulties arising out of unfavourable local conditions.

In planning mobile television broadcasting equipment the design must satisfy a number of basic

needs which may be summarized as follows:—

(a) Accommodation: The equipment should be housed in a van providing adequate shelter and heat insulation for plant and operators. It must be sufficiently rugged to protect the equipment in moving on unprepared sites and durable in resisting the weather during prolonged exposure in service.

(b) The vision transmitters must readily be capable of carrier frequency change over the whole of the present television broadcasting band (41-68 Mc/s). The vestigial sideband characteristic must comply with previously published standards.

(c) The equipment provided must include adequate provision for prolonged operation and in addition it may be necessary to arrange for the reception of programmes by radio link when normal cable incoming programme routes cannot be provided.

(d) In some cases power may have to be supplied from mobile diesel generating plant.

In planning this mobile television transmitter

* B.B.C., Planning and Installation Dept.

equipment it was decided, for reasons of economy in both money and time, to use existing designs of vans which were immediately available. Two types of vehicle were found to satisfy the requirements and to permit close adherence to a basic plant design. One of these types is self-propelling and the other a trailer providing a floor area of 7ft x 17ft with a satisfactory headroom of 7ft. The floor plan of the vehicle showing the layout of the transmitting station equipment is given in the diagram on page 334.

The mobile transmitting stations established in this way to provide a broadcast service over a prolonged period are equipped with sufficient spares and test apparatus to ensure the maintenance of a reliable service.

Programmes can be received from coaxial cable input, if this is available, but in addition there are duplicate television receivers which can provide a programme by reception of the nearest high-power transmitter. Picture monitoring is provided at the television receiver output with a similar picture monitor indicating the output of the vision transmitter. The two monitors are mounted side by side to permit immediate comparison of the incoming and the radiated picture quality. Duplicate television transmitters are provided, each capable of an output power at peak white of about 500 W.

In the sound programme chain provision is also made for reception by radio link if necessary, but normally sound would be received by land line. After equalization to remove any frequency/amplitude distortion which may be present, the sound signals are amplified and radiated by one of a duplicate pair of sound transmitters which have a maximum carrier power of 200 W. For test purposes the mobile transmitter is provided with video signal test generators and a gramophone as a sound programme test source.

A combining filter constructed from coaxial feeder sections permits the use of a single transmitting aerial for both vision and sound signals and a test load can be switched at will to sound or vision transmitters or alternatively to the combined output of both.

The power distribution scheme is arranged to separate the load of the transmitting equipment from the lighting and heating loads in order to permit the former to be energized economically through a voltage regulator provided to protect the performance of the apparatus against variations in the incoming supply mains. If necessary the whole of the power supply for the station may be taken from a mobile diesel generator but this is avoided wherever possible to prevent difficulties due to any residual hum which might exist in the equipment.

Vision Transmitters

The television transmitters used in this equipment can produce between 400 and 500 W of power at peak white with a video frequency characteristic conforming to the B.B.C.'s published asymmetrical sideband characteristic. The r.f. circuits of the transmitter were designed and developed by the B.B.C. The modulator was adapted from a stabilizing amplifier of an existing design produced by the Designs Department of the B.B.C. for use in the video frequency distribution system at studios and elsewhere.

The master oscillator is followed by two stages of frequency multipliers each with a multiplying factor

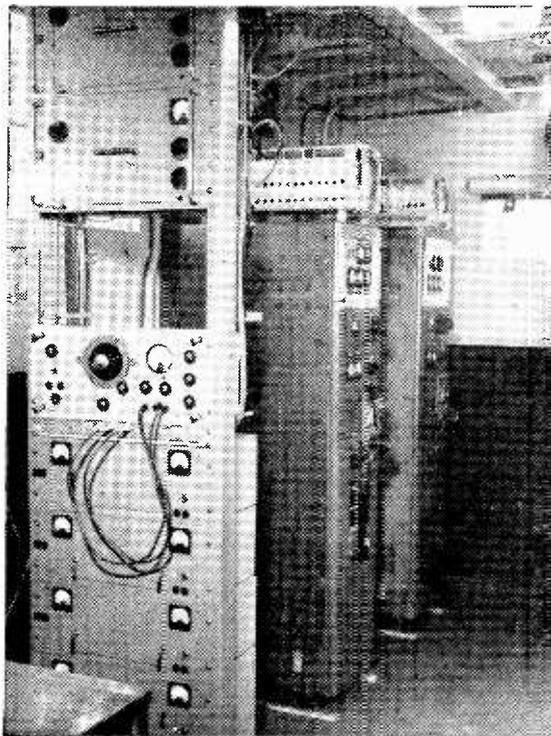
of three to produce a carrier nine times the master oscillator frequency. The modulated amplifier consists of a QQVO6-40 double-tetrode valve used in push/pull with a 350V stabilized h.t. supply. This is followed by the output amplifier stage which consists of two QY4-250 power tetrode valves in push/pull. In this stage the screen supply is stabilized but the anode h.t. supply is taken from the smoothed h.t. The r.f. inter-stage coupling circuit and the output circuit are arranged to produce the shaping of the asymmetrical sideband characteristic and the transmitter is connected to a 50-ohm unbalanced feeder which is provided with further sideband suppression filters and harmonic radiation suppressors.

The amplifier stage is grid modulated from a television distribution amplifier modified to give a d.c. restored output of approximately 30V peak to peak. This amplifier also provides stabilization of the amplitude of the synchronizing pulses with good linearity and negligible change in black level with changes in picture amplitude.

Sound Transmitters

The sound transmitters are required to produce a carrier frequency appropriate to the vision channel with which it is associated, and, where the frequency is shared with a high-power transmitter, a carrier frequency offset by -20 kc/s is used to minimize interference in fringe areas. The power output from the sound transmitters is adjusted to be related to the peak white power of the associated vision transmitter in the ratio of 1:5 with correction for any differences in gain

Duplicate 500-watt vision transmitters and, left, distribution amplifiers installed in the vehicle which houses the Brighton temporary station.



between the aerials used for vision and sound if these are separate structures.

The sound transmitters used were modified by the B.B.C. from existing h.f. transmitters. These modifications included the replacement of the r.f. stages which with the addition of a frequency multiplier stage extend the frequency range of the transmitter from about 20 Mc/s to 70 Mc/s. The transmitter is anode modulated in the final stage and is arranged to be coupled into an unbalanced feeder.

Transmitting and Receiving Aerials

The planning of transmitting and receiving aerials for use with this mobile television broadcasting equipment is influenced considerably by such factors as the shape of the desired service area, the plane of polarization required and the height of mast required or available, etc. Remarks in this paragraph will be restricted, therefore, to a general description of typical equipment, and more detailed specific installations will be referred to later.

Where the programme to be radiated by the local transmitter is received by radio from an existing B.B.C. transmitter, the receiving aerial used is mounted on a 70ft mast and consists of a four-element Yagi. This aerial is composed of a folded dipole element with solid conductor, directors and reflector; it is connected to the feeder through a balancing transformer to which is connected a low-loss receiving type cable with spiral insulation and aluminium sheath. This feeder has a loss of 0.33 db/100ft. At its designed frequency the receiving aerial described has a front-to-back ratio of 20 db. The locally transmitted frequency will of course be in a different channel to that of the station being received but even so this characteristic of the receiving aerial gives a useful reflection of the locally transmitted frequency provided that transmitting and receiving aerials are suitably sited with reference to the station to be relayed.

The forward gain of such an arrangement can be expected to be about 7.5 db with a satisfactory side-band characteristic.

An alternative array consists of four "inverted V" aerials suspended from a triatic at half wavelength intervals.

The receiving equipment is protected against interference from the associated transmitter by rigorous screening of the sets, by discrimination in the polar diagram of the receiving aerial and by filters in series with the aerial feeder. Noise limiters are also fitted.

At each of the sites of the present mobile television transmitters—Pontop Pike near Newcastle-on-Tyne,

Glencairn near Belfast and Truleigh Hill near Brighton—there are a number of factors which have influenced the basic plan already described.

The site selected at Pontop Pike is approximately ten miles from Newcastle-on-Tyne and has the important advantage of being 1,000ft above sea level. At this site there is already established one of the radio relay stations forming part of the Post Office chain which links the Scottish television transmitter at Kirk o'Shotts with the B.B.C. network. This enables the programme for Pontop Pike to be obtained readily and without the necessity of using direct reception from Holme Moss.

Having regard to the large number of potential viewers in this area around Tyneside the most effective aerial practicable was necessary. There has been erected, therefore, a 250-ft lattice mast surmounted by a three-stack batwing aerial supplied by Marconi's Wireless Telegraph Co., Ltd. This aerial has a circular polar diagram with horizontal polarization and a gain of about 5 db over a half-wave dipole.

Horizontal polarization was used in order to reduce to a minimum the mutual interference between Pontop Pike and the Wenvoe high-power station, with which it shares Channel 5 (vision 66.75 Mc/s and sound 63.25 Mc/s). Wenvoe uses vertical polarization. A further reduction in interference is ensured by Pontop Pike's operation on a vision carrier frequency offset by -5 kc/s.

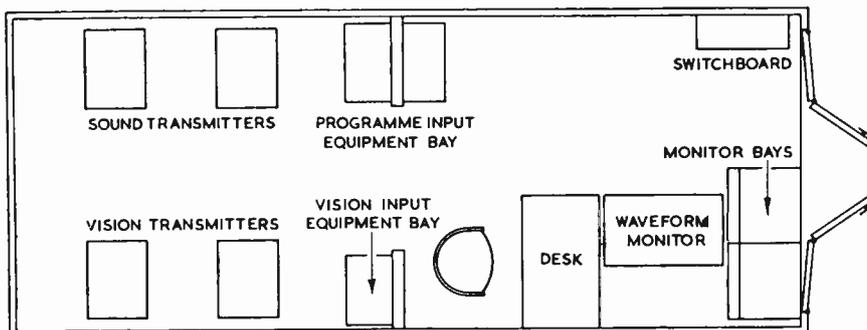
Offset Carriers

The use of offset carrier frequencies to facilitate simultaneous use of a single channel by more than one station was approved by the Stockholm Convention in July 1952, in which Great Britain participated. The amount of the offset must be related to the line frequency of the transmissions and a value of either 0.5 or 0.66 times the line frequency is used.

The output of the vision and sound transmitters at Pontop Pike is combined and conducted to the batwing aerial through a concentric tube feeder.

The van containing the mobile television broadcasting equipment at Pontop Pike, is enclosed within a precast concrete sectional building. The use of a light and speedily erected building in this way ensures reasonable working conditions for staff operating the equipment during winter months on this high and exposed site, and makes possible the use of a van not specifically designed for prolonged exposure in this way. In addition, part of the sectional building can be arranged to provide storage space for bulky spares.

The arrangements made for providing a television service in time for the Coronation for Belfast and dis-



Layout of the equipment in the transmitter trailer in use at Truleigh Hill, near Brighton.

Three-stack batwing transmitting aerial, supplied by Marconi's, which surmounts the 250-ft lattice mast at Pontop Pike.



strict have followed the general pattern described for the Newcastle area.

The transmitters are arranged to radiate on Channel 1 (vision 45 Mc/s, sound 41.5 Mc/s) which this station shares with the London station.

The site selected for this station is approximately four miles from Belfast City centre. It is about 400ft above sea level and the aerial is further elevated by a 250ft stayed steel lattice mast. The aerial is a single-stack batwing and provides a circular polar diagram. The radiation is horizontally polarized which gives discrimination against interference from the vertically polarized Alexandra Palace transmitter.

Sound programme for radiation from this station is received in the conventional manner by G.P.O. land line. Temporarily the vision programme is obtained by the direct reception of the Kirk o' Shotts transmitter until such time as a permanent programme link with the mainland can be provided by the Post Office.

The Brighton station, established on the South Downs about five miles north-west of the town, to improve the service in the area is basically similar to those already described. It is approximately 600ft above sea level, which gives unobstructed line of sight transmission to the target area with relatively short masts, and in addition makes possible reception at good quality of vision signals from the Alexandra Palace transmitting station. Although provision is made for reception of sound transmissions directly from Alexandra Palace this arrangement is used only in an emergency and normally sound programmes are received on a rented G.P.O. line. There is no alternative available, however, to the reception of vision signals directly from Alexandra Palace and tests have shown that a satisfactory standard of picture can be obtained in this way. The receiving equipment uses a Yagi aerial directed on Alexandra Palace, which, in addition to providing 7 or 8 db of gain in the required direction, provides valuable discrimination against the local relaying transmitter as well as against the transmissions from the Eiffel Tower, which uses approximately the same frequencies as Alexandra Palace.

The transmitters feed a vertically polarized dipole fitted with a reflector and mounted on a 70ft mast. The Brighton station shares Channel 3 (vision 56.75 Mc/s, sound 53.25 Mc/s) with Kirk o' Shotts, and at Brighton the frequencies have been offset 5 kc/s and 20 kc/s respectively.

Purchase Tax on Loudspeakers

FROM 1st July the purchase tax on all loudspeakers other than cone types of 10-inches nominal diameter or less has been lifted. The relevant wording of the notice is as follows:

"1. The following will be regarded as *not* chargeable with tax:—

"(a) Loudspeakers of other than the cone type, e.g., pressure units.

"(b) Cone type chassis of sizes exceeding 10 inches nominal diameter, and

"(c) Mounted (i.e., baffled) loudspeakers incorporating such chassis.

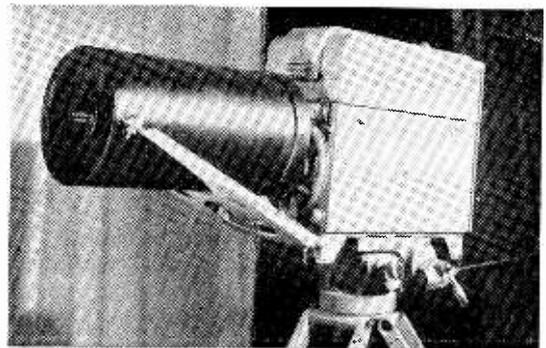
"2. All unmounted cone-type chassis of sizes up to and including 10 inches nominal diameter will be regarded as *chargeable* with tax, irrespective of the purpose for which they are supplied and of the quantity supplied, and whether or not they are supplied with other apparatus.

"3. Mounted loudspeakers incorporating cone type chassis of sizes up to and including 10 inches nominal diameter will be regarded as *chargeable* with tax unless they are housed in an industrial casing and are shown to the satisfaction of the Commissioners to be designed and advertised for sale only for use with equipment of public address and/or communication type.

"4. Loudspeakers incorporated in wireless receiving sets are not separately chargeable with tax, but the tax value of a chargeable set must continue to include the value of any incorporated loudspeaker whatever its type and size.

"Manufacturers who wish to claim exclusion from tax under paragraph 3 above in respect of particular models of loudspeaker should notify either their local Officer of Customs and Excise or Section 20(E), Secretaries' Office, H.M. Customs and Excise, King's Beam House, Mark Lane, E.C.3, giving full details of the loudspeakers concerned, together with copies of any advertising matter issued in connection therewith."

The changes in the regulations will be welcomed by manufacturers and users of high-quality reproducers, the majority of which are clearly exempt from tax. Superficially, paragraph 3 would seem to discriminate against the use of small-diameter cone units for high-frequencies in multiple-unit, wide-range reproducers designed for high-quality reproduction; but it is possible that a claim for exemption may be established on the grounds of power-handling capacity and suitability for use in p.a. systems.

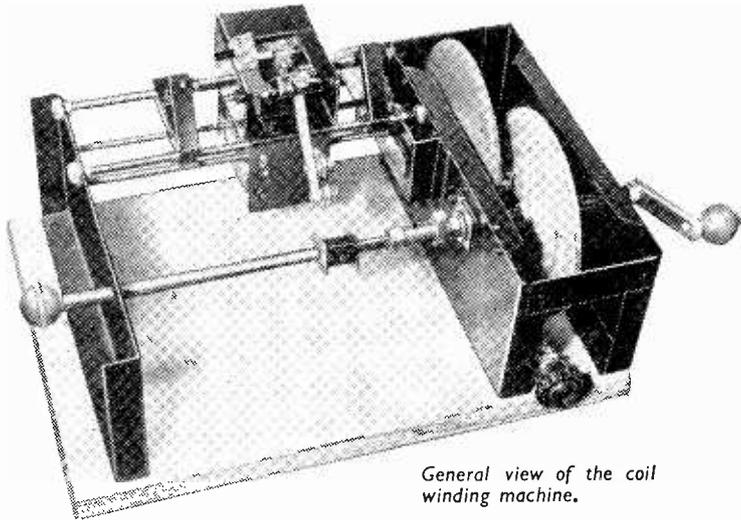


This new telephoto lens for television cameras being used by the B.B.C. has the exceptionally long focal length of 80in. Instead of the usual refracting system it uses a reflecting system consisting of a concave main mirror and a convex secondary mirror. The lens was designed by Marconi's in co-operation with Cox, Hargreaves and Thomson.

A.F. Coil

Design of a Machine for Making Mains Transformers and Chokes

By B. V. NORTALL



General view of the coil winding machine.

SOME form of automatic winding machine is a most useful aid for winding small transformers and chokes of the kind used in radio and audio equipment. The primary requirement is that the wire must be made to traverse a former so that succeeding turns lie parallel. The author has constructed a machine using threaded rods geared to the spindle driving the bobbin to give a controlled movement of the feed of the wires and the basic design of this machine is shown in Fig. 1.

A wooden core of appropriate size supports a coil bobbin on the main drive shaft while wire is reeled on to it. Backward and forward motion of the wire feed is given by a double half-nut (inset Fig. 1) switching between two contra-rotating feed screws. The half-nut controls the position of a wire feed carriage which moves above the feed screw on silver-steel guides. A toggle mechanism and cam engage the half-nut with one or other of the feed screws.

The variable friction drive consists of a driver roller running between two 5½-in diameter discs mounted at 3-in centres. The position of the drive roller determines the rate of traverse of the wire feed assembly. The gear ratio is given by:—

$$\frac{\text{Radius described by drive roller on feed disc}}{\text{Radius described by drive roller on drive disc.}}$$

A maximum ratio of 5 to 1 and a minimum ratio of 1 to 5 are obtainable. As it is both cheap and easy to obtain, two pieces of ¼-in b.s.f. studding (26 threads per inch) are used for the feed screws. These are coupled by two 50-tooth gear wheels so that they rotate at equal speeds in opposite directions. A 10-tooth gear wheel on feed-disc shaft drives this gear train. This 5 to 1 fixed reduction gear increases the effective threads per inch to 130 and the machine can thus wind between the limits of 26 and 650 turns per inch.

Wire-feed Assembly

The design of the wire-feed assembly is influenced by the ¼-in b.s.f. studding. If the feed screw is bowed by side pressure the number of contacting threads is reduced and wear is increased. The mechanism is designed so that the half-nut does not exert direct side pressure on the feed screw. However, the thrust of a

triangular thread is at an angle producing a side pressure proportional to the resistance of movement of the wire-feed assembly.

The friction of the wire-feed carriage on its guides, the sideways pull of the wire as it is fed from the spool and the force required to actuate the changeover mechanism all contribute to the total resistance. The design of the machine attempts to reduce these forces.

A cross-section of the wire-feed carriage is shown in Fig. 2. The main carriage is made from a 2-in wide strip of steel sheet, bent to shape and mounted on two pieces of ½-in × ¼-in mild steel bar drilled to accommodate the guide rods. The bearing holes are countersunk at each end to reduce the total bearing surface and lessen friction. A subsidiary carriage made in a similar manner slides on silver-steel guides bolted to the skirts of the main carriage. This carries the half-nut which is made from ½-in square mild steel bar drilled and tapped ¼-in b.s.f. at centres ¾-in less than those of the feed screws. The half-nut's travel is small and the momentum gained during changeover is low, reducing the chance of impact damage to the threads.

An exploded view of the changeover mechanism is shown in Fig. 3. Two horizontal and two vertical

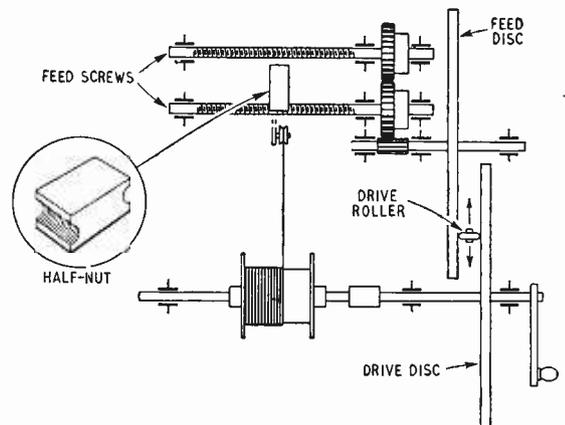


Fig. 1. Basic design of the coil winder.

Winder

guides A at each end of the sliding cam B allow it to move in one plane only. The centre of the cam is shaped as illustrated so that it fits between the two projecting shanks C of the bolts which fix the half-nut to its carriage. As the cam moves the half-nut is thrust over. In this way the drive is transferred from one feed screw to the other. The curves of the cam are cut so that the half-nut cannot be pressed beyond the point of full engagement. Thus the changeover mechanism does not bow the feed screw. Two studs D are fixed along the centre line of the cam and a toggle-joint E operates between them to change the cam's position. Two stops F actuate the changeover. The top section of the toggle-joint is a curved wedge shape. When it is raised to the vertical by a stop the spring-loaded wheel G is lifted. Just after the point of balance is reached the wheel runs down the opposite face of the wedge, giving a snap action and so ensuring that changeover takes place at precise points. The minimum traverse is $\frac{1}{4}$ in.

Two channel-shaped pieces of steel sheet are screwed to the top of the wire-feed carriage and form the mounting for the wire feed and switching wheel. Further pieces of sheet soldered across the top and back make a rigid structure. Holes for the stops to pass through are drilled in the sides. Two V-pulleys mounted on a square-section bar form the wire feed. A clamp pivoted at the top front of the carriage allows variation of the bar's projection. The complete assembly is illustrated in Fig. 4.

Construction of the Stops

The stops are clamped on the carriage guides and their position is adjustable. The construction of a stop is shown in Fig. 5. A length of square-section bar is drilled at the centres of the guide rods. It is cut longitudinally through the centres of the holes so making a slide for each stop. A piece of steel sheet bent to a triangular box lid shape is screwed and soldered to the slide. These screws project below and serve as guides for the clamping bar. A thumb screw in the centre tightens up the bar. The stop proper,

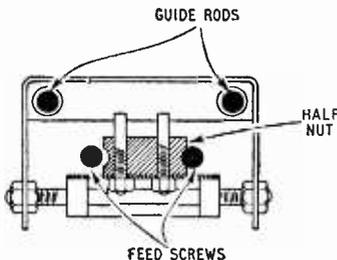


Fig. 2. Cross-section of the wire-feed carriage.

This view of the coil winder shows the friction drive on right and traversing gearing at the right rear.

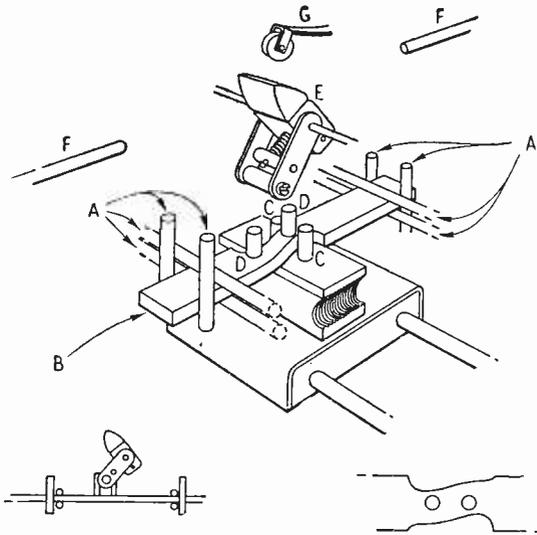
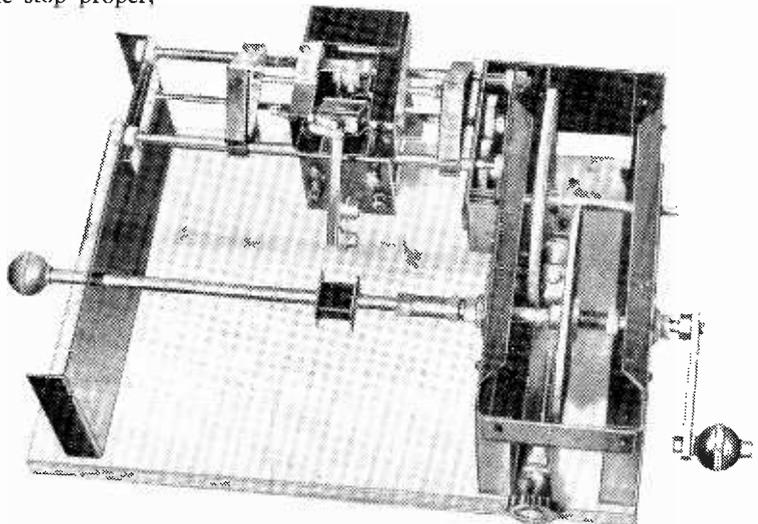
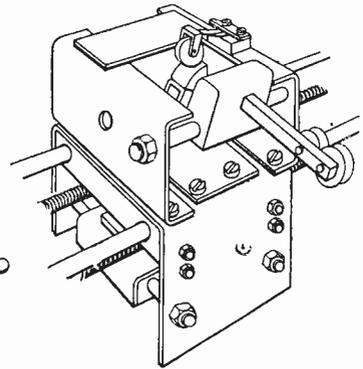
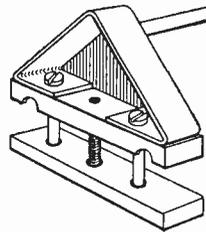


Fig. 3. Exploded view of the changeover mechanism.

Right: Fig. 4. Complete assembly of the changeover and wire-feed mechanism.



Left: Fig. 5. Details of the stops (two required) actuating the toggle changeover mechanism at the end of each layer of wire.



which is bolted near the apex of the triangle, is made from silver-steel rod. It is rounded at the operating end.

Details of the complete machine are given in Fig. 6. The various assemblies are screwed to a 9-in x 14-in wooden baseboard. The main mountings are made from steel sheet bent to box lid shapes. Those enclosing the variable friction drive have further pieces of sheet soldered across the ends to make a rigid box. A smaller box soldered to this surrounds the fixed reduction gear and it is used as an oil bath. The bearings are made from 1/8-in thick brass soldered to the mountings.

The collar A joins the two sections of the main drive shaft. Both sections of the shaft are made from 7/8-in dia silver-steel rod and a flat is filed along the section which supports the transformer bobbin. The cam B operates a mechanical counter.

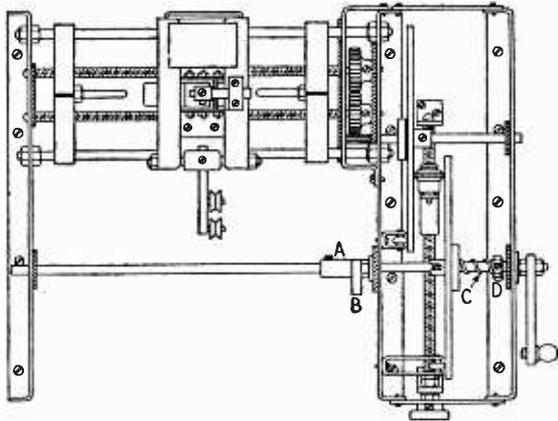


Fig. 6. Details of the complete machine.

The friction discs are covered with a thin sheet of cork and the brass drive roller (terminal) is lightly knurled. A 6-BA stud screwed into the drive shaft engages in a slot cut in the drive disc bush. The spring C maintains the driving friction and compensates for irregularities in roller or discs. The collar D adjusts the pressure. When the machine is not in use, or when it is desired to make large gear changes, the drive disc is withdrawn against the spring and rotated slightly. The stud then holds it disengaged. The feed disc is firmly fixed to its shaft and a jockey roller ensures that it runs more truly.

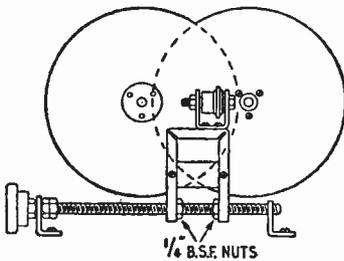
A side view of the friction drive is given in Fig. 7. The drive roller mounting allows side movement so that the spring can compensate for irregularities. The freedom of movement also gives equal pressures between the roller and each disc. The mounting is from a channel-shaped piece of sheet cut and bent to the form shown. Two further pieces of sheet screwed and soldered across the sides reinforce it. Quarter-inch b.s.f. nuts soldered in the lower ends of the mounting couple with the adjusting screw. A pair of small angle brackets fix the assembly to the baseboard.

A wooden bridge built over the machine supports a wire operated brake mechanism of a type described in a previous article.* The bridge should be as high as possible since the sideways pull of the wire between spool and wire feed lessens with increase of distance between the brake pulley and wire feed. The method of feeding the wire is shown in Fig. 8.

The wooden core which supports the former to be wound is tightly fixed to the drive shaft. A wood screw through the core engaging with the flat filed along the shaft is satisfactory for small formers. Fig. 9 illustrates one of the pair of clamps used for larger formers. A piece of steel sheet shaped as shown is soldered to a collar. A grub screw through the collar engages the flat on the drive shaft and the clamp is screwed to the core.

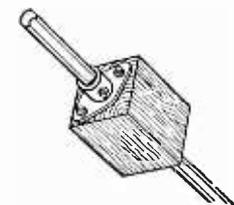
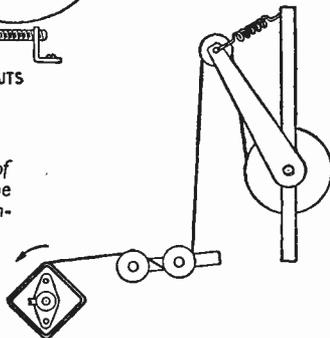
Eighteen gauge steel sheet makes mountings of adequate strength. The pitch of the gears used for this machine is forty, but any closely meshing gear wheels may be used. A change of gear ratio will of course alter the winding limits. The machine is designed for a step-up gear drive such as that used on hand grindstones.

The following method of turning without the aid of a lathe, the ends of the studding to form plain bearings, may be of interest. The items required are, a drill, suitable files, and a simple wooden jig. The drill is fastened in a horizontal position to a baseboard, high enough to turn freely. Two pieces of hardwood of the same size are used to construct the jig. Two holes about three inches apart are drilled through both boards. The positions of the holes in each board should exactly correspond. Their heights should be such that a rod held in the drill chuck passes through either pair of holes when the boards are standing on the baseboard. The boards are fastened so that the first is close to the drill chuck and the second leaves only the section of rod to be turned projecting from it. These wooden bearings are reinforced with cross struts. The end of a second rod passed through the other holes acts as rest for the file. A loose sleeve fitted over the end protects it when filing and acts as a roller. As the work rotates it is turned down evenly with the file.



Left: Fig. 7. Side view of the friction-drive mechanism.

Right: Fig. 8. Method of feeding the wire. The spring maintains a constant tension.



Left: Fig. 9. Details of the method used to secure the wooden core of the bobbin to the driving shaft.

* "Multi-Layer R.F. Coil Winder," *Wireless World*, April, 1953, pp. 179-181.

British Instrument Exhibition

New Measurement and Test Gear

THE instruments now to be described must not be taken as indicating the full scope of communication and electronics test and measurement apparatus on show at the second British Instrument Industries Exhibition held at Olympia last month, or even of those that have appeared since the first exhibition, two years ago. The present report is confined to instruments that are new since the recent Physical Society's and Components exhibitions, and should be regarded as supplementary to the review of those exhibitions in the June issue.

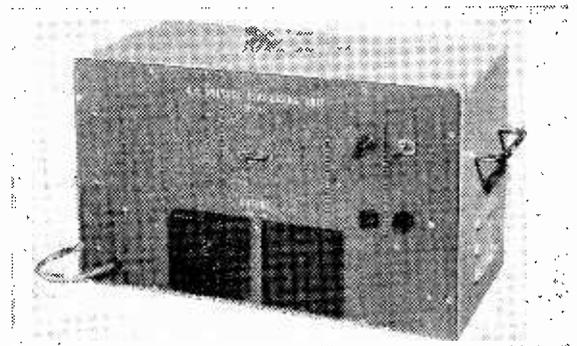
Although all these three exhibitions unfortunately overlap in this field, the B.I.I. show includes the largest number of manufacturers of what are popularly termed meters, especially those of the switchboard class. A decided trend was revealed towards larger angles of deflection, 240° - 300° now being almost the rule, this providing more than double the length of scale for a given case diameter. Mains voltage and frequency meters have become a necessity in most laboratories and test rooms since the practice of load shedding began, and many models distinguished for clean design and clear scales are now available. Robustness has obviously been receiving much attention. A demonstration on the Electrical Apparatus Company's stand was sure to appeal to all experimental workers: a switchboard pattern milliammeter reading 0-1 mA was being subjected every five seconds to a suddenly applied current of about 60 mA without detriment to the instrument. Microammeters by the same firm are obtainable with rectifier shunts affording protection against 10,000-fold overload. Crompton Parkinson were showing $3\frac{1}{2}$ -in 240° -scale switchboard meters of Admiralty type, proof against severe shock.

Another influence of load shedding on instrumentation is the need for counteracting mains voltage and frequency fluctuations, either by stabilizers incorporated separately in the instruments or interposed in the common supply. A large choice of stabilizers with d.c. output now exists, and their design seems now to have become stabilized, more interest, therefore, attaches to a.c. stabilization, owing to the variety of methods employed. These can be divided broadly into the saturated-inductor and electronic classes. The difficulty with the former is waveform distortion. In a new Furzehill stabilizer, Type X/1 for a.c., the electronic method is used, and the harmonic content is claimed to be less than 1% for 2nd, 3rd and 5th, and negligible for any other. Output. 320 VA. The waveform aspect was prominent also in an exhibit by the British Scientific Instrument Research Association: an electronic stabilizer with the mean output stabilized by means of a rectifier detector but able at the same time to respond to a.c. signals from a thermal type of detector, modifying the form factor of the output. Thus both rectified mean and r.m.s. voltages may be stabilized at the same time.

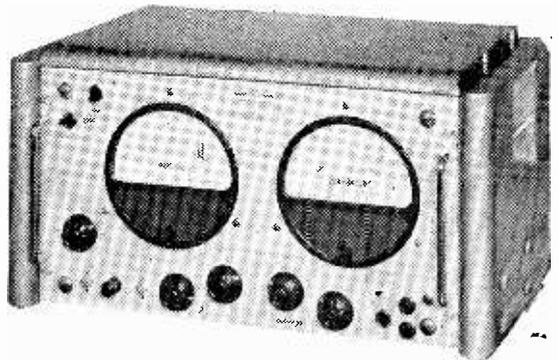
A new Taylor instrument is Model 131A electrostatic voltmeter and megohmmeter. To make it completely portable, the 500-V supply for measurement up to $5,000 M\Omega$ is obtained by means of a vibrator run from three dry cells. Provision is made for testing capacitors.

The B.T.-H. gaussmeter, shown some time ago at the Physical Society's exhibition, utilizing the Hall effect, is now manufactured by Sunvic Controls.

An alternative to the electrostatic type of voltmeter for high voltages was shown by the British Electrical and Allied Trades Research Association, consisting of a CV174 tetrode worked "inverted," with fractional μ , that is to say with grid current controlled by anode voltage. Mean values of unidirectional voltages of either polarity can be measured, with input resistance limited only by leakage surfaces inside and outside the valve. Other exhibits by the same Association included a portable a.c. discharge detector for measuring the characteristics of discharges in voids in solid in-



Furzehill a.c. voltage stabilizing unit Type X/1



Solartron VP250 phase-sensitive voltmeter

sulation, which are a clue to long-term life of the insulation; a dielectric dispersion meter, for testing the moistness of paper insulation by measuring the variation of instantaneous capacitance with time; a decade amplifier; and an aerial unit for measuring electric or magnetic field strength in the frequency range 0.15 to 30 Mc/s.

One of the most interesting new instruments is the Solartron VP250 phase-sensitive voltmeter. This is intended mainly for deriving Nyquist characteristics of amplifiers in the range 20 c/s to 20 kc/s. Two 6-in centre-zero meters indicate respectively the in-phase and quadrature components of the output of the unit under test with reference to the phase of the input signal. Each of these meters is provided with a separate amplifier channel having input resistance greater than 50 M Ω ; one of them has a 90° phase shifter. The meters themselves are wattmeters (to provide phase discrimination) of a new thermocouple type (to cover the wide frequency range). The range of measurement is 15 mV to 15 V in seven ranges.

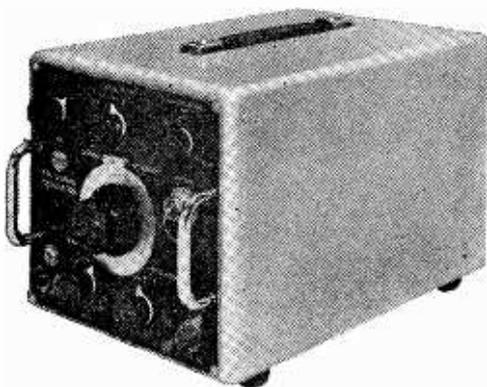
Information is now available on the Solartron wide-band attenuator. It is made up of high-stability carbon resistors in 600- Ω T sections, and covers 0-60 db in 1-db steps from 0 to 5 Mc/s with 0.1 db maximum error up to 1 Mc/s and 0.3 db up to 5 Mc/s.

Also shown by Solartron was a prototype of a T.R.E. general-purpose monitor oscilloscope. It is a good example of modern design, by means of which its predecessor has been reduced to half size and one-third weight, with a gain rather than loss in accessibility. Interesting features are C-core transformers, "potted" assemblies, "Visconol" capacitors, and miniature valves arranged in two rows in V formation to assist convection cooling.

The 20th Century 4-gun precision c.r. tube is now available in a 4-channel oscilloscope by Southern Instruments, characterized by very clear traces, free from intermodulation or defocussing over the whole field.

A new Nagard accessory is an "electrometer" input stage, for applications where the input resistance of the usual amplifier is too low. A Mullard ME1401 miniature electrometer triode is used to keep the resistance upwards of 10⁹ Ω . The gain is approximately zero and the bandwidth 1 Mc/s.

Marconi Instruments were showing their TF984/1 S-band spectrum analyser, produced for the Ministry of Supply but to be made available commercially later.



The Mullard f.m. signal generator Type E7572

It covers the range 2,900 to 3,150 Mc/s and displays on a c.r. tube the output of the sender under test as a spectrum of from 1 to 10 Mc/s width. This band is covered by frequency-modulating the local klystron oscillator of the receiver by means of a sawtooth voltage wave applied to the reflector.

The same firm's TF894 audio tester, consisting of a b.f. oscillator and an output meter, is now available as the TF894A with an extended specification: 50 to 27,000 (instead of 12,000) c/s, and output 2 W (instead of 0.3 W), at 15 and 3 (instead of 5,000) ohms.

The well-known Mullard cathode-ray valve tester, with contacts set up automatically for each type of valve by inserting the appropriate punched card, now appears under the type number CT80 as a tropicalized version to Service requirements. For this, the cards are marked with CV numbers, which makes the test procedure even simpler than in the commercial world where basically similar valves bear widely different designations according to the particular manufacturer. Another primarily Services instrument is the Mullard portable battery-driven crystal-controlled frequency calibrator. The crystal oscillates at 1 Mc/s and by means of locked multivibrators produces signals at 1 Mc/s, 100 kc/s and 10 kc/s points up to about 30 Mc/s. Lastly there is the Mullard E7572 f.m. signal generator, covering 80 to 104 Mc/s for the v.h.f. broadcasting band and 2 to 20 Mc/s for associated i.f. stages. The output can be modulated either by a 100-c/s sawtooth waveform for oscillograph work or by a 500-c/s sine waveform.

Manufacturers' Literature

Temperature Indicating Materials in the form of paints and crayons which change colour when applied to heated surfaces. Descriptive booklet from Allied Colloids (Bradford), 11 Great St. Thomas Apostle, Queen Street, London, E.C.4.

Dual Stabilized Power Unit giving two h.t. supplies which can be connected in series aiding or series opposition or in parallel, and can be earthed at any terminal. Descriptive leaflet from Joyce Loeb & Co., Vine Lane, Newcastle upon Tyne, 1.

Television Converter, Type 53, for converting a fixed-tuned receiver to another channel; with amplifying stage and two EF91s as frequency changers, one for vision and the other for sound. Leaflet from the Rainbow Radio Manufacturing Company, Mincing Lane, Blackburn, Lancs.

Armchair Picture Control for television receivers, consisting of a variable attenuator inserted between aerial feeder and aerial socket. Leaflet from Reproducers (Electronic), 82 Great Portland Street, London, W.1.

Connecting Wires insulated with PVC, polythene, silicone rubber or PTFE, in various conductor sizes and colours and conforming to M.O.S. (Air) specification EL1701. Tables and illustrations in a leaflet from British Insulated Callender's Cables, 21 Bloomsbury Street, London, W.C.1.

Brazing Aluminium and "low-temperature welding" using "Sifalumin" rod, which has a melting point 80°C below that of aluminium. Illustrated booklet describing the process from Suffolk Iron Foundry (1920), Sifbronze Works, Stowmarket, Suffolk.

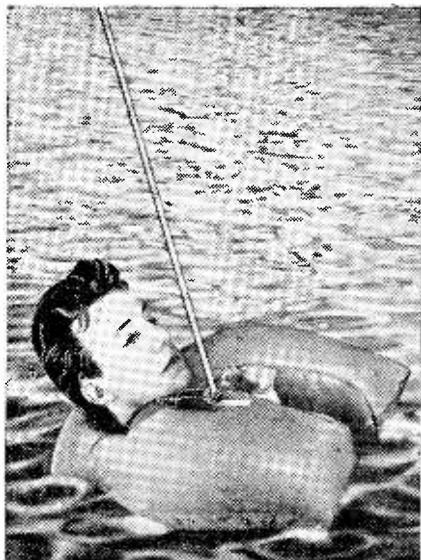
Delayed-action Fuses designed to withstand 75 per cent overload for 120 seconds to avoid unnecessary blowing on surges. These and other components described briefly in a leaflet from A. F. Bulgin & Co., Bye-Pass Road, Barking, Essex.

Tropicalized Receivers for export working on 100-150 V and 200-250 V a.c. Brief descriptions in a leaflet from Pamrex, 41, New Bond Street, London, W.1.

Microphones, carbon, crystal and ribbon, for hand use and on stands; a summarized illustrated list of the types and accessories made by Lustraphone, St. George's Works, Regents Park Road, London, N.W.1.

Radio Rescue Beacon

For Locating Wrecked or Lost Airmen in all Conditions of Weather During Day and Night



"Sarah" beacon transmitter with aerial erected fitted to airman's life-saving jacket.

A V.H.F. radio aid designed for locating the survivors of a wrecked aircraft, but which also could be included as part of the equipment of any expedition of a hazardous nature, has been developed by Ultra Electric. Known as "Sarah" (Search And Rescue and Homing) the apparatus is primarily a small radio beacon, which, when brought into action, continues to transmit an omni-directional pulsed signal until the battery is exhausted.

With the comparatively small battery provided with the air-sea rescue version of the equipment, which is the one described here, the battery capacity is sufficient to give 20 hours continuous operation. The survival probability of "ditched" persons floating in the sea is not likely to be longer than this.

For other purposes it is possible to employ a battery of larger capacity, and consequently of greater weight, but giving a correspondingly longer operating time.

When used by Service flying personnel it is proposed that the equipment be attached to the inflatable life-saving jacket as, even if everything else is lost, this will be on the survivor. Thus a strict limitation is imposed both on size and weight.

Miniaturization is now no novelty, but one cannot help admiring the super-miniaturization applied to the Ultra "Sarah." For convenience of stowage about the person it is broken down into three units connected by cable. These comprise a transmitter measuring $7 \times 1 \times 1$ in weighing 6 oz and including a rolled-up aerial; a speech modulator and receiver unit measuring $4 \times 2\frac{1}{2} \times 1\frac{1}{4}$ in and weighing 12 oz, and the battery measuring $6 \times 4\frac{1}{2} \times 1$ in and weighing 32 oz. The whole is fully waterproofed and capable of withstanding wide changes in temperature.

In addition to functioning as a beacon on to which a rescue aircraft, or launch, can "home" by directional receiving technique, one version of "Sarah" also provides for two-way speech communication over a restricted distance.

The beacon is brought into action very simply. It is only necessary to remove the protective cover from the rolled up aerial which unfolds and takes up a vertical position, forming an aerial of about 0.6 wavelength long, this having been found to be the optimum

for this particular equipment. The transmitter is also automatically switched on.

Under beacon conditions of operation the transmitter generates groups of pulses at 5 millisecond intervals, the pulses in each group being coded for identification by using a different pulse repetition frequency (p.r.f.) for each beacon or group of beacons.

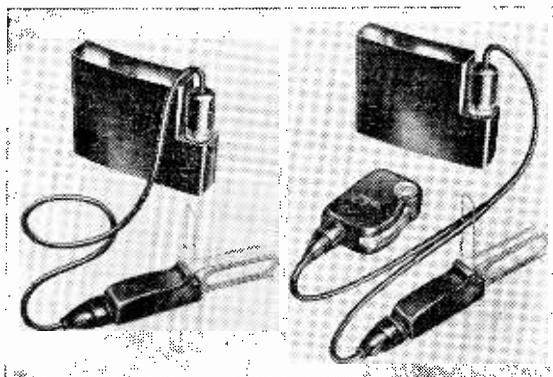
Whilst the average power of the small beacon transmitter is about only 0.5 watt input the r.f. pulse-power output is comparatively high, being of the order of 16 watts. This gives a working range of about 66 miles to a rescue aircraft flying at 10,000 ft altitude, or 6 miles to a vessel with aerials between 30 and 40 ft high. The distress signal at sea can therefore be picked up by a searching aircraft within an area of some 10,000 square miles.

Once in operation the equipment cannot be switched off without folding the aerial and replacing the cover, but the mode of operation can be varied.

Voice Communication

On the speech modulator and receiver unit (when this is included), which also includes a combined microphone and telephone, is a three-position switch normally held by a strong spring in the beacon's "send" position. Pressing it one way converts the transmitter into a super-regenerative receiver with a self-quenching frequency of 60 kc/s and capable of receiving amplitude modulated speech. In the opposite position of the switch the set again becomes a pulse transmitter, but with a p.r.f. of 6 kc/s and a peak

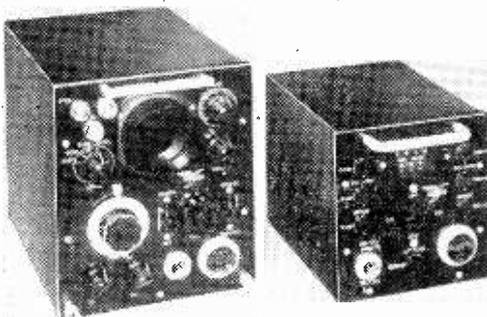
The survivor's equipment of the Ultra lifesaver "Sarah". (Left) beacon only (right) beacon with speech facilities. Aerials shown folded but cover removed.



CONITION	TRANSMISSION FROM BEACON	C. R. T. SCREEN
SEARCH PHASE AFTER AIRCRAFT HAS RECEIVED SIGNAL FROM WRECKED PERSONNEL-BEACON ON PORT SIDE		
HOMING ON TO BEACON		
VOICE FROM BEACON P. R. F. MODULATED BY SPEECH		
BEACON ON LISTEN; SEARCHER KNOWS WHEN TO TALK		
BEACON BACK ON BEACON MODE		
AIRCRAFT GOES THROUGH NULL AND GETS FIX		
BEACON ON STARBOARD		
THREE BEACONS, 2 ON PORT 1 ON STARBOARD		
THREE BEACONS, 2 ON PORT AIRCRAFT HOMING ON BEACON "C"		

Sequence and interpretation of displayed signals on cathode ray tube in the searching craft's receiver.

Rescue craft portion of "Sarah" beacon equipment. (Left) receiver with c.r. display tube, (centre) power unit, (right) miniaturized version combining receiver and power unit.



pulse-power of about 4 watts. Speech is transmitted by frequency modulation of the 6-kc/s pulse repetition frequency.

Owing to the lower output power when using telephony this facility is only intended to be used over a short distance, and generally for last-minute instructions when the user of the beacon has been sighted. The h.t. battery consumption rises from 1.1 mA on beacon to 4.5 mA on speech, the l.t. demands jump from 150 mA to 175 mA so that battery life will be appreciably shortened if speech transmission is used indiscriminately.

Rescue Craft Receiver

As might be expected from the foregoing, the receiving equipment carried by the search aircraft or ship is somewhat specialized. It consists of two main units, a search receiver with cathode-ray tube display of the received pulses and a power unit. There is also a miniaturized version of these combined in a single unit and having a smaller c.r.t. Direction finding or homing on to the beacon is effected by the use of two aerials operated on a time sharing basis and mounted abeam on the rescue craft.

Any beacon within range of the receiver displays a horizontal spike on a vertical reference trace on the c.r.t. A sequency of such displayed signals is shown in one of the illustrations here. By time sharing methods the right- and left-hand receiving aerials are arranged to give a spike alternately on the right and on the left of the vertical trace. Comparison of the length of the spikes, which are proportional to strength of the received signals at each aerial, gives a rough indication of direction, while steering to produce spikes of equal length enables homing to be effected on the beacon.

The distance of the spike along the vertical trace is a measure of the distance separating beacon and search craft. It is possible to receive any number of beacons within range simultaneously by employing a panoramic method of search which tunes the receiver back and forth at a slow rate over a 4-Mc/s range of frequencies. In addition to the automatic sweep there is provision for manual tuning over a range of 10 Mc/s.

When visibility is poor, or at night or in fog, a searching aircraft can tell when it is immediately over a "Sarah" beacon by complete cessation of signals. It is under such conditions that the radio-telephone facility possibly has its greatest advantage, since the castaway can be assured he has not been missed and it is only a question of time before a rescue craft will be along to pick him up.

The rescue beacon and its associated search aircraft, or vessel, apparatus was shown at the exhibition of special and military electronic equipment held recently at Farnborough, Hampshire, by the Radio Communication and Electronic Engineering Association. From the length of the aerial seen there we judge the operating frequency to be just over 200 M/cs. We were afforded an opportunity to sample the communication part of the equipment over a short radio path and found the speech quality adequate for its purpose.



OHM'S LAW

Do We Know What it Really Means?

By "CATHODE RAY"

TO some readers the last few months' discussions may have been rather up in the air. Now that the holiday season is upon us, something a little easier and more familiar may be a pleasant change. What about Ohm's Law? To an electrical man it sounds very much like "ABC." So it may come as a surprise to know that two eminent British authorities on electricity maintained a serious and lengthy controversy on the meaning of Ohm's Law and failed to agree in the end. And since then quite a number of articles have appeared on the subject in several periodicals, including the prodigiously learned *Wireless Engineer*.

To most people, I suppose, Ohm's Law is a simple rule, neatly expressed as

$$I = \frac{E}{R}$$

by which, given any two of the following—current, voltage and resistance—the third can be calculated. What more is there to it?

Well, some may be interested in what it really was that Ohm discovered. Did he deserve to be honoured by the use of his name for one of the basic electrical units? Did his "law" mean the same to him as it does to us? What does it mean to us? What is a law, anyway?

Others may be incapable of caring less than they already do about Ohm and what he thought; they are quite happy to be able to make good practical use of the formula as it stands to-day. To these I would say that the formula as it stands to-day is not so simple that it cannot be misunderstood. One has only to ask a mixed gathering of electrical types "Does Ohm's law hold good for a rectifier?" to start a lively controversy.

Two Interpretations

I think it is now fairly definitely established what Ohm discovered and what he meant. Of course we are not necessarily bound to mean the same thing when we use Ohm's law, but we ought to be quite clear what we do mean. If you think you can settle the matter by looking up the accepted textbooks you are likely to be surprised, not to say disillusioned. The variety of meanings given to Ohm's law is quite remarkable.

However, most of them can be put into two main groups. One comprises those that regard Ohm's law as saying that the ratio of voltage to current is resistance, and if the number of volts is divided by the number of amps the answer is the resistance in ohms. This, they would probably say, applies to any part of a circuit, including a valve or a rectifier; the only

exception is a part that includes an e.m.f. The other group would hold that what Ohm discovered was that the current through any conductor kept at constant temperature is directly proportional to the voltage applied, but that many of the conductors used to-day are non-linear so "do not obey Ohm's law"; such conductors are "non-ohmic."

Which side are you on?

Early Experiments

First of all, and in spite of any readers who share Henry Ford's view that "history is bunk," I am going to go back to Dr. Georg Simon Ohm, the date of whose birth is variously given as 1781, 1787 and 1789. There seems to be no doubt that he was born, lived and died in Germany (as it now is), that he was a teacher of mathematics and physics, and that (as usual) his work was little esteemed at the time. One must remember that at that time the generation of electricity by dynamo and other magnetic means was still in the future, and to most people electricity meant chiefly static electricity—catskins, glass rods, pith balls and all that. Current electricity was an imperfectly understood innovation. And of course instruments and even such commonplaces as insulated wire were more or less unobtainable. So unreliable were the batteries Ohm used that his experiments on the conduction of current by metals led him at first to a logarithmic law! It was only when he repeated the experiments using thermo-junctions to supply the current that he came to the conclusion that the current was directly proportional to the voltage. If you are thinking that Ohm can't have been a very clever professor of physics, even 126 years ago, if he couldn't demonstrate correctly what sixth-form boys have been able to for decades, ask yourself how you would demonstrate the truth of Ohm's law without voltmeter or ammeter. Voltmeters assume Ohm's law.

The conclusion he reached was that the current through a conductor is directly proportional to the tension applied and inversely proportional to what he called the equivalent length of the conductor—there was, of course, no unit of resistance then—this equivalent length being proportional to the actual length and inversely proportional to the cross-section area and the conductivity. That the conductivity varied with temperature, whether or not the variation was brought about by the current itself or in some other way, had already been observed by Humphrey Davy, as Ohm acknowledged. But except for this Ohm seems to have regarded resistance as a constant; in particular, not affected by the current or voltage as are certain types of conductor commonly used now. If this was so, then presumably Ohm would regard

rectifiers and suchlike as being exceptions to his law, just as there are exceptions to Hooke's ("strain proportional to stress") law, and the description "non-ohmic" is appropriate to describe the exceptional non-linear conductors. ☞

It is sometimes said that they do not obey Ohm's law. I suppose everybody knows what this means, and does not imagine that these materials are perverse and rebellious, wilfully refusing to obey a law of Nature? Yet it is not so very long since even scientists cherished ideas of this kind, judging from their writings. A law in our sense, however, is just a convenient general statement of observed facts, and is always liable to be found (a) mistaken, (b) inaccurate, or (c) subject to exceptions. (b) or (c) or both may even be admitted from the start. Experience during the last hundred years has confirmed the correctness of Ohm's law, as regards most of the common metals at least, to enormously greater accuracy than Ohm's experiments. But it has also brought to light a great variety of conductors whose resistance is not even roughly constant.

Meaningless Ratio

The alternative view of what Ohm's law means is that if you divide the voltage by the current the answer is resistance. This can always be true, even for rectifiers, because there is no need to assume that the resistance of any particular conductor is constant. If this view were correct, then Ohm's law certainly wouldn't do him much credit. Except for giving a name to the ratio of voltage to current, it tells one precisely nothing. The fact that 100 volts across a certain resistor caused 0.2 amp to flow through it would not enable one to predict the current at any other voltage—unless it could be assumed that the resistance was constant, and that would be going over to the other view of Ohm's law.

I can hardly believe that anybody credits Ohm's law with so little meaning, and I suspect that to them the significance of the law lies in its being

$$I = \frac{E}{R}$$

and not, for example

$$I = 12.36 \frac{E}{R} \times 10^{-1}$$

or even

$$I = 2\pi \frac{E}{R}$$

It is certainly very helpful that there are no constants to be remembered. But that has nothing to do with Ohm; it is thanks to a system of units that came later, when the volt was defined as the potential difference across a resistance of one ohm when one ampere was flowing through it.

What, then, is Ohm's law generally understood to mean? Does it mean a convenient formula, relying on a system of units Ohm never knew, and applicable to

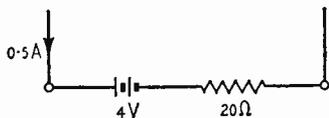


Fig. 1. The voltage between the terminals is not equal to the current multiplied by the resistance. The reason is the e.m.f. of the battery, which must be added in order to get the correct answer.

any kind of conductor? Or does it mean that the ratio of voltage to current—the resistance—is constant, and therefore has exceptions? I have been trying to think, and have come to the conclusion that I use it in both senses, trusting to the intelligence of those concerned to sort them out. This is admittedly rather a risky practice, and I shall try to avoid any uncertainties of this kind! At the same time I think it is just as well that everyone should realize that at least two meanings do exist, for that should reduce the risk of misunderstanding. The crux of the matter is: Does any given reference to Ohm's law imply that the resistance is constant, or not?

If I were to say, "The current through a 500-ohm resistor is 0.3 amps; use Ohm's law to find the voltage across it," this would obviously mean use the well-known formula, multiplying 500 by 0.3 to give the answer, 150 volts. It is really a misuse of the term "Ohm's law," because Ohm would not know what amps and volts were; as for the ohm, he knew it only as a unit of wine, equal to about 40 gallons, and therefore probably beyond his means. His own contribution to electrical science—proportionality of current to voltage—does not arise in this question at all. Yet I suppose everybody would understand what was meant.

On the other hand, if the problem were "When 150 volts is applied to a resistor the current is 0.3 amp; what is it with 40 volts?" one would have to assume that the resistor was within the scope of Ohm's law (i.e., linear) in order to answer the question at all, whereas a knowledge of the units used would not be necessary. If the current had been given in bongs—a unit of totally unknown magnitude—the question would have been no harder. Whatever the given current is, and in whatever units, the answer must be that figure multiplied by 40/150, if Ohm is to be believed.

While on the matter of units, I suppose everyone realises that the simple formula holds good for certain other combinations of units than volts, amps, and ohms? Take it in the form $E = IR$; obviously it makes no difference if the units of I are smaller so long as the units of R are larger in the same ratio. In our kind of work milliamps are often more convenient than amps, and as they are thousandths of an amp the corresponding unit of resistance must be a thousand ohms—the kilohm. So volts, milliamps, and kilohms are what is called a consistent set of units. If we were interested in small fractions of a volt it would be convenient to use millivolts; to make this right the other side of the equation would have to be changed in the same ratio, say by reckoning in ohms and milliamps. In work connected with ammeter shunts, amps and milliohms would probably be better. And so on.

Right at the beginning I mentioned that it is no good trying to apply Ohm's law to a circuit containing an e.m.f.—at least, not without allowing for the e.m.f. This seems to be very seldom pointed out, even in the most elementary books. I wonder if it is always safe to assume that it goes without saying? Take Fig. 1, for example. If $E = IR$ were applied to find the voltage between the terminals the answer would be $0.5 \times 20 = 10V$. But the measured voltage would be 14. The reason for this discrepancy is obvious, and even a beginner would have to be rather dim to fall into the trap; but Fig. 2 may be a little more subtle. It is supposed to depict a transformer winding consisting of a single turn of thick copper, having negligible

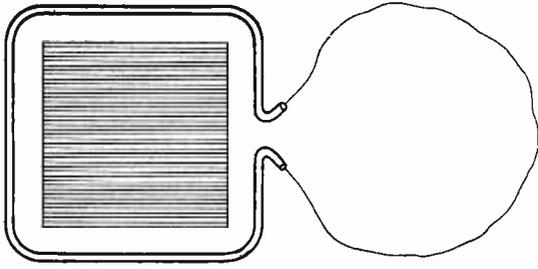


Fig. 2. Here the source of e.m.f. is a single-turn transformer winding, whose voltage can be measured between the terminals.

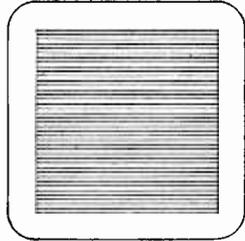


Fig. 3. This is the same as Fig. 2 except that the resistance wire itself is the transformer winding. Although the same current flows through it, no voltage can be measured between any two points on it.

resistance, connected to an equal length of thin Eureka wire, having a resistance of say 10 ohms. Then if the e.m.f. were 0.5 volt, one could apply Ohm's law (!) to the Eureka wire and say that the current was 0.05 amp. The 0.5 volt could actually be measured by connecting a suitable voltmeter to the terminals.

But now suppose that the Eureka wire itself is used as the transformer winding (Fig. 3). Having already performed the Fig. 2 experiment, one can be confident that a current of 0.05 amp is flowing in the wire. Given a sufficiently low-impedance milliammeter, this could be confirmed by experiment. But one would be quite unable to measure the voltage applied to the wire without disconnecting it, except, of course, indirectly by measuring the voltage obtained from another single turn. We would have a current flowing through a resistive circuit, with no difference of potential between any two points on it. This situation can give rise to a good deal of discussion. The only aspect I want to stress just now is that using $E = IR$ to calculate the voltage between any two points on the wire is apt to be misleading.

Voltage Symbol

And that leads to another little argument. The symbol used in the Ohm's law formula for voltage is (I think) usually E . But I am inclined to agree with those who hold that it ought to be V . E is the symbol for e.m.f., and we have seen that when e.m.f. comes within a part of a circuit to which the formula is applied it must be taken out or allowed for if the answer is to be correct. What one is really concerned with is the potential drop across the resistance R when the current I flows through it, and where a distinction is drawn between e.m.f. and p.d. it is generally accepted that the symbol for p.d. is V . I don't think it is anything to get very excited about, but perhaps worth considering.

With d.c. the idea of resistance seems simple. One can measure the current and the voltage drop as in Fig. 4, and from these readings calculate the resistance.

It may not be realized that what one is really doing is comparing two resistances. Voltmeters (except the electrostatic type) are actually current indicators, responding to the current passing through a known resistance incorporated in the voltmeter and relying on Ohm's law for their ability to tell the voltage between their terminals. This fact is obscured by the convenient practice of scaling the meter directly in volts rather than in milliamps. But the knowledgeable buyer enquires not only about the voltage range but also the "ohms per volt." What this tells him—whether he realizes it or not—is the range of the instrument as a current meter. Why the information should be presented in the form "ohms per volt" instead of simply in milliamps, heaven knows—I don't. Strictly speaking, it is "ohms per volt of full scale-value," otherwise it doesn't make any sense at all. If an instrument is specified as "1,000 ohms per volt," this simply means that its full-scale current is 1 mA. Then why not say so, instead of quoting a ratio of two quantities? Personally I think voltmeters ought to be scaled in current—perhaps with smaller figures—as well as voltage, so that the current drawn by the instrument at any reading can be read off and deducted from the reading of A in Fig. 4 to give the correct current through R .

Fictitious Resistance

When one progresses from d.c. to a.c., complications multiply. One learns that the procedure shown in Fig. 4 tells one not the resistance but the impedance, which is something more comprehensive, including resistance as one of its parts. Moreover, the resistance to a.c. is usually quite different from the resistance to d.c. It is often affected by things not directly connected to the circuit at all; for instance, an iron core around which the wire may happen to be wound. Then there is the "radiation resistance" we have mentioned in recent months. These things seem to be altogether different from the resistance in Ohm's law. So one is often taught to regard them as "fictitious" resistances. I suppose it must be left to psychologists to say whether or not the introduction of "fictions" into electrical engineering tends to undermine one's confidence in it. But actually there is no need to bring in this element of doubt if resistance is suitably defined. The idea of resistance as E/I breaks down in any case, with a.c.

In d.c. one has been taught that power (in watts) is equal to current (in amps) multiplied by e.m.f. (in volts) — $P = IE$. From "Ohm's law" $E = IR$, so $P = I^2R = E^2/R$. This gives alternative ways of arriving at R : $R = P/I^2 = E^2/P$. There is no particular advantage in them with d.c., because P itself is usually found by multiplying I by E , so one might as well get at R direct, as I/E ; but defining resistance as P/I^2 does still cover d.c. and has the advantage with a.c. that it includes all the "fictitious"

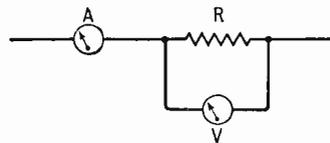


Fig. 4. This simple method of measuring the resistance R is really a comparison of R with the resistance of the voltmeter by comparing the currents through them.

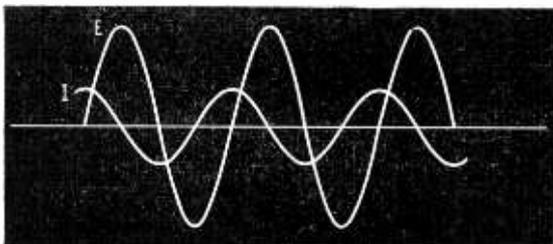


Fig. 5. Oscillograms of current through and voltage across a loss-free capacitor. Although power is flowing all the time, its direction changes twice per cycle, so the average is nil, which means that the a.c. resistance is nil.

resistances, such as core losses, secondary load, dielectric losses, and radiation resistance.

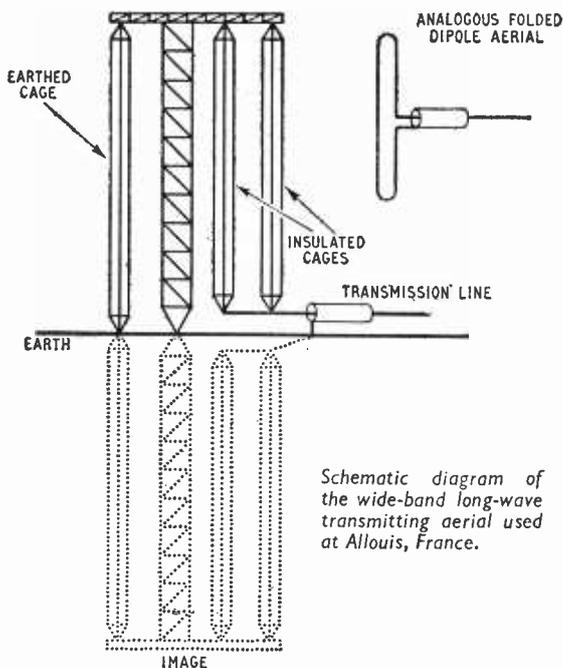
Several conditions have to be understood, however. Unless anything is said to the contrary, "power" in electrical engineering means only one-way power. Suppose you connect a capacitor across the a.c. mains. If an oscillograph were arranged to trace the voltage and current, the picture would be something like Fig. 5. Note that except at the instants when either E or I is zero there is power all the time. But if the capacitor were completely loss-free, the power half the time would be positive and half the time negative, and over any and every whole cycle they would cancel one another out, leaving an average of nil. In other words, during half of each cycle power flows from the mains into the capacitor, charging it, and during the other half the capacitor discharges into the mains, returning the power. For most purposes,

including the reckoning of resistance, it is the average over a cycle, not the instantaneous power, that is counted.

In a real capacitor or other circuit, the current is not exactly 90° out of phase with the voltage, and when the average power is taken over a cycle it is found that there is a positive balance—"positive" being understood to mean the direction from source into circuit. Resistance, defined as this average power divided by the average current-squared, includes everything that runs away with energy from the source. In a.c. circuits it is compulsory to think of resistance as a permanent runner-away of energy (as distinct from reactance, which accepts only short-term loans), rather than as the ratio of voltage to current (which it obviously is not). In d.c. circuits it is not compulsory, but one might just as well accept it as the basic definition; then one is covered for all situations.

One must, however, always be prepared for the possibility that R may be non-linear or "non-ohmic"; that is to say, not a constant. But it can still be defined as P/I^2 or E^2/P , so long as it is remembered that the value so found holds good only at that particular value of I or E. Another thing to remember is that I or E may not be the same everywhere in the circuit. This is especially so at high frequencies; think of an aerial, for instance. So it is necessary for I or E to be the values at the place where P is measured, and the resistance calculated from them is the resistance at that place. Elsewhere in the circuit it may be quite different. At the centre of a half-wave dipole, where the current is a maximum, the resistance is about 73Ω; at the end, where the current is small, it may be about 2,000Ω.

WIDE-BAND LONG-WAVE AERIAL



Schematic diagram of the wide-band long-wave transmitting aerial used at Allouis, France.

Novel Type Installed for New High-Power Station in France

AN aerial of unusual design is in use at the rebuilt French long-wave broadcasting station at Allouis. According to a description in *Radio Informations Documentation*, a house publication of Radiodiffusion et Télévision Française (RTF), the problem of designing an effective long-wave transmitting aerial is by no means as simple as it may at first seem. The band width radiated is an appreciable fraction of the carrier frequency, which in this case is 164 kc/s, and the band to be radiated is 154 to 174 kc/s.

The design chosen takes the form of a vertical centre-fed folded dipole loaded at the extremities and it consists of a stayed lattice mast 308 metres high having three radial arms at the top each 20 metres long and spaced 120 degs. From each radial drops a vertical wire cage, two being insulated from earth at ground level, but the third, like the mast itself, is earthed.

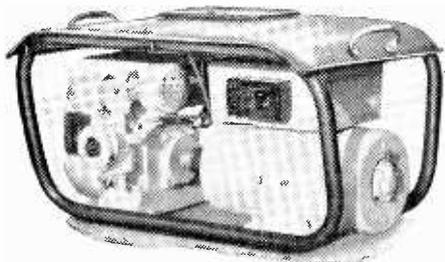
When the "image" in the earth of the quarter-wave vertical assembly is taken into account the whole represents a half-wave folded dipole as shown in the accompanying drawing. The physical part of the aerial above ground level might be more accurately described as a folded unipole although electrically it behaves as a folded dipole.

Manufacturers' Products

NEW EQUIPMENT AND ACCESSORIES FOR RADIO AND ELECTRONICS

Home A.C. Generator

THE electric generating set illustrated will supply all the domestic needs of a farm or cottage in the country not connected to the supply mains and it has the additional



Morrison portable 500-watt, 250-V a.c. generator.

advantage of being reasonably mobile.

It is powered by a compact Villiers Mk 10 petrol/paraffin engine for which service and spares are obtainable in most parts of the world. The a.c. output is 500 watts at 230 V and the generator is capable of supplying a television set, radiogram and various electric appliances, as well as providing light.

Obtainable with either hand starter, automatic starting or remote control, it costs £85, and is made by A. C. Morrison (Engineers) Ltd., Loughborough, Leicestershire.

Noise-reducing Loop

A LOOP aerial intended primarily for reception of local broadcast stations under conditions of severe electrical interference has been introduced by Telecraft, Ltd., Quadrant Road, Thornton Heath, Surrey.

Telecraft anti-interference loop aerial.



Consisting of a single turn of self-supporting light-alloy tube about 2½ft square, it is tuned approximately by switching in fixed capacitors for reception of three stations, two in the medium waveband and one in the long. Each is broadly tuned.

The three frequency bands available are centred on the Home and medium and long waveband Light programmes.

Apart from being frequency-selective, and so restricting the pick-up of local electrical interference to narrow bands of frequencies, the directional properties of the loop can be utilized further to discriminate between signal and noise.

This indoor aerial is described as the "Telecraft Radio Square" and costs £3 10s.

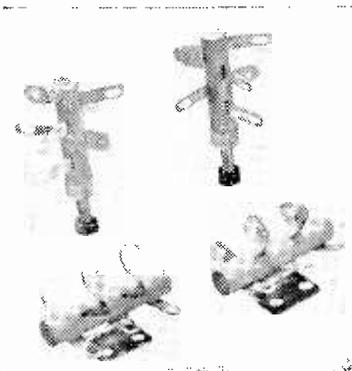
Insulated Tag Mountings

ARRANGING for suitable anchorages of components and wires is always a problem in designing radio and electronic equipment. Two insulated tag mountings, the "Cactus" and "Porcupine" introduced by United Insulator Co. Ltd., Oakcroft Road, Tolworth, Surbiton, Surrey, should go some way to solve most of these difficulties.

In each case the bodies are porcelain, all metal parts are silver-plated and the metal tags are easily removed, reversed or arranged to suit individual requirements.

The "Cactus" for vertical mounting, measure 1.1 in high and the "Porcupine" for horizontal mounting 0.8 in high. The insulation resistance is said to be better than 100 MΩ and both are suitable for 750-V working. The flash-over voltage is 4.5 kV r.m.s.

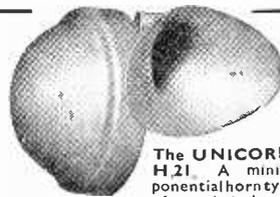
Porcelain-insulated tag mountings made by United Insulators.



Sound Policy

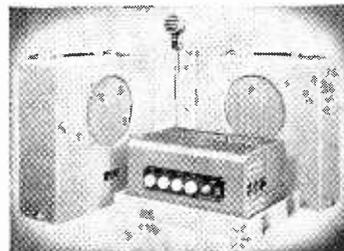
Our policy is to specialise in sound equipment. Sound problems are our problems and we have been solving them for over 25 years. For the usual or unusual in sound amplification install TRIX equipment. Our advice is always at your disposal.

RADIO SHOW—STAND 16



The UNICORN, model H.21. A miniature exponential horn type speaker of novel design and construction (prov. patent). Ideal for noisy locations, vehicles, etc. Handling capacity approx. 5 watts, impedance 15 ohms.

Model G7808 Moving Coil Dynamic high fidelity Microphone. Excellent frequency response between 50 and 8,000 cps with freedom from resonance. Also high impedance G7808/H.



Model U885/P 20 watts AC/DC Equipment. Comprises amplifier unit, two 10in. loudspeakers, moving coil mike, folding stand and cables. Also supplied with high-fidelity Ribbon microphone.

SERVICE IN SOUND BY

TRIX

The TRIX ELECTRICAL CO. LTD.
1-5, MAPLE PLACE, TOTTENHAM CT. ROAD,
LONDON, W.1. Phone: MUSEum 5817
Telegrams and Cables: TRIXADIO, WESDO, LONDON

RANDOM RADIATIONS

By "DIALLIST"

Well Done!

THOUGH IT MAY SEEM a bit late in the day, I must offer the B.B.C. my congratulations on the fine job of work it did on Coronation Day. Both the sound and the vision broadcasts were first-rate and I can't remember a single hitch, technical or otherwise. For the engineering staff it must have meant an immense amount of careful planning and of hard work; one only hopes that the millions in this country who saw both the ceremony and the procession (to say nothing of the fly-past and the fireworks), or heard the commentaries on them, realize this and were duly appreciative. B.B.C. engineers weren't the only ones concerned either, for the G.P.O. did a grand job in linking sound and vision O.B. points, control centres and transmitters—and keeping them linked.

Relays Abroad

A still more remarkable feat from the electronic and engineering points of view was the relaying of the vision programmes to France, Belgium, Holland and Germany. The first essential was to provide (and maintain) first-class 405-line images on the master screen at the Télévision Française centre at Cassel. Hundreds of amplifying stages must have been at work between the cameras in London and the conversion station in France and, until someone invents (amongst a few other things) a valve with really straight "straight portions" of its characteristics and a mutual conductance which stays put as the working point moves about, every such stage is a potential source of distortion. Add to that changes from land-line to radio-link as well as several carrier-frequency conversions and you'll see what a triumph it was to deliver an excellent picture not only with 405 lines at Cassel, but with 441 and 819 lines to French transmitters and with 625 lines to Holland and Germany.

Worth Thinking About

Two technical friends who saw the 819-line picture (one was in Paris and the other near Versailles) tell me that the quality was very nearly as good as that of normal

transmissions made direct by means of 819-line cameras. That seems to bring out two points worth thinking about. The first is that our 405-line image is proved to have what has long been claimed for it: perfectly balanced horizontal and vertical definition and as much detail, even after being spot-wobbled, as the normal eye can resolve. Were that not so, the 819-line images wouldn't have been up to the mark. The only thing amiss with the usual unwobbled 405-line image is its lininess. The second point is that the tears shed over the adoption of different scanning systems on the Continent were largely wasted. Conversion from one system to another (or to several others) has turned out to be a comparatively straightforward business and the adoption of different standards is no menace to international television broadcasting, though it was confidently predicted that it would be. As a matter of interest, though, a 405-line image transmitted with a 2.7-Mc/s modulation range will probably give far better results on conversion than will a 625-line image with a 3.5 or even 4-Mc/s range.

Reversion to Type

WE HAVEN'T, up to now, heard a great deal about the layer-built dry Leclanché cell in this country,

though it's a good many years since it made its appearance in the United States. So far as I know, its only large-scale application here is to be found now in the combined h.t. and l.t. batteries for hearing-aids and "all dry" portables. I fancy, though, that it will have much wider uses in the future. The layer-built cell is in some ways a reversion to ancestral type; for it is made on the "sandwich" lines of Volta's Pile, the sandwich here consisting of thin plates of zinc and carbon. One big advantage is that the zinc is given its proper job and no other. By that I mean that it is not largely wasted by being made to act as the container of the cell. All of it is available to react with electrolyte and by so doing to convert chemical into electrical energy. Yes, I believe that the layer-built cell has a big future for many purposes.

The Valve

WHEN I SUGGESTED in June that the valve is a power, rather than a voltage, amplifier I didn't mean to imply that the power appearing in its output circuit was so many times that in the input circuit. I ought, probably, to have written: the valve amplifies because it enables a minute power input to control a very much larger power output. The tiny amount of power in the input circuit



"WIRELESS WORLD" PUBLICATIONS

	Net Price	By Post
RADIO DESIGNER'S HANDBOOK. F. Langford-Smith, B.Sc., B.E., M.I.R.E., A.M.I.E.E., A.M.I.E., 4th Edition	42/-	43/6
RADIO INTERFERENCE SUPPRESSION as Applied to Radio and Television Reception. G. L. Stephens, A.M.I.E.E. ...	10/6	10/11
SOUND RECORDING AND REPRODUCTION. J. W. Godfrey and S. W. Amos, B.Sc. A.M.I.E.E., in collaboration with the B.B.C. Engineering Division ...	30/-	30/8
MICROPHONES. By the Staff of the Engineering Training Dept. B.B.C. ...	15/-	15/5
ADVANCED THEORY OF WAVEGUIDES. L. Lewin. ...	30/-	30/7
FOUNDATIONS OF WIRELESS. M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition ...	12/6	13/-
TELEVISION RECEIVING EQUIPMENT. W. T. Cocking, M.I.E.E. 3rd Edition ...	18/-	18/8
SHORT-WAVE RADIO AND THE IONOSPHERE. T. W. Bennington. 2nd Edition ...	10/6	10/10
THE WILLIAMSON AMPLIFIER. 2nd Edition. D. T. N. Williamson. ...	3/6	3/9
BASIC MATHEMATICS FOR RADIO STUDENTS. F. M. Colebrook, B.Sc., D.I.C., A.C.G.I. 2nd Edition ...	10/6	10/10

A complete list of books is available on application.

Obtainable from all leading booksellers or from

ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1.

is so used as to apply voltage variations to the grid. How you use the power in the output circuit depends on what you want it to do. One kind reader suggests that the valve is a voltage-operated generator with a power output. I don't quite like that for two reasons. First, that definition says nothing about amplification; and secondly, the valve is more of a convertor of d.c. to a.c. than a generator—despite the μV_g "generator" of equivalent circuits.

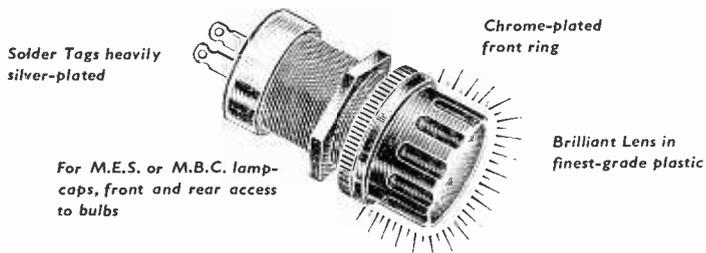
Time and Earth Connections

A GOOD MANY LETTERS have come in on the subject of the reduction in range undergone by l.w. and m.w. transmitters with the passing of the years. All the writers agree that stations ashore suffer in this way; but there is a difference of opinion about ships' transmitters using such wavelengths. Most of those who mention ships argue in this way: no loss of range occurs as years go by; a ship constantly renews her earth contact as she travels and there can be no deterioration here; therefore, the reduced ranges observed for similar transmitters ashore must be due to falling effectiveness of the earth contact which has no such renewal. On the other hand, there are some—including a retired R.O.—who hold that time does bring about a reduction in the range of ships' transmitters! Experiences would be welcome.

The Useful Poker

THERE ARE one or two useful tips in the new Multicore leaflet "Hints on Soldering," a copy of which was handed to me by the owner of my local wireless shop. One that appeals to me concerns small "sweating" jobs: If your electric iron isn't hot enough to make the solder run, try applying a black-hot domestic fire poker for a few moments. Another kind of poker has also served me well at times as an aid to soldering, that blessed aid to fire-lighting, the gas poker. This is in effect a handy form of Bunsen burner, giving a strong, hot flame which deals admirably with quite large sweating jobs. Considered just as a fire-lighter, it is admirably designed for its intended task; but as an emergency tool it has the drawback of giving you two flames, splayed out like the arms of a V. That, however, is very easily remedied: simply push a nail of the right size into one of the holes through which the gas comes—*et voila*.

AN ATTRACTIVE ADDITION, TO ALL MODERN EQUIPMENT AND A WIDE RANGE TO CHOOSE FROM



Solder Tags heavily silver-plated

Chrome-plated front ring

For M.E.S. or M.B.C. lamp-caps, front and rear access to bulbs

Brilliant Lens in finest-grade plastic

Red, Green, Blue, Amber, and Clear lens available

BEAUTY & USEFULNESS COMBINED



BULGIN Signal-lamp fittings cover a wide range, there is a type for every purpose, and to accept all lamp-caps from the tiny Lilliput Edison Screw to the large Bayonet-Cap. All these lamp fittings are manufactured to the highest standards and electrical specifications.

Full technical details are available.

★ SEND FOR THE LATEST CATALOGUE No. 191/WW. Price 1/- Post free.



BULGIN
REGD. TRADE MARK

A. F. BULGIN & CO. LTD., BYE-PASS RD., BARKING, ESSEX

Manufacturers of Radio & Electronic Components

Telephone: RIPPleway 3474 (5 lines)

UNBIASED

By FREE GRID

Labours of Hercules

NATURALLY I am completely unbiased in the matter of sponsored TV but I cannot help feeling that as it is a newcomer in the field it should be made to prove its worth before it is let loose on us. But it cannot do that unless it is given a trial, but why not make use of the old principle of trying it on the dog first?

Let the would-be TV sponsors



Quite useless

erect a station in the Hebrides or in the sterner and colder parts of the Caledonian mainland. If they can put out "advertising" programmes good enough to sell things to the canny Scot they will have won their spurs (or should it be their dipoles?) and the right to operate on this side of the Scottish economic iron curtain where sales resistance is not so high. It is quite useless to appeal to an unadulterated Scot by direct and blatant advertising. The idea of buying has to be put over to him so subtly and so insidiously that he doesn't realize that something is being put across him and believe me that takes some doing, as St. Columba found out long centuries ago.

Fiat Lux

WRITING IN THE JULY ISSUE, the Editor asks "What precisely is *electronics*?" and he leaves us in no doubt that he is in sympathy with those who feel that the present accepted definition should be widened. This definition, which owes its origin to the American Institute of Electrical Engineers, is "Electronics is that branch of science and technology which relates to the conduction of electricity through gases or *in vacuo*."

I will not attempt to offer an improved definition but will content myself by saying that I hope it will be phrased with more regard to good English than the one it displaces. I cannot for the life of me see why the English expression "through gases"

should be followed by the Latin "*in vacuo*"—which is anyway not as accurate as it might be. It would be better rendered as "*per vacuum*," unless we are to suppose that the electrons are not conducted through the glass-enclosed vacuum of our valves but merely float aimlessly about in it, peering stonily at us like a lot of imprisoned goldfish.

It is true, of course, that certain Latin writers, including Cicero, did use the word "*in*" followed by the ablative when they meant "through" in certain specialized contexts; just as Queen Victoria did in the case of the word "ain't," which she never feared to use when it was correct and apt. I have little doubt that the "*in vacuo*" pedants would turn the phrase "through gases" into Latin but unfortunately the Romans didn't have a word for gas, which was coined at the time of Queen Elizabeth I by Van Helmont from the Greek word $\chi\alpha\omicron\varsigma$ (chaos).

Surely the word "vacuum" has become as much an English word as the Latin word "tedium" and is entitled to be treated as such? We do not read in Hansard that "overcome by the *tedio* of the debate the Hon. Member fell asleep." Finally we have the authority of the great Dr. Johnson for treating vacuum as a word which has become English by naturalization. He used it as such long before the American Declaration of Independence, let alone the formation of the American I.E.E.

$\sim = b$ or $\#$

THERE ARE PEOPLE in this world who are so lacking in musical appreciation that the only tune they can recognize is the National Anthem and even then only because on such occasions all men remove their hats or stand to attention and some women stop talking. I don't pretend to have much of an ear for music myself but I did notice a few months ago (in "drear Februeer," as the poet calls it) that my appreciation of music, such as it is, seemed to vary according to the time of day at which I listened to a recording. At certain times I found a tune lively, sparkling and invigorating and at others the same tune seemed flat and lifeless.

With the coming of summer these symptoms dramatically ceased; I naturally decided that my trouble was a subjective one and put the cure down to the tonic effect of the sun. As a result I have invested in an expensive sunlamp in order to prevent a recurrence of the trouble next winter. However, a musical friend tells me that I have wasted my money.

He offers the simple explanation

that the whole trouble is that the e.m.f. and \sim of the mains in my district varies considerably according to the load. Thus at peak-load hours both my voltage and frequency are down and so is the turntable speed of my gramophone; sufficiently so, my friend alleges, to make the music sound flat. I am, however, suspicious of this explanation as my friend is trying to sell me a variable-speed motor to replace the synchronous type I use at present.

Hallelujah Chorus Jammed

THE B.B.C.'s handling of the Coronation was so good and the praise rightly bestowed on it so great that there is some danger of swollen heads in Portland Place unless some fault be found with the head-owners' presentation of the day's pageantry.

Fortunately, the B.B.C. did, in my opinion, make one very bad mistake and I intend to make the most of it. As you will recall, during the progress of the Coronation procession through the streets we were switched from point to point along the route to receive a description of the passing pageant from various commentators.

After a time this began to get monotonous as it was the same procession that was described each time. This could have been avoided if we had been switched over now and again to a commentator in the procession who could have given us a procession's-eye-view of the crowds and street scenes.

It would have been an easy matter to fit one of the coaches with a v.h.f. transmitter, and although the Ear!



Economic necessity

Marshal would not have allowed an ordinary B.B.C. commentator in the procession I do not doubt that one of the Noble Lords who are compelled by economic necessity to throw open their ancestral homes to us Paul Prys at half-a-crown a peep would have been glad to earn a fat fee for the occasion.



£60

Here is a VALVE TESTER

with sufficient scope for YOUR requirements!

When purchasing a Valve Tester ask the following questions:—

Is it a simple Go/No Go instrument, or will it enable you to take measurements at any point on a characteristic curve?

The "AVO" Valve Characteristic Meter can be set up in a matter of seconds and used as a simple Go/No Go tester if required. It will, in addition, produce sufficient information to enable the valve's static characteristic curves to be plotted.

Does the instrument depend for its operation on pre-determined empirical data issued by its manufacturer?

The "AVO" Valve Characteristic Meter simulates normal working conditions for the valve under test and thus is capable of reproducing the valve manufacturer's data.

If you are called upon to select a pair of accurately matched valves, will the valve tester carry out the required checks, and maintain your reputation as an expert?

The "AVO" Valve Characteristic Meter enables the slope, and anode, screen, or grid current of a multi-electrode valve to be checked with any voltage between 0 and—100V on the control grid.

Before any information can be obtained about a valve, must the instrument be provided with a complex series of accessories which may become lost, mutilated, or are not available when an unusual or new type of valve has to be tested?

The "AVO" Valve Characteristic Meter is provided with two handbooks. The first gives detailed information on the technique of valve testing, full circuit diagrams and adequate operating instructions. The second is a quick reference Data Manual covering more than 3,000 British, American and Continental valves, and gives inter-service equivalents. The Valve Data Manual is issued for the convenience of the instrument user, but even without it valves can, if necessary, be checked using data taken from the valve maker's data sheets.

Will a high slope valve, when placed in the instrument, burst into spurious oscillation, thus giving rise to incorrect readings and possible damage to the valve?

The "AVO" Valve Characteristic Meter incorporates a specially designed panel layout and wiring system (prov. patent) which virtually eliminates spurious oscillation.

Does the instrument contain valves which may need replacing from time to time?

With the exception of a small protection diode, there are no internal valves to deteriorate or break down and cause misleading readings to be given. Thus, expensive periodical replacements are not required.

Will the instrument detect grid current and indicate its direction and magnitude?

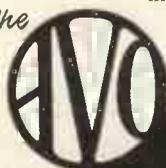
The "AVO" Valve Characteristic Meter will indicate the direction of flow of grid current and give its magnitude in microamps.

Does the instrument test diodes and rectifiers under load?

The "AVO" Valve Characteristic Meter checks diodes and rectifiers under load conditions.

The "AVO" Valve Characteristic Meter measures inter-electrode insulation in megohms with valve cold or hot, also cathode/heater insulation with the valve hot, and indicates any breakdown below 10 megohms. It will carry out tests on small thyratrons, tuning indicators, etc. It is fitted with bases for most valves in current use and adaptors will be available to keep the instrument fully up-to-date should new bases come into use. A special form of polarised relay is incorporated to give protection against inadvertent overloads or valve failure.

Write for fully descriptive literature



The Valve CHARACTERISTIC Meter



THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON S.W.1 Telephone VICTORIA 3404-9

AVOSET TRADE MARK

V.C.5

Who isn't on the right programme?

Are you? The frequency with which you send scrap from your works is vitally important — because roughly half this country's supplies of new steel are made from scrap. Factories like yours are among the main sources of the raw material needed in the steel-works. These sources must not be allowed to dry up.

Obsolete machines and equipment, redundant buildings, in fact everything made from iron and steel which has outlived its effective purpose — all this is scrap and should be sent off to your local scrap merchant as soon as possible.

Search your works for it and turn it in. You will be doing yourselves a great service.

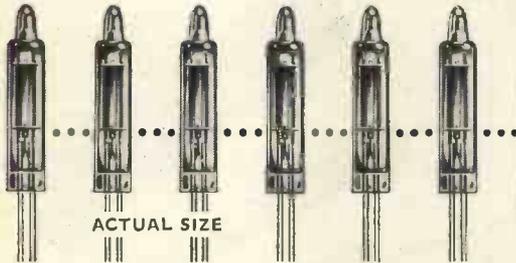
VISIT STAND No 12 .

at the National Radio and Television Exhibition,
Earls Court, Sept. 1-12 — and see what STEEL
is doing to help the national effort.

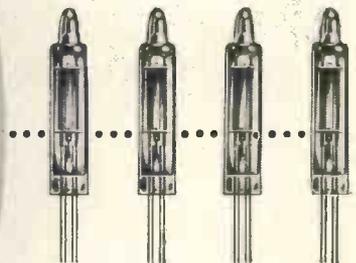
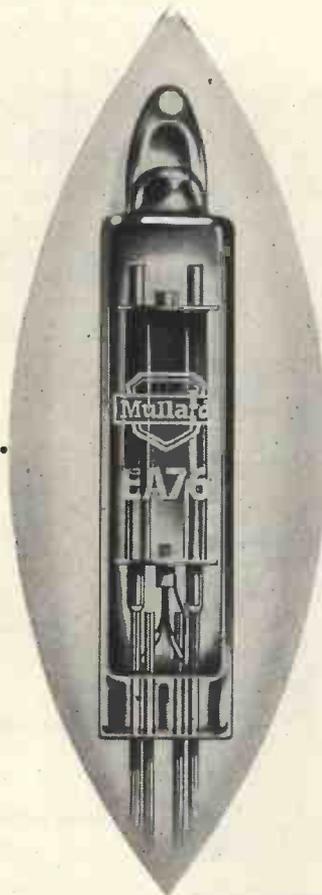


Issued for the STEEL SCRAP DRIVE by the British Iron and Steel Federation and the
National Federation of Scrap Iron, Steel and Metal Merchants.

AN OUTSTANDING



SUBMINIATURE DIODE



The Mullard subminiature diode, EA76, is one of the smallest and most efficient thermionic valves of its kind in the world.

A special feature of this valve is that despite its extremely small size (5mm. diameter), it operates efficiently under similar ambient temperature conditions to those governing normal miniature and subminiature valves.

As a result, the EA76 may be used in almost every communications, radar and military equipment where savings in space are required.

The EA76 is now freely available, and designers who require full particulars of performance and price are invited to apply to the address below.

PRINCIPAL CHARACTERISTICS			
HEATER			
V_h	6.3		V
I_h	0.15		A
CAPACITANCES (Measured without external shield)			
C_{a-k}	2.5		$\mu\mu\text{F}$
C_{a-h}	0.5		$\mu\mu\text{F}$
C_{h-k}	2.0		$\mu\mu\text{F}$
CHARACTERISTICS			
D.C. voltage drop ($I = 18\text{mA}$)	3.1		V
LIMITING VALUES			
P.I.V. max.	420		V
V_a max.	180		V
I_a max.	9.0		mA
$i_a(\text{pk})$ max.	54		mA
* $V_{h-k}(\text{pk})$ max.	330		V
* Heater negative with respect to cathode.			
BASE			
B5B (5 mm. subminiature)			
GOVERNMENT PREFERRED TYPE NUMBER			
CV469			



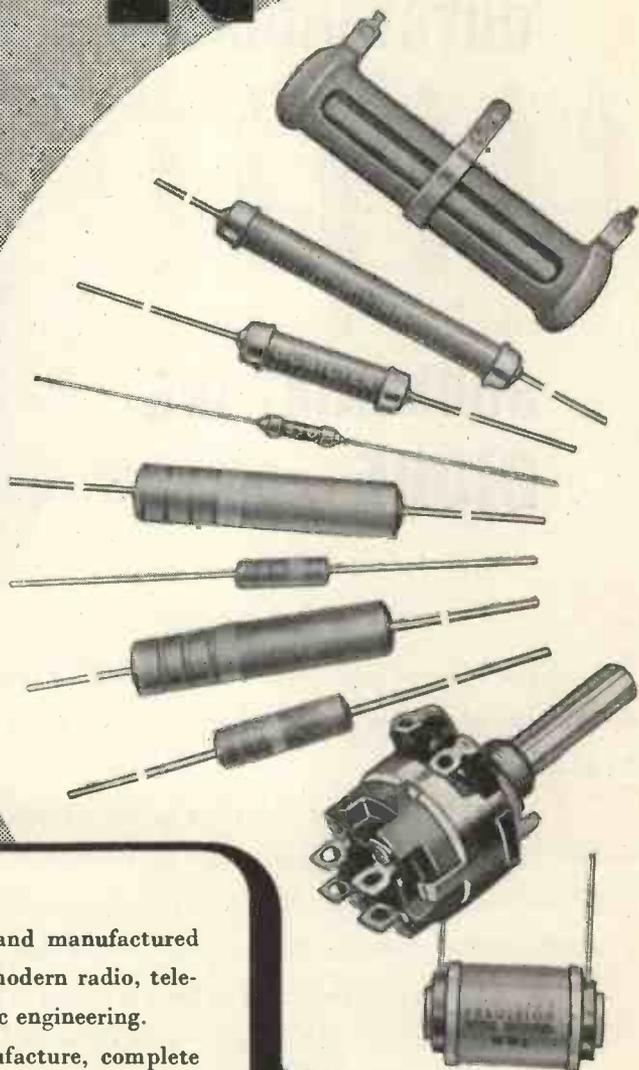
DUBILIER

RESISTORS

FOR THE

SERVICE

ENGINEER



Dubilier Resistors are designed and manufactured to meet the exacting requirements of modern radio, television, telecommunication and electronic engineering.

Throughout every stage of their manufacture, complete mechanisation and production testing ensures maximum uniformity and quality control, which is your assurance of reliability. Catalogue GR.353 giving details of the full range of DUBILIER Resistors will be sent to you upon request.

DUBILIER CONDENSER CO. (1925) LTD

DUCON WORKS, VICTORIA ROAD, NORTH ACTON, LONDON, W.3. ENGLAND

*Phone: ACOrn 2241 (5 lines)

*Grams: Hivoltcon, Wesphone, London

Cables: Hivoltcon, London



The Vital Link . . .

. . . with safety in the hazardous enterprise of the deep sea trawler is its radio and radar equipment upon which safe navigation depends. Thousands of soldered joints contribute to the efficient functioning of this delicate apparatus. One dry or H.R. joint could mean the breakdown of a circuit, the destruction of the vital link, a perilous voyage.

FAULTLESS FLUXING PRESERVES THE VITAL LINK

Dry or H.R. joints are impossible with Superspeed for the flux is always released in exactly the correct proportion. This faultless fluxing action is achieved by the unique STELLATE core which gives six points of rapid solder collapse. At soldering temperature the activated rosin flux is released immediately for effective spreading and wetting. Superspeed is being used more and more in the production of radio and radar equipment where faultless joints are essential.



Superspeed

"WHITE FLASH" ACTIVATED ROSIN-CORED SOLDER

for general electrical, electronic and telecommunication work and all standard uses. A.I.D. and G.P.O. approved. Complies with M.O.S. Specification DTD 599. In all standard tin/lead alloys, 10-22 s.w.g. Also available in a range of coloured cores, indispensable for simple intermediate and final inspection and circuit or operator identification. Samples of Superspeed and the comprehensive Superspeed booklet gladly sent on request. Technical advisers are available for free consultation.

Cored and solid solder rings and solid solder washers supplied to customers' specifications.

MANUFACTURED BY THE **ENTHOVEN** GROUP

VALVES For
SPECIAL PURPOSES

Vacuum thermal delay switches

Ediswan vacuum thermal delay switches are recommended for use with mercury vapour rectifiers to provide the necessary delay before the anode voltage is applied. The normal average delay time is 60 seconds but variations above and below this period may be effected by suitable filament voltage adjustments.

These vacuum delay switches are designed on a principle intended to overcome the disadvantages of the ordinary bi-metallic strip delay switch by virtue of the fact that the operating parts are enclosed in an evacuated glass envelope which renders the action immune from atmospheric influence. Three types of switch are available; the DLS 10 for all normal applications and the DLS 15 and the DLS 16 for use where physical size must be kept to a minimum. The DLS 15 utilises a standard 4 pin base whilst the DLS 16 has an international octal base. Otherwise, apart from filament voltage, they are similar in all respects.

RATING	DLS.15	DLS.16
Filament Voltage (volts)	4	6.3
Filament Current (amps)	.75	.48
Delay Time (secs.)	min. 30—max. 90	
Maximum Mean Current (Low Voltage Rating)	5 amps at 240 v.	
Maximum Mean Current (High Voltage Rating)	100 mA at 1,000 v.	

DIMENSIONS	DLS.15	DLS.16
Maximum Overall Length (mm)	60 N.I.P. *	
Maximum Diameter (mm)	32	
Maximum Height (mm)	60	65

* Not Including Pins

DLS.15	DLS.16
BASE	BASE
B.V.A. 4 pin	International Octal Base
Pin 1—Fixed Contact	Pin 1—
Pin 2—Moving Contact	Pin 2—Filament
Pin 3—Filament	Pin 3—
Pin 4—Filament	Pin 4—Moving Contact
	Pin 5—
	Pin 6—Fixed Contact
	Pin 7—
	Pin 8—Filament

MOUNTING POSITION—Unrestricted.



RATING	DLS.10
Filament Voltage (volts)	4.0
Filament Current (amps)	** 1.5
Delay Time at 4.0 v. (secs)	min. 30—max. 90
Maximum Peak Current (Low Voltage Rating)	6 amps at 250 v.
Maximum Peak Current (High Voltage Rating)	200 mA at 1 kV.

** At approximately 4.0 v.

DIMENSIONS	DLS.10
Maximum Overall Length (mm)	120 N.I.P. §
Maximum Diameter (mm)	45
Approximate Nett Weight (ozs.)	1½
Approximate Packed Weight (ozs.)	2½
Approximate Packed Export Weight (ozs.)	4

§ Not including pins.

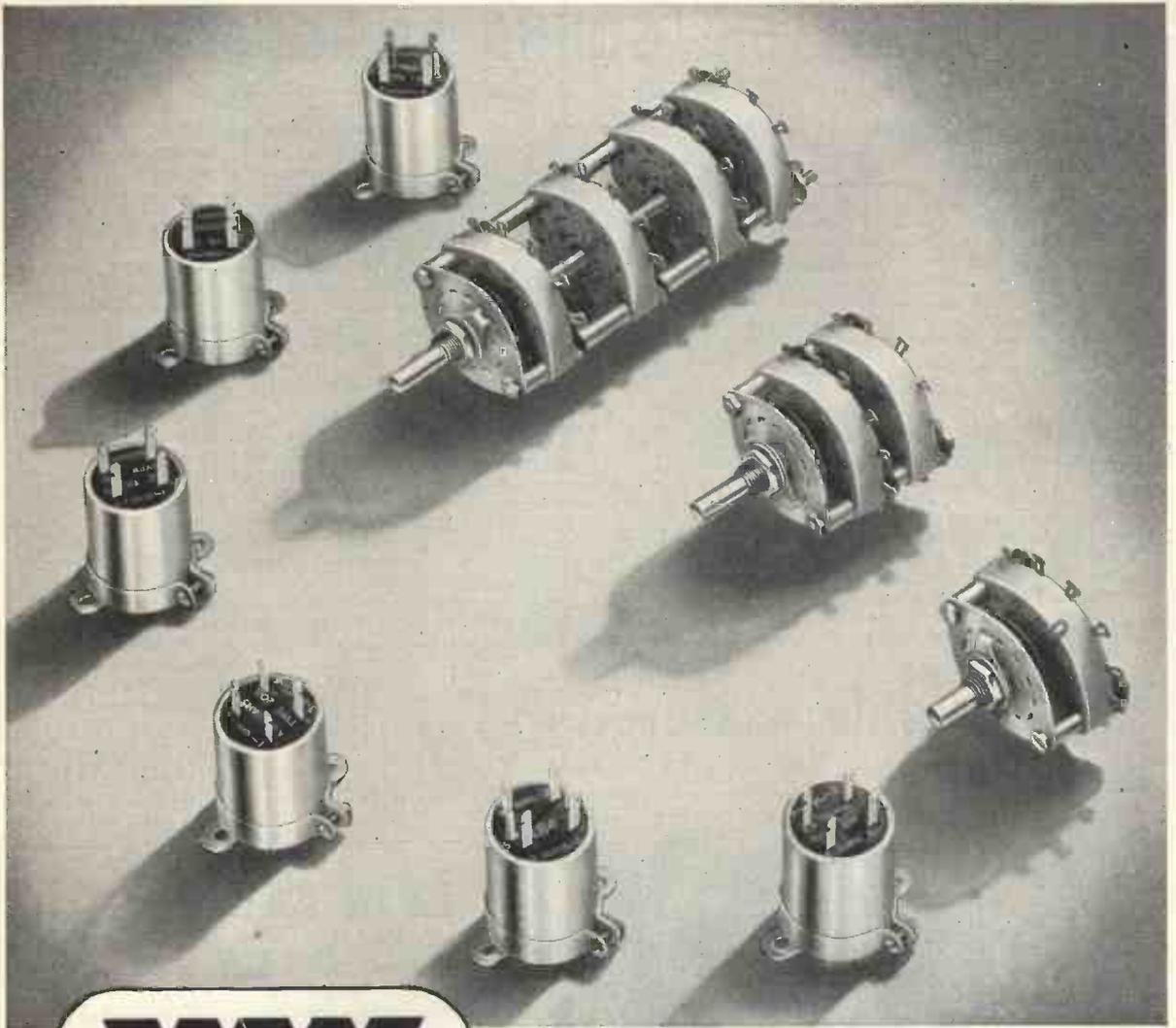
MOUNTING POSITION—Vertical

EDISWAN

THE EDISON SWAN ELECTRIC COMPANY LTD., 155 CHARING CROSS ROAD, LONDON, W.C.2

Member of the A.E.I. Group of Companies

EV 84



A.F. TRANSFORMERS AND CERAMIC ROTARY SWITCHES

The "Hyperloy" series of A.F. Transformers and Chokes of over a 100 Specifications is now available in hermetically-sealed containers capable of withstanding the most rigorous climatic conditions. Also available in similar gas-tight containers is a range of Bi-limboid transformers having hum-cancelling windings for use in situations demanding the lowest hum-levels without recourse to expensive mumetal screening.

The high-quality ceramic rotary switch is designed

for use in low-power transmitters, instruments or for similar circuit selection functions. The insulating material is "Frequentite", and silver-alloy contacts ensure very low contact resistance and trouble-free service over a long life.

A "Wearite" Switch Chest is available for laboratories and research organisations and contains all necessary component parts to permit of the assembly of switches to meet particular requirements.

W R I G H T & W E A I R E L T D

138 SLOANE STREET · LONDON · S.W.1 · Telephone: SLOANE 2214/5

The Critics on "SOUND REPRODUCTION"

By G. A. BRIGGS, 3rd Edition, 368 pages, 17/6 (Plus 1/- postage)

Wireless and Electrical Trader, May 23, 1953
The style of writing employed by Mr. Briggs continues to be informal, and at times humorous, but that implies no criticism on the reviewer's part. In fact, the book is a pleasure to read, which is more than can be said of many technical or semi-technical publications. It is difficult to imagine anyone interested in high-fidelity sound reproduction, however experienced and knowledgeable, who would not gain considerable new information and ideas from this book.

Radio and Television News, New York, 1953
Since this work is addressed to the layman, the treatment is non-technical but much of the data would be of considerable value to the audiophile or the technician working with high-fidelity equipment. The book is lavishly illustrated with actual oscillograms, performance graphs, circuit diagrams, and photographs. The author's style is refreshingly witty so that the book makes good as well as informative reading.

Wireless World, June, 1953

The field covered is wide—literally all aspects of sound reproduction not dealt with in greater detail in the author's other books. Mr. Briggs has been fortunate in his collaborators, and the chapter on Vented Reflex Cabinets by R. E. Cooke is probably the best exposition of the underlying principles so far published. Whether one is learning from or disagreeing with the author—and no one interested in sound reproduction can fail to do both—there is little fear of falling asleep while reading this book.

Proceedings of the Institute of Electronics, 1st Quarter, 1953

This third revised and enlarged edition of a popular text confirms our suspicion that the light-hearted treatment by the author covers a profound appreciation of what we are trying to do in reproducing sound.

The whole book is very practical and to be recommended to those who have to get quickly at the fundamentals of a wide collection of aspects of sound reproduction.

Popular Radio, Stockholm, May, 1953

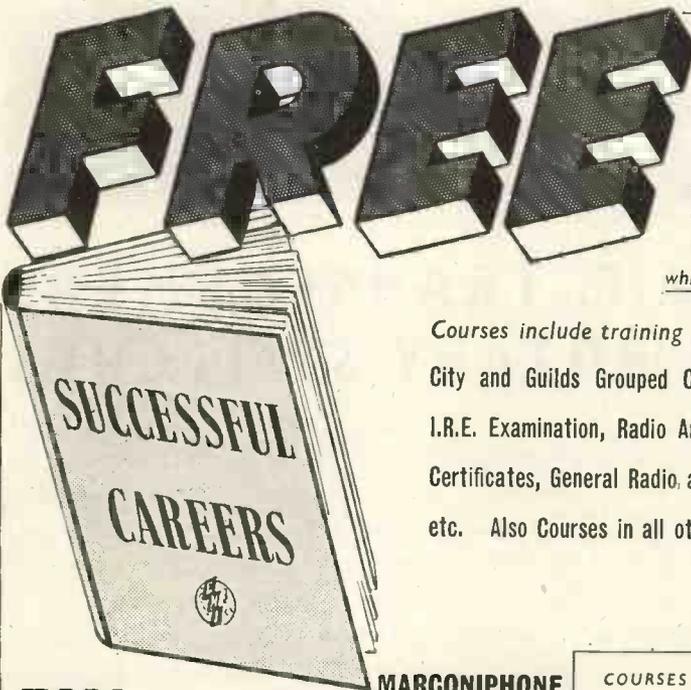
The book is written in a friendly way and the descriptions are almost informal, but there is no old store cupboard from which the author has drawn. On the contrary, it is new, actual material of great interest for the amateur as well as for the technician. The author seems to be quite an original gentleman, and the reader must be ready for a share of surprise. For example, the author has here and there among the oscillograms and curves in the most surprising way interpolated literary quotations.

Audio Engineering, New York, June, 1953

Mr. Briggs goes into many of the peculiarities of enclosures, room acoustics, and the speaker mechanisms themselves. But always there is the diagram to substantiate his premise. It is significant indeed that in America where the amount of hi-fi apparatus sold far outdistances that of the British market, no one has ever dared attempt such a book. Every one of us is in Mr. Briggs' debt, and will be for a long time, for a careful following of his fundamentals will assure the optimum sound from a given speaker and enclosure combination.

Wharfedale WIRELESS WORKS
BRADFORD ROAD, IDLE, BRADFORD, YORKS

Telephone ; IDLE 461



THIS VALUABLE BOOK

which details the wide range of Engineering and Commercial courses of modern training offered by E.M.I. Institutes — *the only Postal College which is part of a world-wide Industrial Organisation.*

Courses include training for :

City and Guilds Grouped Certificates in Telecommunications ; A.M. Brit. I.R.E. Examination, Radio Amateur's Licence, Radio & Television Servicing Certificates, General Radio and Television Courses, Radar, Sound Recording, etc. Also Courses in all other branches of Engineering.

POST NOW

Please send, without obligation, the above FREE book

E.M.I. Institutes, Dept. 16,
43 Grove Park Road, Chiswick, London, W.4.

Name _____

Address _____

EMI INSTITUTES
associated with

**MARCONIPHONE
COLUMBIA &
H.M.V.**
(His Master's Voice, etc.)

COURSES
FROM

£1

PER MONTH

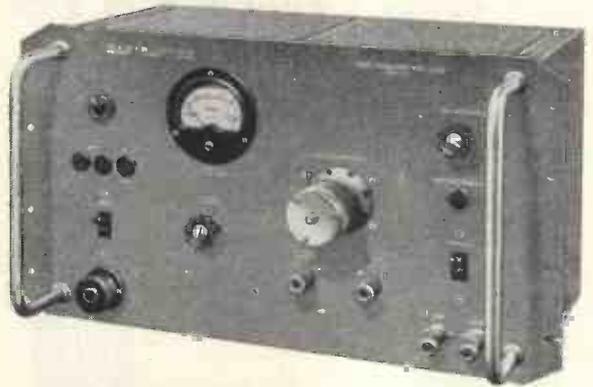
S-Band Test Oscillator

TYPE 0.223

A general purpose test oscillator for use in the frequency range 2800-3600 Mc/s with an output in the order of 500 milliwatts.

The instrument incorporates a constant wattage power supply unit, and square wave modulator, adjustable between 400-4000 cycles. It is fitted with crystal monitor and meter to provide continuous indication of power output.

Supplied for standard 19" rack mounting, height 10½".



A small number of these instruments is available from stock. PRICE £230

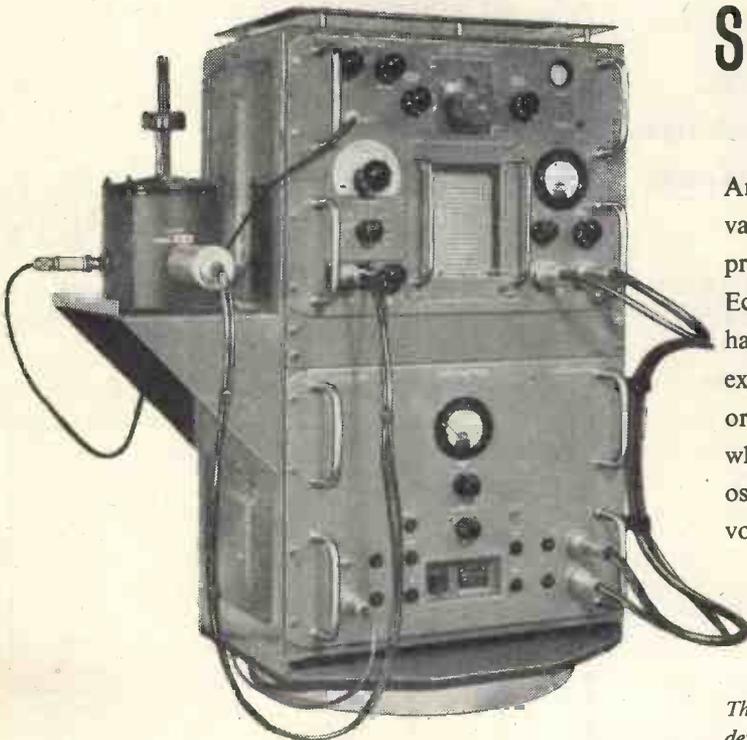
S-Band Q Meter

TYPE L.181

An instrument designed to measure high Q values in the range 2800-3600 Mc/s. Its primary function is the measurement of Echo Boxes but, as with other Q meters, it has a wider field of application: it can, for example, be used to determine conductivity or dielectric loss. It uses a technique which compares the rate of decay of free oscillations in a resonant cavity with the voltage across a known capacitor discharging into a known resistor.

The accuracy of measurement is ½% over a Q range of 20,000-60,000.

The Test Oscillator and Q Meter have both been developed in collaboration with R.R.D.E.



THE WAYNE KERR
LABORATORIES LIMITED

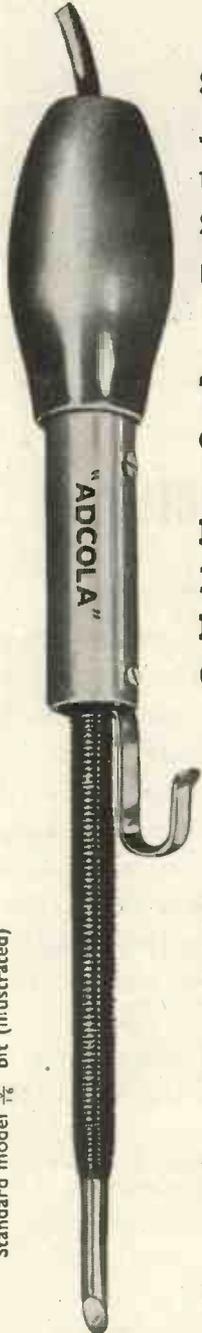


MALDEN 2202
NEW MALDEN · SURREY

ADCOLA

PRODUCTS LIMITED
(Regd. Trade Mark)

SOLDERING INSTRUMENTS



Standard model $\frac{3}{16}$ " bit (illustrated)

SOUND JOINTS
for all
SOUND EQUIPMENT

Types are available for
Factory Bench Line, Maintenance Engineer & Home Constructor

Supplied for any volt range to meet our world-wide consumers demands

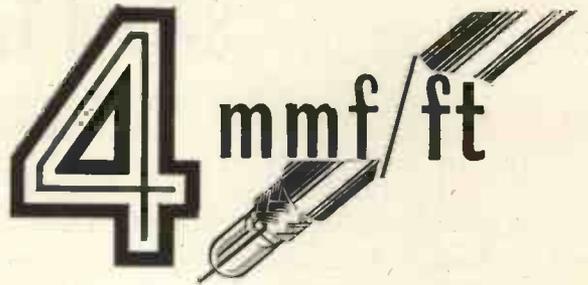
- Heating time: 90 seconds.
- Consumption: 25 watts.
- Weight: 4 ozs.
- High temperature.
- Handle unaffected by element temperature.
- Length of instrument: 9".
- Equally suitable for daily or intermittent use.

$\frac{3}{16}$ " dia. bit Standard Model.
 $\frac{1}{8}$ " dia. bit Standard Model.
 $\frac{1}{8}$ " Detachable bit; Type (Factory Bench Line).

Made In England
Registered Design (British, U.S.A., Canadian) and Foreign Patents.

● Apply Sole Manufacturers and Suppliers

ADCOLA PRODUCTS LTD.
Sales Offices & Works: GRANMER COURT, CLAPHAM HIGH ST., LONDON, S.W.4. MACaulay 4272



AIR-SPACED ARTICULATED CO-AX CABLES

offer a unique combination of

- ✓ FRACTIONAL CAPACITANCE
- ✓ HIGH IMPEDANCE
- ✓ MINIMUM ATTENUATION

ALONG WITH

- ✓ EXCEPTIONAL FLEXIBILITY
- ✓ LIGHT WEIGHT

38 STOCK TYPES

FOR ANY OF YOUR STANDARD OR SPECIAL APPLICATIONS

A few of the very low capacitance types are:

Type No.	Capacit. μ F/ft.	Impedance ohms	O.D.
C.44	4.1	252	1.03"
C.4	4.6	229	1.03"
C.33	4.8	220	0.64"
C.3	5.4	197	0.64"
C.22	5.5	184	0.44"
C.2	6.3	171	0.44"
C.II	6.3	173	0.36"
C.I	7.3	150	0.36"

TRANSRADIO
CONTRACTORS TO
H.M. GOVERNMENT
LTD.

138A CROMWELL ROAD, LONDON, S.W.7



Grinding Mullard 'Ticonal' permanent magnets to required size.

MAGNETIC MATERIALS Extensive research and manufacturing facilities have established Mullard as the leading producers of magnetic materials. They were the first, for example, to introduce Ferroxcube, the world's most efficient magnetic ferrite; 'Ticonal' anisotropic permanent magnets, renowned for their high stability and high energy output; and Magnadur, an entirely new type of permanent magnet with the insulating properties of a ceramic.

The wealth of experience gained from these developments is available to all users of magnetic materials through the Mullard advisory service. An enquiry to the address below will put a team of specialised engineers at your disposal.

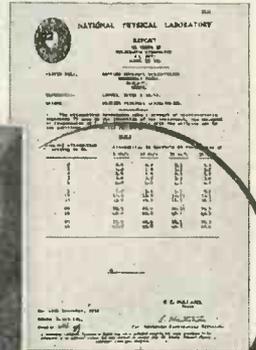


Mullard

'TICONAL' PERMANENT MAGNETS · MAGNADUR (Formerly Ferroxdure)
PERMANENT MAGNETS · FERROXCUBE MAGNETIC CORE MATERIAL

MULLARD LTD., COMPONENT DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

INCREMENTAL ACCURACY *Within 1% up to 70 Mc/s*
BACKED BY N.P.L. CERTIFICATE



MODEL RA104
WIDE FREQUENCY RANGE ATTENUATOR

It is the only unit of its type, independent of frequencies up to 70 Mc/s designed to operate between 75 ohms resistive loads.

THE ONLY COMMERCIALY AVAILABLE INSTRUMENT

over the range 1-104 db in steps of 1 db. A National Physical Laboratory Certificate quotes the adjoining figures.

Please write for full details.

(EXTRACT)
 Table

Nominal attenuation setting in db.	Attenuation in decibels at frequencies of			
	1 Mc/s	10 Mc/s	30 Mc/s	50 Mc/s
0	0.0	0.0	0.1	0.2
1	1.0	1.0	1.1	1.2
2	2.0	2.0	2.1	2.2
3	3.0	3.0	3.1	3.2
4	4.0	4.0	4.1	4.2
5	5.0	5.0	5.1	5.2
10	10.0	10.0	10.15	10.3
15	15.0	15.0	15.2	15.3
20	20.0	20.0	20.15	20.3
40	40.0	40.0	40.2	40.3
20	20.0	20.0	20.1	20.3
40	40.0	40.0	40.3	40.4

BRITISH PHYSICAL LABORATORIES LTD

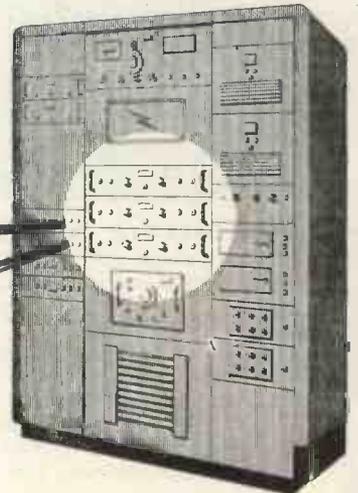
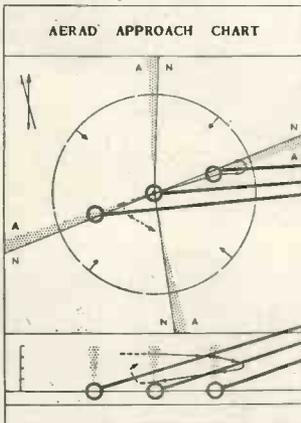
Tel: Radlett 5674-5-6



Radlett HERTS

dmBP11

beacon monitor receivers...



mean HOMING SAFETY

IAL BEACON MONITOR RECEIVERS (which fully conform to ICAO standards) provide automatic monitoring of high and low power MF Beacons. The constant watch they keep is a vital link in the navigational chain—their vigilance providing maximum *Homing Safety*.

INTERNATIONAL AERADIO LIMITED

40, Park Street, London W.1. (REGent5024) Cables: *Intaerio, London.*

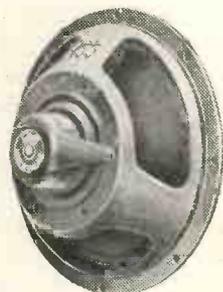
WE DON'T MAKE

loud-speakers of every size . . .

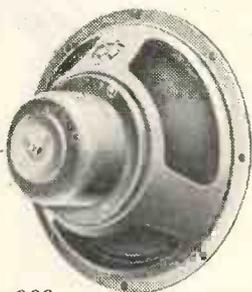
..... from 2 inches up to 2 feet. By concentrating on a more compact range, we can give set-makers the real benefits in price and consistency which result from large and economic production runs.

In North America they call this "simplification" and well understand its value. Possibly this is one of the reasons why our sales across the Atlantic are steadily growing.

The current R. & A. range is detailed below: samples, technical information and quotations will be supplied to engineers and purchasing officers on request.



Type 880
8-in. dia.



Type 980
8-in. dia.

SERIES 800, Mark II		
Type	Size	Flux Densities
850	5-in. dia.	7,000, 8,000, 9,000 and 10,000 Gauss
865	6½-in. dia.	
874	7 × 4-in. elliptical	
880	8-in. dia.	7,000, 8,000 and 9,000 Gauss
8100	10-in. dia.	
8120	12-in. dia.	
SERIES 900, Mark II		
Type	Size	Flux Densities
980	8-in. dia.	10,000 and 12,000 Gauss in all sizes
9100	10-in. dia.	
9120	12-in. dia.	



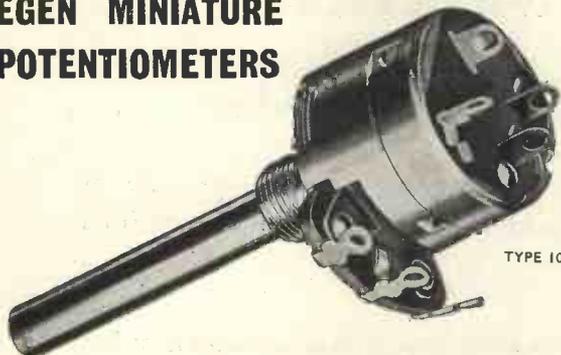
*Loud-speaker
Manufacturers
to the radio industry
since 1930*

**REPRODUCERS AND AMPLIFIERS LIMITED
WOLVERHAMPTON ENGLAND**

Telephone : Wolverhampton 22241 (5 lines)

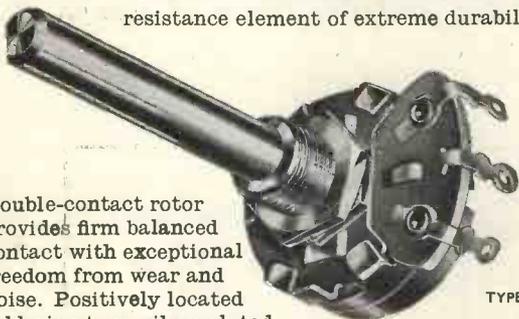
Telegrams : Audio, Wolverhampton

NEW EGEN MINIATURE POTENTIOMETERS



TYPE 105

Designed to meet the demand for Egen reliability within the smallest possible compass, these exceptionally small carbon potentiometers ($\frac{1}{8}$ " diameter) retain all the desirable features of their standard-size counterparts. The special Egen carbon deposition process ensures a highly stable resistance element of extreme durability.



TYPE 115

Double-contact rotor provides firm balanced contact with exceptional freedom from wear and noise. Positively located soldering tags, silver plated for easy soldering. All steel parts rustproofed. Standard resistance values available, from 5000 ohms to 2 megohms.

Type 115 is identical to Type 105 except that a 2-pole Q.M.B. switch is incorporated.



SUB-MINIATURE VOLUME CONTROLS
For use in Deaf Aids and other miniature electronic apparatus



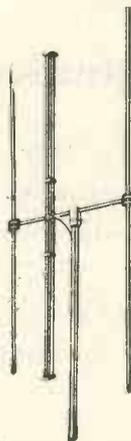
PRE-SET RESISTORS
A wire-wound pre-set resistor for panel or chassis mounting

Export enquiries welcomed



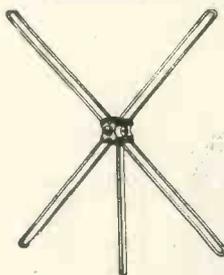
EGEN ELECTRIC LTD., CHARELEET INDUSTRIAL ESTATE,
CANVEY ISLAND, ESSEX. PHONE: CANVEY 691-2

SIGNAL GAIN



is important when you realise that the quality of the television picture is entirely dependent on the efficiency of the aerial system. Using an inefficient aerial is like running a good motor car on inferior petrol—the final performance suffers. That is why we advocate the careful selection of the aerial type, the use of good quality downlead and the aerial installed correctly. These

are the reasons why you should specify an Aerialite aerial, accessories and downlead.



THE AERIALITE TV AERIAL RANGE

includes all types from the "fringe" (Aerfringe, Aerbeam) to the indoor dipoles for starting board mounting (Aerdoor). The prices are from 13/6.

AERIALITE ACCESSORIES

include lightning arrestors, connector and matching boxes, mains and car ignition suppressors, coaxial plugs and sockets—the latter are specified and used by a large percentage of the television receiver manufacturers.

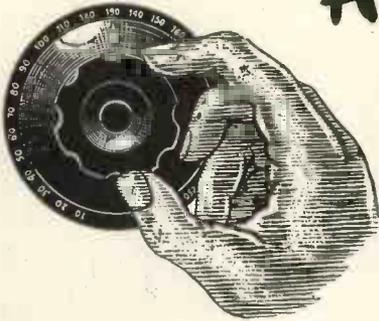


AERIALITE CAR AERIALS include

Model 6 side fitting, telescopic, chromium plated	£2 2 6
Model 8 under car fitting (large).....	£1 18 6
Model 9 under car fitting (small).....	£1 7 0
Model 16 mudguard fitting, telescopic, chromium plated	£3 3 0
Model 17 header fitting, telescopic, chromium plated	£1 12 6

Please send for details of our products to:
Aerialite Limited, Castle Works, Stalybridge, Cheshire.





Adjustable-Stabilized A.C. Voltage

WITH HARMONIC FILTER

This new Advance Constant Voltage Transformer is designed for use when an adjustable but closely regulated source of constant A.C. voltage is required. The "Volstat" is ideally suitable for the most exacting industrial applications as well as for general laboratory work.

It provides a portable, simple to handle instrument for such duties as instrument calibration and testing and many other operations involving factors that are sensitive to wave form and voltage.

Full technical details on Leaflet S19/W

- One Output Regulated, $\pm 1\%$ regulated from 0 to 260 volts.
- One Fixed Output, 230 volts regulated $\pm 1\%$.
- Total Harmonic Distortion less than 5%
- Maximum Output 170 watts.



Advance 'VOLSTAT'

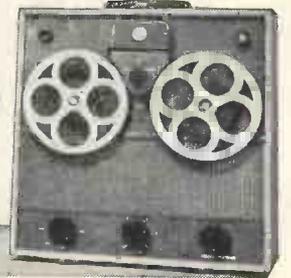
ADVANCE COMPONENTS LIMITED, BACK ROAD, SHERNHALL STREET, LONDON, E.17

Telephone : LARKSwood 4366/7/8

Telegrams : Attenuate, Walt, London

A Service in Sound

"—from the finest of portable tape recorders" says BRIAN RIX, Actor-Manager-Producer of "Reluctant Heroes"



Brian Rix, G2DQU, successful impresario with a keen interest in Amateur Radio, has a trained ear for the technical merits of the Baird Tape Recorder. "Here is a portable instrument," he says, "with a performance equal to that of costly professional equipment. Its distortion-free true-to-life recordings are the result of many new and impressive advances in high fidelity technique. The finest of all portable recording instruments, it's invaluable at rehearsals."

BAIRD RECORDING TAPE CEMENT is specially prepared for splicing plastic base magnetic tape. Makes clean, quick-setting joints, which are strong and free from creeping. Each bottle is fitted with a brush for easy application. 3/6d.

(post-and packing 6d. extra)

Complete with microphone and tape 65 gns.



THE ALL-BRITISH TAPE RECORDER

BAIRD TELEVISION LTD : LANCELOT ROAD : WEMBLEY · MIDDLESEX



Manufacturers of Ammeters, Voltmeters, Ohmmeters, Wattmeters and frequency meters for switchboard or portable use.

MULTI-RANGE TEST SET SERIES 100

The Universal testing set for Service Engineers. Sensitivity 10,000 ohms per volt. Strong metal case with carrying handle, complete with leads having detachable bulldog clips and test prods. Size 9 x 5½ x 4 ins.

MEASURING INSTRUMENTS (PULLIN) LTD.
Electrin Works, Winchester Street, London. W.3
Tel.: ACOrn 4651/3 and 4995



RANGES
AC/DC VOLTS: 10, 25, 100, 250, 500, 1,000.
DC MILLIAMPS: 2.5, 10, 25, 100, 500.
AC/DC MICROAMPS: 100 Microamps 10v range.
RESISTANCE RANGES: 0/1 Meg (13,500 ohms mid-scale) 0/10,000 ohms (135 ohms mid-scale).



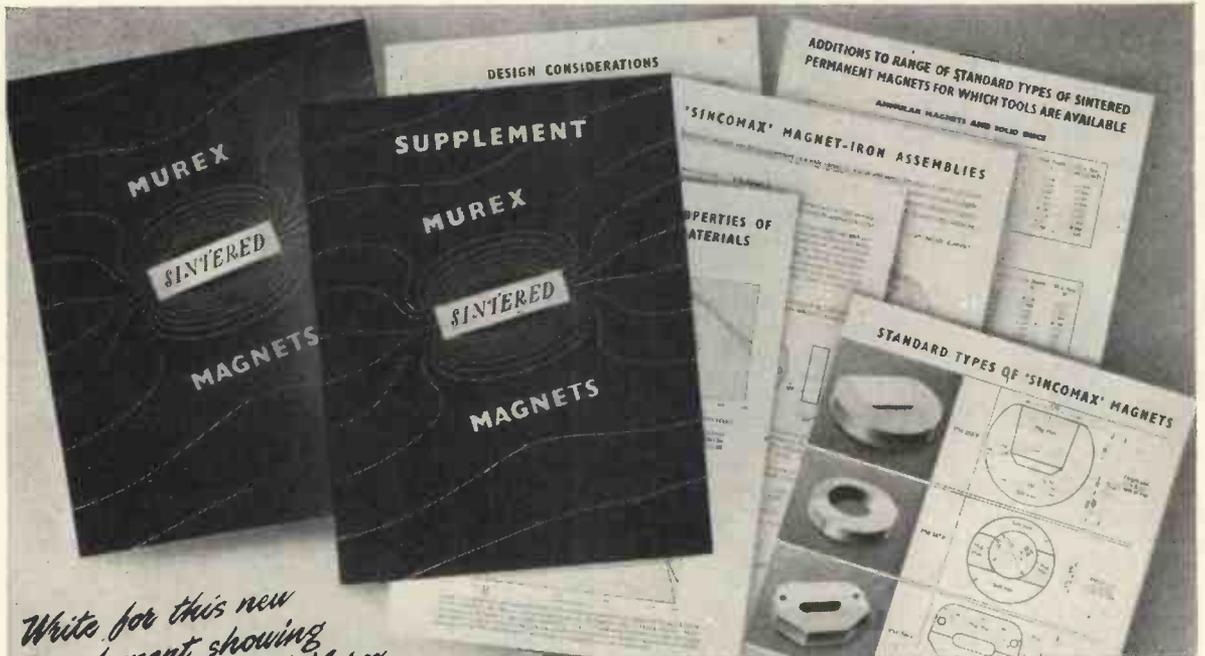
New types to meet the requirements of modern television

New types recently added to the range of OSRAM VALVES and G.E.C. cathode ray tubes and germanium diodes, are briefly described here. In addition the table below forms an application guide to the current television range, showing at a glance the most suitable type for use in the various stages of a modern television receiver.

- ★ **Z309** A B9A based video output pentode designed to provide the increased drive required by modern cathode ray tubes. It has a slope of 15mA/V. and the 12.6V., 0.3A heater is centred-trapped for 6.3V. operation.
- ★ **Z719** An internally screened R.F. pentode on the B9A base. It may be used for R.F. and I.F. amplification in television receivers, and also as a video amplifier or sync. separator. The slope is 7.4mA/V. and the low anode voltage of 170V. ensures satisfactory operation in transformerless receivers. The heater, rated at 6.3V. 0.3A. is suitable for series or parallel operation. Two cathode connections are provided to reduce R.F. input damping.
- ★ **N329** A B9A based output pentode with a 16.5V., 0.3A heater for use as a sound or frame time base output valve in transformerless television receivers. The slope is 9mA/V., and an audio output of 4 watts can be obtained with an anode supply of 170V.
- ★ **U43** A miniature wire-in indirectly heated half wave rectifier suitable for providing E.H.T. from the line time base fly-back pulse or R.F. oscillator. The heater rating is 6.3V. 90mA. and the maximum P.I.V. 17kV.
- ★ **GEX34** A germanium diode developed for use as a sound detector, sound noise limiter and a high level vision detector. It is particularly suitable for driving the sound output stage direct where a sufficiently great R.F. input is available, and undergoes a special functional test during manufacture to ensure satisfactory operation in this application. The GEX34 replaces the GEX44/1 for all purposes
- ★ **7201A** A 14" rectangular all-glass cathode ray tube with 70° deflection angle. The screen is aluminised, and the sensibly flat filter glass front which has a transmission factor of 65% obviates the need for a separate viewing filter. The maximum EHT is 14 kV. The heater is rated at 6.3V. 0.3A and is suitable for series or parallel operation.
- ★ **305 barretter** A 0.3A. barretter for use as a heater current stabiliser in television receivers with series connected heater circuits. It has a voltage range of 40-90V., the current regulation being 5%. The use of a barretter tends to prolong valve and tube life under conditions of fluctuating mains voltage and minimises deterioration of picture quality when the input voltage is abnormally low.

Mixer	R.F. & I.F. amplifier	Video detector	Video amplifier	Sync. separator	Line osc.	Line output	Booster diode	EHT rectifier
B309 X79 Z77 ★ Z719 GEX66	Z77 ★ Z719	★ GEX34 GEX35	★ Z309 ★ Z719 Z77	Z77 ★ Z719	B309 Z77 L77	N339	U329 U309	★ U43
Frame osc.	Frame amp.	Sound amp.	Sound output	Sound detector. Sound noise limiter	Sync. clipper and spot limiter	Barretter	Power rectifier	Cathode ray tube
B309 ‡LN309. L77	★ N329 ‡LN309	L77 ‡LN309	★ N329 ‡LN309	★ GEX34	D77	★ 305	U319	12" 7102A 14" 7201A (rect.)

Write to Osram Valve and Electronics Dept. for full technical details



Write for this new Supplement showing the latest range of Murex Sintered Permanent Magnets

MUREX LTD (Powder Metallurgy Division)

RAINHAM, ESSEX. Telephone : Rainham Essex 3322

London Sales Office : **CENTRAL HOUSE, UPPER WOBURN PLACE, W.C.1.** Telephone : EUSton 8265

Connoisseur

3-speed MOTOR

Test this new motor at your earliest opportunity. You will find it possesses all the qualities you have been looking for! 12in. turntable, 33 $\frac{1}{3}$, 45 and 78 r.p.m. Synchronous motor, virtually vibrationless. Suitable for standard, transcription and microgroove recordings. Input voltages : 200-250 A.C. 50 cycles. 110 volts 60 cycles to order.



3 Head PICK-UP

The CONNOISSEUR SUPER LIGHTWEIGHT PICK-UP

Extremely low mass at needle point (4/5 m.g. only), allowing for reduction in downward pressure to 8/10 grams for standard recordings, and 4/6 grams for microgroove recordings.

PRICES with one Head, £4/10/-, plus £1/9/3 tax.

Extra Heads, each £2/10/-, plus 16/3 tax.

Spare Armature System with sapphire. 10/3, plus 3/4 tax.



PRICE (without Pick-up)
£16.10.0 Plus £5.7.3 tax

OVERSEAS AGENTS

S. AFRICA : W. L. Procter (Pty.) Ltd., 63 Strand Street, Cape Town.

AUSTRALIA : J. H. Magrath & Co. Pty. Ltd., 208 Little Lonsdale Street, Melbourne.

CANADA : The Astral Electric Co., 44 Danforth Street, Toronto, Ontario.

NEW ZEALAND : Turnbull & Jones Ltd. Head Office : 12/14 Courtenay Place, Wellington.

HONG KONG : The Radio People Ltd., 31 Nathan Road, Hong Kong.

A. R. SUGDEN & CO.
(ENGINEERS) LTD.

WELL GREEN LANE, BRIGHOUSE, YORKSHIRE

Telephone : HALIFAX 69169

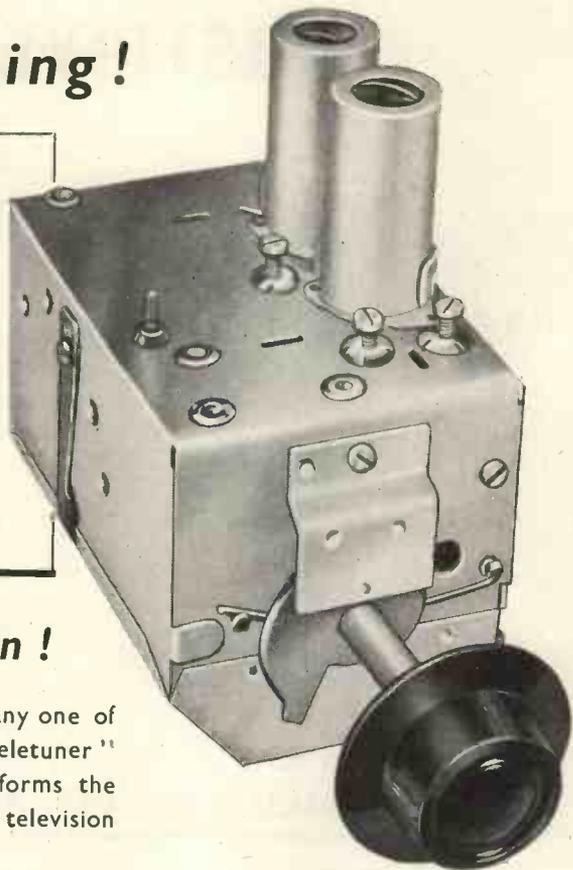
Multi-channel tuning!

Cyldon

"TELETUNER"

(TRADE MARK)

Type TV.12

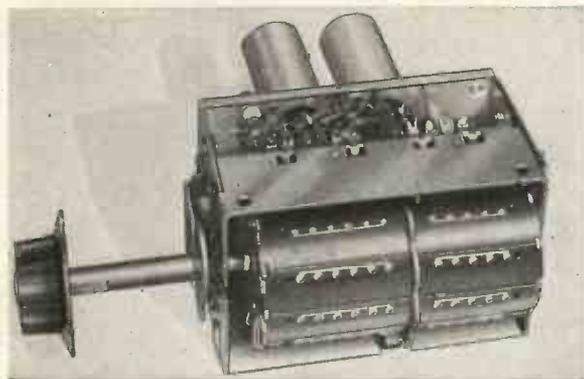


Instant, single-knob selection!

Select a frequency in the 50-220 Mc/s range—select any one of twelve in fact—and this new Cyldon Multi-channel "Teletuner" will handle it. This compact two valve unit performs the functions of R.F. amplifier and frequency changer in a television receiver.

Instant, single-knob channel selection is made by a rotating turret containing twelve aerial and twelve R.F. coupling and oscillator coils, each coil being mounted on a low-loss bakelite contact strip and retained on the turret by means of a phosphor bronze clip. All circuit switching is accomplished by means of eleven spring pressure contacts, rotation of the

turret bringing the coils for the desired channel into circuit and leaving the remaining eleven completely isolated. High efficiency with low losses is thus obtained, together with great flexibility, and the tuner can be supplied to cover television transmissions from any of the systems used throughout the world in the carrier frequency range of 50-220 Mc/s.



Underside view of Cyldon TV.12 "Teletuner," with casing removed.

Another new Cyldon "Teletuner" . . . Type TV.5.
Gives instant selection of any one of the five B.B.C.
Television channels.

Write for booklet TV.1953 giving full details.

SYDNEY S. BIRD
& SONS, LTD.

Contractors to Ministry of Supply, Post
Office, and other H.M. Government Depts

CAMBRIDGE ARTERIAL ROAD · ENFIELD · MIDDX. Enfield 2071-2

CIRCUIT DESCRIPTION

The signal input to the tuner may be made either at an impedance of 300 ohms balanced with respect to earth, or at 75 ohms unbalanced. The R.F. amplifier uses a double triode valve in a cascode circuit with neutralizing on the input triode, so enabling a low noise figure to be obtained. Provision is made for the use of A.G.C. on this valve.

The frequency changer uses a triode-pentode valve with inductive injection of local oscillator voltage. Bandpass coupling is used between the R.F. amplifier and mixer stages, giving good curve-shape characteristics which assist in the prevention of adjacent channel interference.

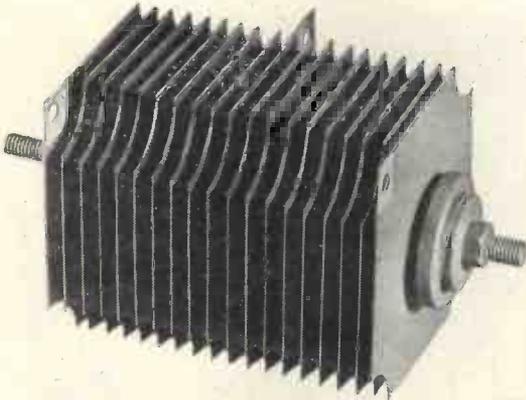
Fine adjustment of the local oscillator frequency is provided by a variable dielectric trimmer capacitor, the spindle of which is brought out concentrically with the main channel selector spindle.

Extensive shielding, both internal and external, is provided, together with bypassing of A.G.C., H.T. and heater feeds to reduce oscillator radiation.

Signals at intermediate frequency from the mixer anode may be fed to the I.F. amplifier at either high impedance or at 75 ohms, the coupling transformer being incorporated in the tuner chassis. The intermediate frequency is in the range 40.47 Mc/s.

Supplies required to the tuner are 220 volts H.T. 16 volts at .3 amps, the heaters being series connected, and an A.G.C. line with a standing voltage of -1.5 volts.

POSITIVELY the most EFFICIENT for H.T. SUPPLIES



Write in for further details.
A copy of "THE ALL
METAL WAY" can be ob-
tained by sending 6d. in stamps
to

Dept. W.W.8.

to radio and television receivers and without a doubt the most reliable. Constant development of Westinghouse rectifiers to produce units capable of meeting all demands in this particular field has resulted in a decrease in size while maintaining the same output. More recent designs have produced units to supersede those in current ranges of commercial and home constructed television receivers, and although physically they are of the same dimensions the current output has been considerably increased.

WESTINGHOUSE
WESTALITE

METAL RECTIFIERS

WESTINGHOUSE BRAKE & SIGNAL CO. LTD, 82 YORK WAY, KING'S CROSS, LONDON, N.1

Introducing - THE "RD JUNIOR" RADIO UNIT A HIGH FIDELITY, VARIABLE SELECTIVITY SUPERHET

Designed primarily for use with our own amplifiers, this unit may also be used satisfactorily with the majority of other high-quality amplifiers, in particular, models are available specially matched to work with the Leak Point 1 and QUAD amplifiers.

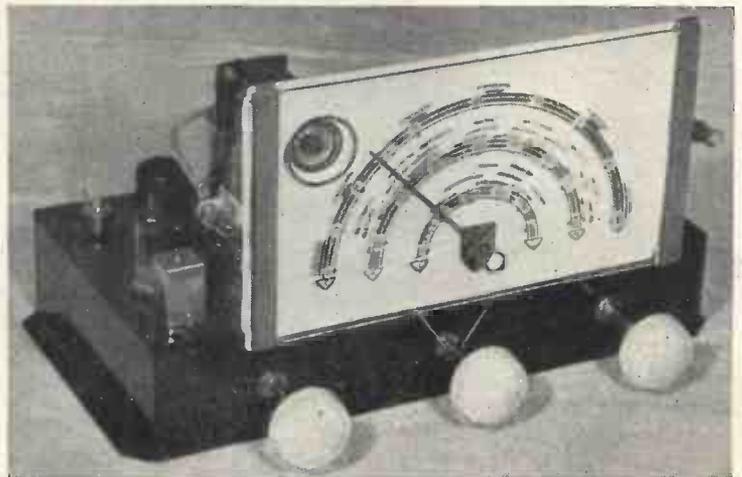
MAIN FEATURES.

- ★ Coverage: 16-50 m., 200-550 m., and 800-2,000 m.
- ★ Three degrees of Selectivity: 7, 15 and 23 kc/s.
- ★ Amplified A.V.C.
- ★ Low distortion N.F.B. detector.
- ★ "Magic Eye" tuning indicator.
- ★ Latest miniature BRIMAR valves throughout.
- ★ Power consumption: 300 v., 25 m/A., 6.3 v. 1.5 a.
- ★ 5½ in. x 9½ in. illuminated dial; flywheel drive system.

PRICE: Including suitable connecting lead, £18/7/6, plus Purchase Tax £6/8/7.

A detailed technical specification of this unit will gladly be forwarded post free on request. Available from leading dealers in London and the Provinces, or If in any difficulty please apply direct.

Trade and Export Enquiries invited.



ROGERS DEVELOPMENTS CO.

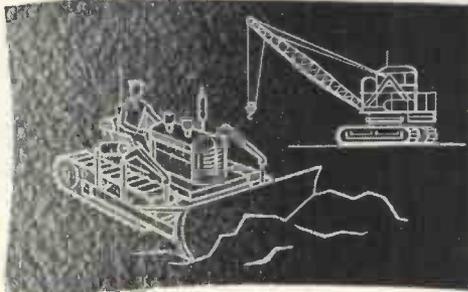
MANUFACTURERS OF PRECISION BUILT SOUND EQUIPMENT

"RODEVCO HOUSE", 116 BLACKHEATH ROAD, GREENWICH. S.E.10. TIDeway 1723

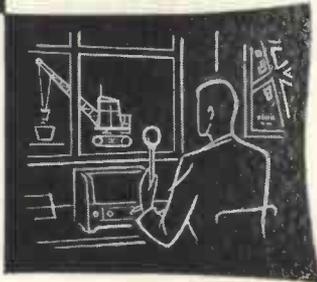


"REPORTER" PTC 116/117 MOBILE RADIO-TELEPHONE FOR ENGINEERING COMMUNICATIONS

Ranking high among the benefits derived from V.H.F. radio-telephone communication is the control of mobile vehicles and personnel. The Pye "Reporter" fulfils this function in admirable and versatile fashions.



A compact and economical equipment, it is designed to fit neatly under vehicle dashboards but is also available in transportable form. Reason enough that it should feature so prominently in over two-thirds of the V.H.F. schemes in the United Kingdom.

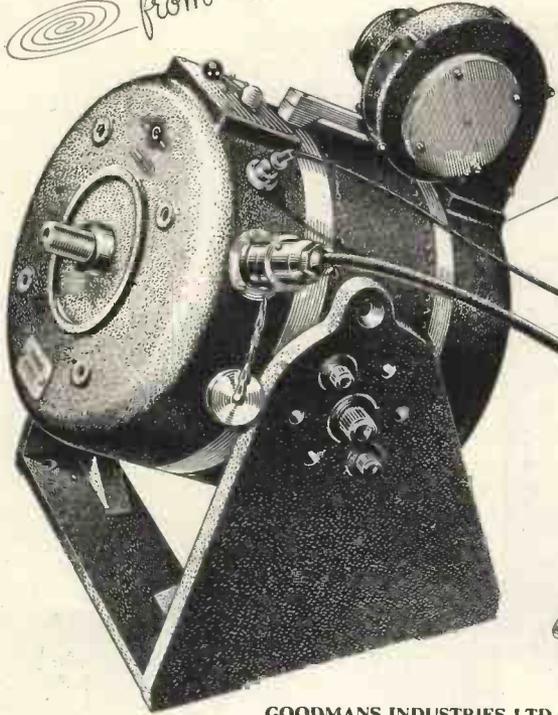


Telecommunications



from Hairspring torque testing

to guided Weapon Research



GOODMANS VIBRATION GENERATORS

play their vital part

Some typical applications

- FATIGUE TESTING
 - ELECTRICAL COMPONENT TESTING
 - VALVE MICROPHONY TESTING
 - TORSIONAL VIBRATION TESTING
 - FLEXURE TESTING OF PLASTICS, ETC.
 - MECHANICAL STRUCTURE TESTING
 - SPECIALISED GUIDED WEAPON RESEARCH
- or wherever ACCURATE CONTROL OF FREQUENCY AND AMPLITUDE is demanded



Illustrated are the Model 8/600 that develops a force of ± 300 lbs and the midget Model with a force output of approximately ± 2 lbs for optical-cell research and hairspring torque testing, etc.

GOODMANS INDUSTRIES LTD · AXIOM WORKS · WEMBLEY · MIDDX · Phone : Wembley 1200 (8 lines).

DEMONSTRATIONS DAILY

Between 9—5.30
Saturdays 9—1



A.D.S. SUPER QUALITY

8½ WATT AMPLIFIER

Push Pull 6V6s 15 db neg. feed back 25-18,000 cps ± 1/db. Hum Level—80 db at 6½ watts. Bass boost—Treble boost and cut : LP correction : Provision radio feeder unit. **BUILT AND TESTED 16 gns.**

The above Amplifier can now be supplied in kit form. **£13. 13. 0**
Complete with fully illustrated instruction book.

METAL COVERS
complete with carrying handle, can now be supplied at 17/6 each

SUPERHET FEEDER
Three wavebands—88A Valves
7 ks band width. Wired complete and tested.

10 GUINEAS FULLY GUARANTEED

(Dept. W.W.)
18 Tottenham Court Road,
LONDON, W.1
Museum 4539. Museum 2453

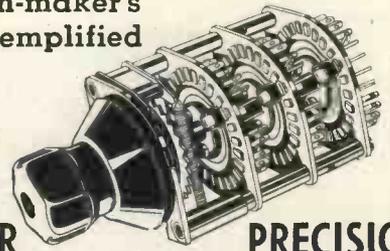
Shop Hours :
Monday to Friday 9-5.30 p.m.
Saturdays 1 p.m.



FOR A.C. MAINS ONLY

SWITCHMANSHIP!

A term in current vogue describing the switch-maker's art as exemplified by . . .



WINKLER PRECISION MULTI-WAY SWITCHES

The range of Winkler Precision Multi-way Switches fulfils the requirements of the instrument designer for a high grade component consistent with the quality demanded of present-day instruments and electronic equipment.

Now available with up to 30 contacts per wafer, 1 to 16 banks, 1 to 3 pole, ½ amp., 80 V.A. per contact.

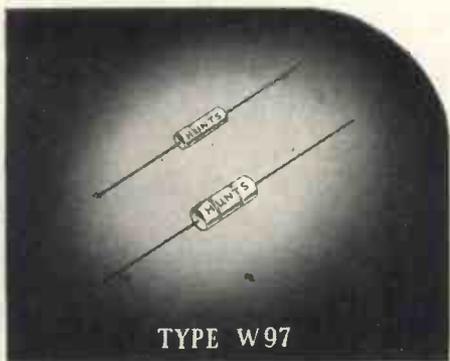
Write also for details of WINKLER KEY SWITCHES

G. A. STANLEY PALMER
A. R. Ae. S.

Maxwell House, Arundel Street, LONDON, W.C.2.

Phone : TEMple Bar 1610

REVOLUTIONARY
*in design—
and performance!*



TYPE W97

HUNTS "THERMETIC" MIDGET METALLISED PAPER CAPACITORS WITH A TRUE HERMETIC SEAL

TEMPERATURE RANGE: -100°C to +120°C
and to CATEGORY 'A', CLASS H.1

With the hitherto unattainable temperature range of -100°C. to +120°C., Hunts W.97 "Thermetic" midget metallised Paper Capacitors are to Category A (100°C.) Class H1 (84 days tropical exposure) and are the smallest capacitors for their rating to this, the most stringent test condition of the R.C.S.C. Specifications.

Construction is the well known Hunts "castellated" metallised paper with rugged end connections ensuring freedom from intermittent open circuit and open circuits at low voltage. The capacitor unit is sealed in a metal tube with Hunts "Thermetic" compound, which also ensures mechanical rigidity of the end wires thus avoiding any reliance on foil and wire contacts for mechanical strength.

W97 Capacitors are non-inductive and suitable for operation at frequencies up to and in excess of 200 mc/s.

They are impregnated with a new material which is absolutely stable over the specified temperature range, and the temperature/capacitance co-efficient is infinitely superior to other types of capacitors in this class.

This unique capacitor is designed to withstand very high rates of "g", its rugged construction enabling it to be used in equipment where such conditions are encountered.

W97 can be supplied with a transparent plastic sleeve where insulation of case is required.

TYPE W97 STANDARD RANGE

LIST NO.	CAP (μF.)	DIMENSIONS (inches)	
		L.	D.
200 volts D.C.			
150 volts D.C.			
BM7	0.002	0.610	0.135
BM8	0.004	0.610	0.135
BM11	0.004	0.500	0.180
BM19	0.005	0.610	0.135
BM12	0.005	0.500	0.180
BM10	0.01	0.610	0.135
BM13	0.01	0.500	0.180
BM14	0.02	0.610	0.180
BM15	0.03	0.610	0.260
BM16	0.04	0.610	0.260
400 volts D.C.			
300 volts D.C.			
BM4	0.0004	0.610	0.135
BM5	0.0005	0.610	0.135
BM6	0.001	0.610	0.135
BM17	0.001	0.500	0.180
BM18	0.002	0.500	0.180
BM19	0.003	0.500	0.180
BM20	0.005	0.610	0.180
BM21	0.01	0.610	0.260
600 volts D.C.			
450 volts D.C.			
BM22	2.5 pF.	0.500	0.180
BM23	4 pF.	0.500	0.180
BM24	10 pF.	0.500	0.180
BM25	50 pF.	0.500	0.180
BM1	0.0001	0.610	0.135
BM26	0.0001	0.500	0.180
BM2	0.0002	0.610	0.135
BM27	0.0002	0.500	0.180
BM28	0.00022	0.500	0.180
BM29	0.00025	0.500	0.180
BM3	0.0003	0.610	0.135
BM30	0.0003	0.500	0.180
BM36	0.0004	0.500	0.180
BM31	0.0005	0.500	0.180
BM32	0.001	0.500	0.180
BM33	0.002	0.610	0.260
BM34	0.003	0.610	0.260
BM35	0.004	0.610	0.260

A. H. Hunt (Capacitors) Ltd, Wandsworth S.W.18-BAT 1083

REGISTERED TRADE MARK

HUNTS

CAPACITORS

THE TRADE MARK OF RELIABILITY

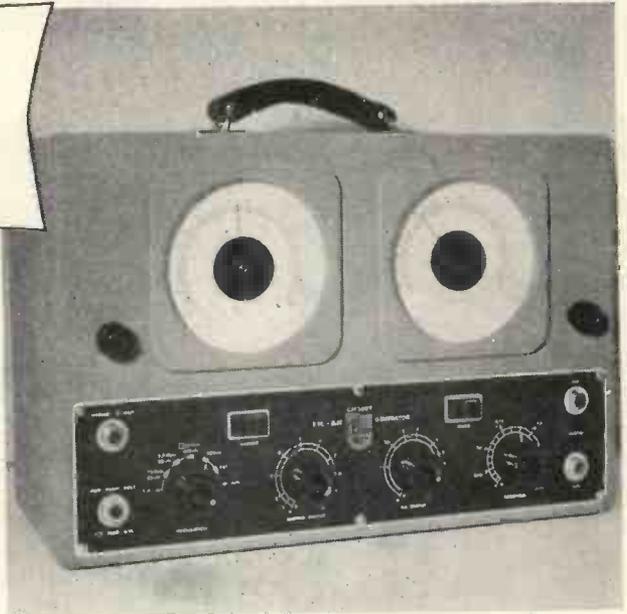
PHILIPS

present...

GM 2889 A.M. F.M. Signal Generator

Features:—

- 1 Frequency range 5-225 Mc/s in one band.
- 2 Marker oscillator 15-30 Mc/s.
- 3 A.M. Modulation int. 400 c/s ext. 0-10 Mc/s.
- 4 F.M. Modulation sweep 0-15 Mc/s.
- 5 Output impedance 75 and 300 ohms.



INDUSTRIAL X-RAY EQUIPMENT · ELECTRONIC APPARATUS
LAMPS AND LIGHTING EQUIPMENT · ARC AND RESISTANCE
WELDING PLANT AND ELECTRODES · MAGNETIC FILTERS
BATTERY CHARGERS AND RECTIFIERS · H.F. HEATING
GENERATORS · RADIO AND TELEVISION RECEIVERS



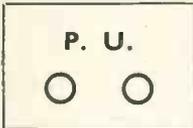
PHILIPS ELECTRICAL LTD.

INDUSTRIAL DEPARTMENT

CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2

(PI 410)

PUT IT HERE!



(The Pickup
socket on your
radio of course!)

DELIVERY FROM STOCK OF THE NEW

**PHILIPS
disc-jockey**

**3-speed record player for
ALL RECORDS—ALL SPEEDS**

- Featherweight pickup with twin sapphires.
- Beautifully finished ribbed grey portable case.
- Suitable for 50 c/s AC mains, 110-240 volts.

ON EASY TERMS

£3.13.8

WITH and £1 monthly
ORDER for 8 months.

CASH PRICE

£10.13.8

EASY PAYMENT ORDER BLANK

Date.....

To: Frith Radiocraft Ltd., Leicester.

Please supply "Philips DISC-JOCKEY" for which I enclose
£3.13.8 Deposit and agree to pay 8 further monthly payments of
£1 commencing on the first day of next month.

Signed (usual signature).....

Name in full (CAPITALS)

Address.....

State if householder If over 21 Occupation

FRITH RADIOCRAFT Ltd., Churchgate, LEICESTER

CUT OUT

W.W. AUG. 53

-towards perfection-



LOWTHER

MASTER CONTROL UNIT

See p. 301 last issue "Wireless World"

A.M.-F.M. PILOT TUNER

for experimental transmissions from
Wrotham (Kent)

Both are essential units for amateur
or professional user.

Full particulars upon request.

THE LOWTHER MANUFACTURING CO.

Lowther House, St. Mark's Road, Bromley,
Kent. RAV. 5225.

THE ELAC "DUOMAG" FOCALISER



THE SENSATIONAL NEW ELAC T/V COMPONENT

The DUOMAG focaliser gives precision beam focus and complete picture positioning with minimum effect on scan coils and ion trap assemblies. It is designed for use with magnetically focused tubes having 38 m/m diameter necks.

DUOMAG is a permanent magnet type unit using two concentrically mounted Sintered Oxide ring magnets arranged with opposed magnetic fields.

- Minimum stray magnetic field. Symmetrical, uniform and very low external field.
- Magnets of high electrical resistivity enable the unit to be placed in close proximity to high efficiency scan coils.
- All insulated construction—No risk of high voltage shock.
- Wide range picture shift.

RETAIL PRICES IN U.K.

Low Flux, 37/6 ; Med. Flux, 39/6 ; High Flux, 42/-.

*Leading the
field in TV
components*



ELECTRO ACOUSTIC INDUSTRIES LTD

STAMFORD WORKS. BROAD LANE. TOTTENHAM. N.15 TEL: STAMFORD HILL 5606-8

Redifon

AERIAL SPLITTERS

Redifon make five types of aerial splitters—or, to give them their more official name—Multi-coupling Units.

The MCU.1 works over 2 to 27 mc/s and splits one aerial input into eight separate cathode follower outputs; the MCU.2 splits two aerial inputs each into four outputs, and is intended for diversity working. The MCU.4 works over 95 kc/s to 27 mc/s, giving eight outputs from one aerial.

For broadcast reception the MCU.3 is used in ships, flats and other buildings, to feed up to 30 aerial points, and the A.133 for larger installations of up to 300 points. Both cover the short, medium and long wave bands.

Communications and radio engineers interested in problems of reception involving the use of more than one receiver on a single aerial, are invited to consult

REDIFON LIMITED, BROOMHILL ROAD, LONDON, S.W.18. Phone: VANdyke 7281

Designers and Manufacturers of Radio Communications and Industrial Electronic Equipment



CELSONIC

(REGD. TRADE MARK)

MAGNETIC TAPE RECORDERS

Used as a first class recorder for high fidelity work; also employed with 'CELSONIC' Synchroniser Unit for high quality synchronised sound with sub-standard film projectors. Standard full track; also half track to order.

- WIDE FREQUENCY RESPONSE
- FREEDOM FROM "WOW" AND FLUTTER
- 10in. DIAMETER FLYWHEEL
- SUPERIMPOSING
- NOISE SUPPRESSION
- TAPE CAPACITY: Standard 3250 ft. single sided spools and NAB 2400 ft. double sided spools.
- PORTABLE. WIDTH 14½in. DEPTH 17½in. HEIGHT 8½in.

For full details and nearest Agent please write to

EXCEL SOUND SERVICES LTD.
NORWOOD WORKS, NORWOOD AVE., SHIPLEY, YORKS.
Telephone: Shipley 51291



Our design and development department is available to help solve your Cabinet problem. The service can extend from the production of design sketches to the manufacture of complete Cabinets, which can vary in size from simple instrument cases to the most complicated consoles.

Write for further information to
TECHNICAL SALES OFFICE
299 NEW KING'S ROAD
LONDON, S.W.6 Tel.: RENown 1601

Manufacturers



ESTABLISHED 1898

HALLAM, SLEIGH & CHESTON LTD
WIDNEY WORKS, BIRMINGHAM 3

Phone: Aston Cross 0916 (4 lines) • Grams: SuperSec, Birmingham 4



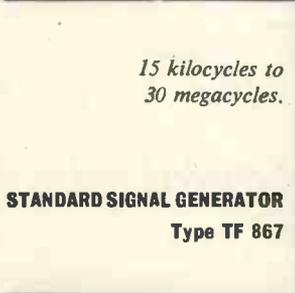
25 cycles to 5 megacycles.

VIDEO OSCILLATOR
Type TF 885A

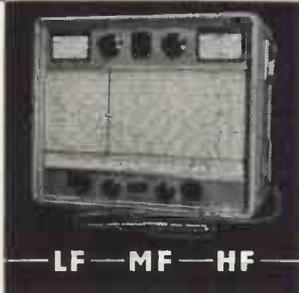


2.5 to 10 megacycles and 20 to 100 megacycles.

CARRIER DEVIATION METER
Type TF 934

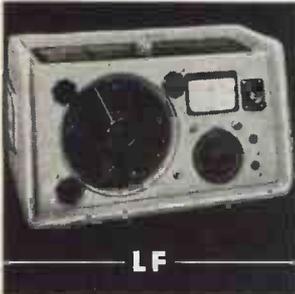
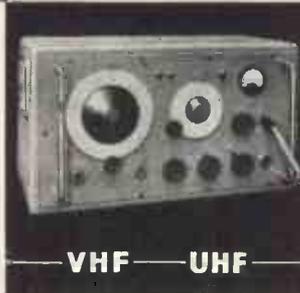


15 kilocycles to 30 megacycles.



300 to 600 megacycles or 200 to 400 megacycles or 450 to 900 megacycles.

SIGNAL GENERATOR
Type TF 762C (series)



1,000 cycles, Inductance and Capacitance; Resistance at D.C.

UNIVERSAL BRIDGE
Type TF 868

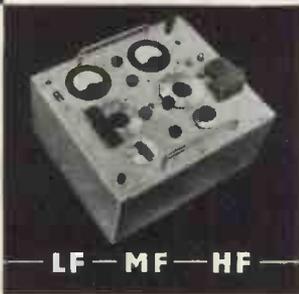


13.5 to 216 megacycles.

FM/AM SIGNAL GENERATOR
Type TF 995



50 kilocycles to 50 megacycles.



9,000 to 9,680 megacycles.

R.F. TEST SET
Type TF 890A



◀ Covering the whole radio spectrum ▶

A few examples of telecommunications test equipment, representative of the quality, reliability and precision workmanship of the wide range manufactured by

MARCONI INSTRUMENTS

SIGNAL GENERATORS • BRIDGES • VALVE VOLTMETERS • WAVE METERS
FREQUENCY STANDARDS • WAVE ANALYSERS • BEAT FREQUENCY OSCILLATORS

MARCONI INSTRUMENTS LTD., ST. ALBANS, HERTS. TELEPHONE: ST. ALBANS 6161/7

Midland Office: 19 The Parade, Leamington Spa.

Northern Office: 30 Albion Street, Kingston-upon-Hull

Export Office: Marconi House, Strand, London, W.C.2

with confidence, as only OKERIN Waxes are used.

Yours faithfully,

P.S.

J. Power Factor

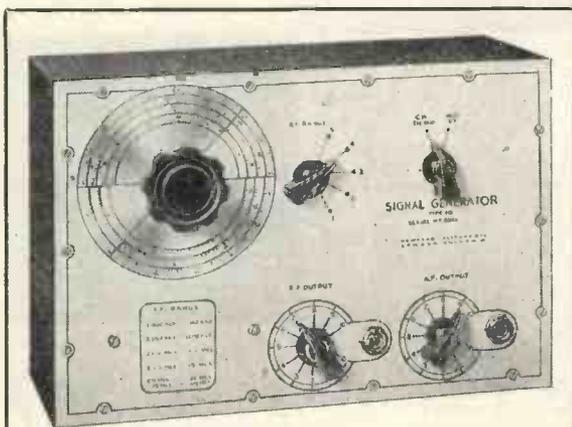
*Waxes are small in bulk but
bulk large in importance —
they must be just right for the
job and reliable. Specify OKERIN.*

Sales Department

ASTOR BOISSELIER & LAWRENCE LTD.

9, SAVOY STREET · STRAND · LONDON · W.C.2

Works and Laboratories · WEST DRAYTON · Middlesex



SIGNAL GENERATOR TYPE 10. 100 Kc/s-100 Mc/s
Price £7 . 10 . 0

The accuracy, reliability and comprehensive specification, are some of the reasons why the TYPE 10 has achieved such outstanding success.

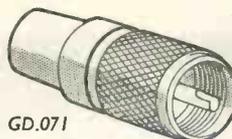
- 100 Kc/s to 100 Mc/s ● Modulated or unmodulated carrier ● Direct calibration ● Adjustable 400 c.p.s., AF signal ● Stable RF oscillator
- Large, easily read scale ● AC mains operation.

New instruments now available include the HOMELAB CHECKTEST price 37/6d. and a range of accurately calibrated variable condensers, 100pf, 500pf, and 1000pf, price 42/- each.

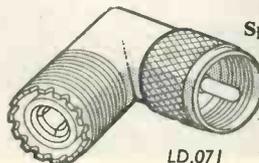
Obtainable only direct from the manufacturers. Send for full technical details or call at address below.

Overseas enquiries invited.

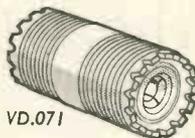
HOMELAB INSTRUMENTS LTD.,
615-617, HIGH ROAD, LEYTON, LONDON, E.10
Telephone : LEY 5651



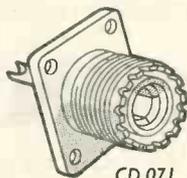
GD.071



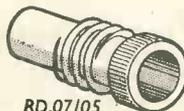
LD.071



VD.071



CD.071



RD.07/05

SCREENED CONNECTORS

for cables of 0.2" to 1.03" O.D.
Single and multi-way types.
Special types fitted with coupling rings.
Cable joining connectors.
U.S. Type Connectors
as illustrated.

CABLE O.D.	TYPE	CODE NO.
0.41"	Straight plug	GD.071
0.25"	Reducing adaptor	RD.07/05
0.2"	Reducing adaptor	RD.07/03
fits on GD.071, CD.071, VD.071	Elbow plug adaptor	LD.071
fits on GD.071, LD.071	Bulkhead (Junction) adaptor	VD.071
fits on GD.071, LD.071	Chassis receptacle	CD.071

Other Transradio specialised products:
CO-AX air-spaced articulated
Very Low Loss Cables.
Microdual Two-speed Precision Drives.

TRANSRADIO LTD

138A CROMWELL ROAD, LONDON, SW7,
ENGLAND Telephone: FREmantle 4421 (P.B.X.)

Fine wires in telecommunication & electronic equipment
need



the only vitalised pure rosin cored Solder

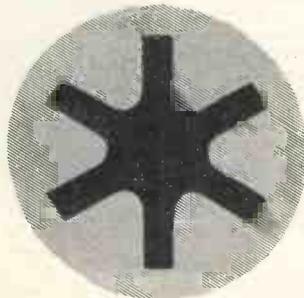
ACTOL is the only fast-working cored solder which is chlorine free. Its *pure rosin* flux is vitalised by an exclusive process to increase its wetting power without altering its chemical properties; it contains no additive. Furthermore, ACTOL has the unique Enthoven stellate core for rapid solder wall collapse and faultless fluxing. ACTOL leaves a hard, non-corrosive

residue of maximum insulation resistance.

A.I.D. approved. In all standard tin/lead alloys, 10-22 s.w.g.

Please send for a sample of ACTOL or ask one of our technical advisers to call.

Perfect joints in precision instruments and delicate components need ACTOL, the only vitalised pure rosin cored solder.



Developed and manufactured at the Enthoven Solder Factory

MARKETED BY ENTHOVEN SOLDERS LTD., 89 UPPER THAMES STREET, LONDON, E.C.4

Telephone: MANsion House 4533



Send for our fully illustrated Catalogue

THE HEART OF EVERY CIRCUIT

is to be found in its Transformer, which, like the human heart, must keep the lifeblood flowing evenly and constantly under both normal and abnormal conditions.

POTTED COMPOUND FILLED TRANSFORMERS AND CHOKES

manufactured by WODEN have been designed to fulfil such a purpose, and for this reason they have been standardized by many leading Radio, Television and Electronic manufacturers and also Government Research Departments. Their choice is only made after exhaustive tests for accuracy and reliability. To merit this confidence, there is a constant need to provide components of the highest quality and our ample research and testing facilities ensure continued progress in this direction.

WODEN TRANSFORMER CO. LTD.
MOXLEY ROAD · BILSTON · STAFFS.
 TELEPHONE: BILSTON · 41959

CORONATION OFFER!

★ *The coupon below will save you MONEY*

Let International Correspondence Schools perfect your knowledge of radio and T/V. To mark the Coronation, I.C.S. offer their Standard Home Study Courses at specially reduced fees, for a limited period only. These include :-

RADIO ENGINEERING · RADIO SERVICE ENGINEERING · RADAR, ELEMENTARY ELECTRONICS, ADVANCED SHORT WAVE RADIO · RADIO · T/V TECHNOLOGY and training for the following examinations—B.I.R.E. · P.M.G. CERTIFICATES FOR WIRELESS OPERATORS · C. & G. TELECOMMUNICATIONS · C. & G. RADIO SERVICING CERT. (R.T.E.B.) · C. & G. RADIO AMATEURS, etc., etc.

But ACT NOW—Don't miss this chance of obtaining an I.C.S. training at reduced fees. Fill in the coupon, stating the subject in which you are interested, and POST TODAY!

Dept. 223C, I.C.S., 71, Kingsway, W.C.2

★

INTERNATIONAL CORRESPONDENCE SCHOOLS
 Dept. 223C, International Bldgs., Kingsway, London, W.C.2.
 I am interested in your Coronation offer.
 Please send FREE Book on

Name Age

(BLOCK LETTERS, PLEASE)

Address

SINCE 1945 I.C.S. HAVE TRAINED 150,000 AMBITIOUS MEN



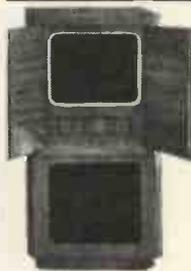
CONSOLES

For Major Film Mixer Suites to Individual requirements.

"VIEWMASTER" CONSOLES

AS SHOWN

Beautifully designed and finished in Walnut, Oak, Mahogany and Teak, to customers' requirements



Standard "VIEWMASTER" model as shown £13.0.0
 With Full Length Doors £14.0.0
 Universal Model for all 16" tubes now in preparation.
 Carriage and Packing 15/- extra.

Fitted with shelf for easy mounting. These are NOT mass produced and dimensions can be altered to suit personal requirements.

Individual and Trade Enquiries to

H. ASHDOWN

CABINET MAKER

98 HERTFORD ROAD, EDMONTON, N.9

Phone: TOT. 2621

Come to the Radio Centre

THE **RONETTE**

World Famous

B110 CRYSTAL REPORTER MICROPHONE For Amateur Radio and P.A. Communication Service



- Rugged construction.
- High grade finished ivory or black Polopas moulding.
- Effective output level 1.1 MV/μBAR at 1,000 c/s in 5 megohms.
- Frequency response 30-13,000 a/s.
- Output impedance 2,200 pfd.
- Semi directional characteristic.
- Vacuum sealed, precision ground crystal with annealed corrosion resistive aluminium diaphragm.
- Decreasing the load resistance to 220,000 v. decreases bass response and gives that "DX" quality wanted by amateurs.
- Supplied complete with shielded plug Fits any regular microphone stand.

Only 52/- List Price.

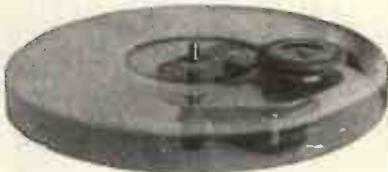
All Ronette microphones are fully guaranteed and a full range of types are available from stock.

RONETTE—The House of Aristocratic Microphones.

ALL B.S.R. GRAMOPHONE MOTORS

are first class, but we particularly recommend the Dual Speed Motor Unit Type M.C.10. A few left only!

- De Luxe 4-pole motor of advanced design assures low rumble and vibration factor.
- No stray field radiation noticeable with any type of pickup.
- Uniform turntable speed under widely varying record loads.



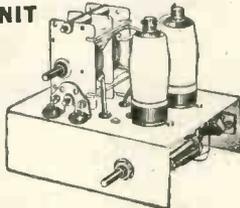
- Self-lubricating bearings—quiet running, long life, no oiling.
- Speed change 78 to 33 1/3 r.p.m. in a few seconds by merely reversing main drive pulley.
- Absolute minimum instantaneous speed variation (wow).

78/7 Cash

- 10in. dia. heavy pressed steel turntable fitting on precision ground taper steel spindle.
- Ideal for use with any type of magnetic or crystal pickup.

M.O.S. RF1 RADIO FEEDER UNIT

This tuning unit uses a "straight" TEF circuit tuning the Medium Wave Band only... If provided with its own power unit, it can be used with any amplifier. The unit is exceptionally sensitive; can be used in areas of only moderate signal strength. By use of a TRF circuit the bandpass is such that the output fed into an amplifier is of very high fidelity and full advantage can be taken of the transmitter quality. The unit is provided with only two controls—Tuning and Sensitivity—and consequently is very simple to operate. No tuning scale is provided as it is thought that the great majority of constructors will prefer to fit the unit into a cabinet and so be able to choose an assembly to suit the housing. Adequate spindle length is provided in all cases. In line with others in the "Easy-to-Build" series, kit is complete in every detail, and instruction manual fully detailed and illustrated.



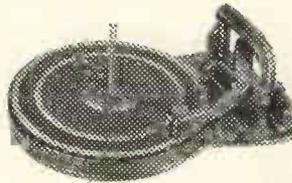
Complete Kit with Valve £2.12.6
Instruction Manual only 2.0
Ready assembled and wired £3.12.6

BURGOYNE COMBINED PREAMPLIFIER AND TONE CONTROL UNIT TYPE A7 only 70/-

For use with any amplifier and pick-up, this preamplifier employs two valves in a well designed circuit providing variable boost and cut between ±15-20 DB at 60 and 10,000 c/s respectively. Fitted also with a three-position SELECTOR indicating "Radio" "78" and "33 1/45." Fixed frequency compensation ensures the optimum results from all sources. Power supply can be taken from your amplifier and the unit is supplied complete ready for use as illustrated. IMPROVE YOUR RECORD REPRODUCTION for a small outlay of only 70/- . H.P. terms: Deposit 20/- and 12 monthly payments of 7/-.



THE BURGOYNE A6 TAPE RECORDER ONLY 32 gns complete with 12 months guarantee— is still the best value today in tape recorders, cash or easy payments.



£11 only

PLESSEY MULTI-SPEED AUTO-CHANGERS

Special offer this month only! Limited quantity 850 brand new units at £11 only List price £23/13/0. Or mounted on walnut playing desk £13/13/0.

The AMPLION All-Purpose TEST METER • HIGHEST QUALITY MOVING COIL METER MOVEMENT. • SELF-CONTAINED INTERNAL BATTERY. • 10 RANGES.

Who would have thought that all these features—and more—could be made available in a high grade all-purpose multi-range Test instrument for so small a cost? The outstanding sensitivity of this precision moving coil instrument makes it ideal for all who require a universal test meter for professional or amateur use. SENSITIVITY 1,800 ohms per volt on all D.C. and A.C. ranges.

- RANGES:
- 10 v., 100 v. and 500 volts D.C. and A.C.
 - 50 m/a. and 500 m/a. D.C.
 - Resistance up to 200,000 ohms (3,000 ohm centre scale) with self-contained battery.
 - 5,000 volts range with a separate H.T. test prod (9/6 extra).
 - Supplied with test prods.
 - Multicolour scale easily readable.

Limited Quantity Only
Price £5 or 20/- deposit and 12 monthly payments of 10/-. High grade leather case, if required, 15/- extra.

PULLIN MULTI-RANGE TEST SET Series 100

The universal testing set for Service Engineers. Sensitivity 10,000 ohms per volt. Strong metal case with carrying handle—complete with leads having detachable bulldog clips and test prods. Size 9in. by 5 1/4in. by 4in.

Ranges: A.C./D.C. Volts: 10, 25, 100, 250, 500, 1000. D.C. Milliamps: 2.5, 10, 25, 100, 500. A.C./D.C. Microamps: 100 Microamps 10 volt range. Resistance ranges: 0/1 Meg. (13,500 ohms mid-scale), 0/10,000 (335 ohms mid-scale). £11.11.0 Cash or 40/- deposit and 12 monthly payments of 20/-

★ **M.O.S. SURPLUS SALE**
Have you visited us yet to inspect our sale offers of electronic equipment? If you have been once, come again we have a new display.

MAIL ORDER



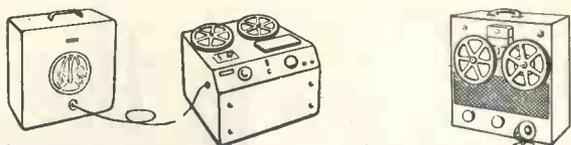
SUPPLY COMPANY

The Radio Centre

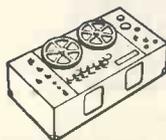
33 Tottenham Court Road · London · W.1. Telephone: MUSEum 6667



This plastic backed, strong and reliable tape offers high fidelity reproduction over a wide range of playing speeds and recording conditions. Medium coercivity gives a high signal output with an extended high frequency response, while



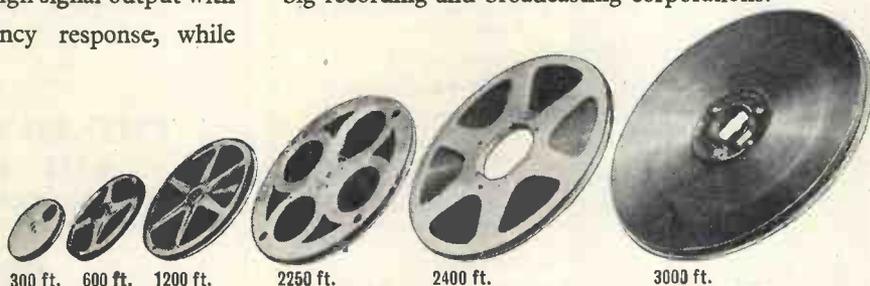
TO FIT ALL MAKES OF TAPE RECORDER



retaining ease of erasure. Signal/noise ratio is high; transfer and distortion negligible.

'Scotch Boy' is used by the B.B.C. and most other big recording and broadcasting corporations.

'Scotch Boy' is now available in 6 reel sizes

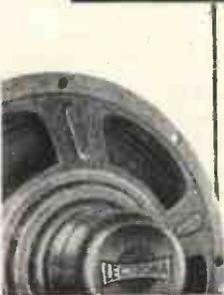


Write for further particulars: MINNESOTA MINING & MANUFACTURING CO. LTD, 167 STRAND, LONDON W.C.2 TEMple Bar 6363 ANOTHER 3M COMPANY PRODUCT

*** RADIO COMPONENTS**

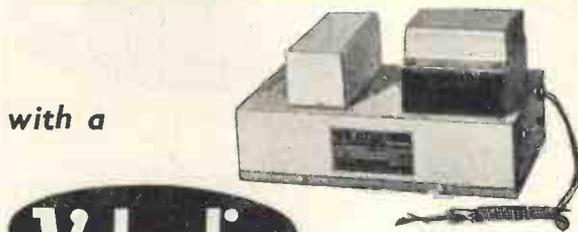


*** Loudspeakers, Condensers, I.F. Transformers, Vibrators, Wavechange Switches, Electrical wires, etc. Export agents for many well-known British Radio Components. Write for Literature and Prices to:**



*** EDSTONE (ELECTRICAL) LIMITED**
15, Buckingham Palace Gardens, LONDON, S.W 1, England.
Cable Address: Edsalorg, London.

ALL the AC. power you require from your DC. supply



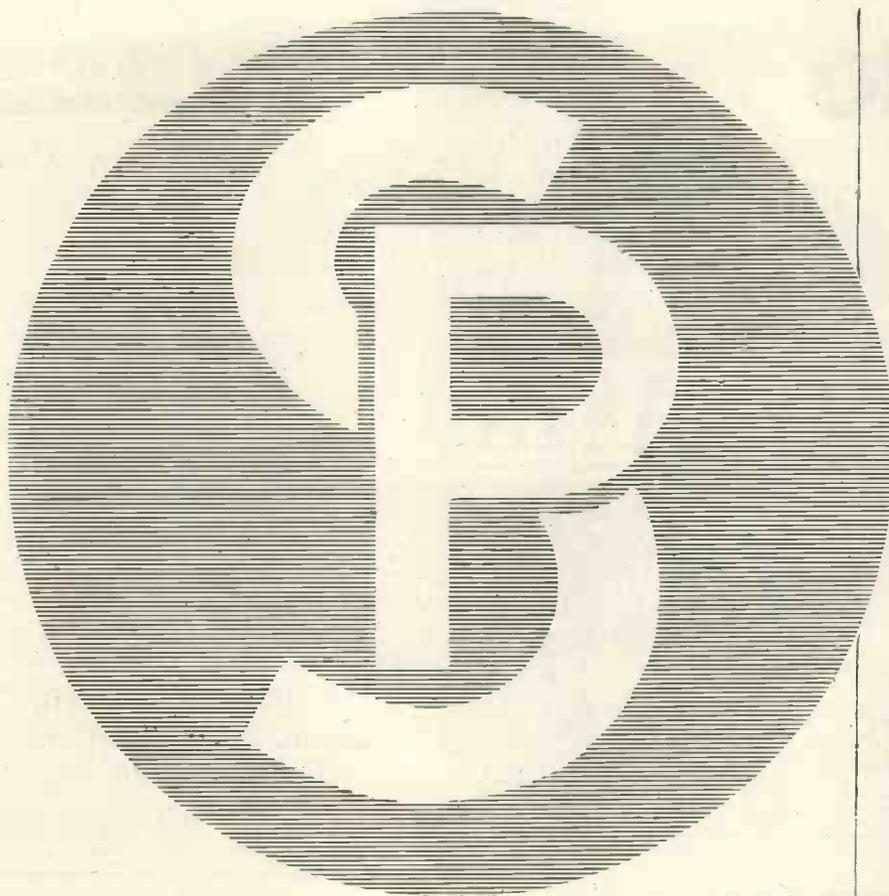
with a



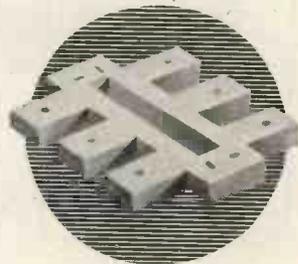
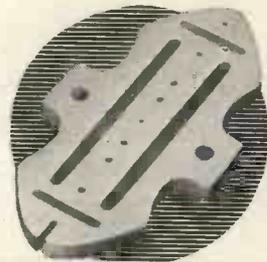
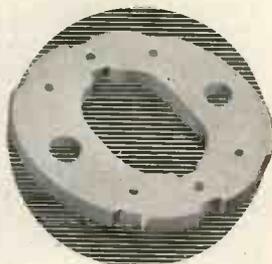
D.C./A.C. CONVERTER

- Models for Electric Gramophones from £8 16 0
Models for
- Radiograms and Autochange Radiograms (inc. 3-speed motors)
 - Radios, Televisions, etc. from £11 16 6
 - Tape Recorders, Dictating Machines, etc. Input, 6, 12, 24, 32, 50, 110 or 200/250V. D.C. Output 230V. 50 or 60 c/s.

Descriptive literature W.W.31 from the manufacturers:
VALRADIO LIMITED
NEW CHAPEL RD., HIGH ST., FELTHAM, MIDD. Tel.: FELtham 4242
Service Dept.: 57 Fortess Rd., London, N.W.5. Tel.: GULLiver 5165 & 7202
Scottish Depot: 257 Gorbals Street, Glasgow, C.5. Tel.: South 1326
Overseas enquiries to nearest E.M.I. Organisation Depot.



**for
radio
ceramics**



STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn, Worcestershire. Tel: Stourport 111. Telegrams: Steatoin, Stourport



SP87

RADIO

TUBES



900 types
of Receiving and
Transmitting Radio
Tubes available ex stock.

HALL ELECTRIC LTD
Haltron House, 49-55 Lisson Grove,
London, N.W.1.

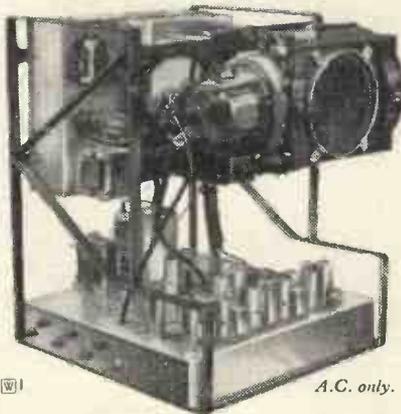
Tel.: Ambassador 1041 (5 lines) Cables: Hallelectric, London

For your OWN-STYLED Cabinet!

'TELEMAX' (4ft. x 3ft.)
PICTURE

PROJECTION
TELEVISION

CHASSIS



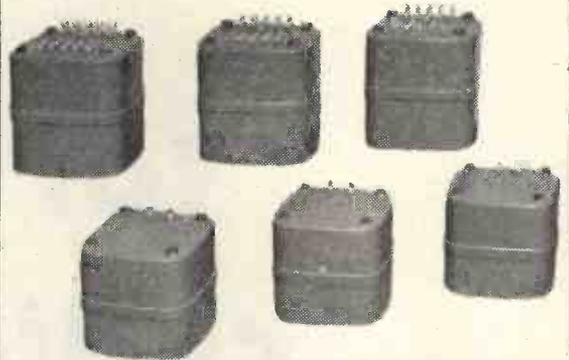
A.C. only.

- ★ 23-valve s/fh. circuit.
- ★ Sensitivity better than 50 microvolts.
- ★ Full band-width.
- ★ 5-channel facility.
- ★ Complete with valves, c.r.t. and optical unit.
- ★ Ready for fitting.
- ★ Chassis size approx. 19" x 17" x 15".

★ Detailed Specification from the Manufacturers :

TELEMECHANICS LTD

3 NEWMAN YARD, NEWMAN ST., LONDON, W.1 LAngham 7965



Hermetically sealed, oil filled, transformers and chokes utilising the higher efficiency of the 'C' core.

Manufactured to the most stringent specifications and incorporating up-to-the-minute technique in design and construction.

Just a further series in the service we offer to meet your particular needs.

WILLEDEN TRANSFORMER CO. LTD.

2a, FRITHVILLE GARDENS,
SHEPHERDS BUSH, LONDON, W.12.

Tel.: SHEpherds Bush 5819.

a new
**INDEPENDENT SIDEBAND
 RECEIVER**

**... developed to British Post Office
 Specification**

THIS new Independent Sideband Receiver type GFR 552 is designed for operation on long-distance, point-to-point, short-wave radio links forming part of the international trunk network. On independent sideband working, the GFR 552 provides facilities for the reception of two single sideband signals, each 6 kc/s wide, one above and one below the frequency of a reduced-level pilot carrier. Each sideband will accommodate either two 3 kc/s wide telephony channels, or several voice frequency telegraph channels. The GFR 552 may also be used for reception of single sideband or double sideband transmission. In the case of the second application this receiver offers two advantages: firstly, the absence of non-linear distortion which occurs in normal d.s.b. receivers when signals are subjected to selective fading conditions; and, secondly, the ability to select upper or lower sideband for demodulation, dependent upon which is freer from adjacent channel interference. The circuit and chassis layout of the GFR 552 closely follows that of the Mullard Receiver GFR 551, which was based on a British Post Office design (Receiver, Radio No. 22).

Special features of the GFR 552 include a high order of oscillator stability and freedom from cross-modulation through which cross-talk between channels or inter-modulation between wanted and unwanted signals might occur. A brief technical summary is given below. More detailed information supplied on request.

FREQUENCY RANGE—4-30 Mc/s.

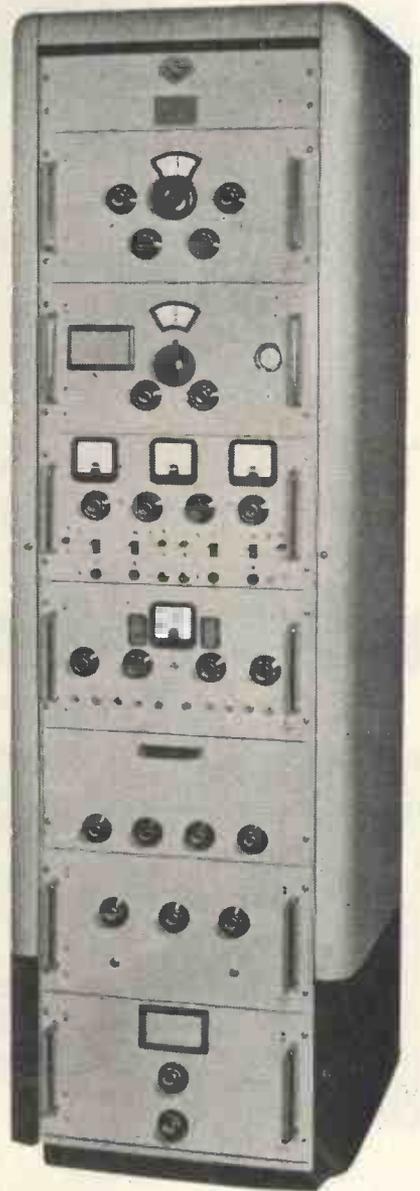
NOISE FACTOR—better than 7 dB over the band.

SIGNAL TO NOISE RATIO—25 dB for 4 microvolts peak sideband input over the band.

SELECTIVITY—The response is flat within 2 dB for sideband frequencies between 100 c/s and 6000 c/s. At 10 kc/s from the carrier frequency the response is -60 dB relative to the pass band.
A.F.C.—The a.f.c. system operates effectively with a pilot carrier level of -26 dB relative to 1 microvolt (which corresponds to a peak sideband level of 1 microvolt and a signal to noise ratio of 15 dB).

NON-LINEAR DISTORTION—Third order intermodulation products which might result in cross talk between sidebands do not exceed -50 dB relative to the sideband levels.

OUTPUT—Variable up to +14 dB relative to 1 mW into 600 ohms.

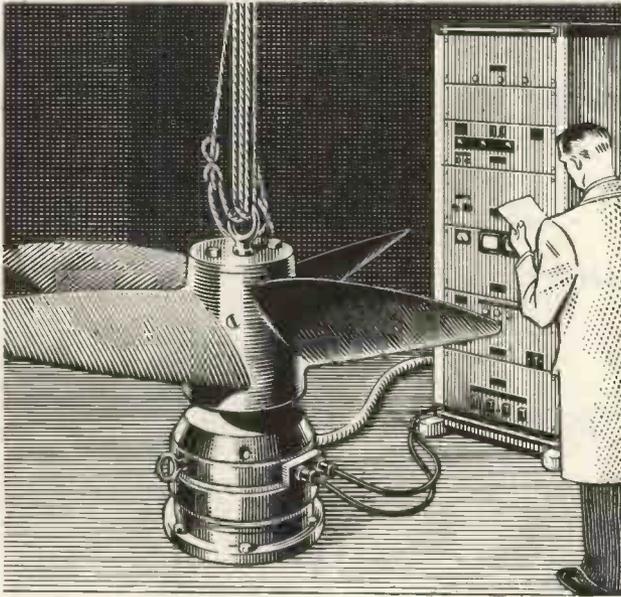


Mullard



SPECIALISED ELECTRONIC EQUIPMENT

Resonance—the key to vibration analysis



Electronic means are available by which the vibration characteristics of a propeller—be it for a ship or for an aircraft—can be analysed accurately, enabling the designer to ensure a safe component without excessive weight or unforeseen resonances. The technique has been established in the course of experience over many years.

The de Havilland Propeller Company has evolved not only technique but also equipment, and both are available to designers in the many industries that need precise knowledge of vibratory strains to be certain of engineering success.

DE HAVILLAND PROPELLERS LIMITED

Electronics Division, Hatfield, Hertfordshire

S. G. Brown

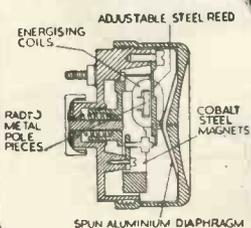
"A"
TYPE
HEADPHONES

The first choice of
RADIO OPERATORS
throughout the world

These headphones feature a High Permeability Reed tuned to 1,000 c/s. and coupled to a conical aluminium diaphragm. Earpieces individually adjustable while in use for sensitivity and power-handling characteristic.

D.C. Resistance : 4,000 ohms.
Impedance : 16,000 ohms at 1,000 c/s.

The S. G. Brown range of headphones covers types for many specific requirements. Details of the full range are available in the illustrated Brochure "W."—Sent on Request.



S. G. Brown Ltd.

SHAKESPEARE ST., WATFORD, HERTS.
Telephone: Watford 7241.

THE GOLDRING MAGNA CARTRIDGE



- A magnetic Turnover Cartridge with high output and cantilever styli.
- Entirely new principle. (Pat. applied for.)
- Output comparable to crystal pickups.
- Cantilever styli give minimum record wear and eliminate needle-talk.
- Styli easily replaceable.
- Smooth extended frequency response on both standard and L-P. records.
- The ideal replacement Cartridge for 3-speed record changers and units.

Of special interest to the designer of new equipment.

Write for full technical information to:—

ERWIN SCHARF

49-51a, DE BEAUVOIR ROAD N.I

Telephone: CLissold 3434-5-6

5 **SOUND**
REASONS
FOR CHOOSING
THIS BRITISH MADE
TWIN TRACK
Soundmirror
TAPE RECORDER

- 1 Twin track and choice of speeds 7½" per sec. or 3½" per sec.
- 2 Single Lever control for RECORD, PLAYBACK FAST FORWARD FAST REVERSE and STOP.
- 3 Headphones can be used for monitoring.
- 4 Output can be fed into amplifier, radiogram or film projector amplifier when required for use in public halls or theatre.
- 5 British Made throughout.



This latest Soundmirror Magnetic Tape Recorder, with its twin track and other requirements, is now available for early delivery.

Book your order now, or write to the address below for free demonstration anywhere in the British Isles.

THE
Soundmirror
 MAGNETIC TAPE RECORDER

The Soundmirror as illustrated here, in handsome polished cabinet, is priced at . . . **£69.10.0**

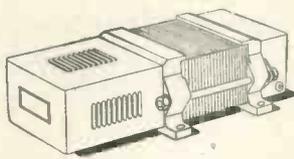


A portable model is also available at . . . **£74.10.0**
 Where desired, arrangements can be made for the purchase of either model to be spread over twelve or eighteen months.

THERMIONIC PRODUCTS LIMITED
leaders in the field of magnetic recording

AND
BRUSH CRYSTAL COMPANY LIMITED
HYTHE • SOUTHAMPTON • ENGLAND
 Telephone: Hythe, Southampton 3265/9
 Cables: Technico, Hythe, Southampton

constant light source voltage



Can now be supplied with multiple secondary windings to provide stabilisation on a number of outputs. A specification of your requirements may enable us to provide you with CONSTANT VOLTAGE throughout your equipment.

Constantly reliable readings or indications of any photometric device require a *constant* light source, which, in turn, demands *constant* voltage. Advance Constant Voltage Transformers keep the mains supply voltage steady to within $\pm 1\%$ with input variations of up to $\pm 15\%$. Full details in Folder S.15/W available on request.

Advance

ADVANCE COMPONENTS LTD. . BACK ROAD . SHERNHALL STREET . WALTHAMSTOW . LONDON . E.17
 Telephone : LARKSwood 4366/7/8 . Telegrams : Attenuate, Walt, London.

HIVAC INDICATOR LAMPS

Neon
INDICATOR LAMPS



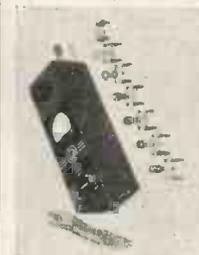
Build Your Own Tape Recorder

ALL PARTS PRECISION ENGINEERED

SEND S.A.E. FOR SPECIAL PARTS LIST

LINCOLN SPOOL ADAPTORS	each	s. d.
5	5	9
LINCOLN OSCILLATOR COILS, completely enclosed in Neosid Former, 45 Kc/s	each	12 6
LINCOLN OSCILLATOR UNIT, complete with 6BW6 valve	each	50 0

ALL COMPONENT PARTS FOR WEARITE TAPE AMPLIFIER IN STOCK



"G-MAX"
MODEL G.D.O.I.A.
GRID DIP
OSCILLATOR

is an ideal instrument for the determination of tuned circuit resonant frequency, tuning transmitters without application of power, for the determination of coil, mutual and stray inductances and both fixed and stray capacitances. Covers 1.5 to 300 Mc/s in

"G-MAX"
CHASSIS
CUTTERS

	each
$\frac{1}{2}$ " or $\frac{3}{4}$ "	11/6
$\frac{7}{8}$ "	12/6
$1\frac{1}{4}$ " or $1\frac{1}{2}$ "	14/9
$1\frac{3}{4}$ " or $1\frac{1}{2}$ "	16/6
$1\frac{1}{2}$ "	18/6
$2\frac{1}{8}$ "	30/-
$2\frac{1}{4}$ "	35/-
1" square	23/-
Keys, small, 10d., medium, 1/3, large, 1/9.	

eight ranges. PRICE : 12 Gns. Complete.

OUR NEW CATALOGUE IS AVAILABLE, 6d., POST FREE.

BERRY'S

(SHORT WAVE) LTD.

25 HIGH HOLBORN, LONDON, W.C.1
 TEL. · HOLBORN 6231

**WIDE RANGE
CAPACITANCE
BRIDGE**



For the accurate measurement of *in situ* capacitance or resistance, all measurements being made in the form of a three terminal network.

Capacitance range — 0.002 pF to 100 μ F in 18 ranges.

Resistance range — 1 Ω to 10,000 M Ω in 18 ranges.

Ranges increase in alternate decimal multiples of 3 and 10.

Frequency 1592 c/s ($\omega = 10,000$).

Accuracy $\pm 1.0\%$ of full scale on all ranges.

Full technical details are available on request.

CINEMA-TELEVISION LIMITED

A Company within the J. Arthur Rank Organisation

WORSLEY BRIDGE ROAD · LONDON · SE26

Telephone Hither Green 4600

SALES AND
SERVICING AGENTS

F. C. Robinson & Partners Ltd.,
287 Deansgate, Manchester, 3

Hawnt & Co., Ltd.,
89 Moor St. Birmingham, 4

Atkins, Robertson & Whiteford Ltd.,
100 Torrisdale Street, Glasgow, S.2.

MAINS TRANSFORMERS

FULLY INTERLEAVED

SCREENED AND IMPREGNATED. ALL GUARANTEED. ALL PRIMARIES ARE 200/250 v. Half Shrouded.

HSM63 (Midget). Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. at 22 amps.	16/3
HS63. Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. at 2 amps.	16/6
HS40. Windings as above. 4 v. at 4 amps., 4 v. at 2 amps. Output	16/6
HS2. 250-0-250 v. 80 m/a.	19/-
HS3. 350-0-350 v. 80 m/a., 19/-.	19/-
HS2X. 250-0-250 v. 100 m/a., 21/-.	21/-
HS30X. 300-0-300 v. 100 m/a., 21/-.	21/-
HS3X. 350-0-350 v. 100 m/a.	21/-

Fully Shrouded.

FSM63 (Midget). Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. 2 amps. Output	16/9
FS2. 250-0-250 v. 80 m/a.	21/-
FS30. 300-0-300 v. 80 m/a., 21/-.	21/-
FS2X. 250-0-250 v. 100 m/a., 23/-.	23/-
FS30X. 300-0-300 v. 100 m/a., 23/-.	23/-
FS3X. 350-0-350 v. 100 m/a.	23/-
All the above have 6.3 4-0 v. at 4 amps., 5-4-0 v. at 2 amps.	
FS43. Output 425-0-425 v. 200 m/a., 6.3 v. 4 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded	47/6
FS50. Output 450-0-450 v. 250 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded	67/6
F30X. Output 300-0-300 v. 80 m/a., 6.3 v. 7 amps., 5 v. 2 amps. Framed. Flying leads	29/-
F35X. Output 350-0-350 v. 250 m/a., 6.3 v. 6 amps., 4 v. 8 amps., 4 v. 3 amps., 0-2-6.3 v. 2 amps. Fully shrouded	65/-
FS160X. Output 350-0-350 v. 160 m/a., 6.3 v. 6 amps., 6.3 v. 3 amps., 5 v. 3 amps. Fully shrouded	44/-
FS43X. Output 425-0-425 v. 250 m/a., 6.3 v. 6 amps., 6.3 v. 6 amps., 5 v. 3 amps. Fully shrouded	63/6
HS6. Output 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. For receiver R1355. Half shrouded	26/6
HS150. Output 350-0-350 v. 150 m/a., 6.3 v. 3 amps., C.T. 5 v. 3 amps. Half shrouded	27/9
F36. Output 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. Fully shrouded	29/6
FS120. Output 350-0-350 v. 120 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 2 amps., C.T. 5 v. 3 amps. Fully shrouded	29/9
FS256. Output 250-0-250 v. 80 m/a., 6.3 v. at 6 amps., 5 v. at 3 amps. Fully shrouded	28/6
PR1/1. Output 230 v. at 30 m/a., 6.3 v. at 1.5/2 amps.	21/-
FS150. 350-0-350 v. 150 m/a., 6.3 v. 4 amps., 5 v. 3 amps.	31/6
FS150X. Output 350-0-350 v. at 150 m/a., 6.3 v. at 2 amps., C.T. 6.3 v. at 2 amps., C.T. 5 v. at 3 amps. Fully shrouded	31/6
The above have inputs of 200/250 v.	

OUTPUT TRANSFORMERS

MOPI. Ratios, 26, 46, 56, 66, 90, 120-1 50 m/a. max. current. C.T. for Q.P.P. Class B, etc. Secondary 2/4 ohms. Top panel and clamped, each	5/6
OP10. 10/15 watts output. 20 ratios on Full and Half Primary	17/9
OP30. 30 watts output. 20 ratios on Full and Half Primary	25/9
Williamson's O.P. Transformer to Author's specification...	£4/4/-
Chokes for Williamson's Amplifier. 30 H. at 20 m/a.	16/6
10 H. at 150 m/a.	32/-

FOR FAULTY C.R. TUBES.

Special very low capacity secondary winding Transformer for Heater of Cathode shorts, restores picture after above failure.

Standard Types. 2 v., 4 v., 6.3 v. at 2 amps. Primary 200/250 v., each	29/6
10.8 v. at 0.3 amps. for G.E.C. tubes. Primary 200/250 v., each	29/6
Any other voltages quoted for, but please state current as well as voltage.	
E.H.T. Unit. 2,500 v. at 5 m/a., 2-0-2 v. at 1.1 amp., 2-0-2 v. at 1.1 amp.	35/6

Quotations, etc.—stamped addressed envelope, please.

C.W.O. (add 1/6 in £ for carriage).

Trade and also export enquiries invited.

H. ASHWORTH (Dept. WW),
676, Gt. Horton Road, Bradford, Yorks.

LEWIS RADIO COMPANY

for

COMPONENTS Send for FREE comprehensive 40pp catalogue.

AMPLIFIERS Send for details of 5 or 4½ Watt models.

CHASSIS Illustrated leaflet on our radiogram chassis available FREE.

TAPE RECORDERS Send for details of our latest model.

T/V KITS & CHASSIS Send for OUR Viewmaster and Telcking Price List.

CABINETS

Pictured here is our latest T/V cabinet at **£15. 10. 10**



Full details of our range which includes Table, T/V, Radiogram and Loud-speaker cabinets are available on request.

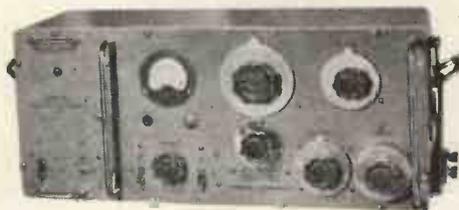
Comprehensive cabinet catalogue available FREE. Cabinets made to individual specification.

120 Green Lanes, Palmers Green, London, N.13

BOWes Park 6064

HIGH GRADE LABORATORY EQUIPMENT

REBUILT AND GUARANTEED AS NEW



SIGNAL GENERATOR TYPE 390G

WE HAVE A COMPREHENSIVE RANGE OF ELECTRONIC EQUIPMENT BY WELL KNOWN MAKERS, INCLUDING ULTRA HIGH FREQUENCY RECEIVERS WITH FREQUENCY RANGES UP TO 6,000 Mc/s. A SMALL SELECTION OF OTHER EQUIPMENT IS SHOWN BELOW:—

- "Q" Meter type TF. 329G.
- Transmitter Output Meters
- 3-10W Max. 100/200 Mc/s F.M. Signal Generators by Boonton.
- Furzehill Oscilloscope type Sullivan Precision Beat Frequency Oscillators.
- 1684D.
- Microwave Receivers, Frequency ranges from 150-3,000 Mc/s.

For further particulars of these and other high-grade electronic instruments, write to:—

HATFIELD INSTRUMENTS LTD.

175 UXBRIDGE ROAD, HANWELL, LONDON, W.7

Telephone: EALING 0779/9857

Wings Day Give for those who Gave
 SEPT 19

Bring your friends and your records



Do not miss this wonderful opportunity to listen to your records as they should be heard—of seeing, hearing and choosing under expert guidance from Goodman's range of Axiom High Fidelity and Audiom Good Quality Commercial Loudspeakers. To avoid disappointment, apply in writing as below, or come straight to our stand and book your seat.

TO

Goodmans

**RADIO SHOW
 DEMONSTRATIONS
 EARLS COURT Sept. 1-12
 STAND No. 37**

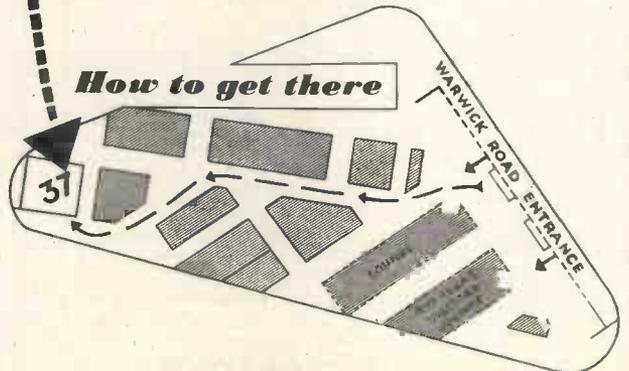
STOP PRESS! Purchase Tax removed from 12-inch speakers.

A P P L I C A T I O N S

are invited for invitations to our demonstration: which will take place at the following times: A.M.:— 11.30, 12.15. P.M.:— 2.00, 2.45, 3.30, 4.15, 6.00, 6.45, 7.30 and 9.30. Please state day and time you wish to attend.

Make sure of your seat by booking NOW!

How to get there



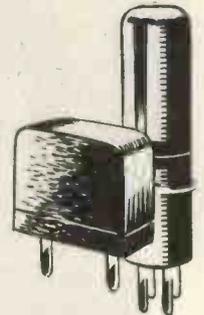


From take-off to touch-down, the safety of the aircraft is dependent on trouble-free radio contact being maintained. The components used in the radio equipment must be the best obtainable.

For reliable communications under all conditions, use G.E.C. Quartz Crystal Units.

Write to-day for list Q.C. 5012(R)

SALFORD ELECTRICAL INSTRUMENTS LTD
A Subsidiary of THE GENERAL ELECTRIC CO. LTD. OF ENGLAND
PEEL WORKS · SILK STREET · SALFORD 3 · LANCs.



"MAGNUM OPUS"

If you should have any doubts just what our "HOME CONSTRUCTOR'S HANDBOOK" can mean to YOU then read what one delighted owner writes:—

"... after careful perusal, amongst many others, I feel sure your Handbook is truly the 'magnum opus' for the Home Constructor. The mode of presentation of data, details, and circuits has been rendered without the usual forms of embellishment, and I still find humour in the penultimate paragraph of the Introduction. Since I want a 'Rolls-Royce' I have decided upon the 10 Watt Quality Amplifier and RL 40 Feeder, using the Goodmans 12in. speaker. This conclusion has been reached after receipt of many brochures, catalogues, etc., from many sources, famous and not so famous and I shall certainly find pleasure in recommending your service to my friends." C.R.W., B'ham 31.

You, too, will feel like this satisfied Client when you receive your copy! This book contains ALL of the following time-proved outfits YOU can build under our "Easy-as-A.B.C." construction system: ● 3V 3 Band FEEDER ● 4V 3 Band FEEDER "Norm/HiFi/Gram" ● 5V 3 Band SUPERHET AC ● 5V 3 Band SUPERHET AC/DC ● 6V 3 Band SUPERHET AC ● 6V 3 Band SUPERHET AC/DC ● 3V 2 Band "Local Station" HiFi FEEDER ● FEEDER AMPLIFIER/POWER PACK ● MAGIC EYE UNIT ● SIGNAL TRACER ● 5 Watt AMPLIFIER ● 10 watt AMPLIFIER ● SIGNAL GENERATOR, etc., etc., etc.

Apart from DETAILS for construction there are LARGE blue-print circuits, COMPLETE parts lists and TECHNICAL DESCRIPTIONS, of these famous circuits, also Set Building Hints, Servicing Hints, Facts and Formulae, Resistance Colour Code, Symbols, Data, etc., etc. AND our current Catalogue, ALL FOR HALF-A-CROWN!!

Printed on glossy art paper this famous publication contains many advances over previous issues; is profusely illustrated throughout its 46 pages and should definitely be in every radio man's Den. DON'T DELAY, SEND FOR YOUR COPY TO-DAY! Over 55,000 copies sold!

* The original of this entirely unsolicited testimonial may be seen at our offices.

obtainable only from:

RODING LABORATORIES
(Dept W8), BOURNEMOUTH AIRPORT, HANTS.

M. R. SUPPLIES, LTD.

We now have in stock for immediate delivery the answer to many POWERING and CONTROL problems:—

Exceptional offers of brand new

F.H.P. MOTORS, GEARED MOTORS and GEAR BOXES

REDUCTION GEAR BOXES. Ratio 3/1. Transmission up to 1/2 h.p., housing 7 1/2 in. x 6 in., £7/6. Also same ratio, trans. up to 1/2 h.p., 75/- (despatch either 2/6). Ratio 150/1, trans. up to 1/8th h.p., housing 5 1/2 in. x 5 1/2 in., 49/6 (des. 2/6). Ratio 300/1 trans. up to 1/10th h.p., housing approx. 3in. cube, 45/- (des. 1/6). Also Variable Gear Boxes, 1-0-4-1, infinitely variable from 1.5/1 to 4/1 with reversing action, trans. up to 1/30th h.p., precision made, housing 7 in. x 4 in. x 4 in., 83/- (des. 2/6). Various other models available—further details, with sketch, on request, but quantities limited.

REDUCTION GEAR MOTORS. Universal A.C./D.C. 220/240 v. Reversible and capable of speed control by external variable resistance. Average overall length 8in. Four models from stock, final speed (A) 100 r.p.m., (B) 50 r.p.m., either £5/17/6 (des. 2/6), (C) double reduction, 10 r.p.m. and (D) 1 r.p.m., either £6/18/6 (des. 2/6). Also Permanent Capacitor/Induction type with single reduction gear box, 220/250 v. 50 c., average overall length 7 1/2 in., Reversible. Available from stock in the following final speeds (four models): (E) 16 r.p.m., (F) 33 r.p.m., (G) 46 r.p.m. and (H) 92 r.p.m., any one, 29 (des. 2/6). Also double reduction models with final speeds ranging from 0.2 r.p.m. upwards with final torque up to 40 lb/in., details on request, £11/10/- (des. 2/6). All of these motors are new and guaranteed—many other requirements can be satisfied.

HIGH SPEED MOTORS. 220/240 v. 50c. Approx. 1/8th h.p., 15,000 r.p.m., suitable for sanders, high-speed drilling, polishing, buffers, etc., size of body, 7in. long by 5in. dia., shaft 1 1/2 in. prof. x 3/16 in. dia., 55/- (des. 3/-). Also a few left of the G.E.C. 1/2 h.p. capacitor/induction motors, ball-bearing, 1,440 r.p.m., new in maker's wood boxes, £8/6/- (des. 6/-).

MOTOR REVERSING SWITCHES, 2-pole C.O., up to 1/2 h.p. with lever arm, in metal housing 5in. x 5in. x 4in., extremely well made, £2/6 (des. 1/6).

HIGH-POWER BLOWERS, 220/230 v. A.C./D.C., dimensions: 7in. dia. 6in. high, max. length 8in., orifice diameters, inlet 3in., outlet 1 1/2 in., £3/15/- (des. 3/6).

STUD SWITCHES, with 20 stud tabs, panel 5in. square, by 2in., with laminated switch arm, new, boxed, 6/6 (des. 1/-).

MICROAMMETERS—very special offer of brand new instruments in projection housing 3 1/2 in. dia. by 5in. prof., exceptionally suitable for bench work. Deflection 0/50 Microamps D.C., 1st grade microl, 49/6 (des. 1/6).

SELENIUM RECTIFIERS. (Please note that, notwithstanding the special low prices, these are brand new products of S.T.C.) D.C. deliveries: 126 v. 150 mA, 14/6. 250 v. 150 mA, 29/- 60 v. 0.6 amp., 22/6. 140 v. 0.6 amp., 39/6. 280 v. 0.6 amp., £3/17/6. Also various high current ratings including 30 v. 25 amps., £5/10/-.

SYNCHRONOUS CLOCK MOVEMENTS, 200/250 v. 50c. With spindles for hours, minutes, seconds hands, in dust cover 3 1/2 in. dia. by 2in. deep, with flex. ready for use, 27/6 (des. 1/-). Set of three hands for 5/7in. dial, 2/-.

STUART CENTRIFUGAL PUMPS—the finest small motor-pump units in the world. We have the largest stock of all models for immediate delivery. All for 220/250 v. A.C. No. 10 (120 g.p.h.), £7/10/-, No. 12 (600 g.p.h.), £10 (des. either 2/-), No. 21, with induction motor (1,000 g.p.h.), £22/10/- (des. 7/6), and others—details on request.

Illustrated lists on request: Philips Variable Transformers, G.E.C. Miniature Crystal Calibrators, B.P.L. Measuring Instruments, Synchronous Timing Devices.

M. R. SUPPLIES, Ltd., 68 New Oxford St., London, W.C.1

Telephone: MUSEUM 2958

NATURALLY—

he's using the NEW V.H.F. Pack Set

- ★ Exceptional spurious response rejection
- ★ Crystal controlled transmitter and receiver with high stability and selectivity
- ★ No tuning—simple to operate—only two controls
- ★ Light—compact—robust
- ★ Unbreakable aerial
- ★ Fully tropicalised

Now Available



TECHNICAL DATA

Frequency ranges: L46, 75—100 Mc/s.

H46, 100—140 Mc/s.

HH46, 140—184 Mc/s.

Weights: with all dry battery power pack for 10 hours' duration, 8½ lbs., with accumulator battery and vibrator power pack for 16 hours' duration, 10½ lbs.

Transmitter Power Output: 100 mw.

Receiver Sensitivity: 2-3 μ v.

Spurious Responses: better than -70 db.



**BRITISH COMMUNICATIONS
CORPORATION LIMITED**

Second Way, Exhibition Grounds, Wembley, Middlesex.

Telephone: Wembley 1212



with the SOLARTRON VARI-PACK

MODEL
SRS 153

DESCRIPTION. An entirely new instrument which provides a continuously variable H.T. supply from 0 to 500 volts, either positive or negative, and, in addition an L.T. supply of 4 and 6.3 volts at 3 amps.

SPECIFICATION.

D.C. Output Voltage : 0-500 volts positive or negative.
D.C. Output Current : 100 m/a up to 350 volts.
 50 m/a up to 450 volts.
A.C. Output : 4 and 6.3 volts at 3 amps.
Ripple : Less than 0.1 volt at 400 volts.
Mains Input : 200-250 volts 40-60 c/s.
 Rack Mounting version supplied to order.

APPLICATIONS.

Industry.

- Laboratory supply unit for testing valves, components, circuitry, etc.
- Test departments for a wide range of test voltages.
- Production departments for provision of power supplies at low cost.

Education.

A power supply for research, student use, and demonstration purposes.

FEATURES.

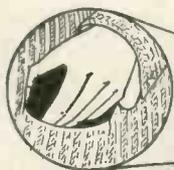
- Range :** The full range of voltage is obtained in a single sweep of the output control without switching by use of the controlled series valve circuit.
- Reliability :** High quality components including only paper type capacitors are used.
- Robustness :** The chassis is of all steel construction finished in bright zinc and is rigidly fixed to the anodised dural panel.

SOLARTRON

• ORDER NOW FOR EARLY DELIVERY.

SOLARTRON LABORATORY INSTRUMENTS LTD.
22 HIGH STREET KINGSTON SURREY Tel.: KINGSTON 8981 PBX.

**A workshop
in your
pocket!**



FOR ONLY
25/6
Post Free

THE
TELEVISION
& RADIO SERVICE

ENGINEERS' MASTER TRIMMER KIT

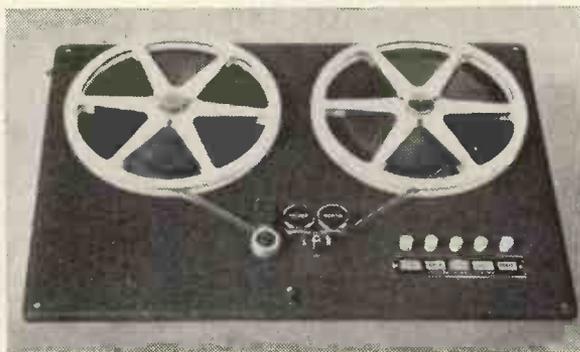
- 1 End Trimmer
 - 1 Side Trimmer
 - 1 Yaxley Switch Contact Adjuster
 - 1 Low Capacity Trimmer
 - 1 Screwdriver
 - 1 Set of Feeler Gauges
 - 1 Set of Six Box Spanners from 1 to 8 B.A.
 - 1 Set of Four Spanners from 0 to 8 B.A.
- in durable black crackle finish metal case.

Export Enquiries
invited

J. & S. NEWMAN Ltd.

100 HAMPSTEAD RD., LONDON, N.W.1 Telephone: EUSon 5176/7

MOTEK



**Motek—The name
for tape units.**

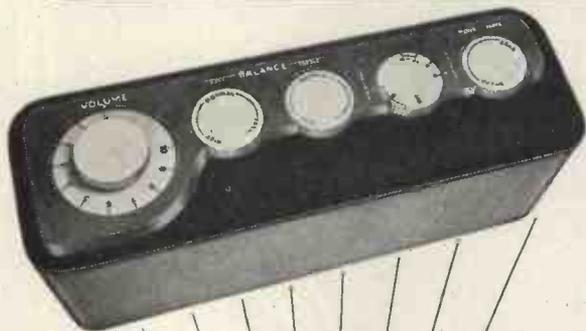
Illustrated leaflet
available on request.

MODERN TECHNIQUES

138-144 Petherton Road, London, N.5

Tel.: Canonbury 5896

★ A POINT OF DETAIL No. 5 ★



LOADING and CORRECTION

The design of a pickup input is complicated by the number of variables with different pickups. These can be briefly summarised . . .

- (a) Characteristic may be basically constant velocity or constant amplitude.
- (b) Variations from the ideal velocity or amplitude characteristic.
- (c) Variations in the loading required.
- (d) Variations in output level.

The situation is further complicated with microgroove recordings since one may wish to use different types of pickups for Standard and Long Playing.

The solution is obtained in the Q.U.A.D. amplifier by the provision of a complete range of compensator units covering virtually every high grade pickup at present available. It is thus possible to select any pickup or pickups for standard and microgroove recordings with the knowledge that loading and compensation are correct for that pickup and that volume adjustment will be sensibly spread over the whole range of the volume control.



This series of announcements deals with single points of interest in the design and performance of the Q.U.A.D. amplifier. Full detailed specifications can be obtained by writing for the Q.U.A.D. booklet.

FOR HIGH-FREQUENCY INSULATION

specify

'FREQUELEX'

The Inductance shown is supported by our "FREQUELEX" Ceramic Rods and forms part of a 100 k.w. Radio Transmitter.

This is only one of many applications where Rods made to close limits are required.

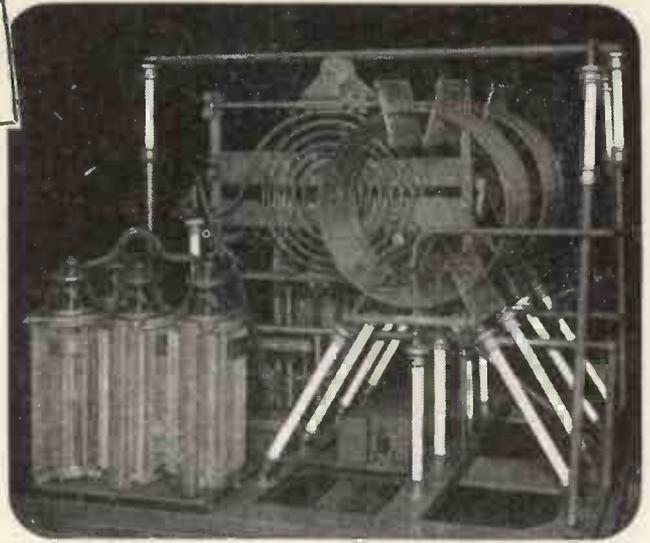
We specialise in the manufacture of Ceramic Rods and Tubes of various sections in several classes of materials over wide dimensional ranges.

The Principal Materials Are :—

1. Porcelain for general insulation.
2. Frequelex for High Frequency Insulation.
3. Permalax and Templex for Capacitors.

The degree of accuracy depends on the size of the Rod or Tube, but the standard degree of accuracy is outlined in the Inter-Service Component Manufacturer's Council—Panel R Specification embodied in our Catalogue of Radio Frequency Ceramics, copy of which will be sent on request.

Large Rods up to 44" long and 1½" square are used as supports for Tuning Coils, etc.



We shall be pleased to have your enquiries for all sizes of Tubes and Rods. Prompt deliveries can be given for most sizes.

Photograph by permission of The Marconi Wireless Telegraph Company Ltd., Chelmsford.

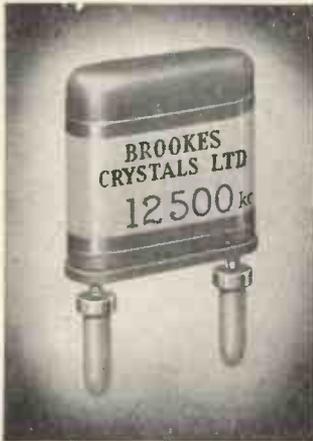


Bullers LOW LOSS CERAMICS

BULLERS LIMITED, 6 Laurence Pountney Hill, E.C.4. Phone: MANsion House 9971 (3 lines). Grams: 'Bullers, Cannon, London'

BL2D

BROOKES Crystals



mean
DEPENDABLE
frequency
control

Illustrated left is a Type M Crystal unit from a range covering 8 Mc/s to 17 Mc/s

- Frequency 12,500 kc/s.
- Hermetically sealed metal can.
- Frequency tolerance $\pm 0.01\%$ of nominal at 20°C., or better for special applications.

All Brook's Crystals are made to exacting standards and close tolerances. They are available with a variety of bases and in a wide range of frequencies. There is a Brook's Crystal to suit your purpose—let us have your enquiry now.



Brookes Crystals Ltd.,

Suppliers to Ministry of Supply, Home Office, etc.
10 STOCKWELL ST., GREENWICH, LONDON S.E.10
Telephone: GREENwich 1828
Grams: Xtals Green London. Cables: Xta's London

POWER SUPPLY UNITS

PRICES REDUCED—STABILITY IMPROVED



SERIES 100

DC Output, Stabilised, 175-350V 120mA, continuously variable. AC Output, Unstabilised 0-4-6.3v. 3.0A.

100A Bench Model as illustrated £53
100AR Rack Mounting Model £54

Delivery ex stock.

Available with negative bias supply at £58 and £59.

Stability now $\pm 0.1\%$ for input variation $\pm 10\%$

No load to full load, output voltage variation less than $\pm 0.1\%$.

Source impedance, 3 ohms.

Power Supply Units and other special electronic equipment made to customers' specification.

Pamphlet and full particulars from :—

HARVEY ELECTRONICS LTD.

Precision Mechanical and Electrical Engineers

273 FARNBOROUGH ROAD, FARNBOROUGH
HAMPSHIRE Telephone: FARNBOROUGH 1120

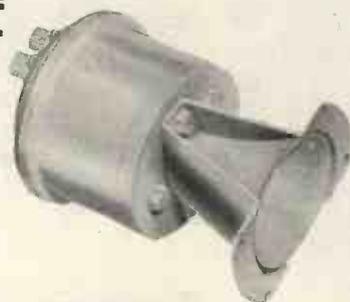
WE are constantly receiving letters from enthusiasts who have proved for themselves the outstanding performance given by the Stentorian Tweeter Unit in conjunction with our Standard 10" Speaker, or used with their existing cone unit. Such support for our claims is welcome for two reasons: it proves that quality can be successfully combined with economy, and it demonstrates the reliance placed on the name "Stentorian" by the experimenter and constructor.

The complete range of speakers can be heard at our London showrooms (109 Kingsway) from 9 a.m. to noon any Saturday, by appointment. Please write, or telephone Holborn 3074. Fully descriptive leaflets gladly sent on request.

**HIGH
QUALITY
REPRODUCTION**
at moderate cost

**PRESSURE TYPE
TWEETER UNIT**

The Unit is of the moving coil pressure type, similar to that in the 10 in. and 12 in. Concentric Duplex Units. Speech coil of aluminium wire, wound on an aluminium former, rigidly fixed to an aluminium diaphragm. Speech coil and diaphragm are at the rear of the magnet; the centre pole is hollowed out to form the commencement of the horn, in the centre of which is the **75/6** phase equaliser.
Tax Free



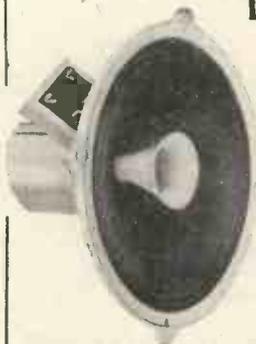
Speech coil impedance: 15 or 30 ohms. Flux density: 14,000 gauss. Response: 2,000/14,000 c.p.s. Power handling capacity: 3 watts.

A suitable cross-over network is available at 26/6

NOW TAX-FREE!

We are pleased to announce that 12" P.M. Units are now free of Tax, and the prices of these two famous speakers are therefore substantially reduced.

**12" CONCENTRIC
DUPLEX UNIT**



SPECIFICATION
Series Gap magnet of Alcomax 3. Flux in L.F. gap 14,000 gauss on 1 1/2" pole. Flux in H.F. gap 17,000 gauss on 1 1/2" pole. Power handling capacity, 15 watts. Frequency range 30-17,000 c.p.s. Fundamental base resonance 45 c.p.s.

Complete with cross-over network but without transformer

£22 . 11 . 0

12" STANDARD P.M. UNIT
(Type S.12135)

Price (without transformer) **£9 . 2 . 6**

----- **PLUS** -----

**STANDARD
10" UNIT**
(Model S1012)

Generally regarded as the most outstanding speaker of its kind. Response: 55 — 11,000 c.p.s. Magnet of 12,000 gauss. Handling capacity 10 watts u.d.o.

Price (tax paid) minus transformer **£3 . 9 . 0**

With universal transformer **£4 . 13 . 9**



FROM THE

Stentorian

RANGE



"TELE-SCOPE-D"

Into a small space is telescoped all the refinements needed by the laboratory technician plus the ruggedness asked for by the service engineer.

Note the features of this new, miniaturised, lightweight Oscilloscope and write for details NOW.

Model 2300 *Miniaturised*
Cathode Ray Oscilloscope.

Manufactured by

INDUSTRIAL ELECTRONICS

Sole Distributors:

G. A. STANLEY PALMER, A.R.Ae.S., MAXWELL HOUSE, ARUNDEL ST.
STRAND, LONDON, W.C.2. Tem. Bar 1610.

- ★ 21" effective screen diameter.
- ★ Direct-coupled X and Y amplifiers.
- ★ D.C. to 3 Mc/s frequency response.
- ★ 50 mVolts/cm deflection sensitivity.
- ★ 5 c/s to 50 Kc/s time-base with a trace expansion control from zero to 15".
- ★ Automatic synchronisation.
- ★ In tantaneous shifts.
- ★ Size: 7½" × 4¾" × 7½".
- ★ Weight: 6½ lbs.



ASK ARTHURS FIRST

★ NEW VALVES

Send your enquiries for all Radio and Electrical goods, especially those in short supply.

We have probably the largest variety of valves in the country. Let us know your requirements.

AVO METERS IN STOCK

Avo Model 7	£19 10 0
Avo Model 8	£23 10 0
Signal Generator, Mains and Battery	
Models	£30 0 0
Electronic Test Meter	£40 0 0
Valve Characteristics Meter	£60 0 0
★ Cossor Oscilloscope Models 1035	£93 10 0
1049	£132 0 0

Also full range "TAYLOR METERS". List on request.

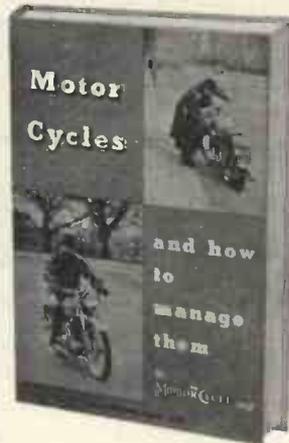
VALVE MANUALS

Mullard	5 0
Osram	5 0
Brimar Nos. 4 & 5	5 0
each.	
Mazda, Part 2...	2 0
Mullard Valve Replacement Guide	2 6
Amateurs' Guide to Valve Selection by Mullard	1 6
Postage 6d. each extra.	

Leak Point I Amplifiers	£28 7 0
Leak Pre-Amplifiers	£9 9 0
Leak Tuning Unit	£35 6 3
Wearite Tape Deck	£35 0 0
Grundig Tape Recorder	
two-speed	£84 0 0
Recording Tapes: E.M.I., G.E.C. and Scotch Boy, 35/- each.	
Ferrovoice Tape, 1,200ft. on 7in. spool 22/6 only (plus 9d. postage).	
Terms C.O.D. or Cash with order. Goods offered subject to being unsold and to price alteration.	

Arthur's EST. 1919
PROPS: ARTHUR GRAY, LTD.

GRAY HOUSE, 150-152 CHARING CROSS ROAD, LONDON, W.C.2
Temple Bar 5833/4 and 4765. Cables: TELEGRAY, LONDON



Completely revised up-to-the minute new edition

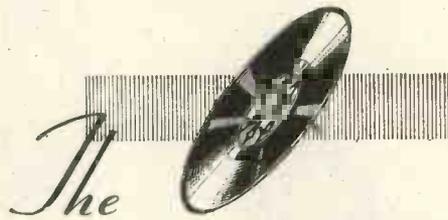
Motor Cycles and How to Manage Them

A practical handbook by the staff of "The Motor Cycle" describing the working of a motor cycle engine and much useful information on all aspects of riding and maintaining solo and sidecar machines. Hints on the care of tyres, decarbonisation, fitting piston rings and tracing general trouble are also included.

6s. net By Post 6s. 4d. **Order Now**

Obtainable from all booksellers or direct from:

ILIFFE & SONS LTD. DORSET HOUSE, STAMFORD ST., S.E.1



ECONOMY of PURPOSEFUL DISK SELECTION

THE great development in the art of direct recording has resulted in the use of disks for a steadily increasing variety of purposes. Some applications call for a disk possessing a quality not demanded by other applications. For example, in the recording of disks as "masters" for processing gramophone records the disk must not only be beyond reproach in performance but also in appearance. On the other hand, there are many occasions, such as auditions, rehearsals, etc., when this high standard is not required, and when the extra cost of the finest disks is not justified.

In order to fulfil every possible recording requirement in the most economical way we have arranged that any user can select disks of a quality most suited to the particular recording needs. To this end we have

adopted a new and exacting system of classification by which our disk production is divided into four selected groups. Each group has been carefully chosen to cover effectively the class of recording for which we consider the disk most suitable:

THE NEW CLASSIFICATION

WHITE LABEL ("Master")

For processing where a perfect blank is required. Since only one side of a disk can be processed, an easily removable label is affixed to the reverse side.

GREEN LABEL

A disk of excellent quality, recommended for use by Broadcasting Stations, Film Studios and Commercial Recording Studios, where both sides of the disk are required for direct playback.

YELLOW LABEL

A disk of excellent quality, recommended for use by Broadcasting Stations, Film Studios and Commercial Recording Studios, where one side of the disk is required for direct playback. The second side may, or may not, be slightly inferior in appearance, but is capable of being fully recorded for rehearsal or audition.

BLUE LABEL

A high quality double-sided disk which may have one or both sides only slightly inferior to those of the Green and Yellow Label disks. Recommended for use in speech training, speech therapy and for rehearsals.

Since the same high quality M.S.S. lacquer is used for coating the disks in all four groups, the user is assured of the finest possible performance within the price class.

It is opportune to mention here that very large numbers have been selected every year from M.S.S. standard disks for processing by some of the most critical users throughout the world.

M.S.S. disks will in future be available with the labels as shown which indicate their recommended uses.



Fullest technical details available on request.

NEW ARCOLECTRIC SIGNAL LAMPS

For Low Voltage or Mains

Illustrated are a few of our wide range of new signal or indicator lamps.

A new mains voltage lampholder, Cat. No. S.L.88/N, has been developed for use with the Arcolectric MES neon tube. Among the features of this design are easy lamp replacement, from front or rear of panel, and a built-in resistor.

The low voltage lampholders are designed for use with standard MES bulbs. Features are, easy single-hole fixing and pleasing appearance. Bulbs are accessible from front or back of panel. Insulation of all types will withstand a flash test in excess of 1,500 volts A.C.

Write for Catalogue No. 128



CENTRAL AVENUE, WEST MOLESEY, SURREY · TELEPHONE: MOLESEY 4336 (3 LINES)

HANNEY of BATH offers

CATHODE RAY TUBES. All prices include tax.

MULLARD		
MW6-2, projection tube.....	£8	6 10
MW22-16, 17 or 18, 9in.....	£12	10 3
MW31-16, 17, 18 or 74 (grey filter screen), 12in.....	£16	13 8
MW36-22 and 24, 14in. rectangular.....	£19	9 3
MW43-64, 17in. rectangular.....	£23	12 8

BRIMAR		
C.12B, 12in. aluminised.....	£17	14 6
C.12FM, tetrode with ion trap.....	£16	13 8
C.14BM, 14in. rectangular, aluminised.....	£20	10 0
C.17BM, 17in. rectangular, aluminised.....	£24	13 6

MAZDA		
CRM.122 and CRM.121B, 12in.....	£16	13 8
CRM.123, 12in. aluminised.....	£17	14 6

COSSOR		
121.K, 12in.....	£16	13 8
85.K, 15in.....	£20	17 0

FERRANTI		
T12/44, T12/54, T12/91 and T12/92, 12in.....	£16	13 8

G.E.C.		
6504A and 6505A, 9in. aluminised.....	£13	11 1
6705A and 6706A, 12in. aluminised.....	£17	14 6
7102A, replaces 6705A, 12in. aluminised.....	£17	14 6

ENGLISH ELECTRIC		
T900, T901 and T901B, 16in.....	£22	4 10

Ion Traps for all the above tubes (where applicable), each 5 0
Please add 10/- carriage, packing and insurance to all tube prices, any excess being refunded. All tubes despatched per passenger train at Railway's risk.

AVAILABLE SHORTLY. Constructor's envelopes for the new **WIDE ANGLE VIEWMASTER** and the **SOUNDMASTER TAPE RECORDER**, both being designed by the designer of the Viewmaster. May we send you details?

VIEWMASTER, TELEKING, MAGNAVUE and **WILLIAMSON AMPLIFIER**. All components still available as previously advertised. Send 6d. in stamps for our new **COMPONENTS CATALOGUE** now.

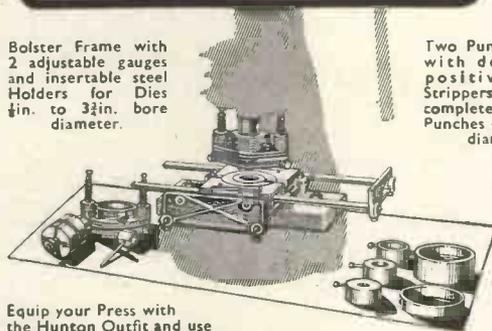
L. F. HANNEY
77, LOWER BRISTOL ROAD, BATH
Tel. 3811

REDUCE YOUR PRESS TOOL COSTS

THE HUNTON UNIVERSAL BOLSTER OUTFIT FOR SHEET METAL PIERCING AND BLANKING ON FLY PRESSES

Bolster Frame with 2 adjustable gauges and insertable steel Holders for Dies 1/2 in. to 3/4 in. bore diameter.

Two Punch Holders with detachable positive-action Strippers take the complete range of Punches 1/2 in. to 3/4 in. diameter.



Equip your Press with the Hunton Outfit and use inexpensive standardised Punches and Dies 1/2 in. to 3/4 in. diameter, obtainable from stock—in 1/16 in. sizes—when required.

Standardised Tools also available at short notice for Square, Oblong and other shapes, Louvre Forming (up to 8 in. long), Corner Notching, Corner Radiusing, Angle Iron Notching and Piercing, etc.

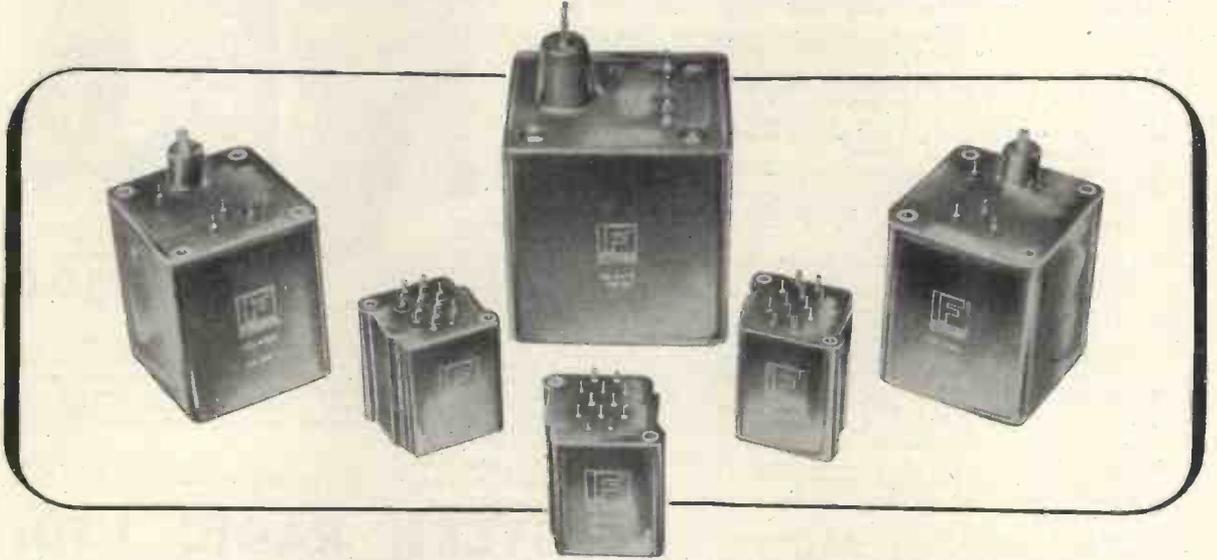
Get the Outfit now—Buy Punches, Dies and Tools as you need them

Descriptive brochure and prices on request

HUNTON LIMITED

Phoenix Works, 114-116, Euston Road, London, N.W.1
Telephone: EUSton 1477-8-9. Telegrams: Unionexh, London

A COMPLETE TRANSFORMER SERVICE TO THE ELECTRONIC EQUIPMENT MANUFACTURER



THE NEW "PENTLAND" SERIES RESIN CAST TRANSFORMER & CHOKES

Complete assembly sealed in resin block—suitable for incorporation in every type of electronic equipment—designed to meet, at low cost, the stringent requirements of Specification RCS. 214—saving in weight and volume—suitable for power, signal, pulse and high voltage applications—designed to individual specification.



"H" SERIES — hermetically sealed oil-filled components. "C" core construction, conforming with RCL. 215.



"K" SERIES—impregnated open type "C" core construction, conforming with RCL. 216.



"M" SERIES—hermetically sealed miniature type for power and signal applications.

FERRANTI



Enquiries to Technical Sales Dept: _____

FERRANTI LTD - CREWE TOLL - EDINBURGH 5

The "TELE-VIEWER"

5 CHANNEL TELEVISOR

A Design of a Complete 12 in. or 9 in.

SUPERHET T/V RECEIVER FOR THE HOME CONSTRUCTOR

This receiver has been developed after most careful research and affords a high standard of Television entertainment by producing a picture of really outstanding quality.

We confidently believe that not only have we achieved a T.V. Receiver that surpasses in efficiency any other designed for the home constructor, but that successful construction, even by the most inexperienced, is assured by the step by step wiring detail and diagrams provided, and at about half the cost of the nearest comparable commercial receiver.

Here are some of the features which combine to make this such a fine receiver :

- The Superhet circuit easily tuned to any of the five channels, i.e. LONDON, SUTTON COLDFIELD, HOLME MOSS, WENVOE and KIRK-O-SHOTT'S. (The extreme ease of tuning is accomplished by the provision of pre-aligned I.F.T.'s.)
- A lifelike, almost stereoscopic, picture quality made possible by the following factors :
 - a. Excellent band width of I.F. circuits.
 - b. A really efficient video amplifier.
 - c. C.R.T. Grid modulated from low impedance source.
 - d. High E.H.T. voltage (approx. 10 kV.).
 The picture brilliance is also much above the average and enables comfortable viewing with normal room lighting or daylight.
- FIRM picture "HOLD" circuits (Frame-Line) ensure a steady picture, free from bounce or flicker even under the most adverse conditions met with in "fringe" areas and excellent "interlace" ensures the absence of "liney effect."
- Negative feedback is used in the audio frequency circuits which provide 2/3 watts of High Quality Sound.
- Entire receiver built on two chassis units, each measuring 14½ in. x 6½ in. x 3½ in.
- Rigid C.R.T. mounting enables entire receiver to be safely handled with tube in position.
- All pre-set controls are mounted on side of chassis enabling all adjustments to be carried out whilst facing the C.R. Tube.



We are able to offer a famous manufacturer's new and unused 12in. C.R.T. to purchasers of this T.V. at the specially reduced price of **£12/19/6**

This complete TELE-VISOR, including all Valves can be built for only **£28-0-0** (Plus cost of C.R.T.)

As no hire purchase terms are available the receiver can be bought in five separate stages (practical diagrams and circuits are provided for each stage) thus enabling hire purchase interest rates to be avoided. The complete set of ASSEMBLY INSTRUCTIONS is now available, price 5/- (refunded against first order). The instructions include really detailed PRACTICAL LAYOUTS, WIRING DATA AND COMPONENT PRICE LIST.

ALL COMPONENTS ARE AVAILABLE FOR INDIVIDUAL PURCHASE. A CABINET WILL ALSO BE AVAILABLE.

STERN RADIO LTD.
109 & 115, FLEET STREET, E.C.4
Tel. : CENTRAL 5812-3-4.

High Value

INSULATION RESISTANCE METER

MODEL
RM175-LZ



0.9 TO 10,000,000 MEGOHMS

Self-contained, mains operated with stabilised voltage compensation and incorporating meter overload protection in the case of sample breakdown, this resistance meter is designed for intensive use in testing high values of insulation. Test pressure variable from 0-1,000 V.D.C.

Write for full specification.

0-1,000 V.D.C.

**SELF-CONTAINED
STABILISED
OVERLOAD
PROTECTION**

BRITISH PHYSICAL LABORATORIES LTD

Radlett HERTS



Tel: RADLETT 5674-5-6

dm,BP13

TRANSFORMERS COILS CHOKES

PLEASE NOTE THIS COMPANY'S
NAME CHANGED FROM
RADIOMENDERS LTD. TO
ELECTRO-WINDS LTD.
ON THE 4th MARCH, 1953

SPECIALISTS IN

FINE WIRE WINDINGS
MINIATURE DEAF AID TRANSFORMERS, PICK-UP
CLOCK AND INSTRUMENT COILS, ETC.

ELECTRO-WINDS LTD.

123-5-7 PARCHMORE ROAD, THORNTON HEATH, SURREY
LIVINGSTONE 2261 EST. 1933

**WILL
BUY
any U.S.
surplus
radio
parts,
equipment**

*
APN-9, TS-67, R-89B/ARN-5,
ARC-1, ARC-3, ART-13,
BC-221, BC-348, SCR-522,
MN-53, MN-61, RA-1,
MN-31, MI-32, ARN-7, Head-
sets, Mikes, Cannon Amphehol
plugs, 274-N, ARC-5, Dyna-
motors, Test sets, "TS." or
"1." prefixes.

State condition and Best Price
**Aircraft Radio
Industries, Inc.**
85 St. John Street, New Haven,
Cables: Arico. Conn., U.S.A.

Fidelity in tape recording

MODEL PR7 TAPE RECORDER.

The Trusound PR7 tape recorder is an instrument of exceptional performance recording to professional standards, yet at the same time it is compact and simple to operate. Primarily designed as a transportable recorder enabling very high quality recordings to be made "on location" the recorder can be supplied in console form if required and further details of this form of mounting are available on request.

As supplied the PR7 is provided with two input channels with mixing between them. Channel A is for microphone input and channel B for Radio or Gramophone input. If it is desired to use more than one microphone then an external mixer unit may be connected into the channel B input. A power socket is provided on the rear of the recorder for providing the necessary voltages for such a mixer unit. The power socket can also be used for a radio feeder unit if required.

The PR7 tape recorder is a single-speed machine completely free from all forms of "wow" and "flutter" with a tape speed of either 7½ in./sec. or 15 in./sec., depending on customers requirements, and accommodating reels up to 2,250ft. (2,400ft. with special adaptor). It is also a twin track machine giving economy in tape usage. Twin heads of extremely high efficiency and performance are employed.

The amplifier employs the latest type miniature valves specially designed for high gain audio amplifiers having extremely low noise and hum factors and this in no small way contributes to the excellent signal to noise ratio of the recorder. Independent Treble and Bass controls are incorporated in a negative feedback circuit employed in the amplifier. The incorporation of feedback reduces the distortion of the whole system to less than 1 per cent.

Provision is made to couple the amplifier to an external amplifier system and a 15-ohm. disc cutter head may be driven from the output of the recorder for tape to disc dubbing.

The recorder is supplied fitted with a high quality 15 ohm. 10in. x 6in. elliptical loudspeaker and this loudspeaker can be used for monitoring when recording from gramophone or radio. A headphone socket is provided for monitoring purposes when recordings using a microphone are being made. Headphones can, if desired, be used for all monitoring. Provision is made for using an external speaker having an impedance of 2/3, 5, or 15 ohms.

£72

Carr. & Pkg. extra

MODEL PR7 TAPE DESK.

The PR7 tape desk is a tape mechanism having a performance of the standard required by professional recording studios and broadcasting organisations. Completely free from all forms of "wow" and "flutter" the machine will accommodate spools up to 10½ in. in diameter (2,400ft.). It has a tape speed of 7½ in./sec. or 15 in./sec. dependent on customers requirements and it features simple drop-in, single slot loading, twin track heads, fast forward and fast rewind facilities, super high fidelity head unit giving an attainable top frequency of 10,500 c.p.s. at 7½ in./sec. and 18 kc/s. at 15 in./sec.

Superbly engineered and powered by three special motors manufactured by a company well known for the high standard of its products, the PR7 gives faultless performance and is a mechanism that will satisfy the most exacting demands of the connoisseur or professional user.

£25

Carr. extra

★ Further details available on receipt of stamped, addressed envelope.

Demonstrations on weekdays by appointment only. Saturdays 9 a.m. — 6 p.m.

MUSICMASTER TAPE RECORDER.

The deservedly popular Musicmaster tape recorder is a machine that has gained great popularity in recent months. Combining moderate price with first-class performance it is a recorder that no discriminating purchaser can afford to overlook.

A twin track, two-speed tape mechanism is employed in the machine and this combination gives great economy in tape usage.

The amplifier incorporated in the recorder employs negative feedback to reduce the overall distortion of the system to a very low percentage. In addition the tone control is a bass boost circuit as opposed to the usual treble cut arrangement. The amplifier has a wide frequency response giving first-class reproduction of music.

The recorder will accommodate Radio, Gramophone or Microphone inputs and has provision for monitoring of the material being recorded. In the case of Radio or Gramophone inputs the internal loudspeaker is used for monitoring and when recording from a microphone the internal speaker is automatically disconnected and a socket accommodating headphones, brought into operation. The use of headphones prevents any possibility of acoustical feedback occurring and allows the operator intimate contact with the material being recorded.

The amplifier of the recorder may be used in conjunction with a record player unit for direct playing of gramophone records. In addition an external loudspeaker may be plugged in and if this is done the internal loudspeaker is automatically disconnected.

The Musicmaster tape recorder is supplied with a 1200ft. reel of tape, take-up spool and microphone absolutely complete and ready to make faithful recordings in sound wherever there is a mains supply of 200-240 v. A.C.

It is a completely and truly manufactured machine, guaranteed for 12 months against mechanical and electrical defects. It is an instrument not only worthy of a name, but also worthy of the name it bears.

The Musicmaster tape recorder represents outstanding value and has to accompany that, outstanding performance. An illustrated leaflet is available on request.

£35

Carr. extra

THE MUSICMASTER TAPE DESK.

The Musicmaster tape desk is a moderately priced two-speed mechanism which will record the most difficult music without any trace of "wow" or "flutter" from one end of the reel to the other.

Featuring single slot loading, fast forward and rewind —without any tape handling—twin track high impedance heads, electromagnetic braking from a self-contained supply, the Musicmaster tape desk is well worthy of its name.

Powered by three motors manufactured by a company whose name is always associated with quality, the tape desk is designed for the recording enthusiast having only a limited pocket, but who requires performance unequalled in the price range.

18 GNS.

DESIGNED FOR CRITICS

Trusound Ltd.

BY CRITICAL DESIGNERS

ALL-POWER REGULATED POWER SUPPLIES

MODEL 501

STABILIZED OUTPUT 200-500 VOLTS 0-250mA
 UNSTABILIZED OUTPUT ... 470/630 VOLTS 0-250mA
 UNSTABILIZED A.C. 6.3 VOLTS 10 AMPS

VOLTAGE STABILIZATION WITHIN $\pm 0.02\%$
 EFFECTIVE OUTPUT RESISTANCE 0.2Ω MAX.
 OUTPUT RIPPLE LESS THAN 2mV RMS.

STANDARD MODEL

19" RACK MOUNTING £70

END FRAMES

REINFORCED, POLISHED HARDWOOD
 £1 15 0 per pair

STEEL INSTRUMENT CASE £4 10 0



MODEL 501
(fitted with end frames)

ALL-POWER TRANSFORMERS LTD.
 CHERTSEY ROAD, BYFLEET, SURREY

Tel.: BYFLEET 3224/5

PRICES QUOTED ARE NET EX WORKS AND ARE
 SUBJECT TO VARIATION WITHOUT NOTICE

ALWAYS FIT



CASTORS

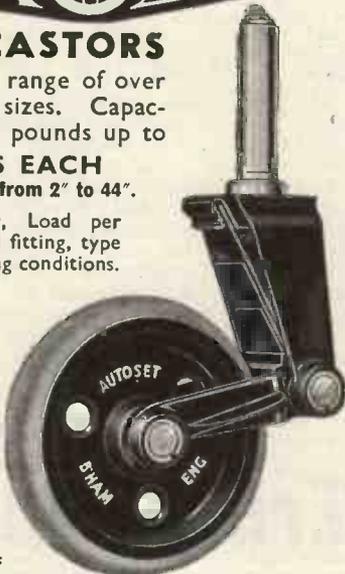
Select from our range of over 7,000 types and sizes. Capacities from a few pounds up to 30 TONS EACH

Wheel diameters from 2" to 44".

SPECIFY—Quantity, Load per fitting, type of head fitting, type of wheel and running conditions.

ASK FOR
 BROCHURE

Leaf equalising castor shown for transport of delicate instruments.



Engineers, Patentee.
 and Sole Manufacturers:

AUTOSET (PRODUCTION) LTD.,
 DEPT. "H", STOUR STREET, BIRMINGHAM, 18.

EDG. 1143/44. Estd. over 30 years. (AT 15)

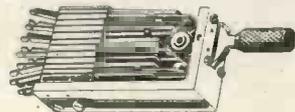
Please mention "Wireless World".

Taylor

Best for
 TEST EQUIPMENT

Please write for our illustrated catalogue . . .

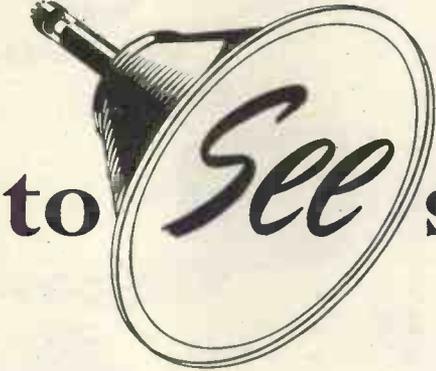
**TAYLOR ELECTRICAL
 INSTRUMENTS LTD.**
 MONTROSE AVENUE, SLOUGH, BUCKS.



THE KEYSWITCH CO.

Also Suppliers of

UNSELECTORS — RELAYS
P.O. EQUIPMENT — PLUGS — SOCKETS
 (SEND ALL YOUR ENQUIRIES TO
 191 KENSAL ROAD, LONDON, W.10
 LAD. C666

If you want

 to *See* something
 for your money...

LOOK into the 'ENGLISH ELECTRIC' 16" Metal C.R. Tube — and see the brilliant black and white picture focussing over the entire screen area with excellent contrast range. This quality alone will interest any home-constructor with big-screen viewing in mind. Next consider the 'ENGLISH ELECTRIC' tube's other features — high optical quality glass

face plate, wide angle scanning (70°), ion trap, high safety factor, long life, ease of handling — and you will appreciate its remarkable value. The 'Tele-King' and 'Magnaview' circuits and 'View-master' conversion circuits were built around the 'ENGLISH ELECTRIC' tube. Buy 'ENGLISH ELECTRIC' and be sure of 'professional' results!

'ENGLISH ELECTRIC'

BRITISH MADE LONG LIFE 16" T901 METAL C. R. TUBE

For full particulars or name and address of your nearest dealer write to:

The ENGLISH ELECTRIC Company Limited, Television Department, Queens House, Kingsway, London, W.C.2

TELCONNECTORS

co-axial plugs and sockets

These connectors enable identical cables to be joined together, or flexible cables to be joined to their lead-sheathed counterparts. They are fully waterproofed and suitable for use up to 3,000 Mc/s. The flange may be fitted to either half for passing cables through panels.

Illustrated is the 53/29M Plug and 53S/29M socket, for use with PT29M cable; also the 53C panel-mounting socket for terminating cable runs and the 53S protective cap for excluding dust and moisture.



All types are readily available in various sizes and combinations. Write for publication T/1.



TELCON

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD
 Head Office: 22 Old Broad Street, London, E.C.2.
 Tel: LONDON Wall 7104
 All enquiries to: Telcon Works, Greenwich, S.E.10.
 Tel: GREENwich 3291



cables

G. WHITAKER & SON

Manufacturers of
LEATHERCLOTH COVERED CASES
 of all descriptions:—

PORTABLE TAPE RECORDERS
 GRAMOPHONE PLAYERS
 RECORD STORAGE CABINETS
 RECORD CARRYING CASES ETC.

Send for details and prices.
5-6A, Lorrimore Buildings, Olney Road,
Walworth, S.E.17. Phone: ROD: 3730

THE WORLD'S GREATEST BOOKSHOP

FOYLES

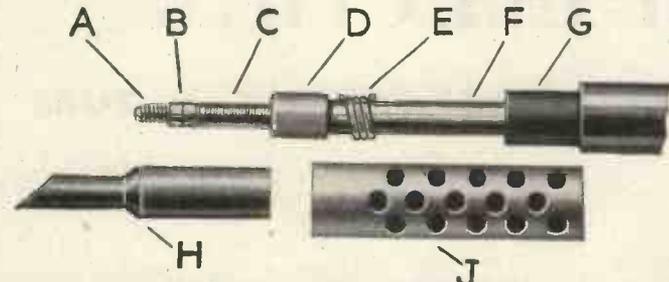
FOR BOOKS

All new Books available on day of publication.
 Secondhand and rare Books on every subject.
 Stock of over three million volumes.

Subscriptions taken for magazines.
 Foyles have depts. for Gramophone Records,
 Handicraft materials, Stationery.

119-125 CHARING CROSS ROAD, LONDON, W.C.2
 Gerrard 5660 (16 lines) ★ Open 9-6 (Thurs. 9-7)
 Nearest Station: Tottenham Court Road

The **ACRU L.V. SOLDERING PENCIL** is one of the smallest and lightest on the market.



ITS OUTSTANDING FEATURES ARE:

- A. Stainless Steel Core.
- B. Brass Clamping Nut.
- C. Easily Replaceable Elements.
- D. Insulating Collar.
- E. Spring Clip for Speedy Assembly.
- F. Stainless Steel Outer Tube.
- G. Bakelite Handle.
- H. Copper Bit.
- J. Perforated Sleeve.

SUPPLIED IN 6, 12 OR 24 VOLT. WITH OR WITHOUT SUITABLE TRANSFORMER.

ACRU ELECTRIC TOOL MFG. CO. LTD. CHAPEL STREET, LEVENSHULME, MANCHESTER 19. Tele: RUSHolme 4613.

FROM A SPOOL TO A COMPLETE OUTFIT



BRITAIN'S FOREMOST SPECIALIST SUPPLIERS IN T/R EQUIPMENT



★ T/R

We offer friends and customers this abbreviation for TAPE RECORDING in the hope that it will catch on and be of service to all—especially the printer! So it's Classic for T/R and T/R for Tape Recording.

It is no exaggeration to say that we have succeeded in gathering together the largest and most up-to-date selection of Tape Recording equipment in the country. Intending purchasers who can reach our premises in person will find our specially equipped showrooms exceptionally attractive. Those living farther afield can depend on our mail-order department to render maximum service with utmost expediency. Hire Purchase facilities are available on all orders for £10 or more. Full list on request.

T/R LIST

Full List giving items of T/R Equipment stocked by Classic free on request.

SPECIAL SHOWROOMS • PROMPT DELIVERIES • H.P. FACILITIES

● TAPE DESKS

	£	s.	d.
583 Qualtape	16	16	0
584 Motek	16	10	0
585 Lane, Mark IV	17	10	0
586 Truvox, Mark IV	23	2	0
587/1 Wearite, Type 2A*	40	0	0
587/2 Wearite, Type 2B*	40	0	0
588/1 Bradmatic, Type 5/6RP*	41	0	0
588/2 Bradmatic, Type 5c*	45	10	0
588/3 Bradmatic, Type 5/6RP*	42	0	0
588/4 Bradmatic, Type 5CL*	47	10	0
588/5 Bradmatic, Type 5D*	50	0	0
589 Soundmirror	33	0	0
590 Electomech, R.C.7 (7½ and 15in. per sec.)*	90	0	0
591 Reflectograph	39	10	0

* Equipped for half-tape recording.

● MICROPHONES

	£	s.	d.
553 Reslo VMC (Moving-Coil) ...	6	0	0
554 Reslo R.V. Ribbon	9	0	0
557 Gramplan Moving-coil	5	17	6
560 Cosmocord Mic/30 Desk Model, Crystal	2	10	0
561 Cosmocord Mic/22-1 Acos Crystal	4	4	0
563 Cosmocord Mic/16-2 Acos Crystal	12	12	0
565 Lustraphone C.H.51 Hand Model, Moving Coil	5	15	6
566 Lustraphone LX.55 Crystal Model	2	10	0

Stands of all types available.

● COMPLETE INSTRUMENTS

580/1 Ferrograph Model 2a (as available)	79	10	0
580/2 G.B. Standard	99	10	0
580/3 Vortexion with Truvox Desk	72	0	0
580/4 Vortexion with Wearite Deck	84	0	0
580/5 M.S.S. P.M.R.3 as available ...	99	15	0
580/6 C.J.R. Model D.2, Portable (3 heads : 2in. reels)	117	0	0
581/2 Crumlog, 2-speed	84	0	0
581/3 Grundig 2-speed, Console	99	15	0
581/4 E.M.I. Emicorda Portable	94	10	0
581/5 Simon Model Ia	83	0	0
581/6 Soundmirror Portable	79	0	0
581/8 R.M.C. with new Lane Tape Desk	47	10	0

● HEADS & COILS

All Bradmatic items including			
500 Bradmatic Plate Coil	9	0	0
501 Bradmatic Oscillator Coil	9	0	0
502 Bradmatic Bias Rejector Unit	12	6	0
506 Bradmatic 5 R.P. Heads	3	5	0
508 Bradmatic 6 R.P. Head	3	15	0
510 Tapemaster Oscillator Unit wired 6V6 valve	2	5	0
511 Tapemaster Recording Head	1	19	6
511/A Tapemaster Junior Erase Head	1	19	6
512 Tapemaster Senior Play/Record Head	2	5	0
All Wearite items including			
513 Wearite Head List Transformer Type 977	1	10	0

● T/R AMPLIFIERS

592/1 Lane Amplifier Kit, K-A.-1/RP	13	10	0
592/2 Lane Amplifier, assembled	15	10	0
593/1 Elpico Junior Amplifier	16	16	0
593/2 Elpico Senior Amplifier	24	0	0
594 Bradmatic C.I. with Push/Pull O/P	62	0	0
593 C.J.R. C.P./I with P.P.O/P	24	12	6
595/1 C.J.R. Professional Type P.A.1	94	0	0

● MOTORS

520 Collaro Clock and Anti-clock-wise	1	18	6
521 B.S.R. Model S.R.2	1	5	0
522 B.S.R. Model S.R.1	1	12	0
523 B.S.R. Model F.P.10	1	18	0

● T/R TAPES

569 Emitape H60/6—600ft.	1	1	0
570 Emitape H60/12—1200ft.	1	15	0
570 Emitape H65/12—1200ft.	1	15	0
572 G.E.C. Plastic, 1200ft.	1	10	0
573 Gevaert—1200ft.	2	0	0
574 Aga—1200ft.	1	17	6
576 Magnetophon—1200ft.	2	0	0
576 Ferrotape (Wearite)—1200ft.	2	5	0
577 Ferrotape (Wearite)—1750ft. —8½in.	3	3	0

SPARE SPOOLS FOR ABOVE

524 5in. diam., metal, from	2	9	
525 7in. diam., metal, from	4	3	
526 8½in. diam., plastic, from	9	6	

In the event of there being any difference between prices quoted here and those quoted by the manufacturers, the latter shall be deemed operative at time of ordering.

HI-FI REMINDER LIST.

The enthusiast for High Fidelity will do well to come to Classic Electrical. We stock the best items and endeavour at all times to give friendly and reliable service no matter what degree of experience and knowledge the customer may have. The few items here indicate something of our standards which are set to suit all pockets. H.P. facilities on orders over £10 in value. NO PURCHASE TAX ON GOODS SENT OVERSEAS.

● AMPLIFIERS

	£	s.	d.
Leak "Point One"	28	7	0
Leak "Varislope"	12	12	0
Quad Complete Unit	35	0	0
Goodsell "Williamson"	36	0	0
Goodsell Pre-amp. F/U/TC	22	10	0
Rogers Baby-de-luxe	22	10	0

● MOTORS, PICK-UPS, ETC.

Connoisseur 3-speed motor	21	17	3
Garrard 3-speed 2018/5	22	14	8
Garrard Autochange with T/O head RC/75A	15	13	0
Acos G.P.20 with 2 heads	5	10	4
Decca XMS Pick-up with 2 heads	6	13	3
Leak Moving Coil Pick-up with diamond stylus	17	10	8

● SPEAKERS

Goodmans Axiom 22, Mk. II	19	8	4
Goodmans Axiom 150, Mk. II	13	11	4
Goodmans Axiom 101	6	12	1
Tannoy Dual Concentric 15in.	33	10	0

Also Wharfedale and W.B. Units, Decca Corner, Voigt Corner, Vitavox "Klipschorn," etc.

FOR 1 MONTH ONLY

To make room for 1954 models and building extensions, we are clearing certain stocks of amplifiers, motors, T/V's, tape recorders, speaker units, etc., at knock-out bargain prices. Genuine reductions. List on request.

CLASSIC ELECTRICAL CO., LTD. 352/364, LOWER ADDISCOMBE ROAD, CROYDON, SURREY. Telephone: ADDISCOMBE 6061-6062.

AT JUNCTION OF SHIRLEY ROAD & LOWER ADDISCOMBE ROAD, Opposite Ashburton Park Buses—Nos. 12, 54, 59a.—Stations—E. Croydon, Woodside or Addiscombe.

PREMIER ANNOUNCEMENT

BUILD A PROFESSIONAL LOOKING RADIO AT LESS THAN HALF TO-DAY'S PRICE

We can supply all the parts to help you.
 Drum (2 1/2 in. dia.), 1/6
 Driving head 1/6
 Double pointer 4d.
 Spring 3d.
 Nylon Cord (yard) 6d.
 Dial Front Plate 2/6
 Engraved Glass Dial 180-550 and 800-2,200 m. With station names, new wavebands 1/6
 R.F. Coils, 180-550, 800-2,200 metres, pair 6/6
 Punched chassis, 3-valve plus rectifier T.R.F. 3/9
 Cabinet, Bakelite, in Walnut or Ivory or Wooden in Walnut Finish 17/6
 Packing and Insurance 2/6



SEND 1/6 FOR EASY TO FOLLOW POINT-TO-POINT DIAGRAMS AND CIRCUIT DIAGRAM which shows how YOU can build the Receiver illustrated above.

THE COMPLETE KIT to construct a 3-valve plus rectifier T.R.F. Receiver for use on 200/250 v. A.C. mains can be supplied at **£5.19.6** plus 2/6 packing and carriage. Each Kit is complete in every detail, nothing has to be made or improvised. Easy to follow, point-to-point diagrams are supplied, making construction very simple. The Dial is illuminated, and the Receiver housed in its Cabinet size 12in. x 5 1/2 in. x 6in. presents and attractive appearance. The valve line-up is: 717A—H.F. Pentode

VR116—Detector, ART4—Output, and Metal Rectifier. Waveband coverage is for the medium and long bands. Choice of 3 Cabinets: Bakelite in Walnut or Ivory, or Wooden (Walnut finish).

STOP PRESS!!

AVAILABLE SHORTLY, DAYLIGHT VIEWING WIDE ANGLE SUPERHET T.V. KIT. ALL CHANNELS WITH NO COIL OR CORE CHANGING. COMPLETELY ISOLATED FROM THE MAINS, SUITABLE FOR 17", 14" or 12" TUBE. NEW TIME BASE MAY BE USED TO CONVERT EXISTING PREMIER T.V. KITS FOR USE WITH THE LATEST TYPE PICTURE TUBE. WRITE FOR DETAILS.

Famous Manufacturer's Surplus of ANTI-INTERFERENCE AERIALS offered at a fraction of original cost



The aerial is designed for reception of long, medium and short waves with any ordinary or communications receiver, having an input impedance greater than 1,000 ohms long/medium waves and 150 ohms short waves. The installation discriminates against locally generated electrical interference, especially on the short wave bands. The equipment enables the installation of an 8.3 Mc/s flatly-tuned diaphragm which operates as a "T" aerial on medium and long waves. The aerial and receiver transformers are intended to be interconnected with a 70 ohms co-axial cable. The aerial transformer comprises a dual transformer matching network whose function is to transfer the energy picked up by the aerial to the down lead. This transformer is inserted in the centre point of a 60ft. aerial. The set transformer is a dual transformer matching network which transfers the energy from the down lead to the receiver.

COMPONENT PARTS
Aluminium Aerial Transformer Assembly
 Comprising one each: Aluminium transformer, Transformer clip, Rubber sucker, 1/2 in. x 1/2 in. brass screw, 4BA x 1/2 in. brass bolts, 4 BA nut.
Receiver Transformer
 Complete with Insulators, clips, etc.; Porcelain Insulators 2 each. 50ft. Insulated Aerial Wire, 60ft. Screened Co-Axial Down Lead.
Installation instruction leaflet included.
LESS CO-AXIAL CABLE & AERIAL WIRE
15/- plus 1/6 pkg. & carr.
COMPLETE WITH CO-AXIAL CABLE & AERIAL WIRE
37/6 plus 1/6 pkg. & carr.

Govt. Surplus EX W.D. STEEL AERIALS
 Also ideal for fishing rods—All Brand New
 12ft.—3 4ft. sections of copper-plated steel highly flexible tapering 1/2 in. to 1/4 in. Brand new in container, Plug-in type 6/9. Screw-in type 7/9. Packing and carriage 1/6. Insulated Base, 3/- Webbing waterproof carrying case with shoulder sling, 2/6.

MANUFACTURER'S SURPLUS STOCK

5 VALVE SUPERHET RADIO RECEIVER CHASSIS, built to high standards ensuring quality reception. **SPECIFICATION** — VALVE LINE-UP: 787, 787, 706, 706, 7Y4. 3 WAVEBANDS Long, medium, and short. CONTROLS: Tuning wave change, volume tone control, on/off Gram. Position on Switch Pick-up and Extension Speaker Sockets incorporated. For use on 200/250 v. A.C. mains. **DIMENSIONS**: Length 14 1/2 in., height 11 1/2 in., width 6 1/2 in. Distance between controls, left to right from edge of chassis: 1in., 3in. **£7.19.6**
 6 1/2 in., 3in. Plus 5/- pkg./carr./ins.
 The above Receiver is less Speaker and Output Transformer. A suitable 10in. Moving Coil Speaker and Output Transformer can be supplied at 28/- extra.

A 4-Valve BATTERY SUPERHET RADIO RECEIVER CHASSIS
 by the same manufacturer is also available. **SPECIFICATION** — MAZDA VALVE LINE-UP: TP25, VP24, HL23DD, Pen. 25, 3 WAVEBANDS Long medium and short. CONTROLS: Tone, Volume On/Off, Tuning, Wavechange, Gram. Position on Switch. Pick-up and Extension Speaker Sockets incorporated. Batteries required LT 2 volt, HT 120 volt. **DIMENSIONS**: Height 6 1/2 in., length 10 1/2 in., width 5 1/2 in. Distance between controls, left to right from edge of chassis, 1 1/2 in., 3 1/2 in., 3 1/2 in. **£5.15.0** (Less Batteries) plus 5/- pkg./carr./ins.
 The above Receiver is less Speaker and Output Transformer. A suitable 8in. Moving Coil Speaker and Output Transformer can be supplied at 23/- extra.

ANOTHER SENSATIONAL BUY!
 A Three-Speed Automatic Record Changer made by a World-famous manufacturer offered at 25 per cent. below the list price. The Unit designed to play 12in. 10in. and 7in. Records intermitted in any order at 33 1/3, 45 or 78 r.p.m. Capacity 10 records. New reversible dual stylus crystal Pick-up has extended frequency range to 10,000 c.p.s. Self-compensated for the L.P. lower frequencies with the Turnover frequency at the correct point. An essential feature is the simplicity of design. For use on 100/125-200/250 volts 50 cycles A.C. mains.

LIMITED QUANTITY ONLY £11.19.6
 Plus packing and carriage 5/-
 BRAND NEW, guaranteed and in LIST PRICE manufacturer's orig. carton. £16.10.0

ELECTRIC GRAM UNITS
 Two-speed, 33 1/3 and 78 r.p.m. For playing standard and L.P. recordings. Complete with Turntable. For use on 200-250 v. A.C. mains. Each unit is in its original manufacturer's carton and is fully guaranteed. Limited quantity only available at approx. half list price. **£4.2.6**
 Plus 2/6 pkg., carr. ins.

GARRARD GRAMOPHONE UNITS
BRAND NEW
 Induction motor, 100-250 volt, 50 cycles A.C. only, 78 r.p.m. The GARRARD Induction motor is totally enclosed. Entirely free from radio frequency disturbance, magnetic hum and electrostatic Variable speed. With 12in. Turntable. Price **£4/19/6** plus packing and carriage 5/-.

GARRARD Type 75, Latest 3-speed Autochange Unit complete with 2 Acos High Fidelity G.P.19 Pick-up Heads. 1 L.P. and 1 standard. **£14.19.6**

GARRARD Rim Drive 78 r.p.m., complete with magnetic pick-up and turntable. **£5.19.6**
COLLAO 3-speed single-gram. unit, complete with head for L.P. and Standard recordings. **£8.8.0**
 Packing and carriage on each of the above units 2/6

EX-U.S.A. U.H.F. AERIAL
 with untuned detector stage, consisting of V.R.92 valve etc. Brand new, in carton, 5/-.

ONLY A FEW LEFT—BUY NOW!

THE 'SOBELL' 4-VALVE SUPERHET TABLE RECEIVER
M. & L. WAVEBANDS
 Valve Line-up 1237, 351A, 1487, 352A.
 Entirely transportable and unusually sensitive owing to special feed-back circuit employed. Housed in attractive plastic cabinet. Choice of 2 Colours—Ice Blue or Aero Green. Carrying handle incorporated in design. For use on 200/250 A.C./D.C. mains. Plus 5/- Pkg./carr./Ins. **£8.19.6**
 Fully covered by Manufacturer's Guarantee



LIMITED QUANTITY ONLY AVAILABLE AT GREATLY REDUCED PRICE
Famous 'ROBERTS' M.A.D.
 All Dry Battery Portable (Ex-B.A.F.)
 This is a 4 valve superhet Receiver covering medium and long wavebands. Built in Aerial. Housed in a superbly finished resin covered case. Brand new in manufacturer's original carton. **£13.13.0**
 plus 7/6 pkg./carr./ins. (Complete with Battery 17/6 extra.)

A WORLD-FAMOUS Manufacturer's Surplus of RADIO RECEIVER CHASSIS 7-valve RECEIVER

Built to exacting specifications and incorporating features ensuring superlative tonal qualities and world-wide reception. Specification: 8 watts push-pull output using 2 Mazda Pen. 45 valves. Ample negative feedback is applied over all the audio-amplifier. Amplifier Mazda Type HL41DD gives signal Detection A.V.C. and Phase Splitting. Two stages of I.F. amplification 465 Kc/s., using Mazda VP41. **FOUR WAVEBANDS—14 M.—24 M., 24 M.—55 M., 190 M.—600 M., 900 M.—2,000 M.** DIRECT AND VERNIER TUNING. Gram. position on Switch. Provision for external Loudspeaker. For use on 200/250 A.C. Mains. **£13/10/-**, plus 21/- pkg. and carr.



WILLIAMSON AMPLIFIER KIT
 A complete kit of parts for the construction of the latest version of this famous amplifier, complete with valves, output and mains transformers. **15 gns.** Plus 7/6 pkg., carr. and ins.
WILLIAMSON AMPLIFIER TRANSFORMERS (To specification)
 The Output Transformer 3.6 ohms sec. **£4/4/-**
 The Mains Transformer PREMIER SP425A, **£3/7/6**.

RECTIFIERS

Type K3/25	650 v.	1 mA.	Type S.T.C.	4/7
.. K3/40	3.2 kv.	1 mA.	.....	6/-
.. K3/45	3.6 kv.	1 mA.	.....	8/2
.. K3/50	4 kv.	1 mA.	.....	8/8
.. K3/160	12 kv.	1 mA.	.....	21/6

S.T. Type S.T.C.

Type RM1	125 v.	60 mA.	.....	4/6
.. RM2	125 v.	100 mA.	.....	5/-
.. RM3	125 v.	125 mA.	.....	6/-
.. RM4	250 v.	250 mA.	.....	18/-

L.T. Type G.E.C. Full Wave.

6 v. 1 amp.	.....	5/-
12 v. 1 amp.	.....	9/-

VCR 517C 6 1/2 in. CR TUBE
 This tube is a replacement for the VCR97 and VCR517. Brand new and guaranteed full size picture. **PRICE 35/-**, plus 2/6 packing and carriage.

ACCUMULATORS
 By world-famous maker, 2 volt 10 amp. 4.11

PREMIER RADIO COMPANY

(Regd.) B. H. Morris & Co. (Radio) Limited. Estab. 40 Yrs.
 (Dept. W.W.) 207 EDGWARE ROAD - LONDON, W.2.
 Telephones: AM Bassard 4033 & PADdington 3271/2
OPEN UNTIL 6 P.M. SATURDAYS **CLOSED 1 P.M. THURSDAYS**

Terms of Business:
 Cash with order or C.O.D. over £1. Please add 1/- for Post Orders under 10/-, 1/6 under 40/- unless otherwise stated.

ACCLAIMED BY ALL
**The PREMIER De Luxe PORTABLE Magnetic
 Tape Recording Kit—Price £37.4.0**



(Plus 15/- Pkg., Carr. & Insur.)



The
**'PREMIER'
 Recorder**

This Recording Outfit has been designed for use with M.C.-2-111 "SCOTCH BOY" Magnetic Tape. With this new and improved high-quality tape a frequency of 50 c.p.s. to 9,000 c.p.s. at tape speed of 7 1/2 in./sec. can be readily achieved. Additional reels of 1,200ft. can be supplied at 5/-.

INSTRUCTIONAL BOOKLET . . . 2/6
 This is credited if a complete kit of the Tape Recorder is ordered.

As is usual in all PREMIER KITS, every single item down to the last nut and bolt is supplied. The Chassis is punched and layout diagrams and theoretical circuits are included. When completed the PREMIER PORTABLE TAPE RECORDER compares MORE than favourably with any other make at double the price.

SEPARATE UNITS CAN BE SUPPLIED AS LISTED BELOW—
AMPLIFIER KIT (including 8in. Speaker). . .£11.0.0 plus 5/- pkg./carr.
AMPLIFIER (already built, wired and tested). . .£14.15.0 plus 7/6 pkg./carr.
LANE TAPE TABLE & REWIND SPOOL. . .£16.10.0 plus 7/6 pkg./carr.
PORTABLE CABINET (rexine covered). . .£4.19.6 plus 5/- pkg./carr.
MICROPHONE . . .£2.19.6 plus 1/- pkg./carr.
REEL OF NEW M.C.-2-111 "SCOTCH BOY" TAPE
 (1,200ft.) . . .£1.15.0 plus 6d. pkg./carr.

To those unable to build this PORTABLE TAPE RECORDER we can supply it completely wired, tested and ready to plug in at **39GNS** Plus 1 gn. pkg./carr.

CRYSTAL MICROPHONE
 An entirely insulated crystal microphone which can be safely used on A.C./D.C. amplifiers. High impedance. No background noise, really natural tone. The Ideal Mike for tape, wire and sound projectors. Price 22/6.



MICROPHONE STAND BASE
 Heavy Moulded Black Base fitted with Standard thread adaptor. Dimensions: 7 1/2 in. across, 2 in. deep. Weight: 1 1/2 lb. Post paid 3/11.

MOVING COIL MICROPHONE
 Low impedance. Incorporates pre-talk switch. Housed in strong black bakelite case. Dimensions: 2 1/2 in. wide, 2 1/2 in. high, 1 1/2 in. deep.
 Plus 1/6 post and packing
19/6
 A matching transformer for high impedance can be supplied at 3/6 extra.

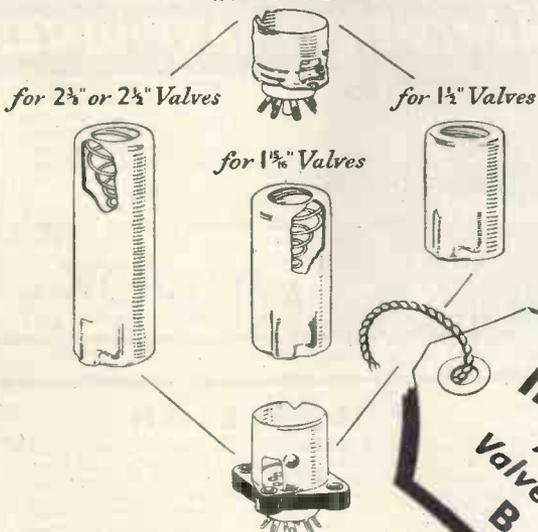


MICROPHONES
LUSTRAPHONE: Moving Coil; High Impedance. Stand Type: £5/12/6—Hand Mike £6/6/-.

RONETTE—Crystal Mike; Incorp. the Filter Cell Insert; High Imped. Ball Type: £3/19/6.
CRYSTAL MICROPHONE—Rothermel 2AD56. Especially recommended. £2/19/6.
 Table Stands for all the above 17/6.

SKIRT No. 4
 Standard Base

Recognised as the Most Reliable Valveholders



B7G Valveholders

are now available moulded in:—
Phenol Formaldehyde (Black).
Nylon loaded Phenol Formaldehyde
 (Natural Brown).
P.T.F.E.



Wholesale Enquiries:—
CYRIL FRENCH HOLDINGS LTD.
 High St., Hampton Wick
 Middlesex. KIN. 2240

The LATEST and IMPROVED TAPE

For all popular tape recording machines



Specially wound on transparent perfectly balanced plastic spools which fit easily to all popular types of tape recorders. The advantages of FERROVOICE are now available to all. FERROVOICE improves the performance of all recorders. It provides twin-track recording of the highest standards of quality and faithfulness. Tape wear and rotation noises are reduced to the minimum.

FERROVOICE is the most modern and most efficient tape available.

It brings to all tape recorders the highest standards of recording and reproduction.

Technical features: Super Calendered Kraft Paper—breaking strain approximately 4 lb.—Tape width 0.247 ± 0.001 ". Medium coercivity—ease of erasure—frequency response 50 c/s to 10 Kc/s at $7\frac{1}{2}$ " per second. Length of tape 1,200 ft. Spool 7" diameter.

NOTE THESE OUTSTANDING FEATURES

- ★ TWIN-TRACK RECORDING WITH UNIFORM RESPONSE.
- ★ HIGH PLAY-BACK LEVEL AND LOW NOISE COMPONENT.
- ★ LIGHTWEIGHT PRECISION BALANCED SPOOL.
- ★ FERROVOICE SPOOLS KEEP WEAR, TEAR AND ROTATION NOISE TO A MINIMUM.

FERROVOICE

REGD

The Tape YOU will ultimately use

Trade Enquiries Invited.

MAGNETIC COATINGS LTD., 38 GROSVENOR GARDENS LONDON SW1

'phone: SLOane 9129

PRICE
22'6
RETAIL

90%
WATT/HOUR EFFICIENCY

and savings up to $\frac{1}{3}$ of the size, and $\frac{1}{3}$ of the weight in comparison with other storage batteries of similar capacities! The Venner silver-zinc accumulator is ideal when exceptionally high rates of discharge are a necessary requirement.

Write for Brochure VA/HI.



VENNER *Lightweight* ACCUMULATORS

VENNER ACCUMULATORS LTD.
Kingston By-Pass, New Malden, Surrey
Telephone: MALden 2442



MINIATURE MAGNETIC LIGHTWEIGHT EARPHONES



The AMPLIVOX E.4, E.5 and E.6 provide a range of highly sensitive lightweight miniature receivers. Ideal for many applications, the inserts have been incorporated in lightweight headsets, stethoscope devices and small microphones.

The E.6 is the smallest of the range, the diameter is 0.835" and weight 1oz. D.C. resistance E.4 & E.5 2-2,000 Ω
E.6 1-600 Ω

AMPLIVOX LTD.
2 Bentinck Street, London, W.1.

TELEVISION

for "Fringe" and "Long distance" viewers is vastly improved with the SPENCER-WEST type AC/3 Pre-Amplifier. The specification includes a first stage neutralised triode cathode coupled to a grounded grid triode. The optimum arrangement for best "noise factor". Self-contained power supply unit complete with correctly adjusted interference filter. Price complete, 10 gns. from your dealer or direct. Leaflets, etc., on request.

RECEIVER CONVERSION TO NEW CHANNELS
The type AC/4 Converter units for perfect simple conversion. Price complete with 5 valves and self-contained power unit, etc., 15 gns. Available for Brighton booster on London receivers (type AC/4KL) and all other conversions. Leaflets on request.

SPENCER-WEST
QUAY WORKS, GT. YARMOUTH

Phone: Gt. Yarmouth 3009

WE PAY TOP PRICES

FOR

AMERICAN SURPLUS ELECTRONIC EQUIPMENT

Any Quantity or Condition

LOOK AT THESE EXAMPLES

for equipment in good condition

SCR291, complete	£350
Receiver R54/APR4 with all tuning units	£135
Transmitter ET4336	£110
Receiver BC348 (R model only)	£25
Frequency Meter TS/175	£80
TX/RX RT18/ARC1	£50
Test Set TS13	£100
Valves 723A/B	£3

We pay similar Remarkable Prices for

RECEIVERS. APR1 with or without tuning units. APR5, R9/APN4, R5/ARN7, R89B/ARN5, BC348Q, BC342, BC312, BC603, BC683, BC788C, R19/TRC1, BC1147.

TRANSMITTERS. ART13, BC640, BC610.

TRANSMITTER/RECEIVER. Part of SCR718. SCR522.

RECEIVER INDICATOR. R65/APN9

INDICATORS. ID6/APN4, BC1151, BC1159, BC1152, I-81A, I-82A, I-152C, I01-D.

TEST SETS. TS3, TS13, TS14, TS34, TS45, TS59, TS100, TS102, TS118, TS120, TS147, TS148, TS170, TS173, TS174, TS323, I-100, IE19, BC221, BC638, BC1091.

MODULATORS. BC1142.

SYNCHRONISERS. BC1148.

RECTIFIER POWER UNITS. RA34, RA42, RA88, RA90.

COMPLETE EQUIPMENT OF PARTS. ARC3, TCS6-12-13-14, SCR291, SCR720, TRC1.

POWER UNITS AND DYNAMOTORS. MG149, MG153, PU16, PE98, DM28, DY11, DY12, DY17,

ANTENNAS. AS27A, AT4.

MISCELLANEOUS ITEMS. Microphones T17. Coils O-16, O-17. Control Boxes MR9B. Headsets HS33.

AND ALMOST EVERY AMERICAN MADE UNIT EVEN IF NOT MENTIONED ABOVE

Phone us immediately, transfer charge

DEAL WITH THE FIRM THAT HAS BEEN ESTABLISHED FOR TWENTY-FIVE YEARS AND WHICH IS BY FAR THE LARGEST BUYER OF HAM EQUIPMENT

ALTHAM RADIO CO.

JERSEY HOUSE, JERSEY ST.

MANCHESTER 4

Tel.: Central 7834/5/6

DESIGNED FOR *economical* SOLDERING

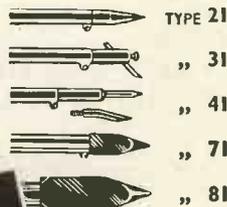


The Wolf Type 51 trigger-feed soldergun is designed for faster, cheaper and easier soldering and is ideal for rapid work on small connections and repair jobs. The solder is fed automatically with a finger-trigger action and two reels of solder are supplied—one 15 feet acid-cored and one 15 feet of resin-cored.

Only Wolf offer all these profitable advantages:—

- Perfect balance
- Rapid constant heat
- Low current consumption
- Localised heat
- Easy grip handle
- 5 feet tough rubber 3-core cable

FIVE OTHER MODELS TO CHOOSE FROM



Also Types 22, 32 & 42 straight handle soldering irons.

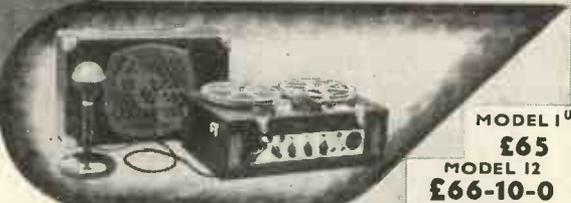
Obtainable from all leading tool merchants and factors

Wolf
Electric
SOLDE RGUNS

WOLF ELECTRIC TOOLS LTD
PIONEER WORKS • HANGER LANE • LONDON • W.5
Branches: Birmingham, Manchester, Leeds, Glasgow. Tel: Perivale 5631-4



ACE TAPE RECORDERS MODELS 10 & 12 HAVE EVERYTHING
10 WATTS PUSH-PULL HIGH FIDELITY AMPLIFIER
3 INPUTS. CRYSTAL & M/C. MICS. & GRAM.
3 TAPE SPEEDS; 3 3/4, 7 1/2 & 15 INCHES PER SECOND
2 TRACKS PER TAPE - 2 HRS. RECORDING
2 SEPARATE INPUT CONTROLS FOR MIXING
COMPLETELY AUTOMATIC ERASE (ELECTRONIC)
DETACHABLE SPEAKER UNIT MODEL 12
FAST REWIND & FORWARD WIND
MONITORED & DIRECT INPUTS
VERY COMPACT MODEL 10 15 1/2" x 10" x 7 3/4"



MODEL 10 £65
MODEL 12 £66-10-0
Demonstrations from:—

ASSOCIATED CINE EQUIPMENTS LTD.
353, BEXLEY ROAD, ERITH, KENT. Phone: Erith 2543.

Television • Radio • Record CABINETS MADE TO ORDER

ANY SIZE OR FINISH

CALL OR SEND DRAWINGS FOR QUOTATIONS

B. KOSKIE (DEPT. E.)
72-76 Leather Lane, Holborn, E.C.1
Phone: CHAncery 6791 & 6792

POLYTHENE H. F. EQUIPMENT

(AMBYTHENE BRAND)
COIL FORMERS
CHOKES
STAND-OFFS
FEED-THROUGHS

Send for particulars and Samples

AMPLEX APPLIANCES (KENT) LTD.
19 DARTMOUTH ROAD, HAYES, BROMLEY, KENT.
(RAVENstourne 5531)
All export enquiries to
ANTEX LTD., 3, TOWER HILL, LONDON, E.C.3

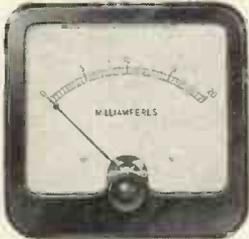


Precision INSTRUMENTS
for the Laboratory

This Bench type portable instrument is used in many laboratories where consistent accuracy is demanded. Single or multi ranges for D.C. or A.C., calibrated to customers' requirements. Sizes 3½", 4" or 6" instruments. Accuracy B.S. First Grade.



A First Grade B.S.I. moving coil, panel mounting instrument, supplied as D.C. Micro-Ammeter, Milli-ammeter, or Voltmeter. Also available as A.C. Voltmeter for frequencies up to 50,000 c/s A.C. Ammeter with internal transformer, or R.F. instrument with internal thermo-couple.



Type M35, 4½" square
Also Type M202, 2" square

Thermaster

New Low Temperature Indicator

The most versatile instrument for temperature measurement. Calibration can be effected for any required range between minus 80 degrees centigrade and plus 200 degrees centigrade, providing the scale extends over any 20 degrees or more, thus giving the most open scale possible to cover the working range. Easy detection of changes to within ½ degree, instant response; self-contained with small dry battery; readings unaffected by voltage change. Pencil type "Thermo-Detector" for surface contact, immersion, air or liquid temperatures; supplied with any length of leads without affecting accuracy. Scale 8in. long.



Price from:-
£12.10.0

Complete with one element and 4ft. leads



● Write for Catalogue No. S/11 giving full details of complete SIFAM range.

SIFAM ELECTRICAL INSTRUMENT CO. LTD.
LEIGH COURT, TORQUAY Telephone: Torquay 4547-8

**EXACT
EFFORTLESS
TUNING**



The S.L.8 Spin wheel drive gives easy control through a ratio 24-1. Fitted with constant velocity coupling, it eliminates strain on the Condenser, providing mechanical and electrical isolation from vibration and noise.

Complete with 3-band glass scale 9in. × 4½in. Printed short, medium and long wavebands with station names. Scale length 7in. Supplied with florentine bronze escutcheon.

PRICE 27/6.

S.L.5, similar but fitted with reverse vernier drive, gives ratios of 18-1 search and 50-1 reverse vernier.

PRICE 26/6.

Replacement Scales calibrated to Copenhagen Plan now available for:

Airplane drive	2/3 retail	Full Vision Drive	2/9 retail
Squareplane Drive	2/6 retail	S.L.8 or S.L.5 Drive	4/6 retail

PRECISION COMPONENTS BY



JACKSON

BROS. (LONDON) LIMITED
KINGSWAY · WADDON · SURREY

Telephone: Croydon 2754
Telegrams: Walfilco, Souphone, London

Immediate delivery - of course

VALVES !! TUBES !!

RECEIVING, TRANSMITTING, MAGNETRONS, KLYSTRONS,
CATHODE-RAY TUBES, PHOTOCELLS, ETC.

First Grade Quality - British and American Make - No Dollar Expenditure Involved

LARGE QUANTITIES & GREAT VARIETIES

S. Szymanski

(pronounced SHE-MAN-SKEE)

ELECTRONIC ENGINEER AND STOCKIST

Office and Stores :

12a LEIGHTON GROVE - LONDON - N.W.5

★ Telephones: { GULtver 6077/8 (2 lines)
HENdon 1617

★ Telegrams: { Overseas: "Shemanskee" London
Inland: "Shemanskee" Norwest London

PROBABLY THE LARGEST ACTUAL STOCKIST IN ENGLAND
WHOLESALE AND EXPORT ONLY

BK

SPECIALISED LOUDSPEAKER
ENCLOSURES No. 2
TYPE V.C.

Non-resonant
sand filled
corner Baffles

Model S.V.C. for 8in. or
10in. speaker units. Of
sturdy laminated wood
construction, individually
hand finished in light, dark
or medium reproduction
oak, mahogany or walnut
to order.

SPECIFICATION

36in. high x 22in. wide.
5in. wings. Wall space:
21in. each side of corner.
Volume: 4) cu. ft. Density
2.8 gms. per centimetre.
Wings, front and lid have
fin. cavity sand filled.
Gold aluminium mesh and
sub-baffle for 8in. or 10in.
units.

Price 12 Gns.

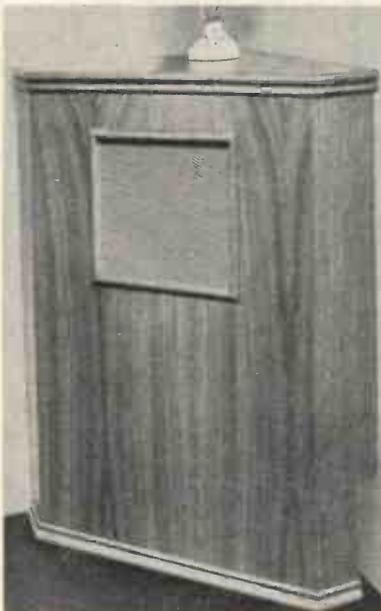
Model M.V.C. for 12in.
speaker units.

Price 16 Gns.

Model C.V.C. for 15in.
speaker units. Price £22.

Top baffles for 8in. and 5in.
treble units from 30/-.

These as well as other high
fidelity speakers and ampli-
fiers can be heard at our
showrooms. Daily be-
tween 10.30 a.m. and 5.30
p.m. Sat.: 10.30 a.m. and
12.30 p.m.



SOUND ENGINEERS TO **LEEVERS-RICH** THE FILM INDUSTRY

LeeRaser

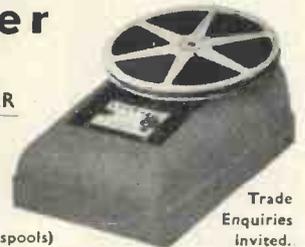
THE ORIGINAL
ULTRA RAPID
TAPE DEMAGNETIZER

MODEL B

(as illustrated)

MODEL C

(for larger professional spools)



Trade
Enquiries
Invited.

LEEVERS-RICH EQUIPMENT LTD.,
80, WARDOUR STREET, LONDON, W.1. GER. 4502



RELAYS AND KEY SWITCHES



LARGEST EX-GOVT. STOCK
IN GT. BRITAIN

Types 600-3000 Relays—Siemens High Speed
Also A.C. 400 volts 50 cycles

Uniselector Switches, Telephone Switch-Boards, Telephone Components,
Plugs, Jacks, Handsets—Government Contractors.

JACK DAVIS (RELAYS) LTD. (Dept. W.)
36 PERCY STREET, LONDON, W.1

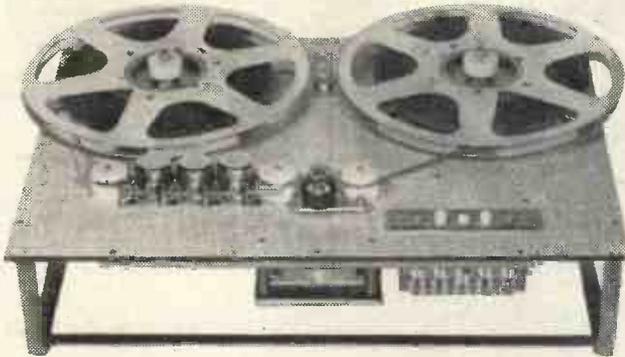
Phones: MUSEum 7960, LANgham 4821

B. K. PARTNERS LTD.,

229 REGENT STREET, W.1. REGent 1051



62 MINUTES AT 7 1/2 INCHES PER SECOND



The new **BRADMATIC MODEL 5d** tape desk is designed to take 2,400ft. reels which provide 62 minutes of high fidelity recording at 7 1/2 i.p.s. or 124 mins. at 3 3/4 i.p.s.

The 5d desk is supplied with reel adaptors for 10 1/2 in. double sided reels which are removable enabling the use of 9 3/8 in., 7 in. or 3 5/8 in. reels. Double track recording, fast wind and rewind, three motors, heavy flywheel, servo brakes and push-button control. Panel size 20 in. x 14 1/2 in.

PRICE (with reel adaptors) 6RP heads £50 0 0

OTHER MODELS AVAILABLE

Model 5c Tape Desk (to take 9 3/8 in. reels).

Programme Time : 55 mins at 7 1/2 i.p.s.

PRICE (with 6RP heads) :

Large panel, 20 in. x 14 1/2 in. £47 10 0

Small Panel, 13 1/4 in. x 15 1/2 in. £45 10 0

Model 5b Tape Desk (to take 7 in. reels).

PRICE (with 6RP heads) £42 0 0

PORTABLE RECORDERS

In rexine covered case, provision for external loudspeaker.

PRICE : Type D2 (fitted with 5b desk) £117 0 0

Type D5 (fitted with 5c desk) £129 10 0

ACCESSORIES AVAILABLE

Magnetic Heads

Type 6RP (super fidelity) £3 15 0

Type 5RP (Record Play) £3 5 0

Type 5E (Erase) £3 5 0

Mumetal Cans for above, 8/6 each. **Amplifiers, Microphones, etc. Magnetic Tape and Reels.** Scotch Boy, Emitape, Gevasonor, Ferrovoice, G.E.C., always in stock.

Send for lists.

Trade supplied.

BRADMATIC LIMITED, STATION ROAD, WITTON LANE, BIRMINGHAM, 6

Telephone: East 0574

Telegrams: Bradmatic, Birmingham, 6

- if you look for BIG RESULTS



It's blooming marvellous—the rise in efficiency that results from the use of OSMOR "Q" Range Coils. No wonder our customers are enthusiastic! They tell us these "mighty marvels in miniature" are super selective and sensitive to a degree they never dreamed possible. And we guarantee them—they're the outcome of patient scientific research plus the highest technical ability. Note these "plus" points that spell superior performance: — ★ Only 1 in. high. ★ Packed in damp-proof containers. ★ Variable iron-dust cores. ★ Fitted tags for easy connection. ★ Low loss Polystyrene formers.

4' - EACH



COILPACKS. Now at new lower prices! A full range is available for Superhet and T.R.F. Mains or Battery. Size only 1 1/2 in. high x 3 1/2 in. wide x 2 1/2 in. Ideal for the reliable construction of new sets, also for conversion of the 21 RECEIVER, TR 1196, TYPE 18, WARTIME UTILITY and others. Aligned and tested, with full circuits, etc. Fully descriptive leaflets available.

We keep stocks of many radio components for use in published circuits, including — "WIRELESS WORLD" NO COMPROMISE TRF TUNER (Osmor coils QA1 1/2 and QHF11 for M.W. and QA12 and QHF12 for L.W. are suitable, price 4/- each.)

MIDGET MAINS RECEIVER

(Osmor coils QA11 for M.W. and QA12 for L.W. are suitable, price 4/- each.)

SENSITIVE 2 VALVE RECEIVER

TELEVISION CONVERTER (special coils in cans available)

"PRACTICAL WIRELESS"

3-speed Autogram. Modern 1-valver. A.C. Band-Pass 3. R1155 Converter. Attache case portable Modern high power Amplifier—2. Beginner's Superhet.



MATCHED COMPONENTS
Various types of OSMOR Dials, Chassis, I.F.s, Speakers, Transformers, etc., to match our coils and coilpacks are all listed.

FREE!

Send 5d. (stamps) for **CIRCUITS** and full lists of coils, Coilpacks and radio components.



Dear Reader,
We can't mention all our products here but shall be glad to receive your enquiries for Chassis, Tuning Condensers, Switches, Volume Controls and all other Radio Components. If it's top-quality components and a speedy, courteous service you are looking for—try Osmor. We really shall do our best for you.

radio products Ltd
(Dept. W.44) BRIDGE VIEW WORKS, BOROUGH HILL, CROYDON, SURREY.
Telephone: Croydon 5148/9

FOR BRILLIANT SOUND RECORDING



- Two speeds, giving TWO HOURS perfect speech recording, or ONE HOUR high-fidelity music recording.
- Push-button control and magic eye tuning give instant mastery of both recording and reproduction.
- The same tape can be used repeatedly, each new recording automatically erasing the previous one, or recordings can be kept and played indefinitely.
- High-speed rewind mechanism returns you to any part of the two hour tape in two minutes.
- Unique condenser microphone, as sensitive as the human ear, faithfully reproduces all tone characteristics.
- Sound Frequency Range: 50-10,000 c/s at 7½ in. per second. 50-6,000 c/s at 3½ in. per second.

As compact and portable as a suitcase.

PRICE 80 GNS. H.P. TERMS AVAILABLE

GRUNDIG

"Reporter" 700L

TWO SPEED TAPE RECORDER

The Finest Tape Recorder
in the World.

Write for illustrated Folder to:

Grundig (Gt. Britain) Ltd., Kidbrooke Park Road, S.E.3.

G.61

SCALAMP ELECTROSTATIC VOLTMETER



Cat. No.
W.W. 11310

DIRECT READING.
ZERO CURRENT DRAIN.
THREE SECONDS PERIOD.
LAMP OPERATES FROM MAINS OR 4 VOLT BATTERY.
BRIGHT SPOT-AND-HAIRLINE INDICATOR.

This instrument introduces a completely new conception of electrostatic voltmeter. It is compact, portable and robust, and does not require critical levelling or special mounting. The movement has a taut suspension, is critically damped, and readings can be taken with rapidity and ease. Three models are available:

Cat. No. W.W. 11308
1 - 5 kV A.C. D.C.
Cat. No. W.W. 11309
3 - 10 kV A.C. D.C.
Cat. No. W.W. 11310
5 - 18 kV D.C. and
5 - 12 kV A.C. R.M.S.

Please write for illustrated leaflet.

SCIENTIFIC  INSTRUMENTS

W. G. PYE & CO. LTD., GRANTA WORKS, CAMBRIDGE

PRATTS RADIO

1070 Harrow Road, London, N.W.10

(Nr. Scrubs Lane)

Tel.: LADbroke 1734



MODEL AC10E £10/7/6.

College general-purpose units. MODEL AC10E, 4 valve, 10 watts. Neg. feedback, £10/7/6. MODEL AC15E, 6 valve, 18½ watt P/P output. Feedback over 3 stages, £15/15/-. MODEL AC32E, 32 watts P/P output. Feedback over 3 stages, £18/18/-. MODEL U10E, for D.C./A.C. mains, 6 valve P/P output. Feedback over 3 stages, £12/19/6. All are COMPLETE WITH CASES and chrome handles. They have a SEPARATE microphone stage, SEPARATE mike and gram. Inputs allowing MIXING of speech and music. Input voltages average .003 mV and .3 gram. Outputs match 3, 8 or 15 ohm speakers. MODEL Q9C, 6-valve unit with Bass and Treble controls. P/P output of 9 watts. This amplifier incorporates an 18 section O/Transfr., variable feedback from zero to 25 db. Output imp. 3.6 to 230. Complete chassis, £13/19/6. MODEL Q4C, 4 valve 4 watt unit Bass and Treble controls. Variable feedback. O/Imp. 3 to 15 ohm. Chassis complete, £9/15/-. Complete range of accessories available. Send stamp for lists. All amplifiers are ready for use.

TRADE ONLY

WE hold large and comprehensive stocks of all types Radio Components. Your enquiries are invited for condensers, resistors, volume controls, fuses, valve-holders, headphones, etc., etc., also new surplus valves.

Ring MUS. 5929-0095, for immediate attention.

R. C. SERVICES (RADIO)

117, CHARLOTTE STREET - LONDON - W.1.

**For Quality
in the
Core**



and efficient screening
**ELECTRICAL STAMPINGS
AND MAGNETIC SCREENS**

by **MEA**
remain unequalled

The extensive M.E.A. range of standard tooling running into hundreds of patterns paces progress in the ever expanding field of Electronics. Your requirements, standard or special, in any grade of Silicon or Nickel Iron Alloy, will receive immediate attention.

*A postcard or letter to our Regd. Office will bring you any of the following Catalogues:—
Transformer and Choke Stamping,
F.H.P. Motor Stampings
Magnetic Screening Tubes and Cases
Nickel Iron Alloys Data*

Please address your requests to Dept. DHM.



*For Service to Science and Industry
throughout the field of Electronics*

MAGNETIC & ELECTRICAL ALLOYS LTD.

Regd. Office: 101/103 BAKER ST., LONDON, W.1.

Tel.: Welbeck 3381/2

Works: BURNBANK, HAMILTON, LANARKSHIRE.

Tel.: Hamilton 932/314 & 1658/9

Manchester: 33 BYROM ST., DEANSGATE.

Tel.: Blackfriars 5223

Birmingham: 12 WESTWOOD RD., SUTTON GOLDFIELD.

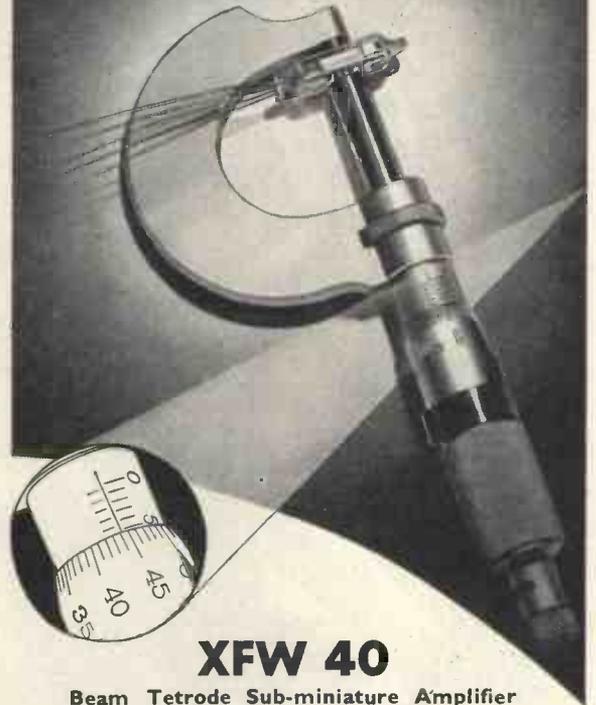
Tel.: Streetly 78586



SUB - MINIATURISATION

HIVAC

**FIRST
TO GET DOWN TO IT!**



XFW 40

**Beam Tetrode Sub-miniature Amplifier
with still lower filament current**

TYPICAL OPERATION

Filament Voltage	0.625v
Filament Current	10mA
H.T. Supply Voltage	22.5v
Anode Load	1 to 2MΩ
Screen Resistance	3MΩ
Stage Gain	32

The maximum cross-section is only 8mm, by 6mm, with a glass length of 27.0mm



The most modern small flat sub-miniature voltage amplifier for hearing aids and other small electronic equipment.

Hivac Ltd.

Telephone: HARrow 2655
GREENHILL CRESCENT, HARROW-ON-THE-HILL, MIDDLESEX



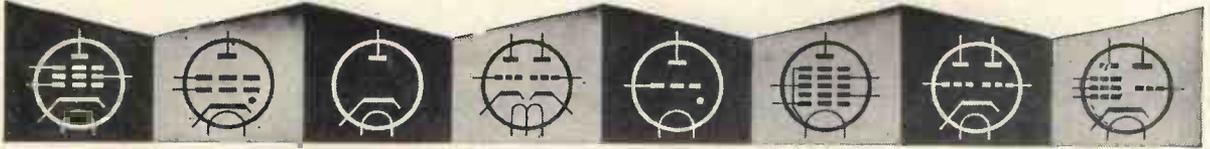
WORLD'S MOST WANTED AUTOCHANGER



Music lovers everywhere are demanding the Monarch—the new idea in automatic record changers. Never before have they had such fidelity of tone; completely automatic selection of all records—12", 10" and 7"; such ease of operation and unfailing reliability.

Many leading set makers fit the Monarch as standard—your request for information will bring full details by return.

Birmingham Sound Reproducers Ltd., Old Hill, Staffs. Grams: 'Electronic Old Hill, Cradley Heath.'



VALVES, TUBES & CIRCUITS

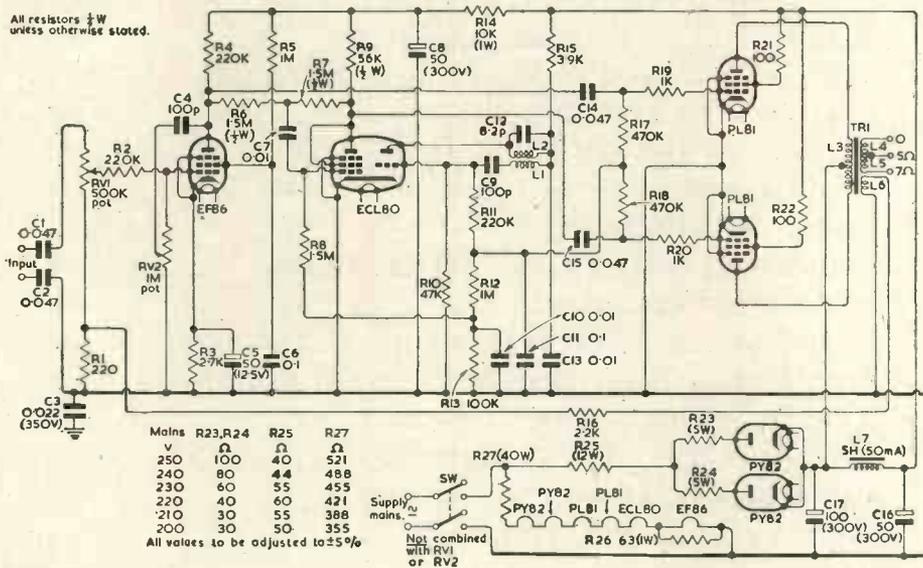
8. 15-WATT D.C./A.C. AUDIO AMPLIFIER

An amplifier suitable for use with D.C. or A.C. mains to give about 15 watts power output can be constructed with Mullard miniature noval-based valves. Two PL81 valves, used as a Class "B" push-pull output stage, are preceded by an ECL80 triode-pentode, the triode section of which operates as an R.F. oscillator at a frequency of about 2Mc/s. The direct voltage developed across its grid leak is used to bias the output valves and also the pentode section of the ECL80. The input signal is amplified by an EF86 and is fed direct to the control grid of one PL81. In addition, a portion of the signal voltage is applied to the pentode section of the ECL80 operating as a triode-connected phase inverter preceding the other PL81.

The power supply consists of two PY82's connected in parallel as a half-wave rectifier. The heaters of all the valves are connected in a 300 mA series chain, the 200 mA heater of the EF86 being shunted by a 63Ω resistor.

The potentiometer, RV2, acts as a treble tone control. An additional secondary winding L6 on the output transformer supplies a negative feedback voltage which is injected into the grid circuit of the EF86 via resistors R16 and R1. As the volume control RV1 is connected to R1, the feedback is minimum at maximum sensitivity of the amplifier and increases when the sensitivity is decreased. Care must be taken, as with all D.C./A.C. equipment, to avoid direct connection between the chassis and earth. In addition the chassis (H.T.—) line should be connected, where possible, to the neutral side of the mains.

An output of 16.2 W is measured at the primary side of the output transformer when the input at the grid of the EF86 is 220 mV. Without feedback the distortion is 6%, this being reduced to 1.8% by the application of feedback. The hum and noise level is 42 dB below at 16.2 W.



BIAS OSCILLATOR COILS L1, L2.
 Standard M.V. local oscillator coil (mains). With no input, current through R10 should be 0.7 mA at 220V mains. Current increased by adding turns to L1 and decreased by removing turns.

OUTPUT TRANSFORMER, TRI.
 Shell type core $1\frac{1}{2}$ in. wide. "No waste" series laminations

0.02 in. thick. 1 in. stack without air-gap. Overall dimensions: $3\frac{1}{2} \times 3\frac{1}{2}$ in.

- L3 : 2 x 880 turns of 33 S.W.G.
- L4 : 88 turns of 18 S.W.G.
- L5 : 16 turns of 18 S.W.G.
- L6 : 120 turns of 29 S.W.G.



Reprints of this advertisement together with additional data may be obtained free of charge from the address below

MULLARD LTD., Technical Publications Dept., Century House, Shaftesbury Avenue, London, W.C.2

BRITISH MADE
BRIMAR
 VALVES



More reliable
than EVER!

Years of experience in the design and manufacture of Trustworthy special quality valves has resulted in *increased reliability throughout the entire BRIMAR Range.*

New techniques and the more accurate control of vital processes have resulted in manufacture of a more uniform and reliable product and in a lower rate of rejection. This, in spite of the fact that testing is more rigorous.

Reliability is especially important in the modern T/V Receiver which employs four times as many valves as radio and — fewer rejects in the factory will mean fewer failures in the field !

The Brimar 6AM6/8D3 and its direct equivalents the Z77, SP6, EF91 and 6F12 have been some of the most widely used valve types in post-war Television Receivers. Large quantities have been used in the following Manufacturers' sets :—

- | | |
|----------|--------------|
| BAIRD | K-B |
| BUSH | MARCONIPHONE |
| COSSOR | MASTERADIO |
| ENGLISH | McMICHAEL |
| ELECTRIC | PHILCO |
| ETRONIC | PILOT |
| G.E.C. | VIDOR |
| H.M.V. | |

Use the improved BRIMAR 6AM6/8D3
 to replace these valves at NO EXTRA COST



now is the time to BRIMARIZE!

Standard Telephones and Cables Limited

FOOTSCRAY · SIDCUP · KENT

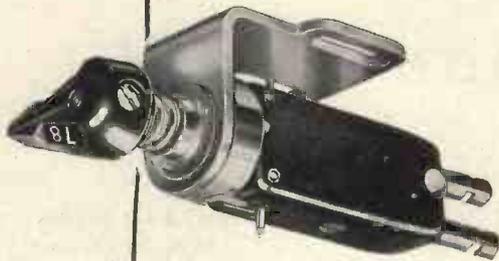
FOOTscray 3333

First of the "Hi-g" Pick-ups

Now available to gramophone manufacturers



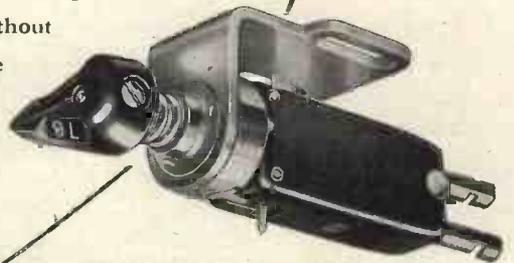
**TURNOVER
PICK-UP CARTRIDGE
TYPE HGP 33-1**



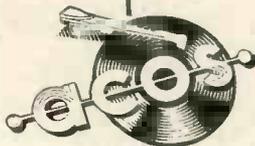
Here it is—the HGP 33, capable of tracking the highest modulation levels that can be engraved on either standard or long playing records.

Nominal output is one volt on standard records and $\frac{1}{2}$ volt on long playing records. Response is smooth and completely without resonances. Equalisation can be easily carried out if required.

Technical Data Sheet on request



- 1** *Extremely high compliance and low mass.*
- 2** *Styli easily replaceable without tools.*
- 3** *Completely hermetically sealed crystal unit.*
- 4** *Universal mounting.*



always well ahead

Acos crystal devices are protected by patents and patent applications in Great Britain and other countries.

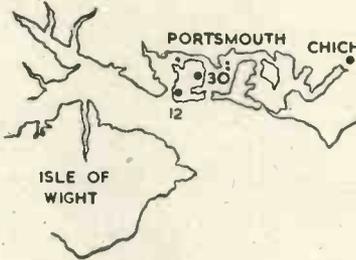
COSMOGORD LIMITED · ENFIELD · MIDDLESEX

THE "BELLING-LEE" PAGE

Providing technical information, service and advice in relation to our products and the suppression of electrical interference.

Further Information re The Truleigh Hill Brighton Booster

As promised in the last issue, the "Belling-Lee" Mobile Research Laboratory has been to the South coast carrying out an investigation into what can reasonably be expected from the Brighton booster in various locations on a front extending from Southsea in the west, to Bexhill in the east;



statistics, shows that a rapidly increasing number of owners of broadcast receivers are suffering from a very severe form of interference generated by the time bases of neighbouring television

receivers. This interference is made the more annoying by the fact that it usually occurs for long periods during peak listening hours, and takes the form of a rough hum or whistle, varying in intensity with picture change.

Although television receiver manufacturers have been taking effective measures to combat this interference for some time, there still remains a large number of existing receivers which are capable of interfering with broadcast receivers over a wide area.

The interference reaches the broadcast receiver by direct radiation on to the aerial, and by conduction along the mains wiring. If the two receivers are very close together (e.g., back to back across a party wall) the first attempt at a cure should consist of moving one or both receivers, in order to increase their separation and decrease coupling.

If interference is still experienced when the receivers are widely separated, then mains propagation may be the trouble, and our mains lead suppressor, L.300/3 price £2/19/6, fitted to either the television or broadcast receiver may form an effective cure.



receivers. This interference is made the more annoying by the fact that it usually occurs for long periods during peak listening hours, and takes the form of a rough hum or whistle, varying in intensity with picture change.

Although television receiver manufacturers have been taking effective measures to combat this interference for some time, there still remains a large number of existing receivers which are capable of interfering with broadcast receivers over a wide area.

The interference reaches the broadcast receiver by direct radiation on to the aerial, and by conduction along the mains wiring. If the two receivers are very close together (e.g., back to back across a party wall) the first attempt at a cure should consist of moving one or both receivers, in order to increase their separation and decrease coupling.

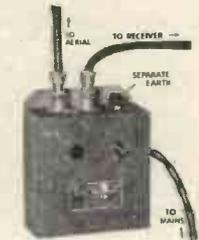
If interference is still experienced when the receivers are widely separated, then mains propagation may be the trouble, and our mains lead suppressor, L.300/3 price £2/19/6, fitted to either the television or broadcast receiver may form an effective cure.

Our Mast Head Pre-Amplifier

While on holiday, we had occasion to visit an old friend who was we think, fortunate in being able to live right away in the country, but was some seventy odd miles from a television transmitter. Now we know of many cases, probably many hundreds, where a satisfactory picture is available at this distance. In this particular case, the aerial was a "Belling-Lee" 3-element "Junior Multirod" but the original picture was shocking, and although the old chap had seen good television, he thought his was worth having, and the best he could hope for. This was a case where money was not the over-ruling factor, and when told about the mast head pre-amplifier, one was ordered immediately, and fortunately one was found.



The change in that household needs to be seen to be appreciated. It seems to be ridiculous, but we have never caught up with orders; there is a long waiting list, and there must be very few amplifiers in dealers' shops.



Written 27th June, 1953.

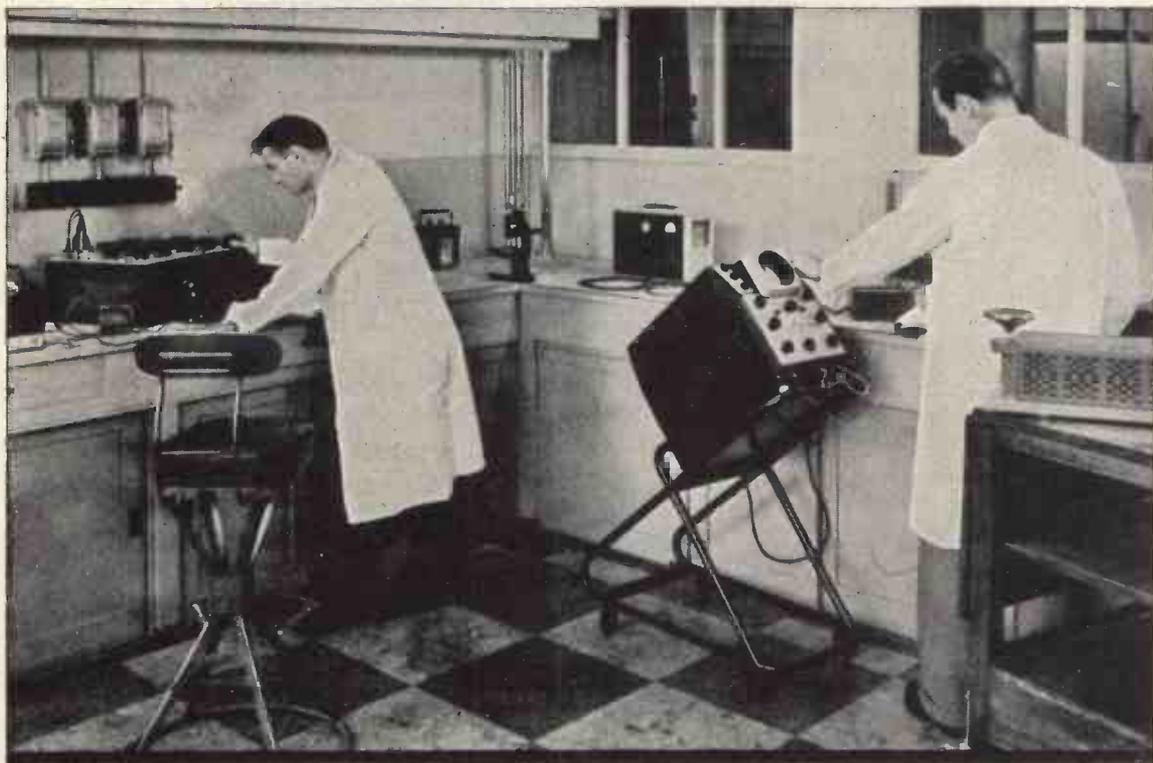
Interference from Television Receivers



"Belling-Lee" Set Lead Suppressor L.300/3

Scrutiny of the correspondence columns of newspapers and technical press, together with collected

BELLING & LEE LTD
CAMBRIDGE ARTERIAL RD., ENFIELD, MIDDX., ENGLAND



THE BENJAMIN ELECTRIC LTD. have equipped their new Research Establishment with the **Cossor Double Beam Oscillograph**, seen here in a section of the instrument and electrical testing laboratory where it is being used for checking wave form on control gear for fluorescent lamps.

In displaying simultaneously the mutual effect of two related and variable quantities the Cossor Double Beam Oscillograph is solving many of the fundamental problems with which the research and development scientist is constantly beset. In addition, workers in every branch of Industry are realising the infinite uses of this instrument in the detection and analysis of faults and the accurate monitoring of manufacturing processes.

COSSOR ELECTRONIC INSTRUMENTS

The Technical Advisory Staff of the COSSOR Instrument Division is always at your service.

Please address enquiries to: A. C. COSSOR LIMITED • INSTRUMENT DIVISION (DEPT. 1)

HIGHBURY GROVE • LONDON • N.5. Telephone: CANonbury 1234 (30 lines)

C.1.50

ALWAYS USE
COSSOR
TUBES &
VALVES

Marconi Television for Thailand



A B.O.A.C. Photograph

MARCONI
television
transmitting
equipment

Thailand, the first country in South East Asia to install Television, has placed the order for its system with Marconi's Wireless Telegraph Company Ltd.

The order includes vision and sound transmitters, Marconi Image Orthicon television cameras and associated equipment.

The system will operate on the international 625 line standard.

This new order follows those gained by the Company for installations in Italy, South America, Canada and the U.S.A.

Marconi high or medium power transmitters and high-power aerials are installed in every one of the B.B.C.'s television transmitter stations.

NEW! RADIO, TELEVISION AND ELECTRONICS



LEARN THE PRACTICAL WAY Instructions + Equipment

Here at last is the only *real* way of making home study truly successful. Actual equipment is supplied, thus combining theory with practice in the correct educational sequence. Whether your need be for career, hobby or general interest, here is the ideal method for acquiring the knowledge in the most efficient way possible.

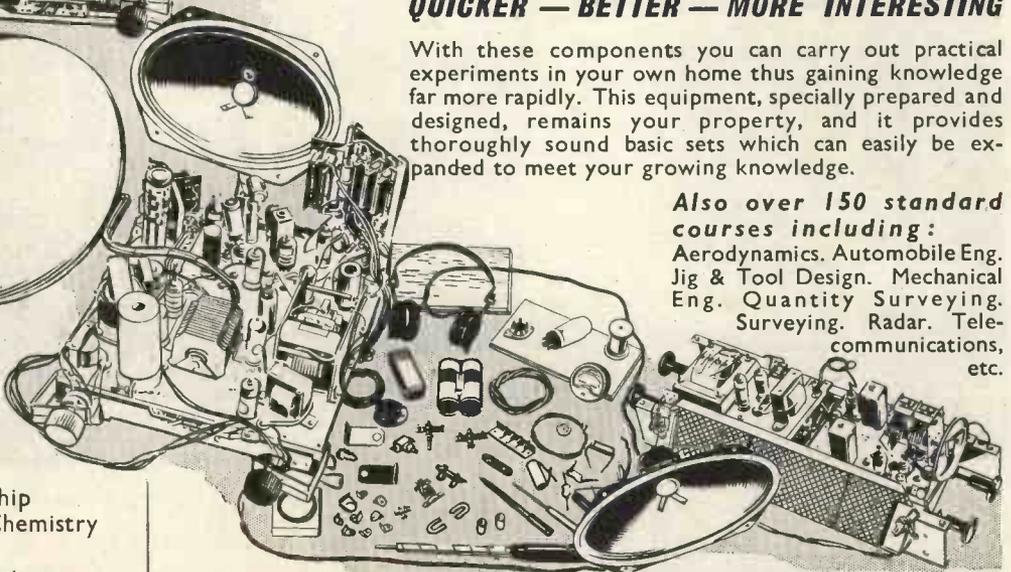
QUICKER — BETTER — MORE INTERESTING

With these components you can carry out practical experiments in your own home thus gaining knowledge far more rapidly. This equipment, specially prepared and designed, remains your property, and it provides thoroughly sound basic sets which can easily be expanded to meet your growing knowledge.

Also over 150 standard courses including:
Aerodynamics. Automobile Eng.
Jig & Tool Design. Mechanical
Eng. Quantity Surveying.
Surveying. Radar. Tele-
communications,
etc.

**Practical
courses in
many other
subjects
including:**

Draughtsmanship
Carpentry Chemistry
Photography
Commercial Art



EMI

INSTITUTES

THE ONLY POSTAL COLLEGE WHICH
IS PART OF A WORLD-WIDE
INDUSTRIAL ORGANISATION

POST THIS COUPON TODAY

Please send me your FREE book on Practical Courses.

To E.M.I. INSTITUTES, Dept. 127X,
43 Grove Park Road, Chiswick, W.4.

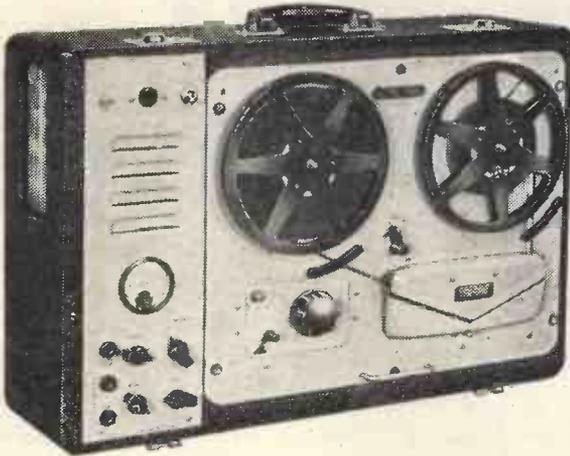
NAME _____

ADDRESS _____

We will not worry you with personal visits

VORTEXION TAPE RECORDER

FEATURES WORTH NOTING



The amplifier, speaker and case, with detachable lid, measures 8½ in. x 22½ in. x 15¾ in. and weighs 30 lb.

PRICE, complete with WEARITE TAPE DECK£84 0 0

POWER SUPPLY UNIT to work from 12 Volt Battery with an output of 230v., 120 Watts, 50 cycles within 1%. Suppressed for use with Tape Recorder. PRICE £18 0 0.

TYPE C.P.20A AMPLIFIER

For A.C. Mains and 12 volt working giving 15 watts output, has switch change-over from A.C. to D.C. and "Stand-by" positions. Consumes only 5½ amperes from 12 volt battery. Fitted with mu-metal shielded microphone transformer for 15 ohm microphone, provision for crystal or moving iron pick-up with tone control for bass and top. Outputs for 7.5 and 15 ohms. Complete in steel case with valves.

PRICE
£30.16.0

Manufactured by

VORTEXION LIMITED, 257-263, The Broadway, Wimbledon, London, S.W.19

Telephones: LIBerty 2814 and 6242-3

Telegrams: "Vortexion, Wimble, London."

★ The noise level is extremely low and audibly the hum level and Johnson noise of the amplifier and deck are approximately equal. Only 25% of this small amount of hum is given by the amplifier alone.

★ Extremely low distortion and background noise, with a frequency response of 50 c/s.—10 Kc/s., plus or minus 1.5 db. A meter is fitted for the measurement of signal level and bias level.

★ Sufficient power is available for recording on disc, either direct or from the tape, without additional amplifiers.

★ A heavy mu-metal shielded microphone transformer is built in for 15-30 ohms balanced and screened line, and requires only 7 micro-volts approximately to fully load.

★ The .5 megohm input is fully loaded by 18 millivolts and is suitable for crystal P.U.'s, microphone or radio inputs.

★ A power plug is provided for a radio feeder unit, etc. Variable bass and treble controls are fitted for control of the play back signal.

★ The power output is 3.5 watts heavily damped by negative feedback and an oval internal speaker is built in for monitoring purposes.

★ Facilities are provided for using the amplifier alone and using power output or headphones while recording or to drive additional amplifiers.

★ The unit may be left running on record or play back even with 1,750 ft. reels with the lid closed.



When is this *NOT* a rectifier?



The answer, of course, is when it's a UNISTOR . . . from that useful range of asymmetric resistors made by *Standard*. SenTerCel Unistors have a wide field of application in electronic circuits, particularly those associated with digital computers and other equipments of a similar nature.

Four current ratings are at present available . . . 0.25 mA, 1.5 mA, 7 mA and 10 mA at various D.C. voltages between 20 and 100V.

Here are some specimen data.

Unistor Code	D.C. Current Rating in Max. Ambient Temp.		Maximum Continuous Inverse D.C. Voltage Volts	Maximum Instantaneous Inverse D.C. Voltage Volts	Capacitance at Approx. Zero Volts pF
	55°C.	71°C.			
Q1/1	0.25	0.25	20	56	20
Q3/1	1.5	1.5	20	56	65
Q6/1	7	3	20	56	500
Q8/1	10	4	20	56	1,000

SenTerCel UNISTORS

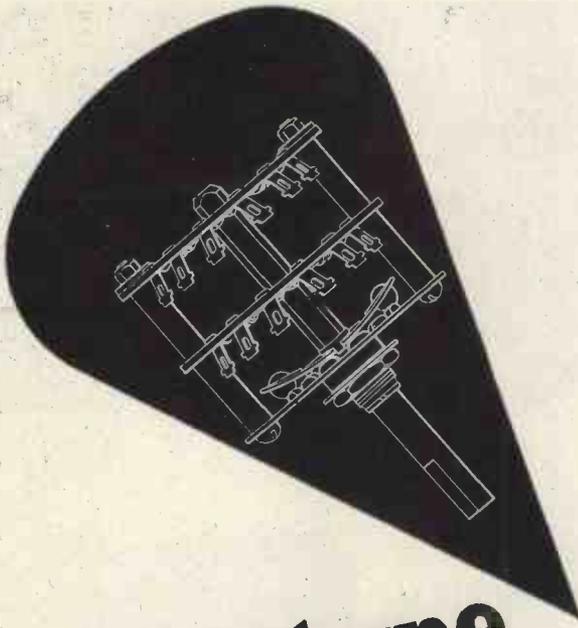
(asymmetric resistors)

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, W.C.2

RECTIFIER DIVISION: Warwick Road, Boreham Wood, Hertfordshire
Telephone: Elstree 2401

Telegrams: Sentercel, Borehamwood



prototype headaches?

EVERYONE has their problems. Do any of yours concern prototype rotary switches? An invaluable aid to your technicians and designers, A.B. Kit Sets provide sufficient standard and interchangeable parts to build up rotary switches for experimental work and special equipment.

The A.B. Kit Set is supplied in a strong polished wooden case, and contains an ample supply of all necessary parts—and tools. Write now for full details and price.



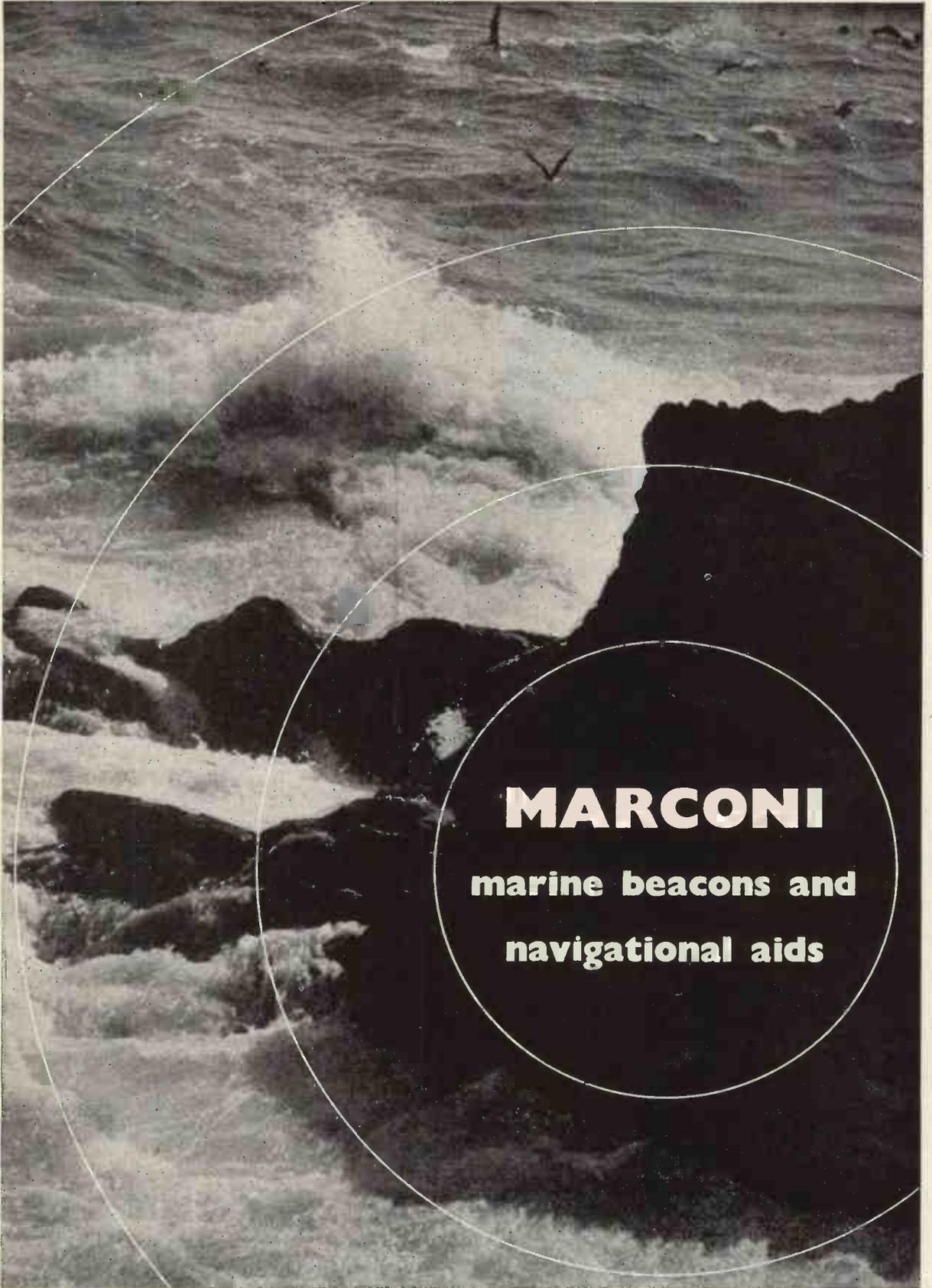
...solve them with an **AB** kit set

A "Return-of-Post" service is available for replacement parts when needed. These can be ordered from the Parts List enclosed with every Kit.



METAL PRODUCTS LTD.
16, BERKELEY STREET, LONDON, W.1

Telephone: GROsvenor 5206/7 Telegrams: Abmet, Piccy, London.



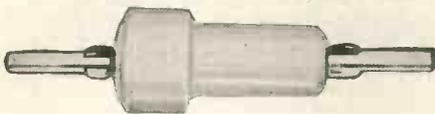
MARCONI
marine beacons and
navigational aids

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD. • CHELMSFORD • ESSEX

POLYTAGS...lead-through and stand-off insulators

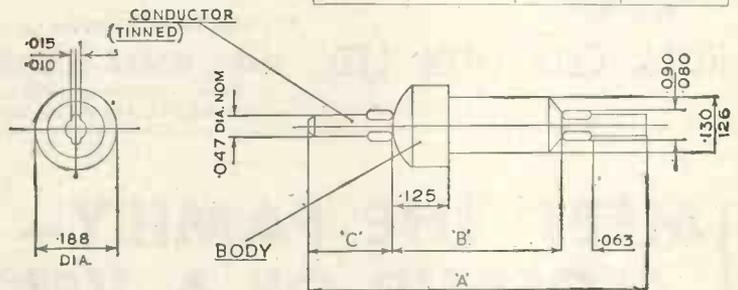
Polytetrafluoroethylene (P.T.F.E.) is an outstanding insulator. It is tough, durable and will not crack or arc. Its dielectric properties are substantially constant over a frequency range of 60 c.p.s. to at least 300 Mc.p.s. and are unaffected by temperature changes between minus 100°C. and plus 288°C. It has zero moisture absorption and is water repellent. It is, therefore, a most suitable material for stand-off and feed-through insulator terminals and has been chosen by Ediswan for this purpose. Ediswan Polytags are available in five types as illustrated below.

PT 1 & 2. Lead-through

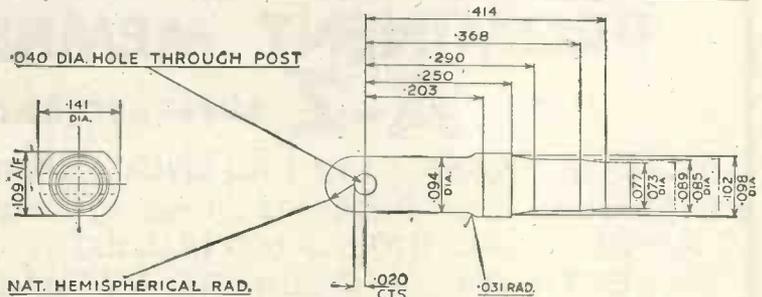


	A	B	C
PT 1	.750	.375	.188
PT 2	.875	.500	.188
PT 3	.563	.375	—
PT 4	.688	.500	—

PT 3 & 4. Stand-off



PT 5. Component mounting



Fixing: Polytags are primarily designed for fixing with a 5 B.A. nut—PT 1—4 or an 8 B.A. nut PT 5. They are self-tapping.

We are equipped to produce components fabricated or moulded in P.T.F.E. to individual specifications and enquiries will be welcomed.

EDISWAN



THE EDISON SWAN ELECTRIC CO., LTD.,

Sales Department P.T.F.E.6, 21 Bruton Street, London, W.1. Telephone: Mayfair 5543
 Head Office: 155 Charing Cross Road, London, W.C.2. Member of the A.E.I. Group of Companies

TRUVOX

It Pays As You Earn!

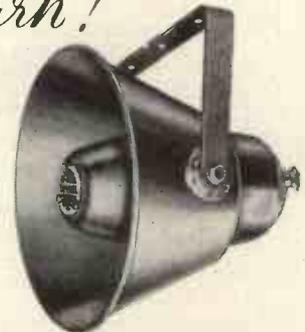
EQUIPMENT

Profitable P.A. business is built upon a reputation for reliability which can only be based on the dependability of your equipment. That is why it pays to use only TRUVOX, the reproducers that have had reliability built into them for a quarter of a century.



TRUVOX PRESSURE TYPE DRIVING UNITS

Senior and Junior models have a power handling capacity of 15 and 10 watts respectively and provide a substantially linear response from 175 to 10,000 c.p.s. The Senior model is available with built-in tropicalised multi-ratio transformer, a noteworthy feature much appreciated by sound engineers.



TRUVOX REFLEX SPEAKERS

Senior models give a substantially linear response from 250 to 8,000 c.p.s. with a peak handling capacity of 8 to 10 watts whilst Junior models range from 350 to 8,000 c.p.s. with 6 to 8 watts peak handling capacity. Either can be supplied with built-in transformer. Completely weather-proofed and designed to withstand prolonged exposure and vibration.

For Full Details Write to:

ROLA CELESTION LTD., FERRY WORKS, SUMMER ROAD, THAMES DITTON, SURREY

*Phone: Emberbrook 3402-6.

Wholesale enquiries to—Truvox Ltd., Exhibition Grounds, Wembley, Middx. (WEM 1212)

MEET THE FAMILY— CLOSE-UP OF A VERY PROMINENT MEMBER

THE **A-Z** SUPERHET RADIO UNIT



COMPACTNESS + EFFICIENCY GIVING "FULL SIZED" RESULTS — SIZE 11½" long, 4¾" high, 4" deep — WAVE RANGE 190 to 570 m - 800 to 2,000 m — PLUS VARIABLE SELECTIVITY — DELAYED AVC AND VOLUME CONTROL. H.T. CONSUMPTION 15 m.a. - 270 v. — LT 1.5 amp. - 6.3 v.

PROJECTION TELEVISION — THE FAMOUS AZ AMPLIFIERS
MINIATURE — JUNIOR — SENIOR — PHASE INVERTER SPEAKERS
SCRATCH FILTERS — TRANSFORMERS AND CHOKES

£12.15.0 Plus P.T.

SOUND SALES LTD

WEST STREET, FARNHAM, SURREY

Telephone: Farnham 6461-2-3

WEBB'S RADIO

14 Soho Street, Oxford Street, W.1
Telephone: GERrard 2089

HOLLEY'S RADIO STORES

285 Camberwell Rd., London, S.E.5
Telephone: RODney 4988

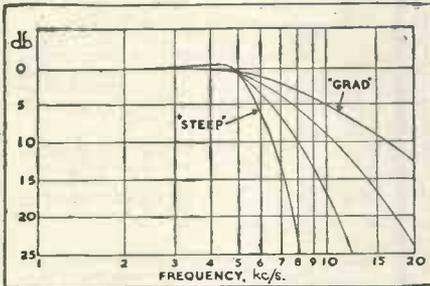
★ The HIGHEST ATTAINABLE QUALITY of ★ SOUND REPRODUCTION

Representing a unique feedback circuit development, the "Vari-Slope" pre-amplifier gives audibly better reproduction. This advance consists of variable-slope "electronic" low-pass filters operating on negative voltage feedback principles.

No Inductors ("Chokes") are used, and their disadvantages are completely eliminated. The turnover frequencies are 5 kc/s, 7 kc/s and 9 kc/s and the slopes of attenuation are continuously variable over the range 5 db to 50 db per octave.



The VARI-SLOPE



Frequency amplitude curves for the "TREBLE-3" position (5kc/s turnover). Curves of the same slopes are obtained on the other two positions turning over at 7kc/s and 9kc/s (" -2 " and " -1 " positions).

The filters consist essentially of twin-T resistor-capacity networks inserted in the return circuit of a single-loop feedback amplifier. The more obvious advantages of this electronic feedback method over conventional choke filters include:

(a) Improved transient response characteristics (due to absence of chokes having self-capacitance) and the consequent reduction of "ringing."

- (b) Extremely low harmonic and inter-modulation distortion due to negative voltage feedback action.
- (c) No discontinuities in the rates of slope when the slope control is operated, and no change in signal level at frequencies below turnover. (Both these faults occur in variable-slope choke filters due to the slope control, altering the terminating impedance and the insertion loss.)
- (d) No chokes to cause magnetic hum pick-up.
- (e) Smaller size, lighter weight, greater uniformity in production.

LIST PRICE IN BRITAIN 12 Gns.

POINT ONE TL/12 Triple Loop Feedback Amplifier

For laboratory use as a stabilised-gain audio frequency power amplifier. For the highest possible standard of disc recording. For the highest possible quality of reproduction from Pick-up, Radio, Microphone, Film and Magnetic Tape. For use as a driver amplifier in the speech modulator chain of broadcast transmitters. Used with the "Vari-Slope" pre-amplifier and the best available complementary equipment, the TL/12 power amplifier gives to the music-lover a quality of reproduction unsurpassed by any equipment at any price.

27 Gns.

Write for fully descriptive literature

H. J. LEAK & CO., LTD., BRUNEL ROAD, WESTWAY FACTORY ESTATE, ACTON, W.3

Phone: SHEpherds Bush 117314.

Telegrams: Sinusoidal, Ealux, London.

Cables: Sinusoidal, London.



The "Point-One" TL/12 Amplifier is built to a tropical specification and used throughout the world, including:

- The British Broadcasting Corporation.
- The South African Broadcasting Corporation.
- The Swedish Broadcasting Corporation.
- The Swiss Broadcasting Corporation.
- The Italian Broadcasting Corporation.

**STOCK OFFERED AT
SENSATIONAL REDUCTION
THIS MONTH!**

SUMMER SALE

**STOCK OFFERED AT
SENSATIONAL REDUCTION
THIS MONTH!**

- S.1. New 12in. T.V. Tubes by very famous maker. 6.3 v.-7 Kv.-ion trap type perfect with makers guarantee. Limited quantity, £10/19/6 each, carriage and insurance 12/6.
- S.2. 15in. chassis Superhet—5 channel—all latest refinements—complete with tube and loudspeaker, ready to receive sound and vision. New with makers guarantee. £42/10/-, carriage and insurance £2.
- S.3. 12in. T.V. chassis as item S.2., but with 12in. Tube. £40, carriage and insurance £2.
- S.4. Line Fly-back E.H.T. transformer suitable for circuits using the EY51. Fully guaranteed, 17/6. P/P. 9d.
- S.5. Rubber mask glass and escutcheon for 12in. television 19/6. P/P. 12/-.
- S.6. 9in. mask glass and escutcheon, 12/6. P/P. 1/6.
- S.7. Metal rectifiers, 200-250 v. 60 mA, ideal small mains sets, 4/6. P/P. 9d.
- S.8. Midget superhet coils, set of 4, with iron dust cores. Comprising Long and Medium wave aerial coils, Long and Medium wave oscillator coils, 6/6. P/P. 9d. (circuit included).
- S.9. Superhet coils, set of 4, all Aladdin formers with dust cores. Comprising Long and Medium wave aerial, oscillator coils, 7/6. P/P. 9d. (circuit included).
- S.10. Aerial Wire, PVC all copper, 2/9 per 100ft.
- S.11. Short Wave coils. 1 pair, aerial and oscillator, for 15-50 metres. 1/6. P/P. 6d.
- S.12. Short Wave coils. Set of 4 Wearite, "P" types, aerial and oscillator, to cover 12-100 metres. 6/6 set. P/P. 6d.
- S.13. Midget IF transformers, dust cored, 465 kc/s, can size 1½in. x 1in. diameter. 6/6 pr. P/P. 9d.
- S.14. Coil Formers in screening cans. Can size 2½in. high x 1½in. diam. 4/6 doz. P/P. 9d.
- S.15. Coil formers in screening cans. Can size 2in. high x 1in. diameter. 3/6 doz. P/P. 9d.
- S.16. Coil Formers in screening cans. Can size 1in. high x ¾in. diameter. Coil has iron dust core. 5/6 doz. P/P. 1/-.
- S.17. Coil Formers in screening cans. 1in. high x ¾in. diameter. Coil former has two dust cores suitable IF's etc. 6/6 doz. P/P. 1/-.
- S.18. Two gang condenser. Standard size .0005 mfd., spindle length approx. ½in. 4/3 each. P/P. 1/-.
- S.19. Two gang condenser. Standard size .0005 mfd., spindle length approx. 1in. 4/9. P/P. 1/-.

The items listed in the side columns are special sale bargains offered at very low prices and in the main non-repeatable. All are first class, brand new goods and sold under our money back guarantee, e.g., if not satisfied, return in good condition within 7 days and we will refund your money less postage.

**SPECIAL BARGAINS FOR
CALLERS**

Try to find an opportunity to visit either our Fleet Street or Ruislip shops during this month, as there will be many sale items for callers only. There will also be percentage reductions on many of our standard lines, radiogram and television cabinets, etc.

THE TRACERSCOPE

**A 12in. TUBE OSCILLOSCOPE FOR
FAULT FINDING**

This instrument will take much of the guess work out of television servicing; for instance in cases where the goodness of the existing tube is suspected, it can be checked by direct replacement of the one in the scope. In addition it can easily be converted into an extension picture (in cases of illness etc.) and with rather more modification into a stand-by television.

In addition to the uses mentioned above and without the complications normally associated with an Oscilloscope, the following principle tests can be carried out:—

1. Check of Vision receiver sensitivity
2. Check of video response.
3. Check of synch separator stages.
4. Check of complete frame time bases.
5. Check of line time bases.
6. Check of E.H.T.
7. Check of complete focusing assemblies.
8. Comparative voltage measurements of both sinusoidal and other e.m.f.
9. Check of stage gain in IF and RF stages.
10. Comparative component check under working conditions.

As a stop-gap until the factory made 'Tracerscopes' are available we are offering all the component parts comprising new 12in. Cathode Ray Tube (with maker's guarantee) three valves, line output E.H.T. and other transformers valve holders and all sundries, together with full constructional and operational data as a parcel, price £12/10/-. Carriage and insurance 12/6 extra. (Note metal work, chassis and case etc. will be available later (extra of course.)

Note.—The constructional data is available separately price 5/- and any one of the many tips on television servicing which this data contains is well worth this amount, so order your copy today and learn T.V. servicing the easy and most practical way.

For The ADVANCED CONSTRUCTOR

For the more advanced constructor, this month we offer a new tuneable five channel superhet sound and vision strip, which in spite of high sensitivity (40 microvolts) will give a picture remarkably free from valve generated noise. I.F. traps are inserted in the aerial stages and particular attention has been paid to sound rejector networks, resulting in a minimum of 80 db rejection. To ensure interlace, a damping network employing a diode has been included in the synch separator stages. Germanium diodes are used for demodulation and for sound and vision noise suppression (with the latter control continuously variable).

This is a unit, which will give superb picture of 3 Mc. bandwidth in good reception areas, and will ensure the very best results in the most difficult locations. It is not expensive to construct as it uses VR91 and other low-priced valves. Full construction data and parts list is available price 5/- post free. Order "M.M. T.V. STRIP."

- S.20. Two gang condenser. As S.19 but fitted with slow motion drive. 5/9. P/P. 1/-.
- S.21. Three gang condenser. Standard size .0005 mfd., fitted with really superior slow motion drive and trimmers. 7/6. P/P. 1/3.
- S.22. Meter, 0-9 amp., 2½in. hot wire type, measures AC or DC current, flush mounting. 9/6. P/P. 1/-.
- S.23. Superhet 5 valve AC chassis. 3 waveband (L.M. & S.), Brand new, all B.V.A. valves, complete ready to work as soon as speaker is fitted. £8/19/6. P/P. 10/-.
- S.24. Superhet 5 valve AC/DC chassis. 3 waveband, (M.S.S.), less valves and speaker. Uses standard octal range. £4/19/6. P/P. 10/-.
- S.25. Coil Pack. 3 waveband (L.M.S.S.), with gram position. Weymouth small type. 18/6. P/P. 1/-.
- S.26. Coil Pack. 3 waveband (M.S.S.), all dust cored coils. 15/- P/P. 1/-.
- S.27. ½ meg. Volume Control midget with double pole switch, medium length spindle. 1/9. P/P. 6d.
- S.28. Pentode output transformer, standard size by most famous maker. 2/6. P/P. 6d.
- S.29. Mains Transformer. 300-0-300, 60/80 mA., 6.3 v. and 5 v. 12/6. P/P. 1/-.
- S.30. Fluorescent lighting kit. 4ft. 40w. complete outfit comprising: Tube, tube holder, starter, ballast unit and ceiling batten. 27/6. Post packing and insurance 10/- on parcel of 4. This is the minimum quantity we can despatch.
- S.31. Woven mesh for speaker opening Size 19in. x 11in. 2/6. P/P. 2/-.
- S.32. Woven mesh for speaker opening Size 29in. x 15½in. Sprayed gold. 5/6. P/P. 2/6.
- S.33. Woven mesh for speaker opening As S.32, but not sprayed. 3/6. P/P. 2/6.
- S.34. Block condenser. .1 mfd. 1,200 v. 1/- P/P. 6d.
- S.35. Block condenser. 1 mfd. 1,000 v. 1/6. P/P. 6d.
- S.36. Germanium Diode. With circuit of crystal set, 1/9.
- S.37. Vibrator unit H.T. and L.T., from 4 v. or 6 v. battery, 12/6. P/P. 2/6.
- S.38. B7G Valveholder. Moulded and with bottom screen. 7/- doz.
- S.39. Conrad 3 speed Gram Motor. These may be a little noisy but well worth 39/6 each. P/P. 2/6.
- S.40. "Bulgin" Toggle switch. All metal removed from new equipment. 1/6 each.
- S.41. Coaxial cable. 80 ohm stranded centre, 8d. yard.
- S.42. Perforated Metal Panels. For ventilating amplifiers, transmitters, etc. Size 13 x 13. 1/6 panel.
- S.42. Plastic handle for portable set. 6d.

SEND NO MONEY



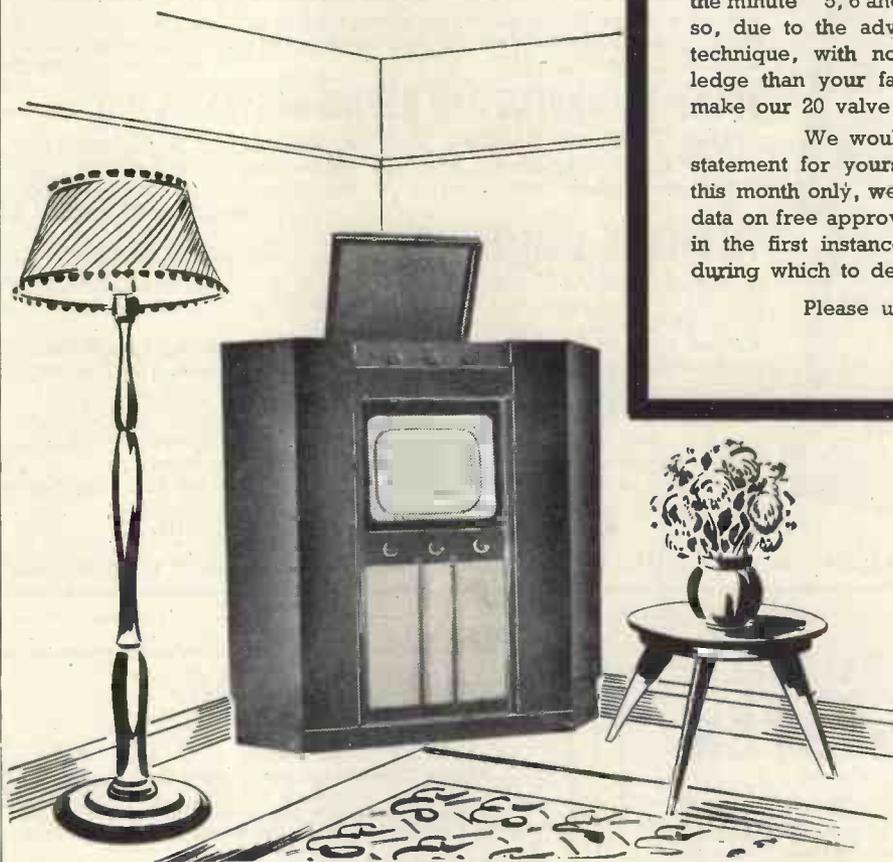
Dear Wireless World Reader

Just as, in the period around 20 years ago, your father made "up to the minute" 5, 6 and 7 valve radio receivers, so, due to the advancement of component technique, with no more technical knowledge than your father had, you can now make our 20 valve Televisor.

We would like you to prove this statement for yourself, and, therefore, for this month only, we offer our Superior 15in. data on free approval. We want no money in the first instance and give you 7 days during which to decide.

Please use the coupon below.

Yours sincerely,
E.P.E. Limited.



THE ELPREQ CORONATION CONSOLE

A Combined Radio, Radiogram and 15in. Televisor valued at a shop price of £300-£400, can be yours for about £75 if you adopt our plan.

OUR PLAN

You first build the Superior 15in. Televisor, which will give you T.V. (sound and vision) right away. Next you should purchase the Coronation Console cabinet, to hold and protect the T.V. chassis. After this build the radio chassis; (the data for this is being prepared and

should be ready by the Autumn). Finally, if you want recordings, then under the lid you can fit a tape recorder or an auto-changer. The cabinet, auto-changer and the tape desk would, of course, be supplied as ready-made units.

PRICE SCHEDULE

All components, including 15in. Cossor Tube, and 20 valves for the Superior 15in. T.V.	£35 0 0	Carriage and Packing	£1 0 0
All components for the radio chassis ..	£8 10 0		5 0
Coronation Console Cabinet	£18 0 0		£1 0 0

H.P. terms available, if required. Send 1/3rd of the cash price, plus carriage. Balance (plus charges) can then be spread over twelve months.

COUPON

To E.P.E. Ltd., ELPREQ HOUSE, WEALDSTONE, Middx.
Please send me your "Superior 15" Data. I agree either to send 7/6 or to return the Data within seven days.

Name

Address

(Ref. 2)

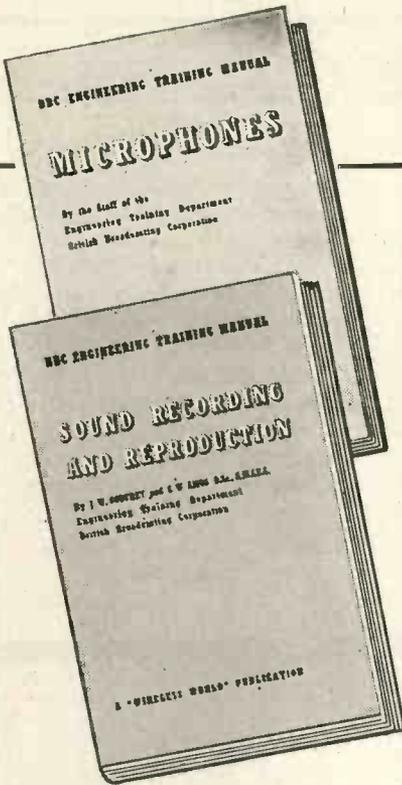
**SEE US
AT THE
RADIO SHOW
SEPT. 1-12
STAND 222**

ELECTRONIC PRECISION EQUIPMENT LTD.

Post order should be addressed to:—
**ELPREQ HOUSE (Ref. 2) HIGH STREET,
WEALDSTONE,
MIDDLESEX.**

Personal shoppers however must continue to call at:—
42/46, WINDMILL HILL, RUISLIP, MIDDLESEX
Phone: RUISLIP 5780 (Half-day, Wednesday)
152/153, FLEET STREET, E.C.4
Phone: CENTRAL 2833 (Half-day, Saturday)

Up-to-date Technical Books



MICROPHONES: A BBC Engineering Training Manual.

Considers the requirements of microphones in a broadcasting service, covers the theory of the subject, and describes studio microphones, including ribbon, moving-coil and condenser types. 15s. net. By post 15s. 5d.

SOUND RECORDING AND REPRODUCTION: A BBC Engineering Training Manual.

By J. W. Godfrey and S. W. Amos, B.Sc., A.M.I.E.E., in collaboration with the Engineering Training Dept., BBC. Covers the theory and practice of disc, magnetic and film recording. 30s. net. By post 30s. 8d.

TELEVISION ENGINEERING: Principles and Practice.

A BBC Engineering Training Manual. By S. W. Amos, B.Sc., A.M.I.E.E., and D. C. Birkinshaw, M.B.E., M.A., M.I.E.E., in collaboration with J. L. Bliss, A.M.I.E.E.

Volume 1 covers fundamentals: camera tubes, television optics and electron optics, including electron lenses. Ready August. 30s. net. By Post 30s. 8d.

INTRODUCTION TO VALVES

By R. W. Hallows, M.C. (Cantab), M.I.E.E., and H. K. Milward, B.Sc., A.M.I.E.E. Describes the principles, construction, characteristics and uses of most types of radio valve.

Ready August. 8s. 6d. net. By Post 9s.

Published for "Wireless World"

From all booksellers or from: — ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

CITY & RURAL IMMEDIATE DELIVERY FROM STOCK "VIEWMASTER"

SPECIFIED COMPONENTS

(London — Sutton Coldfield — Holme Moss — Kirk-O-Shotts — Wenvoe — Newcastle — Belfast.)

Send for Stage 1 now—price £3/2/3, post free. Complete Kits, Stage-by-Stage and Single Components Supplied. "Viewmaster" Construction Envelopes 7/6 ea.

NEW LANE TAPE TABLE, £17/10/-, plus 10/- carriage and packing.

LANE RECORD/PLAYBACK AMPLIFIER (including valves and complete down to the last nut and bolt), £13.

LANE RECORD/PLAYBACK AMPLIFIER (ready-built and tested), £15/10/-.

CONSTRUCTION ENVELOPES. Stage-by-Stage Construction Envelopes for Lane Record/Playback Amplifier, 5/3, post free TA/4P RECORD/PLAYBACK AMPLIFIER (complete and tested), £14.

RONETTE "CORONATION" CRYSTAL MICROPHONES, 52/-.

TRANSFORMERS: 30 v. 2 a. for models, etc. Tapped 3-4-5-6-8-9-10-12-15-18-20-24 v., 21/-; 350-0-250 v. 80 mA. 6.3 v. 4 a., 5 v. 2 a., 21/- . Ditto but 250-0-250 v., 21/- . Heater 6.3 v. 1.5 a., 7/6. 350-0-350 v. 150 mA. 6.3 v. 5 a., 5 v. 3 a., Fully Shrouded, 45/-; EHT 2.5 Kv. 5 mA. 0-2-4 v. 4 a., 0-4 v. 2 a., 45/- . All Primaries 200-220-250 v.

METAL RECTIFIERS: 6 v. 1 a., 5/6; 12 v. 1 a., 9/9. ALUMINIUM CHASSIS: 6 x 4 x 2 1/2 in., 4/9; 8 x 6 x 2 1/2 in., 6/4; 10 x 7 x 2 1/2 in., 7/7; 12 x 8 x 2 1/2 in., 9/6.

S.T.C. METAL RECTIFIERS: E.H.T. K3/40, 7/6; K3/45, 8/2; K3/50, 8/8; K3/100, 14/8; H.T. RMO, 5/-; RM1, 5/3; RM2, 5/9; RM3, 7/-; RM4, 21/-; DRM1B, 11/6; DRM2B, 12/6; DRM3B, 15/-.

CLEAREX 6in. ENLARGERS (for VCR97, etc.), 17/6. Terms: C.W.O. or C.O.D. over £2. Over £2 post free, otherwise please add 1/- post and packing.

FOR ATTENTION—ADVICE—SERVICE, WRITE:

CITY & RURAL RADIO,
101, HIGH STREET, SWANSEA, GLAM.

Telephone: Swansea 4677.



REPLACEMENTS

134-136, LEWISHAM WAY, NEW X, S.E.14.

Tel: Tideway 3696-2330

Additional to our T.V. Spares Manual. Price 9d.

All orders C.O.D. or C.V.O. Prices include packing and postage.

BOWJECTION:

Line output transformers	£2 1 0
E.H.T. trans. with 3 EY51 valves	£7 12 6
Frame oscillator transformers	16 0
Frame output transformers	£1 5 0

These components will work for most projection sets.

BACK PROJECTION SCREENS. 17in. x 14in.,

highest grade	£2 4 6
---------------------	--------

(These can be used for back projection of movies.)

Trade enquiries welcome.

HEATER BOOSTER TRANSFORMERS, RE-

JUVENATOR, for low emission C.R.T.s..... £1 2 9

COSSOR, Model 930. 5 channel vision strip, complete

with all valves £10 12 0.

ULTRA, Model W720. Mains transformer with valve

holder, etc. £3 16 6

INVICTA, Model 101. E.H.T. section windings.....

£1 15 3

PYE, Model 16T. Frame oscillator transformers

£1 1 5

ETRONIC, Model 1536. An improved line output

transformer with simple modification £2 7 6

Model HV203. Line output transformers

£2 5 3

Model HV204. Line output transformers

£2 5 3

METAL RECTIFIERS. 14A86, 25/6; R.M.4's, 22/-;

R.M.3 16 0

BRIMISTORS. CZ1, 4/-; CZ2 3 0

COAXIAL CABLE. 80 ohms, high quality, inner

stranded yd.) 11

SILICONE COMPOUND, M54. Every engineer

should invest in a large tube at 10 6

TELEVISION ENGINEERS SERVICING MANUAL

600 pages of service sheets covering over 29 makes ... £2 3 6

RADIO ENGINEERS SERVICING MANUAL, over

700 pages. Service sheets on 32 different makes ... £2 3 6

RADIO DESIGNERS HANDBOOK. Editor:

Langford Smith. 1,482 pages £2 3 6

Annual Holidays: 27th July to 3rd Aug.

THE NEW EDDYSTONE "840" COMMUNICATIONS RECEIVER

Fulfils a long felt need for an efficient communications Receiver to work from A.C. or D.C. Mains.

A "universal" receiver which operates equally well from D.C. or A.C. 100/115 volts and 220/250 volts. Full "communications" specification with R.F. stage, B.F.O. and self contained loud-speaker.



Available from stock at Webb's

Price **£45. 0. 0.**

(Our well known Hire Purchase facilities are available if desired.)

Let us send you a fully descriptive brochure of this outstanding addition to the Eddystone range of specialized receivers.



14, SOHO STREET, OXFORD STREET, LONDON, W.1.

Telephone: GERrard 2089. Shop Hours: 9 a.m.—5.30 p.m. Sats. 9 a.m.—1 p.m.

JUST OUT!

Webb's New 1953 Catalogue, 52 Large Pages Packed with Information.

Send 1/- for the most comprehensive list in the trade and also registration at Webb's for our unique "Information Folder" service keeping you up to date with the latest electronic developments.

MODERN ELECTRICS LTD.,

164, Charing Cross Road, London, W.C.2.

'phone : TEMple Bar 7587.

Export enquiries welcomed.

Immediate delivery from stock.

Prompt attention to post orders

TAPE RECORDERS

SOUNDMIRROR	
New Table, Twin Track	£69 10 0
Portable Twin Track	£74 10 0
SCOPHONY-BAIRD	
New Model Mk. 2	£68 5 0
SIMPHONIC	
New Model 1A	£83 0 0
GRUNDIG	
2-speed	£84 0 0
EMICORDA	£94 10 0
WIREK	
Portable Battery Model	£55 0 0

RECORDING TAPE

GRUNDIG	
I.G.H. 1,200ft.	£2 0 0
SOUNDMIRROR	
Paper Tape, 1,200ft.	£1 5 0
FERROVOICE	£1 2 6
Spare Spools	4 6
E.M.I. H.60, 1,200ft.	£1 15 0
E.M.I. H.60, 600ft.	£1 1 0
E.M.I. H.65, 1,200ft.	£1 15 0
E.M.I. H.50, 1,200ft.	£2 8 0
SCOTCH BOY	
1,200ft.	£1 15 0
600ft.	£1 1 0
Spare Spools, 1,200ft.	4 3
Spare Spools, 600ft.	3 3
FERROGRAPH	
1,200ft.	£2 5 0
1,750ft.	£3 3 0
8 1/2 in. spools	9 6

RECORD REPRODUCING EQUIPMENT

B.S.R.	
3-spd. (Crystal T/O hds.)	£9 4 11
With 2 GP20 hds.	£10 8 8
With 2 Decca hds.	£12 17 8
GARRARD	
R.C.80	£17 1 3
R.C.75.A.	£15 18 1
201B/5 Variable 3-spd. Transcription Unit.	£22 14 8
3-spd "T" Unit.	£10 0 2
CONNOISSEUR	
3-spd. Deck	£21 17 3

SPEAKERS

GOODMANS	
Axiom 150 Mk. 2	£10 5 6
Axiom 60	£8 12 6
Axiom 102	£9 18 2
WHARFEDALE	
W 12.CS	£9 15 0
Golden 10 C.S.B.	£8 6 7
Super 5 and 8 CS/AL	£6 13 3
Bronze 10in.	£4 12 9
Bronze Bin	£3 4 0
W.B. Crossover unit	£1 6 6
W.B. Tweeter Unit	£3 15 0

TEST GEAR

AVO	
Model 8	£23 10 0
Model 7 (latest)	£19 10 0
Uniminor Mk II	£10 10 0
Electronic Meter	£40 0 0
Wide Band Sig/Gen	£30 0 0
Valve Characteristic Meter	£60 0 0
D.C. Minor	£5 5 0
10KV Multiplier for Model 8	£3 5 0
Carrying Cases for Models 7, 8 and 40	£3 0 0
ADVANCE	
H.1 (Sig/Gen)	£25 0 0
E.2 (Sig/Gen)	£28 0 0
J.1 New Model	£35 12 0
COSSOR	
Oscillograph 1039M	
New Portable Model	£29 10 0
TAYLOR	
ALL NEW TAYLOR TEST GEAR IN STOCK AND AVAILABLE ON H.P. Send S.A.E. for Catalogue and Terms.	

PICK-UPS

ACOS	
GP.20 (Std. or L.P.)	£3 6 1
Spare heads for above	£2 0 0
DECCA	
X.M.S. Magnetic	£6 9 5
CONNOISSEUR	
Super 2 Hds.	£9 5 6
Spare Heads	£3 6 3
COLLARO STUDIO	
Type O or P.	£4 0 8

VALVES

We are one of London's largest stockists—Please write for requirements.

MICROPHONES

ACOS	
Mic 22 (Crystal)	£6 6 0
Mic inserts for above	£1 7 6
Mic 16 (Crystal)	£12 12 0
LUSTRAPHONE	
M/C with T/F.C.51	£5 15 6
Heavy Table Base (or above)	£1 1 0
RESLO M/C (Low Imp.)	
Ribbon High Fidelity	£7 5 0
Mumetal Transformer	£1 15 0

MICROPHONE STANDS

Floor, 3 extensions	£3 12 6
Table Stand	£1 1 0

LEAK AMPLIFIERS

Point 1, TL.12	£28 7 0
Point 2, TL.25	£34 7 0
Vari-slope pre-amp.	£12 12 0
Type VS R.F. Tuner	£34 19 0
Unit	£12 19 0

"R.D. BABY DE LUXE"

With pre-amp.	£22 10 0
Rogers Minor	£11 10 0

ALL GARRARD, CONNOISSEUR, DECCA and COLLARO HEADS AND STYLI IN STOCK.

WEARITE 2A TAPE DECK. £35.0.0. (Carriage Extra). All accessories for Wearite Recorder Amplifier now available.

RECEIVERS · TEST EQUIPMENT · AMPLIFIERS · RECORDERS, ETC.

BRITISH TEST EQUIPMENT

AVO model 7, AS NEW, £15. AVO model 40, AS NEW, £12. AVO Universal Minors, £6/15/-. AVO Electronic Test Meter, £30. AVO Roller Panel Valve Tester, £12. AVO Signal Generator, £20. AVO Valve Tester, listed £60, AS NEW, £50. ADVANCE E2 Signal Generator, £23. EVERSHED Wee Meggers, 500 v., £12/10/-; 250 v., £8. TAYLOR 65B, £8/10/-. WESTON E772 meter, perfect, £12. MARCONI Signal Generators, TF14G, TF517, TF390G. Valve voltmeters. SIMMONDS "Q" meter. CAMBRIDGE Unipivots. Output Meters. FURZEHILL oscilloscope 1936, £35. COSSOR double beam oscilloscopes, from £35.

A fine selection
of real quality equipment
at reasonable prices.

All readers are cordially invited to call and inspect our stocks.

RECEIVERS

AR77E. 550 kc/s.-32 Mc/s. Perfect, £37/10/-. RCA. AR88D-LF. From £55. HALLICRAFTERS. SX24. 550-42 Mc/s. S. meter. £28. SX28's in good condition, £45. S20R. 550 kc/s.-45 Mc/s. 110-250 A.C., £24. HALLICRAFTERS S38, A.C. D.C. 110-250. 550 kc/s.-30 Mc/s. AS NEW, £28. Also in stock: Hallcrafters S27 and S27CA. 30 Mc/s.-230 Mc/s. Hallcrafters HT11A, complete and perfect. HRO Senior and Junior receivers complete with power supply and coils, from £27. NATIONAL. NC100, NC200, NC81X in stock. MARCONI CR100 receivers, 60 kc/s.-30 Mc/s., a first-class set, at £28. EDDY-STONE 640-1, 2-30 Mc/s., £22/10/-. Models 550 kc/s.-30 Mc/s., 740, £33; 750, £50; 680, £65. MCRI portable receivers, £8 each, mains or battery. Type B2 transmitter/receiver, complete, £18/10/-.

AMPLIFIERS · RECORDERS · LOUDSPEAKERS

LEAK Amplifier and pre-Amplifier TA12, complete, £24. WILLIAMSON Amplifier and pre-Amplifier, complete, £18. WILCOX GAY (U.S.A.) portable disc recorder with radio, £30. CPD Disc Cutting equipment, £20. BAIRD Tape Recorder, AS NEW, £35. Loudspeakers: Goodmans, Vitavox, Wharfedale, in stock. Derca corner horn, £22. STC Ball microphones, £10 each.

★ OUR ONLY ADDRESS IS

UNIVERSAL ELECTRONICS

★ 27 LISLE STREET, LEICESTER SQ., LONDON, W.C.2

Shop hours, 9.30 a.m. to 6 p.m.

Thursdays, 9.30 a.m. to 1 p.m.

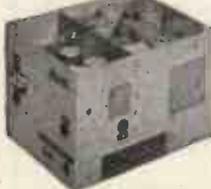
Write, Call or Telephone
GERrard 8410 (Day)
MEAdway 3145 (Night)

VALUE FOR MONEY OFFERS



AIR MINISTRY COMMUNICATION RECEIVER R1155A. Brand New. Frequency ranges—18.5-7.5 Mc/s. 7.5-3 Mc/s, 1,500-600 kc/s, 500-200 kc/s, 200-75 kc/s. Complete with 9 valves and Magic Eye. Guaranteed absolutely perfect. Price £9/10/-, plus 10/- for packing and carriage.

I155 POWER PACK AND OUTPUT STAGE complete with U50 and KT61 valves (not surplus) Black crackle case 12 x 8 x 5in. built-in 5in. pm Speaker and phone jack. 200-250 v. A.C. All connections terminate in Jones plug which enables instant operation of receiver without any modifications whatever. Matches in appearance with receiver. Made to "Wireless World" specifications. Built entirely from top grade new components, £7/10/- plus 3/6 carriage.



G.E.C. VHF RECEIVERS complete with 10 valves. Ex-Govt. As used by police. Used but guaranteed in excellent condition. Valves comprise ZA2's, 954's, or EF50's in HF and 1st Det. stages. Det 19 in local oscillator, KTV63's in three IF stages, D63 Det and AVC, LF H63, Output KT63, Noise suppressor D63, Power requirements 6v. 3a, 270 v. 80 ma. Frequency range 78.5-82 Mc/s. Intermediate frequency adjustable 8.3-9.8 Mc/s. Oscillator Crystal controlled (No Crystal included). Grey enamel steel case with lid 10 x 8 x 7in. Weight 22lbs. Note the amazingly low price, 39/6 plus 5/- carr.

OF INTEREST TO AIRCRAFT COMPANIES

OXYGEN MASKS. 6D/643 and 6D645. Type G. Brand new. Individually boxed. £12/10/- per 100.

GAUGES FOR DE-ICER. New. Black bakelite Case. Approx. 2 1/2in. diameter. 4 screw fixing. Calibrated 14.0 vacuum. 0-10 pressure. Individually boxed. £10 per 100.

AMERICAN AIRCRAFT CABIN HEATERS. Brand new. Type ABV-50D-H7-B. Makers "Surface Combustion" Columbus. 50/- each.

H. P. RADIO SERVICES LTD.

Britain's Leading Radio Mail Order House,

55 County Road Walton, Liverpool, 4

Tel.: Aintree 1445

Established 1935

McELROY-ADAMS MFG. GROUP LTD.

H.R.O. Receivers, complete with tubes but less coils. Rack and table models available	£19 each
H.R.O. Power Packs, 110/230 volts A.C.	65/- ..
H.R.O. Power Packs, battery models	45/- ..
H.R.O. Coils, limited quantity available	50/- ..
Moving Coil Microphone, T50 Electro Voice model 600C for B.C.614E amplifier. New and boxed	80/- ..
Speech Amplifier B.C.614E, for B.C.610 transmitter. New in original cases	£27 ..
Hallcrafters B.C.610 P.A. Coils, with swinging link. Set of seven coils. New and boxed ..	£7 per set
Individual coils available	21/- each
Hallcrafters B.C.610 Tuning Drawers, TU47 to TU60	30/- ..
B.C. 375E Tuning Units, TU5 to TU26	35/- ..
Panoramic Adaptor, B.C.1032B	£30 ..
Ferranti Microameters, 0-500 flush mounting. New	45/- ..
Sparton (Canada) Milliammeter, 0-300 mA. flush mounting. New	20/- ..
Condensers, .05 x .05 mfd. 2,000 volt Wkg.	5/- ..
Mica Heavy Duty, .01 mfd. 3,500 volt Wkg.	8/6 ..
Mica Heavy Duty, .0011 mfd. P or M 5% 28 Kv. 6 a. at 300 Kcs.	17/6 ..
30 x 10 x 10 mfd. 450 volts and 20 mfd. at 25 volts.	10/6 ..
8 x 8 mfd. 475 volts D.C.	7/6 ..
25 mfd. at 50 volts D.C.	3/6 ..
25 mfd. at 300 volts D.C.	3/6 ..
Morse Keys, type J47	6/6 ..
Remote Switch, navy type N.A.F.1118-2 carbon. By Struthers. Dunn Inc. type CX1535AA	17/6 ..

Also available from stock—Hallcrafters B.C.610 transmitters complete. Please send for details.

WANTED

Wilcox Gay V.F.O. or any component parts for R.C.A. transmitters E.T.4336. Also National H.R.O. spare parts.

46, GREYHOUND ROAD, LONDON, W.6.

Cables: Hallicraft London

'Phone: Fulham 1138/9.

Great Britain's Valve Mail-Order House

EXPORT

To all parts of the Commonwealth and beyond—safely packed (no C.O.D.) and Free of Tax.



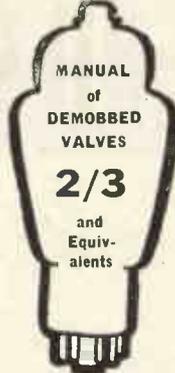
SERVICE SHEETS

The one you require enclosed if available in a dozen assorted of our best choice. **10/6**

FAMOUS MAKE

CONDENSERS			
12 mfd.	50 v.	.....	1/6
50 "	50 v.	.....	1/9
50 "	450 v.	.....	3/6
16 "	450 v.	.....	2/9
32 "	450 v.	.....	3/9
8x8 "	450 v.	.....	3/3
8x16 "	450 v.	.....	3/3
16x32 "	350 v.	.....	3/-
32x32 "	450 v.	.....	4/6

Postage 6d.



If yours is a Valve Problem—Bulls are most likely to solve it. Please write us.

"Demobbed Valves Manual" 2/3

Giving equivalents of British and American Service and Cross Reference of Commercial Types with an Appendix of B.V.A. Equivalents and comprehensive Price List. We have still some Valves left at very old Budget Rates (33 1/3%) which are actually sold at the old price.

** Radio for Beginners," 3/3.
** Crystal Set Construction," 1/3.

SPEAKER FABRIC
Square foot, **2/9**

Pifco Meters, 29/6.
Morse Buzzer Outfits, ex-Air Ministry, 6/-.
Ex-Govt. Mikes, 12/6.
Amplion Test Meters, £5.
Germanium Crystal Diodes w. Circuit, 3/-.
VCR97 C.R.T. only, 20/-.
Rod Antennas, 1ft. sections, dozen 2/6.
Hydrometers, 7/6.
Gas Blow Lights, 3/-.
Resistor Colour Ind., 1/3.

TAYLOR METERS ON EASY TERMS

Model	Cash Price			Deposit	10 Monthly payments of			Total H.P. Price
	£	s.	d.		£	s.	d.	
20B ..	15	15	0	2	7	3	1	10
45B ..	25	10	0	3	16	6	2	8
60A ..	22	10	0	3	7	6	2	3
71A ..	12	10	0	1	17	6	1	4
72A ..	16	0	0	2	8	0	1	10
77A ..	15	0	0	2	5	0	1	8
88A ..	21	10	0	3	4	6	2	1
110C ..	14	10	0	2	3	6	1	7
120A ..	19	0	0	1	7	9	1	8
130A ..	15	0	0	2	5	0	1	8
170A ..	24	0	0	3	12	0	2	5
190A ..	22	10	0	3	7	6	2	3
240A ..	14	0	0	2	2	0	1	6
260A ..	36	15	0	5	10	3	3	10
290A ..	19	0	0	1	10	0	1	1
290A ..	29	10	0	4	8	8	2	16

PHILIPS Neon Testers, 100-500 v., only 5/-.
Condenser Tester and Rectifier Units, 39/6.
A.C./D.C. Neon Testers, Type 400, only 11/3.
Elec. Engravers, 15/-.
Adcola Irons, 25/6.
Everlasting Sapphire Gram Needles, 3/6.
Inspection and Garage Hand Lamps, 6/6.



Q-MAX

Chassis Cutters and Keys
1 1/2 in., 12/4;
1 1/4 in., 12/4;
1 1/8 in., 13/4;
1 in., 1 1/2 in.
and 1 1/2 in., 16/- each;
1 1/2 in. and 1 1/4 in., 18/- each;
1 1/2 in., 19/9; 2 1/2 in., 31/9;
2 1/2 in., 36/9; 1 in. square, 24/3. Post 1/-.

TYANA Soldering Irons
Lightweight, Post 1/-, **16/9**

OLON latest Instrument model Soldering IRON **18/9**



DO IT YOURSELF ELECTRIC TAX FREE PAINT

STRIPPER Latest comes off like MAGIC. Cost 1d. per hour. A.C./D.C. Complete with self-contained. Unit long cable. Easy. Complete with cable & 2-way Plug. Nothing to buy. Extra Nozzles FREE. Easier than a Brush and twice as fast.



MAZDA Octal and B8G Octal VALVE HOLDERS **6d**



(Kindly mark envelope W.W.8)

CITY SALE & EXCHANGE

THE HIGH FIDELITY SPECIALISTS

LIMITED

90-94, Fleet Street, London, E.C.4.

Phone: Central 9391/2

Offer the following MATCHED high quality outfits:—

No. 1. Leak TL/12 amplifier, Vari-slope pre-amplifier, Leak V/S Tuner unit, Connoisseur 3-speed motor, Connoisseur super light weight Pick Up with 2 heads, Wharfedale 15in. and 5in. speakers in sandfilled corner baffle with crossover unit, walnut cabinet to house amplifier, tuner and motor. £185 cash or £65 deposit and 18 monthly payments of £7/8/-.

No. 2. Leak TL/12 amplifier, Vari-slope pre-amplifier, Lowther LES tuner, Garrard RC80 changer with Decca heads, Decca corner speaker, cabinet to house amplifier, tuner, and motor. £120 cash or £40 deposit and 18 monthly payments of £4/19/2

No. 3. R.D. Mark II Baby amplifier and pre-amplifier, Collaro 3-speed auto gram unit, R. & A. Prestige console speaker, console cabinet

to house amplifier and motor, £69 cash or £23 deposit and 18 monthly payments of £2/18/10.

No. 4. R.D. Minor amplifier, Decca 3 speed Record player, walnut case, R.D. console speaker, hi-flux unit. £39 cash or £13 deposit and 18 monthly payments of 33/3.



No. 5. Lee tape Desk push pull amplifier, Lane Mark IV tape table Chapman 3 wave radio tuner unit, B.S.R. Monarch 3 speed autochange record player, 10in. Wharfedale Golden speaker unit, £72 cash or £24 deposit and 18 monthly payments of £3/1/4.

PART EXCHANGE

Your present equipment, H.P. terms on request.

RECONDITIONED BARGAINS

Goodsell push pull amplifier and pre-amplifier with filter, 3 wave tuner with magic eye, 42 gns. Chapman 9 v. 4 wave push pull amplifier and Tuner, 29 gns. Eddystone S750 Communications Receiver as new, 37 gns. Ham-bander Communications Receiver 5 wavebands, 16 gns. Deccalian 78 reproducer, 16 gns. Decca 78 hi-fi player, finger tip control, 6 gns. Decca 2 speed player, portable case 2 XMS heads, 9 gns. Garrard RC65 mixed changer, £8/8/-.

BUILD A PROFESSIONAL RADIO OR AMPLIFIER AT LESS THAN HALF TODAY'S PRICE
A MAINS OR BATTERY PORTABLE KIT



You're SURE to get it at
STERNS
 ESTABLISHED 25 YEARS

A Midget 4-valve Superhet Portable Set covering medium and long-wavebands. Designed to operate on A.C. mains 200/240 volts, or by an "Aldry" battery. The set is so designed that the mains section is supplied as a separate unit which may be added at any time. The Kit therefore can be supplied (a) as an "Aldry" Battery Superhet Personal Set which can then be accommodated in the attaché case as illustrated (size 9 1/2 in. x 4 1/2 in. x 7 in.), this is attractively finished in lizard, maroon, dark green or blue rexine, or (b) as a combined Mains/battery Superhet Portable Receiver, for which a polished wood cabinet is available to accommodate both Mains Unit and Batteries together. Circuit incorporates delayed A.V.C. and pre-selective Audio Feedback. Kit is complete in every detail and includes ready-wound frame aerials, fully aligned I.F. trans. and drilled chassis, etc.

Overall size of assembled chassis 8 in. x 4 in. x 2 1/2 in. This receiver, as illustrated, can be completely built for approx. £10 (plus Mains Unit if required). Send 1/9 for the fully descriptive Assembly Book which includes Practical Layouts and complete price list of Components. Attaché case available separately, 37/6.

THE DENCO ULTRA MIDGET SUPERHET COIL TURRETS WITH A ROTARY TURRET ACTION

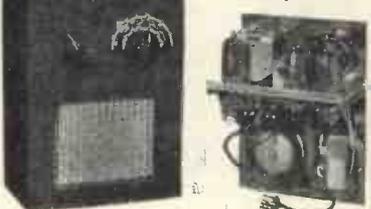
Type CT9 consists of a four station "pre-set" unit from which any three stations on medium waveband and one on long wave can be received by a turn of the turret switch. Price 39/6.
 Type CT10, is a 3 waveband coil pack incorporating a fourth switch position for Gram. Complete coverage is, long waveband 700-2,000 metres, medium waveband 190-570 and shortwave 15-50 metres. Price £23/6.
 A complete receiver circuit and all necessary data is included with each turret. These can be supplied separately for 6d.

HIGH FIDELITY PICK-UP

Incorporating the CONNOISSEUR Lightweight Moving Iron Head. Includes a Connoisseur Matching Transformer for (plus 1/6 normal high impedance inputs. carr. & Ins.) **39/6**

TWO BATTERY PORTABLES (a) THE "MINI-TWO-THREE"

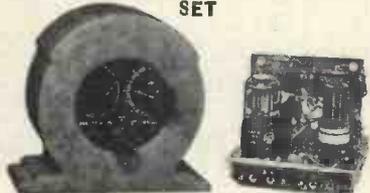
An "Aldry" Battery Portable of midget size, 6 1/2 in. x 4 1/2 in. x 3 1/2 in., designed to cover medium waveband 190-550 metres, with use of short trailer aerial. The simple design of this Receiver is so arranged that either a 3-valve set or a 2-valve (afterwards easily converted to the 3-valve) can be made. Consists of a T.R.F. circuit using a regenerative detector with H.F. stage and a high gain output pentode. Valve line up IT4-IT4-DL94. The 2-valve set can be completely built for £4/3/6 (less case), and the 3-valve for £5/3/6 (less case). Each price includes valves, speaker and drilled chassis. Send 1/9 for the assembly instructions; they include simple and complete practical component layouts and diagrams, which enable the most inexperienced constructor to successfully build either set. All components are available for separate sale, a price list being supplied with assembly instructions.



(b) THE "MINI-FOUR"

A 4-valve Battery Superhet Receiver designed to receive 4 pre-set stations, three on medium waveband and one on long wave to suit local conditions. Each station is obtained on the set by the turn of a rotary switch. No tuning is necessary. It is of midget size, being only 4 1/2 in. x 6 1/2 in. x 4 1/2 in. when completely built, and is very easily assembled from diagrams supplied. Cost of all components to build this set, in accordance with the design, including a drilled and cut chassis and panel and new valves, is £20/10/- (or less valves for £26/7/6). Attractive carrying case finished in blue leatherette, 18/9. Complete constructional data with a blue print, which shows the practical component layout and wiring diagram, together with an individual component price list, is available separately, 1/6. Our battery eliminators (illustrated above) available in kit form are suitable for use with this set.

"MINI-TWIN" 1-VALVE BATTERY SET



A design of a simple 1-valve 2-stage Battery Receiver, giving excellent results on medium and long wavebands and having exceptionally low battery consumption. Drilled chassis and practical diagrams make it the ideal set for the beginner to build. The complete chassis, including valve, can be built for 37/6, the attractive plastic case is 9/6, and suitable headphones 14/9. The complete assembly instructions, layouts and a component price list, are available for 1/6. This Receiver also performs excellently, without modification, as a tuning unit, and in addition, with simple modifications for which a complete diagram is provided, makes a first-class pre-amplifier for pick-up or microphone.

TELEVISION !! A GENUINE SPECIAL OFFER FOR CALLERS ONLY

A FAMOUS MANUFACTURER'S 19-VALVE T/V CHASSIS FULLY ASSEMBLED AND READY FOR USE.

For London transmission only employing a superhet circuit and incorporating the following valve line-up:—

- | | |
|-----------------|------------------|
| 6 Type E.F.42 | 1 Type E.C.H. 42 |
| 2 Type E.L. 33 | 1 Type E.L.38 |
| 2 Type E.B.41 | 1 Type E.Z.35 |
| 1 Type E.F.41 | 1 Type G.Z.32 |
| 1 Type E.C.C.91 | 2 Type E.Y.51 |
| | 1 Type 6SN7 |

WE HAVE A FEW ONLY AT THE VERY SPECIAL PRICE OF **£19'19'/-** including all Valves, £33, or £33, including a NEW MULLARD 12in. Tube. (Loudspeaker extra).

COME AND SEE IT WORKING !

A Famous Manufacturer's SHADED POLE GRAM MOTORS 10/6

(Plus 1/- carriage and insurance.) Clockwise rotations and incorporates a Mains Adjustment Panel. Could also be used as Recording Take Up or Rewind Motor.

The "Wireless World" 3-Valve Set



A Midget 3-valve T.R.F. Receiver for operation on A.C. mains covering long and medium wavebands.

We are able to supply all of the components to build this set, as designed and specified in the Feb. 1950 issue, including the drilled chassis. Valves and moving coil speaker, etc., at the following prices:—To construct complete chassis, less dial and drive assembly, £5/5/-. Ditto including dial and drive assembly, 26/-. To construct the complete set, including dial and drive assembly and cabinet, 27/3/6. Overall size of cabinet is 7 1/2 in. x 8 1/2 in. x 1 1/2 in. A reprint of the designer's article, giving circuit and assembly instructions (this is available separately for 9d.) together with a practical component layout, is included with each of above assemblies.

"PERSONAL SET" BATTERY ELIMINATOR

A complete Kit of parts to build Midget "Aldry" Battery Eliminator, giving approx. 69 volts and 1.4 volts. This eliminator is for use on A.C. mains and is suitable for any 4-valve Superhet Receiver requiring H.T. and L.T. voltage as above, or approx. to 69 volts.

The Kit is quite easily and quickly assembled and is housed in a light aluminium case size 4 1/2 in. x 1 1/2 in. x 3 1/2 in. Price of complete Kit with easy-to-follow assembly instructions, 42/6. In addition we can offer a similar COMPLETE KIT to provide approx. 90 volts and 1.4 volts. Size of assembled unit 7 in. x 2 1/2 in. x 1 1/2 in. Price 47/6.

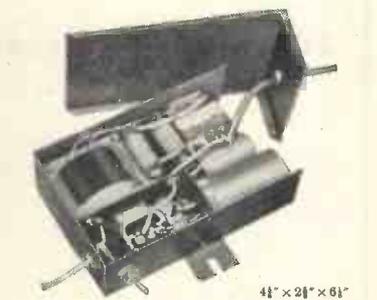


A COMPLETE

"CAR RADIO" FOR THE HOME CONSTRUCTOR



11 1/2" x 4 1/2" x 3 1/2"



4 1/2" x 2 1/2" x 6 1/2"

A design of a complete 5 VALVE SUPERHET RECEIVER employing an R.F. Stage and incorporating a separate VIBRATOR PACK for use on 6 or 12 volt D.C. Supplies. We can supply all Components to build this complete Receiver and Vibrator Pack, including a Metal Case.

Valves, Drilled Chassis and 5in. P.M. Speaker for **£12'19'6** (Carriage and Insurance 5/6 extra).

Or the Receiver Components for **£9'19'6** and the Vibrator Components for **£3'0'0**

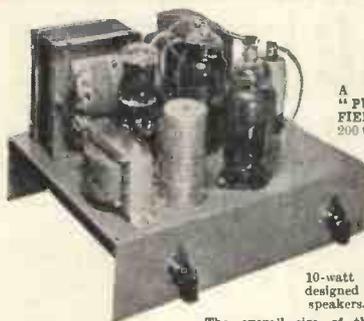
This is NOT an EX-GOVT. Receiver, it is a new design employing new Components.

Send 2/8 for the complete set of ASSEMBLY INSTRUCTIONS, CIRCUITS and PRACTICAL LAYOUTS, including a complete individual Component Price List.

THE VIEWMASTER TELEVISOR

We have had very considerable experience in assisting customers to build this T/V and can supply SPECIFIED COMPONENTS EX-STOCK. The assembly instructions showing practical layouts and price list are available for 7/6 for London, Sutton Coldfield, Holme Moss, Kirk-o-Shotts and Wenvoe. Complete television price list is contained in our general STOCK LIST at 9d., including Haynes, etc., components.

AMPLIFIERS TWO COMPLETE KITS OF PARTS



A 6-8 watt **QUALITY "PUSH-PULL" AMPLIFIER** designed for A.C. mains 200 to 250 volts, incorporating a simple arrangement to enable either a magnetic-crystal or lightweight pick-up to be used, and is suitable for use with Standard or long-playing records. A tone control is incorporated, and the 10-watt output transformer is designed to match 2 to 15 ohm speakers.

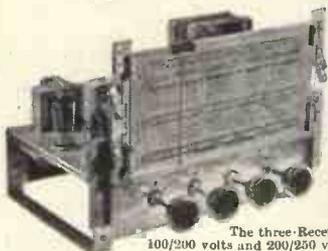
The overall size of the assembled chassis is 10in. x 8in. x 7 1/2in. high, and full practical diagrams are supplied. Price, including drilled chassis and valves, of complete kit, £8/17/6. Price of assembled chassis, supplied ready for use, £8/12/6. Full descriptive leaflets are available separately for 1/-.

A 12-watt **HIGH FIDELITY "PUSH-PULL" AMPLIFIER** designed for A.C. mains 200 to 250 volts, employs 6 valves plus rectifier, with negative feedback, and comprises a main amplifier chassis and a remote controlled Preamplifier and Tone Control Unit, incorporating four controls—bass, treble, main volume or mixing control, and a radio, gram, microphone, selector switch. This control unit measures only 7 x 4 x 2in. The measured frequency range of the amplifier with this unit shows an excellent response from 14,000 cycles down to 20 cycles, the bass and treble controls allowing independent control of gain at both ends of the frequency range from zero to a gain of 50. It can be seen, therefore, that ample correction is provided to suit any type of pick-up with any type of recording. Input voltage for maximum output is 70 mV. 8.3 volts at 2 amps and 30 mA H.T. is provided for tuning unit, etc. Price of complete kit, including drilled chassis and valves, £14. Complete specification and layout, 2/-. We can also supply completely assembled and ready for use at £17.



THREE COMPLETELY ASSEMBLED ALL-WAVE SUPERHET CHASSIS

- Model B.3. A 5-valve 3-waveband Receiver.
- Model B.3. P.P. A 6-valve 3-waveband Receiver with PUSH PULL OUTPUT.
- Model B. A 5-valve 6-waveband (4 Bandsread) Receiver.



The three Receivers are for operation on A.C. mains 100/200 volts and 200/250 volts, and employ the very latest miniature valves. They are designed to the most modern specification, great attention having been given to the quality of reproduction which gives excellent clarity of speech and music on both gram and radio, making them the ideal replacement chassis for that "old Radiogram," etc.

Brief specifications: Model B.3.—Valve line-up, 6BE6, 6BA6, 6AT6, 6BW6, 6X4—waveband coverage, short 16-50, medium 187-550, long 900-2,000 metres. Controls: (1) volume with on/off; (2) tuning (flywheel type); (3) wavechange and gram; (4) tone (3-position switch operative on gram and radio). Negative feedbacks employed over the entire audio stages. Chassis size: 11 x 7 1/2 x 8 1/2in. high. Dial size: 9 1/2in. x 4 1/2in. Price, complete and **READY FOR USE**, excluding speaker, £12/12/-. (Carr. and Ins. 7/6 extra).

Model B.3. P.P.—This model is the B.3 Receiver but incorporates two 6BW6 VALVES in PUSH PULL, resulting in really excellent quality reproduction up to approximately 6 watts. Price £15/15/-. (Plus 7/6 carr. and ins.).

Model B. Employs a similar valve line up as the B.3., but covers 6 wavebands. Short wave 11-16, 16-25, 22-23, 31-46 and 43-120 metres, and medium wave 187-350 metres. The first four short bands are bandspread. The controls employed are as used on the B.3 model, but the tone control operates a six-position switch, having three additional positions for varying bass and treble on gram reproduction. Negative feedback is employed over the entire audio stage. Size of chassis and dial is as given for B.3. Price complete and **READY FOR USE**, excluding speaker, £15/15/-. Carr. & Ins. 7/6 extra.

In addition to the Plessey Auto Changer advertised above, we have various makes and types of Autochangers and non-autochange units in stock by famous manufacturers. These are brand new manufacturer's surplus, and are offered at greatly reduced prices in relation to their cost price. Details given to callers or by post. Send stamped addressed envelope.

A Complete Kit of Parts to build a 3-4 WATT HIGH GAIN AMPLIFIER

for operation on A.C. or D.C. Mains, 200-250 volts.



This amplifier will give 3 watts output for the small input voltage of only 75 millivolts, and is therefore suitable for use with any type of pick-up from the crystal type to the miniature H/F Magnetic type. A tone control is incorporated and the quality produced is excellent. The overall size of chassis is 9in. x 5in. x 7in. and valve line up 25Y6-b6H7-25L6. Price of complete kit, including drilled chassis and valves, £4/2/8, plus 6 1/2in. P.M. (which fits on chassis), 16/-, or 8in. P.M., 18/6. Price of fully assembled chassis ready for use, £5/5/- (plus cost of speaker). Copy of assembly instructions and components price list available for 1/3.

MODERNISE YOUR OLD RADIOGRAM FOR

£ 25

(plus 10/- carriage and insurance) with the very latest equipment. We will supply the 3 waveband chassis on the left with the Plessey auto changer on the right, complete with 10in. speaker for £25 (£28/7/6 with the Model B3P.P. or B.). This is less than half the price of comparable commercial three speed auto radiograms.



A GENUINE SPECIAL OFFER!

PLESSEY 3-SPEED AUTO CHANGE UNITS
Brand New in maker's Cartons, complete with mounting instructions.

£11 - 3 - 6

(Normal price is £23/10/-).

- These units will auto change on all three speeds, 7in., 10in., and 12in.
- They play MIXED 10in. and 12in. records.
- They have separate sapphires for L.P. and 78 r.p.m., which are moved into position by a simple switch.
- Minimum baseboard size required 16in. x 12 1/2in. with height above 5 1/2in. and height below baseboard 2 1/2in.

A bulk purchase enables us to offer these BRAND NEW UNITS at this exceptional price.

Please add 7/6 packing, carriage and insurance.

STOP PRESS OFFER!

A DUAL CHANNEL PRE-AMPLIFIER and TONE CONTROL UNIT

This comprehensive PRE-AMPLIFIER and TONE CONTROL UNIT provides a full control of bass and treble in conjunction with a main Volume/Mixer Control.



It can be used with any amplifier and with any pick-up, the range of frequency control provided by the unit affording ample compensation for all types of pick-up and all natures of recordings, i.e., English American and long playing, without recourse to pick-up correction. The extreme flexibility of the bass and treble controls is such that the level of bass and treble can be set to suit any conditions irrespective of the volume output of the amplifier. Response characteristics are given in 12-watt amplifier advt. The unit measures only 7in. x 4in. x 2in., including self-contained power supply, and can be accommodated either on or away from the main amplifier, i.e., on the front panel of a cabinet or any other position. Price, including drilled chassis, valves (6SN7 and 6J5), £3/16/8. Complete assembly data is available separately for 1/- . Completely assembled and ready for use, £5/5/-.

BATTERY CHARGER KITS

All kits incorporate metal-rectifiers and are for use on A.C. mains 220-250 volts. All kits include an easily followed-wiring diagram. All prices include a TAPPED RESISTOR and a five-position SELECTOR SWITCH to enable the charging rate to be varied.

For 6 or 12 volt batteries at max. 1 amp., £1/18/8 (excluding Resistor and Switch, £1/3/6).

For 6 or 12 volt batteries at max. 1 1/2 amps., £2/4/- (excluding Resistor and Switch, £1/8/9).

For 6 or 12 volt batteries at max. 2 1/2 amps., £2/14/6 (excluding Resistor and Switch, £1/19/6).

For 6 or 12 volt batteries at max. 4 amps., £3/2/6 (excluding Resistor and Switch, £2/7/3).

THE COLLARO MODEL AC47.

GRAM UNIT £4/17/6

(plus 3/- carriage and insurance)

For use with 78 r.p.m. Records. Includes 12 inch Turntable and incorporates a variable speed control.

STERN RADIO Ltd.

109 & 115, FLEET STREET, E.C.4

Tel.: CENTRAL 5812-3-4



THE TELE-KING

A practical 5-channel 16-inch SUPERHET TELEVISION RECEIVER

Using the new 16-inch cathode ray tubes and wide angle components for the home constructor.

Complete instructions, wiring diagrams and 32-page descriptive booklet.

6/- POST FREE

ALL COMPONENTS IN STOCK. WRITE FOR LIST.

SPECIAL C.R.T. OFFER.
Brand new and unused 12in. ion trap cathode ray tubes. 6.3 volt heater, 7.9 Kv. E.H.T. 35 mm. neck. Black and white picture. By famous manufacturer.

PERFECT £12/19/6
Carriage and insurance 15/- per tube extra.

10,000 VALVES IN STOCK.
B.V.A., Special Purpose, Transmitting, etc. A few specials: Raytheon sub miniature CK510AX, pentode, 3/11. 954. 956, VU120, 32, 57. All at 2/6 each. RK34, 2/-; MS/PEN 3/6; VU111 3/6. Sylvania (red) EF50, 10/6.

CRYSTAL DIODES
Germanium 2/3d. each, post free.

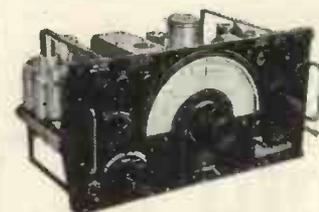
ION TRAPS. All types available. PRICE 5/- each. State type number of c.r.t.

SPECIAL OFFER. IT/6.
(For MW31-16), 3/- each.

MANUFACTURERS' SURPLUS T.V. COMPONENTS.
Frame blocking oscillator transformer, Plessey... 10/6
Multi ratio frame output transformer... 10/6
Scanning coils. Low impedance line and frame... 14/6
Scanning coils. Low impedance frame, low line. With aluminium shroud... 12/6
P.M. Focus units. For any type c.r.t. tube with 35 mm. neck, with vernier... 25/-

TWO-WAY TALKIE. Sound powered inter-com units. Can be set up anywhere, and gives effective communication up to a distance of 500 feet. Units can be purchased to give up to 4-way intercommunication. In metal case, brown crackle finish. Size: 6" x 5 1/2" x 8". Complete with 5in. P.M. speaker and two U2 batteries.

PRICE:
Master Unit, with 4-station selector switch... **37/6**
Sub-Stations 2/6 each... 27/6



Fully Assembled Power Pack and Output Stage, for R.1155 Receiver. For use on 200-250 volts A.C. mains.
LASKY'S PRICE 79/6
Carriage 5/- extra.

ALLEN WIDE ANGLE COMPONENTS
D.C. 300 latest type Ferroxcube Coils... 39/6
GL.16 Coil... 7/6
GL.18 Coil... 7/6
Focus Coil... 31/-
FO.305 trans... 21/-
Frame B.O. transformer... 15/-
Line EHT. transformer, L.30840/-

CHASSIS
Power pack Sound-vision and Scan chassis.
PRICE 11/- each.
All other metal work available from stock.

COILS
13 all exactly as specified. Price £2/4/6.

RESISTANCES 72 Resistances, all exactly as specified, 18/-.

CABINET
Walnut veneer, £8/10/-, plus carriage 12/6 extra.

WIDE ANGLE CATHODE RAY TUBES
14in. MW36-22... £19 9 3
14in. C14B... £20 10 1
16in. MW41-1... £22 4 10
16in. T901... £22 4 10
17in. MW43-64... £23 12 8
17in. C17BM... £24 13 0
Carriage and insurance extra.

9" TABLE T.V. CABINETS



Medium shade mahogany finish. Complete with back, safety glass, speaker-fret. Internal dimensions: 19in. high, 16in. wide, 14in. deep.

LASKY'S 39/6 Carriage 7/6 extra.
Adaptor frame available for 6in. C.R. tubes. The aperture can easily be enlarged to take 12in. or 14in. tubes.

12 VOLT D.C. MOTOR GENERATORS
Output 300 volts at 150 m/A. D.C. 7,500 r.p.m. Size: 2 1/2in. diam. 6in. long.
LASKY'S PRICE 17/6

METAL RECTIFIERS
12 v. 1 a. 6/9 12 v. 1/2 a. 3/6
6 v. 1 a. 3/11
6 and 12 v. 4 a. 18/6 each.

ELECTROLYTICS CONDENSERS

8 mfd. 450 v.w. 2/3
8 mfd. 500 v.w. 2/11
16 mfd. 350 v.w. 2/6
16 mfd. 500 v.w. 3/6
32 mfd. 500 v.w. 4/11
50 mfd. 350 v.w. 3/11
60 mfd. 350 v.w. 3/11
250 mfd. 350 v.w. 4/11
8+8 mfd. 450 v.w. 4/6
8+16 mfd. 500 v.w. 4/11
12 x 12 mfd. 350 v.w. 3/6
16+16 mfd. 500 v.w. 4/6
16+24 mfd. 450 v.w. 5/11
32+100 mfd. 450 v.w. 7/6
60+100 mfd. 350 v.w. 9/6
25 mfd. 25 v.w. 1/6
50 mfd. 12 v.w. 1/6
50 mfd. 50 v.w. 1/6
75 mfd. 12 v.w. 1/-

All brand new and guaranteed (not ex-Govt.). All other types, paper, tubular, waxed, etc., in stock.

RF25 UNITS. New, with valves. 19/11. Carriage 2/6.

GARRARD RECORD PLAYERS
For 6 and 12 v. operation Complete with magnetic pick-up, and volume control. In metal cabinet size: 17in. x 14in. x 11in. Very limited quantity.
£5.19.6
Lasky's Price
Carriage 10/- extra.

METER BARGAINS.
Flush Panel Mounting. 0-5 m.a. Moving coil. 2in. square. 7/8. 0-15 volts 50 cps. Moving Iron. 2 1/2in. scale. 8/6.

ANTENNA ROD SECTIONS
Steel, sprayed khaki. Each rod is 12in. long and 1/4in. diam. Any number can be fitted together. PRICE 2/6 per doz., 6/- for 3 doz.

C.R.T. Rear Neck Protectors, 2/6.

GRAM MOTORS
Rim drive, synchronous, for 200-250v. 50 cps. Many uses, 9/6 each.

RECORD PLAYING DESKS
Sloping steel table, grey crackle finish, size 10in. high, 15in. deep, 19in. wide. Complete with pick-up, centre spindle drive Collaro motor, with adjustable speed, and 10in. turntable. For 200-250 v. 50 c.p.s.
Lasky's Price **79/6** Brand Carr. 7/6 extra.

MAINS POWER UNITS
For use on 230 v. 50 c.p.s. Mains. On steel chassis, size 6in. deep, 17in. wide, 7in. high. Fully smoothed. Output:
No. 1. 6 or 24 volts D.C. 4 amps, 59/6.
No. 2. 6 or 24 volts D.C. 2 amps, 39/6.
Carriage 5/- each extra.
Ideal for battery charging.

ALL WAVE RADIO INTERFERENCE SUPPRESSOR UNITS, 5/6 each.

VCR97 C.R. TUBES, new unused, 35/-. Carriage 5/-.

EHT. Trans. for VCR97, 45/-.

Screen Enlarger for VCR97. Filter type, 17/6. Postage 2/6.

E.H.T. Condensers.
1mfd. 3Kv. 3/6. 1mfd. 2.5 Kv. 2/6.

R1132 RECEIVERS. With all valves and circuit. Slightly soiled. 50/- Carriage 10/- extra.

OUTPUT TRANSFORMERS
40 mA. Multi ratio 6/11
80 mA. Multi ratio 14/11
80 mA. Pentode 12/6
60 mA. Plessey, 6,000 ohms 5/11
Standard pentode 5/11
Pentode 3/6
Midget Pentode 4/3
Miniature Pentode, 354, 1S4 4/6
PX4 Intervalve 8/6
5:1 Intervalve 5/11

P.M. LOUDSPEAKERS
All less o'trans. new and unused. First quality.
3in. .. 12/11 5in. .. 12/6
6 1/2in. .. 13/6 8in. .. 15/-
10in. .. 32/6

PORTABLE RADIO CABINETS
Rexine finish. In silver, blue or red. Complete with dial, pointer, knobs, back, speaker fret and 5in. p.m. speaker, and handle. Size 13 x 7 x 10in. PRICE 37/6 complete. Carriage 5/- extra. Give second choice of colour when ordering.

R.1155 RECEIVERS. BRAND NEW. AERIAL TESTED. BEFORE DESPATCH

These well-known ex-Air Ministry Receivers need no further introduction.

Supplied complete with 10 valves.

LASKY'S PRICE £11.19.6

USED MODELS £7.19.6

Carriage 12/6 per unit extra.

LASKY'S

Lasky's (Harr) 370 HARROW ROAD, PA

(Opposite Paddington) **MAIL ORDER & DESPATCH DEPARTMENTS**
Telephones: CUNningham

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m., Thurs. half-day 1 p.m.

THE VIEWMASTER

ALL COMPONENTS IN STOCK

ANY SINGLE ITEM AVAILABLE SEPARATELY



COILS
All models available including filter chokes. Price (except Alexandra Palace), 28/- per set. Alexandra Palace, 20/- per set. L9 RF choke, 2/-.

CHASSIS
Sound-Vision, 18/6.
Power-Pack/T16 base, 18/6.
Support for S.V. chassis, 6/-.

G.B. T.V. COMPONENTS
Line Trans. 29/6
Frame Trans. 22/6
Main choke 12/6
Width Coil 6/11
Boost Choke 3/9
All suitable for Home Construction T/V.

LASKY'S LINE TRANSFORMER
RF. EHT for line fly back. 6-8Kv., with EY51 heater winding. Suitable for home construction T/V 25/-.

TELEVISION SELENIUM
The very latest "Sentercell" S.T.C. range
K3/40, 3.2 kV. 7/6
K3/45, 3.6 kV. 8/2
K3/50, 4.0 kV. 8/8
K3/100, 8.0 kV 14/8
K3/160, 12.8 kV 21/6

DARK SCREEN FILTERS
18in. x 14in. 25/-
14in. x 12in. 19/6
13in. x 11in. 14/11

PERSPEK. 13 1/2 x 10 1/2 in. Neutral shade, slightly marked 4/11 per piece.

W/B & PLESSEY
Line EHT trans. 32/6
Frame trans. 23/6
3 Mc/s boost choke 5/9
Width control. 7/6
Scanning coil 33/3
Main choke 15/6
Focus ring 22/6
Heater trans.
WB/103 42/-
WB103A 52/6
Front and rear C.R.T. supports 21/6

C.R.T. MASKS. Brand New. LATEST ASPECT RATIO
9in. 7/-
10in. 7/6
12in. 15/-
12in. Flat Face 15/6
12in. Old ratio 9/6
12in. Plastic, with dk. sc. filter and gold finish escutcheon 17/6
15in. do. do. 21/-
14in. Rect'gr. 21/-
15in. Cream rubber 17/6
16in. Eng. Elect. 42/-
16in. Double D 31/6
17in. Rect'gr. 25/-

SOILED. NEW ASPECT RATIO
9in. 5/-
12in. 7/6
12in. with fitted armour plate glass, cream. 11/6
12in. do. Black 8/6

TEST PRODS. Fully fused, with retractable points 4/11 per pair (1 red, 1 black).

METAL RECTIFIERS
WX3 and 6. Ea. 3/9
14D36 12/4
14A86 20/4
14A100 21/6
36EHT45 23/8
36EHT50 26/1
36EHT100 29/6

PLESSEY
Scan coils per pair 25/-
Width Control 6/6

NOW AVAILABLE. LARGE SCREEN, WIDE ANGLE CONVERSION DETAILS FOR THE VIEWMASTER.
Send 3d. stamp for full data. Fully itemised price list of all Viewmaster components now available.

ALL T.C.C. CONDENSERS exactly as specified for use in The Viewmaster can now be supplied from stock

ARMOUR PLATE GLASS
15in. Actual size 18in. x 19in. 7/11
12in. Actual size 13in. x 10in. x 1in. 4/-
9in. Actual size 9in. x 8in. x 1/2in. 3/-

The television set you can build at home from standard parts.

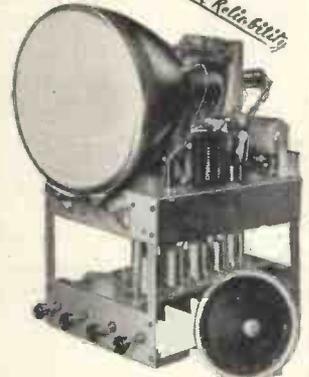
A MODEL FOR EACH FREQUENCY. State station required.

Brilliant high definition black and white picture. Superb reproduction. Uses 9in. or 12in. Cathode Ray Tube. Table or Console Model. Incorporates all the latest developments.

Television for the home constructor at its finest.

Send to-day for the CONSTRUCTION ENVELOPE, 32-page booklet crammed with top-rate information and all the necessary data, also 8 full-size working drawings and stage by stage wiring instructions.

Alexandra Palace, Sutton Coldfield, Holme Moss, Kirk o'Shotts, Wenvoe, Pontop Pike, Belfast. State model required.



PRICE 7/6 per copy.
Post free

Co-Axial Cable. 70-80 ohms impedance. Single core, 9/- doz. yards. Twin core, 12/- doz. yards. Twin feeder, 6/- doz. yards. **Co-Axial Connectors.** For standard 1/2in. cable, 1/11.

12 VOLT VIBRATOR UNITS Output 230 volts 80 mA. **BRAND NEW AND UNUSED.** Size: 9 x 5 x 5 1/2in. Supplied less vibrator. Vibrator required is 6 pin synchronous. **LASKY'S PRICE 19/6** Carr. 3/6 extra.

Other types in stock from 15/-.

T.C.C. VISCONOL HIGH VOLTAGE CONDENSERS (Cathodray).
.001 mfd. 15 kV. 10/-
.001 mfd. 25 kV. 18/-
.0005 mfd. 25 kV. 18/-
.0005 mfd. 12.5 kV. 10/-
Plastic case, single bolt fixing. Other high voltage condensers
.1 mfd. 7 kV. 15/-
.04 mfd. 12.5 kV 7/6

MAINS TRANSFORMERS

All 200-250 volts c.p.s. primary. Finest quality, fully guaranteed. **MBA/3.** 350-0-350 v. 80 mA., 6.3 v. 4 a., 5 v. 2 a. Both filaments tapped at 4 volts. An ideal replacement trans. Price 18/-.
MBA/6. 350-0-350 v. 100 mA 6.3 v. 3 a. 5 v. 2 a. With mains tapping board. Price 22/6.
MBA/7. 250-0-250 v. 80 mA., 6.3 v. 3 a., 5 v. 2 a. Both filaments tapped at 4 volts. Price 18/-.
AT/3. Auto transformer. 0-10-120, 200-230-240 volts 100 watt. Price 17/6.

FILAMENT TRANSFORMERS

6.3 v. 1.5 a., 7/11.
6.3 v. 3 a., 12/6.
Special Transformer. 2 amps. with the following tappings: 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24 and 30 volts. Price 17/6.



LIMITED QUANTITY (Frustated Export). 5 WAVEBAND CHASSIS.

Circuit has RF stage, Magic Bye Tuning Indicator, and many other features. For use on A.C. mains 100-250 volts. Waveband coverage: 11.5 metres to 550 metres. In 5 bands. **LASKY'S PRICE £10-19-6** Complete with valves, less dial. Carriage and packing 15/- extra. **WILL MAKE A SUPER RADIO-GRAM.**

INTERCOM UNITS 4-station operation. For use on A.C./D.C. mains 200-250 volts. Supplied complete, with 3 new valves, ready for immediate installation. Fitted in attractive plastic cabinet. Suitable for use as baby alarm. **MASTER UNIT £7/15/-.** Carr. 5/- extra. **Extension Units.** Price 21/- each complete. Carriage 2/- each extra.

DINGHY AERIALS WITH REFLECTORS Umbrella type, with wire mesh reflector complete with setting up instructions. Mast not supplied. **LASKY'S PRICE 7/6** Post 1/6.

TANNOY PRESSURE UNITS 10 watts. 7.5-ohms impedance. Last Few only **Price Reduced to 59/6** Carriage 4/6 extra.

DE LUXE TELEVISION CABINETS

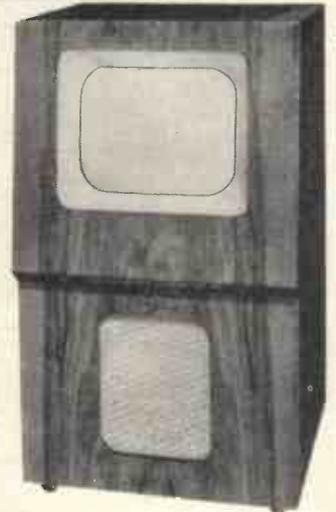
For 12in. cathode ray tubes Beautiful figured medium walnut finish, with high polish. Fitted with shelf for receiver. glass speaker baffle and fret, and castors for easy movement. Undrilled. Suitable for use with the Viewmaster. "Practical Television," "Practical Wireless," and "Wireless World" televisions.

LASKY'S PRICE £8.10.0

Carriage 12/6 extra.

Outside dimensions of cabinet: 17 1/2in. x 16 1/2in. x 32in. Why not convert your table receiver to a console? Adaptor frames for fitting 9in. or 10in. C.R. tubes available if required.

This cabinet can also be supplied cut out for 14, 16 & 17" C.R. tubes.



RADIO

ow Road) Ltd.,
DDINGTON, LONDON, W.9
(Hospital)

485/487 Harrow Road, Paddington, London, W.10
1979 and 7214. All Departments.

TERMS: Pro Forma, Cash with order, or C.O.D. on post items only. Postage and package on orders value £1-1/- extra, £5-2/- extra. £10-3/6 extra. Over £10 carriage free. All goods fully insured in transit.

Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/1 extra under £1. 1/9 extra under £3.

Please enclose S.A.E. with all enquiries.

RADIO SUPPLY CO. (LEEDS) LTD.

32 THE CALLS, LEEDS 2

Open to Callers: 9 a.m. to 5.30 p.m. Saturdays until 1 p.m.

FULL PRICE LIST 5d.

TRADE LIST 5d.

COLLAR TAPE DESK MOTORS, shaded pole type, clockwise or anti-clockwise, 29/9 each.

COAXIAL CABLE. 75 ohms, 1/4in., 10d. yard.

DIAL BULBS, M.E.S., 8 v. 0.15 a., 6/9 dozen.

SPECIAL OFFERS. Germanium Crystal Diodes 2/9. Midget Mains Transformers (size approx. 2 1/2 x 3 1/2 in.). Screened Primary 220/240 v. 50 c/s. Output, 250-0-250 v. 60 mA., 6.3 v. 2.5 a. Only 11/9. Small Filament Transformers, 220/240 v. input, 6.3 v. 1.5 a. output, 5/9. Auto Transformers (with separate l.t. 6.3 v. 1.5 a.), 0-110-200-210, 230-250 v. 50 watts, 4/9 each.

BATTERY SET CONVERTER KITS. All parts for converting any type of Battery receiver to All Mains. A.C. 200-250 v. 50 c/s. Kit will supply fully smoothed h.t. of 120 v. 90 v. or 60 v. at up to 40 mA., and fully smoothed l.t. of 2 v. at up to 1 a. Price complete with circuit, only 48/9. Supplied ready for use to 7/9 extra.

PERSONAL SET BATTERY SUPERSIDER KIT. Complete with case. Supplies 90 v. 10 mA. and 1.4 v. 250 mA. fully smoothed, from normal 200-250 v. 50 c/s. Mains. For 4 valve Superhet Receivers. Price with circuit 31/6. Or ready for use, 38/9. Size of Unit 5 1/2 x 3 1/4 x 1 1/2 in. approx.

H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Consists of h.t. and l.t. transformer, h.t. and l.t. rectifiers, smoothing electrolytic, choke, and steel case with black crackle finish. For Mains input of 200-250 v. Output 120 v.-40 mA. and 2 v. 1/2 a. Price with circuit, 29/6. Or in working order, 37/6.

BATTERY CHARGER KITS For 200-250 v. 50 c/s. Mains input. To charge 6 v. acc. at 2 amp., 25/9. To charge 6 v. or 12 v. acc. at 2 a., 32/9. To charge 6 or 12 v. acc. at 4 a., 49/9. Above consists of transformer, full wave rectifier, fuse, fuseholder, strong steel case with black crackle finish, and circuit. Supplied in working order, 6/9 extra.

SELENIUM RECTIFIERS 6 v. 1/2 a. H.W., 1/11; 6/12 v. 1 a. F.W. (Bridge), 7/6; 6/12 v. 2 a. F.W. (Bridge), 10/9; 6/12 v. 4 a. F.W. (Bridge), 18/9; 6/12 v. 6 a. F.W. (Bridge), 22/9; 120 v. 40 mA., 3/11; 250 v. 50 mA. (ex equip.), 5/9; 230 v. 80 mA. (ex equip.), 7/9; 350 v. 80 mA., 8/9.

Table with columns: Electrolytics (Current production. Not ex-Govt.), Tubular Types, Can Types, 8µF 450 v., 16µF 500 v., 32µF 350 v., 32µF 450 v., 32µF 500 v., 32 mfd. 500 v., 8-16µF 500 v., 25µF 25 v., 50µF 12 v., 50µF 50 v., Can Types, 8 mfd. 450 v., 8 mfd. 500 v., 16 mfd. 350 v.

CHASSIS. (16 s.w.g. Undrilled Aluminium) Receiver type. 6 x 3 1/2 x 1 1/2 in., 1/11; 7 x 4 1/2 x 2 in., 2/9; 16 s.w.g. 10 x 5 1/2 x 2 in., 3/9; 11 x 6 x 2 1/2 in., 4/3; 12 x 8 x 2 1/2 in., 5/3; 16 x 8 x 2 1/2 in., 7/6 20 x 8 x 2 1/2 in., 8/11; Amplifier Type, 12 x 8 x 2 1/2 in., 7/11; 16 x 8 x 2 1/2 in., 10/11; 14 x 10 x 3 in., 13/6; 20 x 8 x 2 1/2 in., 13/6.

SILVER MICA CONDENSERS. 5, 10, 15, 20, 25, 30, 35, 50, 100, 120, 150, 180, 200, 230, 300, 350, 400, 470, 500, 1,000 pfd. (.001µF), .002 mfd. (2,000 pfd.). All at 5d. each; 3/9 dozen one type.

WILLIAMSON AMPLIFIER KIT. All parts as specified by the author exact to spec. 14 gns.

MICROPHONE TRANSFORMERS 100:1 5/9

A PUSH-PULL 3-4 watt HIGH-GAIN AMPLIFIER FOR £3/12/6. For Mains input 200-250 v. 50 c/s. Complete kit of parts including circuit diagram and instructions. (Point-to-point wiring diagrams available for 1/6 extra). Amplifier can be used with any type of Feeder Unit or Pick up. Output is for 2/3 ohm speaker. (We can supply a very suitable 10in. unit by Goodmans at 31/-). The amplifier can be supplied ready for use for £4/17/6. Full descriptive leaflet 1/-.

MASTER INTERCOMM. UNIT with provision for up to 4 "Listen-Talk Back Units." A high gain amplifier enables speech and other sounds emanating from the rooms containing remote control units to be heard at the master control. The unit is in kit form and point-to-point wiring diagrams are supplied. A Walnut veneered cabinet is included. Mains input is 200-250 v. 50 c/s. Sound amplification 4 watts. Price only £5/19/8. "Listen-Talk Back Units" can be supplied at 25/- each. Full descriptive leaflet 1/-.

P.M. SPEAKERS. All 2-3 ohms, 5in. Goodmans, 14/9, 6 1/2 in. Elac. 14/11, 6 1/2 in. Plessey with Pentode Trans., 14/11, 6 1/2 in. Goodmans, 16/9, 8 in. Plessey, 15/9, 10 in. Goodmans, 31/-, 10 in. Plessey, 18/6, 10 in. Rola with Trans., 29/6.

M.E. SPEAKERS. All 2-3 ohms, 6 1/2 in. Rola field 700 ohms., 11/9, 8 in. R.A. field 600 ohms, 12/9, 10 in. R.A. field 600 ohms., 23/9. 10 in. R.A. field 1,500 ohms., 23/9. 10 in. R.A. Field 1,000 ohms, 23/9.

VOLUME CONTROLS with long spindles, all values less switch 2/9, with S.P. switch 3/11. WIRE WOUND POTS.: 5K, 10K, 20K, 35K, 50K (medium length spindles), 2/9.

AMMETERS. Moving coil. G.E.C. 0-5 amps., 2in. scale, 12/6.

R.S.C. MAINS TRANSFORMERS (Fully Guaranteed)

Main table listing various transformer types and prices. Includes sections for: FILAMENT TRANSFORMERS, CHARGER TRANSFORMERS, SMOOTHING CHOKES, ELIMINATOR TRANSFORMERS, OUTPUT TRANSFORMERS, and E.H.T. TRANSFORMERS. Each entry includes specifications like voltage, current, and price.



5 Harrow Road, Paddington, W.2

PADdington 1008/9 and 0401
OPEN MONDAY to SAT. 9-6 THURS. 1 o'clock.

6 WATT AMPLIFIER (UNDISTORTED)

Manufactured by Parmeko and Sound Sales for Admiralty.
4 valves, PX25, 2-AC/HL, MUI4. Output Matching and
3Ω and 15Ω, 100/250v A.C.

COMPLETE IN STEEL GREY AMPLIFIER CASE.

£12-10-0

CALL FOR DEMONSTRATION.

RADIO-GRAM CHASSIS

3 Wave-band Superhet. Med., long and short.
5 Latest Type MULLARD Valves.
4 Position Switching. Gram., med., long and short.
Provision for A.C. Mains
Extension Speaker. 110/250 volts.

Chassis 11in. x 7in. x 2½in. Scale 8in. Square.
Or Chassis 13½in. x 6½in. x 2½in. Dial 10in. x 5½in.

PRICE £10/5/-.

**BRAND NEW AND GUARANTEED. CARR.,
PACKING AND INS. 10/-.**

**SEND
STAMPS
FOR
NEW
1953
28-PAGE
CATA-
LOGUE**

PYE 45 Mc/s STRIP, TYPE 3583 UNITS

Size 15in. x 8in. x 2in. Complete with 45 Mc/s. Pye Strip, 12 valves, 10 EF60, EB34 and EA50, volume controls and knobs of Resistors and Condensers. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price £5. Carriage paid.

P.M. SPEAKERS

3in. Pleseay, with Trans. 15/-
3½in. Elac, less Trans. 15/-
5in. Pleseay, less Trans. 12/6
5in. Bola, with Trans. 16/-
8in. Elac, less Trans. 17/6
10in. Electra, with Trans. 25/-
10in. Bola, with Trans. 25/-
10in. Goodmans, with Trans. 30/-

WELWYN WIRE-WOUND SLIDER RESISTORS

MOUNTED ON PANEL FOR T.V. SETS

4 Bank: 100Ω, 500Ω, 2-10K. 5/-
4 Bank: 1K, 2K, 1-1 meg. (car). 5/-
5 Bank: 200Ω, 2K, 3-10K. 6/-

W/W. PRE-SET VOLUME CONTROLS TYPE "901"

100Ω, 500Ω, 2K, 10K and 30K. each 2/6

METRO-VIC (METROSIL) PENCIL TYPE E.H.T. REGULATOR up to 10 k.v.

particularly suitable for regulating E.H.T. Fly-Back. 5/-

STROBE UNITS. Brand New, in sealed cartons, these contain 6 EF50s, 5 EA50s, 1 SP01, a host of condensers, resistors, transformers, chokes, relays, switches, 7 pots, and 5 smoothing condensers. Size 18in. x 8½in. x 7½in. Only 67/8.

L.T. RECTIFIERS

6 v. 1 amp. G.E.C. 4 0
12 v. 2½ amp. Westinghouse. 12 6
12 v. 4 amp. S.T.C. 17 6
12 v. 8 amp. S.T.C. £12 6

25/73 TRI196 RECEIVER

This unit is complete with 6 valves, 2 EF36, 2 EF39, 1 EK32, 1 EK33 and 465 kc/s I.F.T.s. In new condition. Circuit and conversion data supplied. 39/6.

S.T.C. RECTIFIERS E.H.T.

K3/25, 650 v. 1 mA. 4 0
K3/40, 1,000 v. 1 mA. 6 0
K3/100, 8,500 v. 1 mA. 14 8
K3/200, 10,000 v. 1 mA. £1 6 0

9in. ESCUTCHEON. Brown Bakelite. Suitable plate glass and mask for 9in. tube. Price 7/6.

AMERICAN 12 v. DYNAMOTOR

As new. Output 250 volts. 60 mA. Weight 5 lbs. 29/8 Post free.

H.T. RECTIFIERS

S.T.C. 125 v. 60 mA. 4 6
S.T.C. 125 v. 100 mA. 5 0
S.T.C. 125 v. 125 mA. 6 0
S.T.C. 250 v. 250 mA. 18 0

WESTINGHOUSE 14D/972

250 v. 25 mA. 6 8
S.T.C.M.1/3 Noise Limiter 2 0

G.E.C. METER RECTIFIER, 1 mA. 11 6

RECEIVER R1355. As specified for "Inexpensive Television." Complete with 8 valves VR65 and 1 each 6U4G, VU120, VR92. Only 55/-, carriage 7/8. Brand new in original packing case.

RF, 25/-; RF26, 25/-; RF26, 59/6; RF27, 59/6.

RECEIVER UNIT TYPE 159. Size 8in. x 6½in. x 4½in., containing VR91, VR92, CV66, VR65 and 24 v. selector switch. New condition, 15/-.

WALKIE-TALKIE TYPE "48," complete with 6 valves. 2VP23, HL23 DD, QP25, TP25 and ATP4, aerial rods, I.F. trans., 1.6 Mc/s. mike trans. in new condition, but less transmitting components and coils removed by M.O.S., 35/-, carr. paid. (Less valves, 12/6.)

VCR.517C BLUE & WHITE 6½in. TUBE

This tube replaces the VCR97 and VCR517 without alteration and gives a full blue and white picture. Brand new in original crates, 45/-, carr. free.

CATHODE RAY TUBES

VCR97. Guaranteed full T/V picture (carr. 2/-) £2 0 0
VCR517. Guaranteed full T/V picture (with mu-metal screen) £2 0 0
3BP1. with shield suitable for T/V or scope (carr. 1/6) £1 5 0

MU-METAL SCREENS for VCR97 or 517. P.P. 1/6 10 0

6in. ENLARGER for VCR97 or 517. P.P. 1/6. 17 6

VR91 (EF50). Brand new Red-Sylvania, original boxes 10/-
British types, brand new and boxed. 8/6
VR91 (EF50). Ex-Brand new units, 6/-, or ten for 55/-
PX25, 12/6. Matched PX25's at 25/- per pair.
Raytheon CK510AX Sub-Miniature Valves, brand new, 7/8. GU50, 12/6.

No. 38 "WALKIE TALKIE" TRANS-RECEIVER, complete with Throat Mike, phones, Junction Box and Aerial Rods in canvas bag. Freq. range 7.4 to 9 Mc/s. Range approx. 5 miles. All units are as new and tested before despatch. Offered complete with battery, £41/0/-.

T.V. PRE-AMPLIFIER FOR LONDON AND BIRMINGHAM. Complete with 6AM6. Ready to plug in to your set, 27/6. P.P. 2/6.

VCR139A. 2½in. Brand new in original cartons, 35/-, carr. free.

INDICATOR UNIT TYPE SLCS

This Unit is ideal for conversion for a "Scope" Unit or basis for Midget Television. It contains C/R Tube type ACRI0 (VCR193A) complete with holder and cradle, also earthing clip. 1-VR66, 2-VR65, 24 mfd. 550 v. wkg. condenser, potentiometers and a varied assortment of resistors and condensers. These Units are in new condition and packed in wooden transit cases. The C/R Tube will be tested before despatch. Dimensions 8½in. x 6½in. x 11½in. 57/6.

INDICATOR UNIT TYPE 182A

unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen, 3 EF50, 4 SP61 and 1 6U4G valves, 9 wire-wound volume controls and quantity of resistors and condensers. Suitable either for basis of television (full picture guaranteed) or Oscilloscope. Offered BRAND NEW (less relay) in original packing case at 79/8. Plus 7/6 carr.

VIBRATOR PACKS

Input 6 v., Output 150 v., 40 mA. 25/-
Input 6 v., Output 180 v., 40 mA. (ex. 21 set) 17/8
Input 2 v., Output 180 v./90 v., 35 mA., 1.4 v. 250 mA. 50/-
Input 6 v., Output 200 v., 80 mA. (Masteradio) 30/-
Input 12 v., Output 300 v., 100 mA. 30/-
6 v. Vib. Trans. 250 v., 80 mA. 7/8

WEARITE

705 Coil Pack 3 waveband. £1 17 10
501A and 502 465 kc/s. pair. 10 0
Wearite Mains Trans. Input 110/250 volts, output 325-0-325 80 mA., 6.3 v. 2.5 amps., 5 v. 2 amps. £1 1 0

PLESSEY midget type 230 volts input, output 230-0-230. 50 mA., 6 volt, 2.8 amps., screened primary, 12/6.

WEYMOUTH SUPERHET MINIATURE COIL PACK

Covering Med./Long/Short wave bands. Iron cored coils. Dimens.: Height 1½in. Length 3½in. Width 2½in. Spindle length 2in. Complete with Circuit Price 19/8.

SHADED POLE MOTORS

A.C. 200/250 v. 50 cycles. 2000 r.p.m. Ideal for Tape Recorders, Gram. Motors, Timing Mechanisms, or Switch Movements, Etc. Size 2½" x 3½" x 2½". Brand New. 10/8 each.

WANTED

723 A/B and CV129 Klystron Valves, Philips Trimmers, 3-30 pF. RL18, NR88. Any quantity.

PLEASE ADD POSTAGE. ARTICLES UP TO 10/-, 1/- £1, 1/6. £2, 2/-.

COMMUNICATIONS RECEIVER RI155. The famous ex-Bomber Command Receiver known the world over to be supreme in its class. Covers 5 wave ranges 18.5-7.5 Mc/s, 7.5-3.0 Mc/s, 1,500-600 kc/s, 500-200 kc/s, 200-75 kc/s, and is easily and simply adapted for normal mains use, full details being supplied. Aerial taker before despatch. These are BRAND NEW AND UNUSED IN MAKER'S ORIGINAL TRANSIT CASES, ONLY £11/19/6.

A few used receivers, also tested working before despatch, are available at £7/19/6.

A few of the RI155N model can also be supplied. This is the latest version which covers the Trawler Bands, and in addition is fitted with ultra slow motion tuning. Used, but tested working before despatch, ONLY £17/19/6.

A factory made Power Pack, Output Stage and Speaker, contained in a black crackled cabinet to match the receiver, can be supplied at ONLY £5/10/-. Operates receiver immediately. DEDUCT 10/- IF PURCHASING RECEIVER AND POWER PACK TOGETHER.

Please add carriage costs of 10/6 for receiver, and 5/- for power pack. RECEIVERS RI355, as specified for "Inexpensive Television." Complete with 8 valves SP61, and 1 each 5U4G and VU 120 or VU 111. Used, good condition, ONLY 29/6 (carriage etc. 5/6). RF UNITS TYPE 26 AND 27 for use with the above receiver. The very popular variable tuning units, which use 2 valves EF54 and 1 EC 52. Type 26 covers 65-50 Mc/s, (5-6 metres), and Type 27 covers 85-65 Mc Mc/s, (3.5-5 metres).

BRAND NEW IN MAKER'S CARTONS. ONLY 59/6 each. VIBRATOR UNITS. 2 volt type, American made, delivers 67 volts at 4.7 mA, 130 volts at 20 mA, and 1.4 v. L.T. Easily adapted for use with any battery receiver, full details being supplied. ONLY 50/- (postage 2/-).

6 volt type, made by The National Co. of America for use with HRO Communication Receivers, supplying 165 volts at 85 mA, fully smoothed D.C. Complete with vibrator and 6X5 rectifier in black crackle cabinet, size 7in. x 7 1/2in. x 6in. Slightly used. ONLY 39/6.

INDICATOR UNIT TYPE 62A. Contains VCR97 tube with mu metal screen, 12 valves EF50, 4 of SP61, 3 of EA50, and 2 of EB34. Built on a two deck chassis containing hundreds of condensers and resistors, potentiometers, etc. In BRAND NEW CONDITION IN MAKER'S TRANSIT CASES. ONLY £7/10/- (carriage 9/6).

ADMIRALTY TEST SET TYPE SE2. For 160/230 Mc/s, this contains standard 230/250 v. 50 c. A.C. Mains power pack, 2in 500 microamp. meter, and 7 valves as follows: 2 ea. 6J5 and EA50, 1 each 6X5, VR 137, CV 172. Fitted in metal lined wood case with removable front. ONLY 50/- (carriage etc. 10/-).

6 VOLT 90 A.H. BATTERIES. By famous American makers, these have genuine hard rubber cases, and are BRAND NEW AND UNUSED IN MAKER'S PACKING. Size 8 1/2in. long x 6 1/2in. wide x 7 1/2in. high. ONLY 59/6 (carriage, etc., 7/6).

TELESCOPIC AERIAL. Pulls out of metal tube 15in. long to extend to 73in. BRAND NEW. ONLY 7/6 (post 10d.).

194 I.F. STRIP. An easily modified I.F. Strip recommended for TV constructors who want good results at moderate cost, or for those who have built televisors but are having trouble in the vision or sound receivers. Can also be modified for 2 channel working as per details in "Practical Television" October issue. This 6 stage strip measures 18in. x 5in. x 5in., and contains 6 valves VR 65, 1 VR 92 and 1 of VR 56 or VR 53. Mod. data supplied. ONLY 45/- (postage, etc., 2/6). Or less Valves 19/6 (post 2/6).

208 AMPLIFIER. Ideal for conversion into a high gain TV pre-amp. Complete with 2 valves EF50, ONLY 15/- (postage, etc., 1/6).

CERAMIC 2 WAY 3 BANK SWITCHES, 7/6 each.

CHOKES. 10 H. 60 mA, 3/9; 30 H. 100 mA, 12/6; 5 H. 200 mA, 6/- (postage 1/- per choke).

TRANSFORMERS. Manufactured to our specification and fully guaranteed. Upright mounting, fully shrouded normal primaries.

425-0-425 v. 200 mA, 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a., 50/-.

350-0-350 v. 160 mA, 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a., 42/6.

350-0-350 v. 150 mA, 6.3 v. 5 a., 5 v. 3 a., 32/6.

250-0-250 v. 100 mA, 6.3 v. 6 a., 5 v. 3 a., 32/6.

Please add 2/- per transformer postage.

TRANSFORMERS, FILAMENT. 6.3 v. 2 a., 7/6; 6.3 v. 3 a., 10/6. (Postage 1/-).

TRANSFORMERS EHT. Upright mounting, EHT for VCR 97 tube, 2,500 v. 5 mA, 2-0-2 v. l.l.a., 2-0-2 v. 2 a., 37/6.

EHT 5,500 v. 5 mA, 2 v. l.a., 2 v. l.a., 72/6.

EHT 7,000 v. 5 mA, 4 v. l.a., 82/6. Please add 2/- per transformer postage.

SPECIAL OFFER. L.T. Transformers with windings of 5 v.-0-5 v. 5 amps; 5 v.-0-5 v. 5 amps; 5 v.-0-5 v. 5 amps. By using combination of windings will give various voltages at high current. Brand new and unused these have become damaged, but are still usable, the damage being confined to broken fixing lugs, and/or broken bakelite terminal panels. Formerly sold at 35/-, now offered at 22/6 (postage 2/6).

2 1/2in. SQUARE FLANGE 0-1 M.A. METERS. Brand new. ONLY 15/-.

10in. P.M. SPEAKERS with output trans. Brand new. ONLY 27/6 (postage 2/-).

Cash with order please, and print name and address clearly. Amounts given for carriage refer to inland only.

U.E.I. CORPORATION

Radio Corner, 138, Gray's Inn Road, London, W.C.1.

Phone: TERMINUS 7937.

(Open until 1 p.m. Saturdays. We are 2 min. from High Holborn (Chancery Lane Station) and 5 min. by bus from King's Cross.)

G2AK This Month's Bargains G2AK

SPECIAL VALVE OFFER. 866A Rectifiers, 17/6 each, 807's 12/6 each. or 22/6 pr. 931A, 45/-, 832, 35/-, 829B, 80/-, 813, 70/-.

METERS. 2 1/2in. Flush mounting M.C. 100 mA, 12/6 each; 2in. Flush M.C. 5 mA, 7/6; 4 amp. thermo, 5/-; 2 1/2in. thermo, 0-2 a., 7/6; 2in. Flush 20-0-20 amps. M.C., 5/-; 2 1/2in. Flush M.C. 0-100 mA, 12/6 each; 0-15 a thermo. Proj. 2 1/2in. 7/6 each. 0-9 a. Hot wire, 5/-.

CELESTION 10in. P.M. SPEAKERS. Few only, 27/6 each.

TWIN RIBBON FEEDER. Heavy duty 300 ohm, 5d. per yd. Standard K25 300 ohm ribbon, 9d. per yd. Co-axial cable, 1/2in. dia 50 ohm, 8d. per yd. 7ft. length 1/2in. dia. Co-axial with Pye plug one end, 1/6, post free. All other Co-axial and feeder, plus 1/6 post any length.

POTENTIOMETERS. Carbon Type Potentiometers, 25k, 50k., 100k., 1/2 meg., 2 meg., 1/6. Many V.W. slot types available for T.V. replacements.

SPECIAL OFFER. 300 ohm. Flat Twin 150 w. rating, 6d. per yd. (minimum 20 yds.) post free. **DEAF AID CRYSTAL MICROPHONE UNITS,** 12/6 each.

STANDARD 1/2in. T.V. CO-AXIAL CABLE, 11d. yd. or 9/6 per doz. yds. or 9d. yd. in 100yd. coils. P. & P. 1/6, any quantity. **STREAMLINED BUG KEYS** by famous manufacturer. Listed at over £4. Our Price 45/- only.

SPECIAL TRANSFORMER OFFER. PRI. 115, 210, 240 v. SECS. 260/260 v. 100 mA, 6.3 v. 3 a., 6.3 v. 1 a. (for 6 x 5 Rec.) Universal Mounting. Limited Quantity, 17/6 each, post free.

CARBON MIKE TRANS., 2/- each. P. & P. 6d.

COMPLETE SET OF AR88 TUBES (14) for LF or D model receivers, £5/10/-.

AR88 MATCHING SPEAKERS by R.C.A., fitted rubber feet and 6ft. lead, 65/-.

TAPE RECORDING EQUIPMENT. Desks by Bradmatic, Tamsa, Lane and Qualtape. Ex stock. Heads, Oscillator Coils, Tape and Reels always available.

GERMANIUM DIODES. B.T.H. 2/-, G.E.C. 2/6.

Carriage paid on all orders over £1 except where stated. Please include small amount for orders under £1.

Please print your name and address.

CHAS. H. YOUNG, G2AK

All callers to 110 DALE END, BIRMINGHAM

'Phone: CENTRAL 1635.

Mail orders to 102 HOLLOWAY HEAD, BIRMINGHAM

'Phone: MIDLAND 3254.

1 KW TELEGRAPH TRANSMITTERS. Two HF 300's output. Operation 3.5 mc. to 16 mc.

BC610 TRANSMITTERS with speech amplifier, aerial tuning unit, etc. Brand new.

RCA TRANSMITTERS. Type ET-4336. Complete with speech amplifier, crystal multiplier and VFO units. Unused and re-conditioned. Can be supplied with very large quantity of spares.

RCA TRANSMITTERS. Type ET-4332 modified by R.A.F. for use on crystal or master oscillator. Complete with speech amplifier.

MAGNETO 10 LINE U.C. TELEPHONE SWITCHBOARDS (complete).

NO. 33 TRANSMITTERS.

A.R.88D's, A.R.88LF's, A.R.77's, S27's, HRO, R.109 and others.

AUTOMATIC HIGH-SPEED-TELEGRAPH EQUIPMENT. "BOEHME" (U.S.A.). Up to 400 signs per minute on line and wireless.

NAVY MODEL TBY-8 TRANSMITTING-RECEIVING EQUIPMENT. Output 0.75 watts on M.C.W. telegraphy and 0.5 watts on telephony. Frequency range 28-80 mc.

All above items in excellent working condition. Working demonstration upon request.

SPARES. A large selection available for SCR399 (BC610) or ET-4336 transmitters.

TX VALVES 803, 805, 807, 813, 814, 861, 866A, DET-16 and many others.

Large stock of Tx condensers, crystals and other components. Alignment and repair of communication receivers and all other short-wave equipment undertaken.

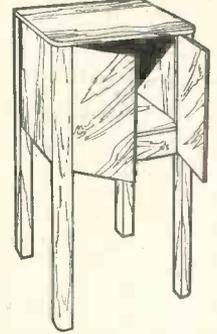
P.C.A. RADIO

Transmitter Division:— Receiver Division:—

The Arches, Cambridge Grove, 170 Goldhawk Road, London, W.6. London, W.12.

Tel.: RIV 3279. Tel.: SHE 4946.

CONSOLE CABINET



In polished walnut originally made for gram. motor. Would make ideal bedside cabinet or T.V. stand. Size 28 1/2 in. high by 17 1/2 wide by 13 1/2 in. deep. 39/6 Plus 7/6 P. & P.

Valve Holders, moulded octal Mazda, and local, 7d. each. Paxolite, octal, Mazda and local, 4d. each. Moulded B7G, B8A and B9A, 7d. each. B7G moulded with screening can, 1/6 each. 32 mid., 350 wkg. 2/-
16 x 24 350 wkg. 4/-
4 mid., 200 wkg. 1/3
40 mid., 450 wkg. 3/6
16 x 8 mid., 500 wkg. 4/6
16 x 16 mid., 500 wkg. 5/8
8 x 16 mid., 450 wkg. 3/9
32 x 32 mid., 350 wkg. 4/-
32 x 32 mid., 350 wkg. and 25 mid., 25 wkg. 6/6
25 mid., 25 wkg. 1/1d.
250 mid., 12 v. wkg. 1/1d.
16 mid., 500 wkg., wire ends 3/3
8 mid., 500 v. wkg., wire ends 2/6
8 mid., 350 v. wkg., tag ends 1/8
50 mid., 25 wkg., wire ends 1/9
100 mid., 350 wkg. 4/-
16-16 mid. 350 wkg. 3/3
Ex-Govt. 8 mid., 500 v. wkg., size 3 1/4 x 1 1/2, 2 for 2/6
60-100 mid., 280 v. wkg. 7/-
16 x 32 mid., 350 wkg. 6/-
50 mid., 180 wkg. 1/9
65 mid., 220 wkg. 1/6
8 mid., 150 wkg. 1/8
60-100 mid., 280 wkg. 8/6
50 mid., 12 wkg. 1/1d.
32-32 mid., mid., 275 wkg. 4/-
50 mid., 50 wkg. 1/9
Miniature wire ends moulded 100 pf., 500 pf., and 400 ea. 7d.
Combined 12in. mask and ecutcheon in lightly tinted perspex. New aspect, edged in brown. Fits on front of cabinet, 17/6. P. & P. 2/-.

Frame Oscillator Blocking Trans., 4/6.
Frame O.P. Transformer, inductance 10 by ratio 10 : 9/6.
Tube Mounting Brackets, size 9 1/2 x 4 1/2 in., 12in. tube clamps, 2/-.
Smoothing Choke, 2 Henry 150 mA., 3/6. 250 mA. 4 Henry, 5/-; 250 mA. 10 Henry, 10/6; 250 mA. 8 Henry, 9/6.
5 M. Focus Unit for any 9 or 12in. tube except Mazda 12in., with Vernier adjustment, 15/- P. & P. 1/6.
P.M. Focus Unit for Mazda, 12in. with Vernier adjustment 17/6. P. & P. 1/6.
Wide Angle P.M. Focus Units, state tube, 25/- P. & P. 2/-.

Energised focus coil, low resistance mounting bracket 17/6 plus 2/- P. & P. Scan Coils, low line low impedance frame, complete with O.P. transformer, 17/6. P. & P. 2/-.

Ion Traps for Mullard or English Electric tubes, 5/-, post paid.
465 Kc. I.F.s, 2-pole 2 1/2 way, Q 110 removed from American equipment, 5/- per pair. Standard 465 Kc. iron-cored I.F.s. 4 x 1 1/4 x 1 1/4 in., per pr. 7/6. Weirrite standard iron-cored 465 Kc. I.F.s, 3 1/4 x 1 1/4 x 1 1/4 in., per pr., 9/6.
Iron-Cored 465 Kc. Whistle Filter, 2/6.

OUTPUT TRANSFORMERS. Standard type 5,000 ohm Imp., 4/8. 42-1 with extra feed-back windings, 4/3. Miniature 42-1, 3/3. Multi-radio 3,500, 7,000 and 14,000, 5/6. 10-watt push-pull, 6V6 matching, 7/-.

PUSH-BACK CONNECTING WIRE. Doz. yds. 1/6. post paid.

STANDARD WAVE-CHANGE SWITCHES, 6-pole 3-way, 2/- 4-pole 3-way, 1/9; 5-pole 3-way, 1/9; 3-pole 3-way, 1/9; 9-pole 3-way, 3/6; Miniature type, long spindle, 3-pole 4-way, 2-pole 4-way, 4-pole 3-way and 4-pole 2-way, 2/6 each. P. & P. 3d.

MAINS OR BATTERY SUPERHERT PORTABLE COILS. Medium-waved frame aerial and long-wave loading coil, used as aerial coils. Midget iron-core screened L/M osc. coils, with circuit I.F. 465 Kc., 9/6.

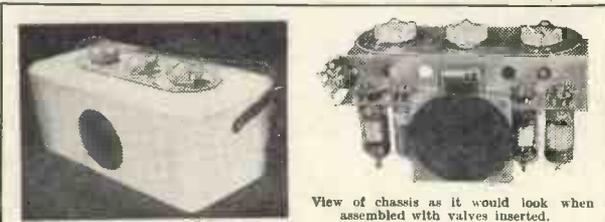
D. COHEN RADIO AND TELEVISION COMPONENTS

Terms of Business: Cash with order. Despatch of goods within 3 days from receipt of order. Where post and packing charge is not stated please add 1/- up to 10/-, 1/6 up to £1, and 2/- up to £2. All enquiries and lists, S.A.E.

SPECIAL NOTE: NO GOODS SENT WHERE CUSTOMS DECLARATION IS APPLICABLE.

23 HIGH STREET (Uxbridge Road) ACTON, W.3 Telephone: ACOrn 5901

Hours of Business:
Saturday 9—6 p.m. Wednesday 9—1 p.m. Other days 9—4.30 p.m.



View of chassis as it would look when assembled with valves inserted.

PERSONAL PORTABLE CABINET. In cream-coloured plastic; size 7 x 4 1/2 x 3in. Complete 4-valve chassis. Scale and 3 knobs. Takes miniature 90 v. and 7 1/2 v. batteries, 9/-, post and pkg. 1/6.

3in. P.M. Speaker to fit above, 10/-. Miniature output transformer, 5/-.

Wavechange switch, 1/6. Miniature 1-pole 4-way used as Volume and Off, 1/6. 4 B7G valve holders 2/4. Midget twin gang 3in. dia., 3in. long and pair medium and longwave TEF coils 3in. long x 1in. wide; complete with 4-valve all-dry mains and longwave circuit, 3/6. Condenser Kit, comprising 11 miniature condensers, 3/6. Resistor Kit, comprising 16 miniature resistors, 4/-. The above receiver (less valves and batteries) could be built for approximately 51/-. All valves to suit above available. Point to Point Wiring Diagram, 1/-.

G.E.C. USED 30 WATT AMPLIFIER in 2 units (4 K.T.66's in push-pull) complete less valves in very good condition 23/10/- P. & P. 2/-

G.E.C. USED 6 or 12 v. INPUT AMPLIFIER. In oak carrying case, complete less valves (2 K.T.61's in push-pull) in very good condition 27/10/0. P. & P. 2/-

T.V. POWER SUPPLY CHASSIS, size 13 x 5 1/2 in. A.C. mains 200/250 v. Complete with smoothing choke, mains transformer, 40 mid 350 wkg, 3 C mid 450 wkg, 5 U4G, twin mains fuse, 1 pin out-put socket & mains lead. Smoothed out-put 350 v. 200 mA heaters 6.3 v. 7 amp. 70/- P. & P. 5/-

MAINS UNIT comprising chassis 6 x 4 in., fully shrouded mains trans 110/250 input, 32 + 32 mid. 350 wkg., U50 rec., octal plug and mains lead. Smoothed out-put 250 v. 70 mA heaters 6.3 v. 2 amp. 25/- P. & P. 2/6.

FULLY SHROUDED MAINS TRANSFORMER, input 110/250, sec. 350-0-350 175 mills 6.3 v. 7 amp. 5 v. 3 amp. 35/- P. & P. 3/-

FULLY SHROUDED PUSH-PULL TRANS Pri 6000 ohms sec. 15 ohms (2 6L6's in push-pull) £1. P. & P. 2/-

FULLY SHROUDED CHOKE 15 Henry 180 mills 15/- P. & P. 2/-

FULLY SHROUDED CHOKE 5 Henry 120 mills 8/6. P. & P. 2/-

These last 4 items by very famous manufacturer.

SPEAKER MATCHING UNIT comprising choke, 2 condensers and chassis size 6 x 2 1/2 in., 3 to 15 ohm. reversible. 12/6. P. & P. 1/6

CABINET as illustrated, 11 1/2 x 6 1/2 x 5 1/2 in. in walnut or cream, complete with T.R.F. chassis, 2 waveband scale, station names, new waveband, back-plate, drum, pointer, spring drive spindle, 3 knobs and back, 22/6. P. & P. 3/6.

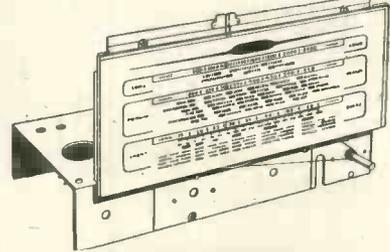
AS ABOVE but complete with 5in. speaker and O.P. trans. (these speakers have been used but tested O.K.), 30/- P. & P. 3/6. Metal rectifier 7/6. Gang with trimmers, 7/6. Medium and long T.R.F. coils 5/6. 3 obsolete ex-Govt. valves, 3 v/holders and circuit of an A.C. mains 3-valve plus rec. T.R.F. which can be built for approx. 24, 8/6. Heater trans. 6/-. Volume control & 8/6.

switch 3/6. Wave-change switch 2/- 32 + 32 mid. 4/-. Bias condenser 1/- Resistor kit 2/- Condenser kit 4/-

KIT OF PARTS FOR SIGNAL GENERATOR. Coverage 10 Kc/s.-200 Kc/s., 320 Kc/s.-900 Kc/s., 900 Kc/s.-2.75 Mc/s., 2.75 Mc/s.-8.5 Mc/s., 8.5 Mc/s.-20 Mc/s., metal case 10in. x 6 1/2 in. x 4 1/2 in. size of scale 6 1/2 in. x 3 1/2 in., 2 valves and 1 rectifier valve, A.C. mains 230/250. Internal modulation 400 c.p.s. to a depth 30 per cent. Frequency calibration accuracy plus or minus 1 per cent. Modulated or unmodulated R.F. output continuously variable 100 millivolts, £3/10/- P. & P. 4/- This includes the return to us for checking and calibration. We will build same for 15/- extra. Circuit and point-to-point wiring diagram, 3/6. Kit of parts for above, less checking and calibration, £3, plus 2/6 P. & P.

CONSTRUCTOR'S PARCEL, comprising chassis 12 1/2 x 8 x 2 1/2 in., cad. plated 18 gauge, v.h., 1F and trans. cut-outs, back-plate, 2 supporting brackets, 3 waveband scale, new waveband length station names. Size of scale 1 1/2 x 4 1/2 in., drive spindle, drum, 2 pulleys, pointer, 2 bulb holders, 5 paxolite international octal valve holders, 4 knobs, and pair of 465 I.F.s, 16/6. P. & P. 1/9.

AS ABOVE, but complete with 16 + 16 mid. 350 wkg. and semi-shrouded drop thro' 250-0-250 60 mA., v. 3 amp. Pri. 200-250 and twin-gang 31/6. P. & P. 3/-



CONSTRUCTOR'S PARCEL comprising chassis 8in. x 4in. x 1 1/2 in., with speaker and valve holder cut-outs, 5in. P.M. speaker with transformer, twin gang with trimmers, pair T.R.F. coils long and medium, four valveholders, 20 K. volume control and wave-change switch. 23/-. P. & P. 1/6.

CONSTRUCTOR'S 3-VALVE T.R.F. PARCEL. Comprising chassis, L. and M. coils, gang, pot., switch, resistor and condensers, heater trans., v/holders, smoothing and bias condenser, 4 ex-Govt. obsolete valves, speaker and O.P. trans., choke, with circuit, 37/6. P. & P. 3/-

465 KC. MIDGET I.F. Q 120, size 1 1/2 in. long, 1 1/2 in. wide, 1in. deep by very famous manufacturer. Pre-aligned adjustable iron-dust cores, per pair, 12/6.

MAINS TRANSFORMERS.
Primary, 200-250 v. P. & P. 2/-
300-0-300 250 mA., 6 v. 5 a., 5 v. 3 a. Unclamped, 27/6.
400-0-400 250 mA., 4 v. C.T., 3 a., 4 times. Unclamped, 32/6.
300-0-300, 100 mA., 6 volt 3 amp., 5 volt 2 amp., 22/6.
Drop thro' 300-0-350 v. 70 mA., 6 v. 2.5 amp., 5 v. 2 amp., 14/6.
Drop thro' 250-0-250 v. 80 mA., 6 v. 3 amp., 5 v. 2 amp., 14/6.
Drop thro' 110-110 60 mA., 6 v. 0.5 amp., 8/6.
280-0-280, drop-through, 80 mA., 6 v. 3 amp., 5 v. 2 amp., 14/6.
Auto-wound, H.T. 280-volts at 360 mA., 4 v. 3 amp., 2 v. 3 amp., or 6 v. 3 amp. Separate 4 v. 3 amp., 10/6.
Auto-transformer, 110 v. 70 watts, 10/6.
250-0-250 80 mA., 6 v. 4 amp., 14/-
Pri. 230 v. Sec. 200-0-200 35 mA., 6 v. 1 amp., 8/6.
Pri. 200/250 v., secondary 3, 4, 5, 6, 8, 9, 10, 12, 16, 18, 20, 24 and 30 volt at 2 amps., 13/-

Semi-shrouded drop-thro' 280-0-280, 200 mA., 6 v. 5 amps., 5 v. 3 amps., 27/6.
Semi-shrouded drop thro', 270-0-270, 80 mA., 6 v. 3 amp., 4 v. 1.5 amp., 13/6.
Semi-shrouded drop thro', 270-0-270 60 mA., 6 v. 3 amp., 11/6.
Heater Transformer. Pri. 230-250 v. of 6 v. 1 1/2 amp., 6/-; 2 v. 2 1/2 amp., 5/-; 2, 4 or 6 v. at 2 amps., 7/6; 2 v. 2 amp. and 6 v. 0.6 amp., 14/6. H.T. insulated, 8/6. P. & P. each 1/-

800-0-800 250 mA., 4 v. 2 amp., 27/6. P. & P. 5/-

P.M. SPEAKERS (closed field)
with less trans. trans.
2 1/2 in. 15/6
3 1/4 in. 13/6
6 in. 16/6
8 in. 12/6
8 in. 18/6
8 in. 15/-

P. & P. on the above 1/- each.
10in. less trans. 21/- P. & P. 1/6.
R. & A. 8in. M.E. Speaker field coil, 1,600 ohms O.P. trans. 5,000 ohms Imp. 18/6. P. & P. 2/-

5in. M.E. field coil 750 ohms with O.P. trans., 17/6. P. & P. 1/-

Extension speaker cabinet, in contrasting walnut veneer, size 15 x 10 1/2 in. with take off or 8in. speaker. 17/6. P. & P. 2/-

Volume Controls, Long spindle less switch, 50K, 500K, 1 meg., 2/6 each. P. & P. 3d. each.

Expanded aluminium speaker fret, 1 1/2 x 3in. 2/-

Volume Controls. Long spindle and switch, 1/2, 1 and 2 meg., 4/- each; 50 K., 3/6 each. 1/2 and 1 meg., 1/6 spindle double pole switch, miniature, 5/- P. & P. 2d. each.

Trimmers, 5-40 pf., 5d.; 10-110, 10-250, 10-450 pf., 10d.

Twin-Gang .0005 Tuning Condenser, 5/- With trimmers, 7/6. P. & P. 1/-

Line Cord. 3-way 0.8 amp. 180 ohms, per yard, 1/2 per yard.

Twin-rang, .0005 with feet, size 3 1/2 x 3 1/2 in., 6/6.

3-gang .0005, with feet, size 4 1/2 x 3 1/2 in. 7/6.

Television Coils wound in alician, size 2 1/2 x 3 1/2 in., with former and iron core, 1/- each.

Hoover Variable Speed 600-1200 revs. Tape Recording Motor. Silent running, 200/250 v. C.T. shaded pole with firing. Weight 5 lb., 27/6. Plus P. & P. 2/6.

PERSONAL SHOPPERS ONLY. 9in. Enlarger 17/6, 12in. 27/6.
Germanium Crystal Diode, 2/3 post paid.

Television Masks. White Rubber 9in. with glass, 7/6. Cream Rubber, 12in. with armour-plate glass, 15/-, 15in. Cream, 17/6 plus 1/6 P. & P.

T.V. Width Control, 3/6.

AMPLIFIER CHASSIS, 18 gauge cadmium plated steel with transformer and 5 v/holder cut-outs. 12 1/2 x 8 x 3in. 3/6. P. & P. 1/6.

USED C.R.T. TUBES. Heater cathode slots, 12in. 75/-, 9in. 45/-, Ion burn, 12in. 55/-, 9in. 35/-. P. & P. 7/6 each.

CRYSTAL PICK-UP by famous manufacturer, complete with sapphire trailer needle and volume control, 23/- P. & P. on each 1/-.

EX-GOV'T. RECEIVER TYPE B28. Complete coil unit, 6 bands, 60 kc/s.-420 kc/s. 500 kc/s.-30 Mc/s., 21/- Plus 2/- P. & P. Circuit for above, 4/-

Variable selectivity IF Switch to suit above, 7/6.

MODERNISE YOUR OLD CABINET BY FITTING A WALNUT BAKELITE ESCUTCHEON. Size 15 x 8 1/2 in. Complete with 3 wave-band scale size 5 1/2 x 4 1/2 in., 5/- P. & P. 1/6.

FLESSEY USED AUTOMATIC CHANGERS. single speed, in working order, A.C. 200/250 v., magnetic pick-up. 25/5/- P. & P. 5/-

CLYDESDALE

Bargains in Ex-Service Radio and Electronic Equipment

THE R1155 AS A COMMUNICATIONS RECEIVER.

With 5 switched bands, 18-7.5 Mc/s, 7.5-3 Mc/s, 1,500-600 Kc/s, 500-200 Kc/s, 200-75 Kc/s. 7 valves: VR99, 3/VR100, 2/VR101, V1103, ME. In black metal case 16½ x 9 x 9in.

ASK FOR No. X/E6 **£9 19 6** CARRIAGE PAID

ASK FOR No. X/H916 **£8 19 6** CARRIAGE PAID

ASK FOR No. X/H893 **£5 19 6** CARRIAGE 7/6

EX-R.A.F. AIRCRAFT TRANSMITTER UNIT T1154B. With valves. 3 range model. ASK FOR No. X/ESA **39/6** CARRIAGE 7/6

TELESONIC XMTR/RECEIVER. YA-4915. Ex-British Army.

Designed for the Transmission and Reception of audio (voice) frequencies (ultra long wave). No R.F. is employed. The Transmitter Unit YA-4911 with Mazda valves 2/ARP12's (VP23), 2/ATP4's (V248A) (loop aerial not supplied). H.T. V.1 60 volts, V.2 120 volts, V.3 and 4, 180 volts. L.T., 2 volts. Space for batteries is provided inside the case. Dimensions: 14½ x 11 x 8in. fitted with handles. Khaki finish. The Receiver Unit YA-4915 with Hivac valves 3/XH 1.5 v., 1/XP 1.5 v., which are in series parallel for 3 v. fil. supply H.T. 67.5 v. Space for batteries is provided inside the case. Dimensions: 7 x 6 x 2in. Finish Khaki with pick-up coil. ASK FOR No. X/E758/9 **50/-** CARRIAGE PAID for both units with revr. (PU) Coil only.

TELESONIC RECEIVER YA-4915 and P.U. COIL ONLY.

Details as above. Special Offer. ASK FOR No. X/E759 **30/-** CARRIAGE PAID

EX-U.S. NAVY TEST OSCILLATORS.

TS24/ARR2 **£2 9 6** ASK FOR No. X/H364
TS24A/ARR2 **£2 19 6** ASK FOR No. X/H364A

F24 AIRCRAFT CAMERA complete with lens and suitable for hand or electric use. Takes 5½in. width film, picture size 5½ x 5½ in. A precision air survey camera. Could be used for laboratory, industrial or portraiture. Focal plane shutter. **Wich #14—5in. lens.** ASK FOR No. X/H302 **£4 19 6** CARRIAGE PAID

MODULATOR I69. BRAND NEW, in original wooden case. Contains: 5UG4, EF50, CV7 Klystron and CV85 Valves. Repeater Motor, 3 Neon Bulbs with holders. 2 metal Rectifiers, High Cycle Transformer. 2 Oil Filled High Voltage Condensers. Oil filled Choke, 4 1 mfd. 500 v. 2 W.W. Pots. Plus Fixed Condensers and Resistance, etc. Built in chassis, 18 x 8½ x 7½in., with black case. ASK FOR No. X/H713 **21/-** CARRIAGE PAID

FLUXMETER WY.0023. Designed to calibrate the field of Magnets within the range of 500 to 4,000 gauss and to determine their polarity. Complete with probe unit and contained in a hardwood case with hinged lid and handle. Instructions on lid. Dimensions: 12½ x 9 x 6in. ASK FOR No. X/H361 **£2 15 0** CARRIAGE PAID

TEST METER TYPE E MADE BY AVO. Air Ministry Ref. 10S/10613. 14 Test Ranges as follows:—
Two voltage readings f.s.d. at 1.25 mA or 2.5 mA, 2 v., 20 v., 200 v., 1,000 v. D.C. 20 mA, 100 mA, 200 mA, 2A, 20A, 10,000 ohms. Scale marked: 0/40 amps volts. 0/20 amps volts. 0/10 amps volts. 0/5,000 ohms and infinity. Dimensions: 4½ x 3½ x 1½in. overall. Each instrument factory reconditioned and tested by experts. Less Battery (Ever Ready U10 1.5 v.) and leads. ASK FOR No. X/H232 **£2 9 6** POST PAID

TEST KIT, TYPE 6. Ref. 10S/720. For testing APN-1 Radio Altimeter Equipment. Comprising the Radio Altimeter F.M. Oscillator operating on 420 Mc/s. British version using mostly American Components including 2/955 acorns. Complete with Dynamotor for 24 v. D.C. operation (recess for alternative 60 v. and 1.5 v. batteries). In metal carrying case with handles and hinged lid, 18 x 15 x 10½in. ASK FOR No. X/E789 **£4 19 6** CARRIAGE PAID

MONITOR CRYSTAL, TYPE 2. Ref. 10T/11390. As used with R.1116 or R.1082. Consists of metal front panel on which is mounted 2 large 4BA terminals, 1 Red Warning Lamp, 1 large PO 4-way Jack, 1 6-way SP/Switch, 1 Rotary ON/OFF Switch, 1 single Crystal Holder. On a sub chassis, which is shock mounted, are 3 4-pin Valve Holders, 6 Crystal Holders, 2 Condensers, 1 Choke, 1 Transformer, 2 Coils, plus numerous small Condensers and Resistors. Housed in a plastic case, 7½ x 5½ x 3½in. IN TRANSIT CASE. ASK FOR No. X/H872 **5/-** POST 1/-

Illustrated Catalogue No. 8D. Price 1/6 (credited on first purchase of 10/- or over).

Order direct from:—

CLYDESDALE SUPPLY CO. LTD. 2, BRIDGE STREET GLASGOW - C.5

Phone: South 2706/9

Branches in Scotland, England and Northern Ireland

MARCONI VALVE VOLTMETER, Model TF889. New. £17/10/-.

U.S. NAVY OSCILLOSCOPE UNITS—Containing 5 BPI. 5in. Tube with fully screened mu shield isolating heater trans. Dozens of H.V. Cond., Resistors, Pots, etc. The finest value offered to date in "Scope" units "W.W." T/V "scope circuit included. Price £7/6.

LABORATORY TEST EQUIPMENT. For aligning and checking Trans./Receivers covering 150 to 234 Mcs. comprising: Type BC906. Frequency Dip Grid Meter. 145-235 Mcs. Type I-196-B. Signal Generator. 150-234 Mcs. Type BC1066-B. Radio Receiver. 150-234 Mcs. Price £12 the Set. Carriage extra.

VALVES. 154, 8/6; 6AG5, 10/6; 117Z6, 12/6; 6SH7, 6/6; EF50, 6/6; 955, 954, 6/-; SG215, 6/6; Pen 220A, 6/6; TT11, 8/6; VR 150, 10/6; 42, 10/6; CK512AX, 9/-; 9001, 9002, 9003, 7/6; 954-955, 6/6.

MAINS TRANSFORMERS. Input 200/240 v. Output 350-0-350 or 250-0-250 volt 80 mA. and 4 and 6.3 v. 4 a. and 4 and 5 v. 2 a. Price 21/6. Input 200/240 v. Output tapped 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30 volts, 2 amps., 21/6. All with one year's guarantee.

D.P.D.T. RELAYS. Operate at 200/300 volts D.C., 8/6. D.P. make and break, 8/6. We can supply any type of voltage and contacts at varying prices.

NEW SELENIUM RECTIFIERS. F.W. 12/6 type 3 amps., 14/6; 4 amp., 22/6; 6 amp., 30/-; 1 amp., 8/6; 12 v. 100 mA., 3/-; 250 v. 100 mA., H.W., 9/-; 80 mA., 6/6.

GERMANIUM CRYSTAL DIODES, 3/9. VCR97 CRTs. New and crated. Picture tested, 45/6. Bases, 3/6. NEW MAG SLIP TRANSMITTER MOTORS. Made by G.E.C. 50 v. 50 cycle. Mk. I—2in., 15/-; Mk. II—3in., 20/-.

NEW P.M. SPEAKERS. 5in., 14/6; 6in., 16/6; 8in., 20/-; 10in., 29/6.

0-500 MICROAMMETERS 2in., 15/6. M/C MICROPHONES with matched Trans., 15/-.

4ft. ROD AERIALS, set of three 6/-; Base 3/6. FL5 FILTER UNITS, 8/6. Same as FL8 but less switch.

TYPE FT243 FREQUENCY CRYSTALS, 5.8 to 8.6 Mcs. In 25 Kc. steps. 8/-.

ADMIRALTY OIL FILLED TRANSFORMERS. Prim. 230 v. Sec. 3000 tapped 3000 v. 85 mA. Weight 65 lbs. 10½in. x 9½in. x 8in. Steel cased, £4.

L.R. ARMY HEADPHONES, 8/6. NEW ROTARY CONVERTERS. Input 6 v. Output 350 v. 120 mA., 27/6.

All Carriage paid in the U.K. from Dept. W.W.,

The RADIO & ELECTRICAL MART
253B PORTOBELLO ROAD, LONDON, W.11
Phone: PARK 6026

C. MARKS & CO.

SPECIAL THIS MONTH!

GRAM MOTORS A.C. mains (200-250 v.). This shaded pole inductance motor is ideal for Rim Drive Turntable, Wire and Tape Recorder work, Fans, Timing Mechanisms, Motion Displays, driving small models, and various other small work. Size (overall) 3½in. x 3in. x 3in. r.p.m. 2,800 (approx.). These motors are silent running. Limited number available at 8/6 each, plus 1/6 post.

1132A RECEIVERS. 11-valve Superhet Receiver, covering 100 to 124 mc/s. using four VR56, two VR56, VR87, VR87, VR87, VR54 and VR87 valves. Fitted with tuning meter, slow motion drive, R.F. and L.F. Gain Control, etc. Circuit: E.P. amp. freq. changer, oscillator, stab., three I.F. amps., B.F.O., Det. 1st audio and output. Brand new, with circuit diagram. Price 59/6, plus 5/- carr.

INDICATOR UNIT TYPE 157. Has same line-up as INDICATOR TYPE 62, viz.: VCR97 C.R.T., mask and mu. screen, 16 8P61, 2 EB34, 4 EA50 valves, 1 mid. 2.5 kv. condenser, 15 potentiometers, Yaxley switches, Muirhead slow-motion dial, resistors, condensers, etc. The well-known unit for TV conversion or oscilloscope work. Absolutely brand new in transit case. Price £23/19/6, plus 7/6 carr.

R3084A RECEIVERS (The later edition of the R3170A). The well-known receiver used in the "Practical Television" Telesistor, with 7 EF50, 2 EF54, 2 EA50, 1 EC52, 1 MU14, 1 HUR2 valves, 3-stage 30 mc/s. I.F. strip, resistors, condensers, etc. Price 75/-, plus 10/- carr.

KAROMOT (Loaded Ebonite) 18in. x 36in. x 1½in. thick at 40/-, plus 5/- carr. 1in. rod x 20in. long at 4/6 doz., plus 1/- carr.

MIDGET 465 kc/s. I.F. TRANSFORMERS. Dust core tuned. Size 1½in. x 1in. dia. Price 6/9 per pair.

CERAMIC VALVE BASES for 813's at 5/- each, 304TH at 10/- each, 832's at 5/- each.

METERS. By well-known manufacturers. 0-200mA 2½in. circular. Brand new at 10/6 each, also 0-500 microamp 2in. circular (calibrated 0-10 v.) at 10/6 each plus 1/- post.

MAINS TRANSFORMERS. Input 200-250 v., output 475-0-475 v. 200 mA. at 32/6, plus 2/6 post. Input 200-240 v., output 320-0-320 v. 75 mA. 6.3 v. 2a. (tapped at 4 v.) 5 v. 2a. (tapped at 4 v.) at 13/6 each, plus 1/6 post.

A1271 AMPLIFIER UNIT with VR56 (EP36) valve 400Ω relay (4 makes, 2 breaks) 10,000Ω pot., Resistors, Condensers, etc., in black metal case, 5in. x 5in. x 5in. Brand new at 9/6 each, plus 1/6 post.

VALVES EF50 (Red Sylvania), 6/- each, EF50 (white), 5/- each. VIBRATORS, 4 PIN 12 VOLT (ZA4878) made by Mallory (Type 650), Price 4/6 each. 48/- doz.

YAXLEY SWITCHES. 4-pole 3 pos. 2 bank at 1/3 each. 12/6 doz.

90 COMMERCIAL ST., NEWPORT, MON. Tele. 4711
Also at 15 Wyndham Arcade, Cardiff
All mail orders and enquiries to Newport branch please

For Quality Bargains Always -Best Buy at Britain's

HALLICRAFTERS SKY CHAMPION S20R. Price £21, plus 10/- carr. **HALLICRAFTERS SKY RIDER DEFIANT.** Price £27/10/-, plus 10/- carriage. Send S.A.E. for further details re these sets.

COMMUNICATION RECEIVER R1155 for world wide reception. Can be heard at any time during shop hours. Air tested prior to despatch. Brand new at £11/19/6. A few soiled at £7/19/6. Also have a number of R1155N's at £17/19/6. Carriage in original transit case 10/6 extra on all models. Send 1/3 for circuit details, etc.

A.C. MAINS POWER PACK/OUTPUT STAGE enables the R1155 to be used to operate speaker from 200/250 volts A.C. without any modification whatever. Guaranteed 6 months. Price £4/10/- plus 3/6 postage.

SAVE MONEY BY PURCHASING THE NEW R1155 AND POWER PACK TOGETHER. ONLY £15/19/6, PLUS 12/6 CARRIAGE.

R1132A RECEIVERS. This superb receiver covers 100-124 Mc/s with variable tuning. Fitted with super slow motion drive, R.F. and L.F. Gain Controls, B.F.O., Tuning Meter, etc. Only requires 250 volts 80 mA., and 6.3 volts 3.3 Amps when it is ready to operate. Coils are very easily altered for other frequencies. Complete with all valves as follows: RF-VR65, FC-VR65, Osc-VR66, Stab.-VS70, 3 I.F.'s-VR53, Det.-VR54, Noise Limiter-VR57, Output-VR65, B.F.O.-VR53. Circuit supplied. **BARGAIN PRICE 59/6 plus 7/6 carriage. THESE ARE BRAND NEW.**

POWER PACKS NO. 3. Standard 19in. rack mounted power packs for operation from 200/250 volts 50 cycles A.C. mains. Paper smoothing, two heavy duty chokes, VU39 rectifier. Output 250 volts D.C. 100 mA., 6.3 volts 4 Amps. Two types, Mark I with H.T. current meter at £4/4/-; Mark II with H.T. current and volt meters at £4/10/-. Carriage 5/-. Suitable for use with P48, R1132, R1481, R1155, etc. Lead for any specified set with Jones plugs 10/- extra. All power packs guaranteed in working order. **TR1196 RECEIVER (RECEIVER 25/73).** A six valve superhet receiver with 465 kc/s I.F.'s. Complete with all valves and full conversion data. In brand new condition only 39/6 post paid.

"INEXPENSIVE TELEVISION." This book describes the building of a T.V. set from ex-Government surplus equipment. Price 2/9, post paid. **R1355 RECEIVER.** The justly famous receiver unit specified for the "Inexpensive T.V." Valve line-up 8-SP61, 1-VU120 and a 5U4. Slightly used, but in very good condition. **BARGAIN PRICE 29/6 plus 5/- carriage and packing.**

BARGAIN OFFER. The R1355 complete with RF24 unit tuned to whichever station is required (sound or vision) for only 62/6 plus 7/6 carriage. **RF26 and RF27** uses 2-EF54 and E352. RF26 covers 50-65 Mc/s and RF27 covers 65-85 Mc/s. Brand new and boxed, either type 59/6.

INDICATOR UNIT TYPE 95. Exactly the same as Indicator Unit 62 but is 50 cycle version. Double decker chassis with VCR97 mu-metal screen, 16-SP61's, 2-EB34's, 4-EA50's, loads of components, etc., in BRAND NEW condition. **CHEAPEST EVER 59/6 plus 7/6 carriage.**

45 MC/S PYE STRIP. Vision unit for London frequency, complete with 6-EF50 and EA50. Circuit provided. Price £3/10/- plus 2/6 carr. **T.V. PRE-AMP** uses 2-EF50's and tunes to 45 Mc/s. Easily altered to other frequency. With valves 19/6, less valves 10/-. Post 1/- extra.

E.H.T. TRANSFORMER for the VCR97, etc. Mains input. Output 2,500 volts, 4 volts 2 Amp., 2-0-2 volts 2 Amp. Fully guaranteed at 35/- plus 1/- post.

6in. MAGNIFYING LENS for the VCR97, etc. First grade, oiled filled. Now only 17/6 plus 2/6 post.

STANDARD TRANSFORMERS of current manufacture. Two types, both standard tapped primaries. Universal mounting. (1) 350-0-350 volts 80 mA., 0-4-5 volt 2 Amp., 0-4-6.3 v 4 Amp. (2) 250-0-250 v. 80 mA., 0-4-5 2 A., 0-4-6.3 v. 4 A. Both these transformers are new and boxed, fully guaranteed. Price 18/- post paid.

HEAVY DUTY CHOKE. 5 Hy. 300 mA., size 3 x 4 x 4 1/2 in. high. Totally enclosed, chassis mounting. A beautiful job, brand new and boxed for only 12/6 plus 2/- postage.

30 VOLT TRANSFORMER standard primary, secondary 30 volts 2 Amp. tapped at 3 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v. Has countless uses. Price 17/6.

METAL RECTIFIER. 12 volt 2 Amp., full wave bridge type. Suitable for use with above trans. Price 12/6.

METAL RECTIFIERS. Selenium 230 volts 60 mA. at 5/-. 250 volts 100 mA. at 7/6. RM2 at 4/3 or two for 8/-. RM3 at 5/-. RM4 at 17/-.
HEAVY DUTY RECTIFIER. Westalite heavy duty with square cooling fins, size 8 1/2 in. x 4 in. x 4 in. 2 units are required for full wave bridge to give 48 volts at 10 Amps. BRAND NEW at £5 per pair.

TEST SET 205A. This is a 3 centimetre precision test set. Latest version, brand new condition at £20.

MARCONI VALVE VOLT METER £25. We have many other types of test equipment in stock. Enquiries invited.

50 MICRO-AMP METER 2 1/2 in. panel mounting at 65/-.

2 1/2 in. SQUARE FLANGE 0-IMA METERS. Brand new and boxed. ONLY 15/-.

1 MA. METER, 2 1/2 in. dial in sloping desk type mounting at 25/-.

3,000 VOLT ELECTROSTATIC METER, 3 1/2 in. dia. Brand new and boxed for only 35/-.

UNIVERSAL AVOMETERS MODEL 40—very little used, thoroughly checked and tested. First class multi-range test meter for ONLY £9/19/6.

SPEAKER CABINET rexine covered 5 ply, takes heavy duty 12in. speaker. Size 19in. x 19in. x 14in. Brand new at 59/6 plus 4/6 carriage. Can be supplied with Vitavox K12/20 12in. extra heavy duty P.M. speaker for only £10 plus 4/6 carr. LIMITED NUMBER AT THIS PRICE.

RECEIVER 68P. A four valve battery superhet set. Uses standard 465 kc/s. IF trans. Complete with all valves. Covers 1.5 to 3 Mc/s, (100 to 200 metres). Circuit supplied. ONLY 32/6.

SYLVANIA RED EF50's. Brand-new at 8/6 each. British types tested at 5/- each.



CHARLES BRITAIN (Radio) Ltd.

11 UPPER SAINT MARTIN'S LANE
LONDON, W.C.2 TEM 0545

One minute from Leicester Square station (up Cranbourn Street)
Shop Hours: 9-6 p.m.: (9-1 p.m. Thursday). Open all day Saturday.

Garland Bros. Ltd

★ **TRUVOX TAPE UNIT.** We are at last able to give early delivery on this long-awaited unit. Price £23/2/-, plus 10/- carriage. Details of the unit and of associated amplifier available on receipt of stamp.

BRENETTE MICROPHONES. Large sales of these popular microphones has enabled us to make substantial reductions in the prices. The following range is available: **Type 9ND** Multi-directional ball-type, in black and chrome, £2/2/-, post 2/-. **Type 7D** Directional type, for instrumental or vocal use; black and chrome, £3/15/-, post 2/6. **Type 11A** A wide-frequency-response microphone, in brown cast case with chrome grill, £5/5/-, post 2/6. **Type 13U** A highly sensitive studio microphone with outstanding frequency characteristics. Flexible mounting enables it to be used directionally or not as required. Black and chrome finish, £6/6/-, post 3/6.

TYANA SOLDERING IRONS. Lightweight 40 watt irons with easily interchangeable elements and 3/16in. diameter bits. Voltage ranges, 100/110 v., 200/220 v. and 230/250 v. Price 16/9. "The iron that makes soldering a pleasure."

VARLEY MAINS TRANSFORMERS. Primary 10-0-200-220-240 volts. Secondary 300-0-300 volts at 150 mA., 5 volt at 3 amps., 6.3 volt at 4 amps., 6.3 volt at 1 amp. Open type construction. Price 45/-, post 2/6.

DECALS. 500 1/2 in. high white transfer letters and words for marking electronic equipment. Price 4/9 per book. The new Decals book for the amateur now available. 29 words per page, 4 pages radio and audio, 4 pages T/V and Scope, 2 pages misc. incl. Tx. and Tape Recording, 3/6 per book, post 3d.

GENERAL PURPOSE TRIODES. Type 2C/22 (7193)-6.3 v. heater, int. octal base. Similar to 6J5G, but anode and grid brought out to top caps. Price 11/6 per half-dozen, post paid (minimum quantity).

RADAR REFLECTORS. Type MX138/-A. These consist of 6—2ft. x 1/2 in. dural tubes covered with fine wire mesh. The whole assembly can be used as an omnidirectional aerial, and the mesh has many horticultural applications. Price 3/9 each, post 9d. Type MX137A: similar to above, but also include a telescopic aerial rod, extending from 1 1/2 in. to 3 ft. 6 in. approx. Price 4/9 each. Post 9d.

TELEVISION MAGNIFYING LENSES. 6in. clear, 19/6; 9in. clear or filter, 59/-; 12in., clear or filter, 70/-. Please state which and add 5/- for carriage and packing.

WHANDA WIRE AND CABLE STRIPPERS, to take all size flexes and cables up to 3/4 in. diam. with 3 alternative heads and triple screw adjustment. These are brand new and boxed, and the original price was 15/- each. Our price 5/- each post paid.

AERIAL RODS. These popular rods, of tough steel copper-plated, are 12in. long, and fit into each other to make any length. Many hundreds of thousands sold to T/V aerial manufacturers and to the public. Price 3/6 per doz. or £1 per 100, post paid. £10 per box of 1800 carriage paid U.K.

MAGNETIC TAPE. Scotch Boy MCI-111: 1,200ft., 35/-; 600ft., 21/-; 300ft., 12/3. Spare 7in. spools, 4/3. Ferrovoice, the new kraft-based medium coercivity tape: 1,200ft., 22/6. Spare 7in. spools, 4/6. Trade supplied.

TAMSA TYPE 100 TAPE RECORDING HEADS. Housed in chromium plated brass case on adjustable mounting. Record/playback heads have 1/4-thou. gaps and erase heads have 2.5 thou. gaps. These heads are of high impedance. Price 45/- each. Trade supplied.

STOP PRESS !

12in. **SPEAKERS** now **TAX-FREE!** Full range—Goodmans, Wharfedale, Whiteley, etc. in stock.

★ **PLEASE ADD POST OR CARRIAGE ON ALL ITEMS. KINDLY PRINT NAME AND ADDRESS. POST ORDERS TO OUR DEPTFORD ADDRESS. EARLY CLOSING THURSDAY, OPEN ALL DAY SATURDAY.** ★

SHOP HOURS: Mon: Tues: Wed: and Sat: 9 a.m.—6 p.m.
Thurs: 9 a.m.—1 p.m. Fri: 9 a.m.—7 p.m.

GARLAND BROS. LTD

CHESHAM HOUSE, DEPTFORD BROADWAY, S.E.8.

TEL: TIDEWAY 4412/3

5 OBELISK PARADE, LEWISHAM, S.E.13. TEL: LEE GREEN 4038

OUTSTANDING OFFERS FOR EXPORT ONLY

U.S.A. Radio and Radar Equipment

- AIRCRAFT TRANSMITTERS, Model GO-9 (Westinghouse):
- RCA TRANSMITTERS. Type ET-4336-B, H, K, L
- RADIO SETS SCR-695. RECEIVERS AR-77 and 88.
- TEST EQUIPMENT IE-46, TS-36/AP, TS-56A/AP, TS-51/APG-4, Type 205A, Type LR-1 (General Radio), BC-221 (Bendix)AN/UPM
- Hallicrafters SCR-299, 399 and 499 (BC-610).
- INTERROGATORS-RESPONDERS BM-1 (and BN-1)
- REPEATER-INDICATORS AN/APA-1.
- RADAR INDICATING EQUIPMENT, Model VF.
- Large Quantities of American Microwave Frequency Meters (Lavoie Laboratories).
- PULSE GENERATORS (RCA and Measurements Corporation).
- AIRCRAFT RADAR, APS-3, APS-4, APS-6, and APN-2.
- AN/APN RADIO ALTIMETER EQUIPMENT.

Spare (Radio and Radar-U.S.A.)

Full range of spares for most U.S.A. Aircraft, Naval and Ground Radio and Radar Units (SCR-187, 188, 193/269, 274-N, 287, 399, 508-10, 17, 536, 566, 593, 608-10 (very large quantities), 694, 695, MRN-3, TRA-1-ABK, BM, BN, SM, SO, SQ, SK, APS-2, 3, 4, 6, 15, etc.). Klystrons 2K33 (Oxford tubes). Large Quantities of Plate Supply Transformers for ET/4336 Transmitters.

- British T/R (X 42, W/S No. 11, W/S No. 17, W/S No. 18 Mk. III, W/S No. 38, W/S No. 58, W/S No. 68-T).

Power Units, Wavemeters, Motor Generators, Dynamotors and large quantities of various components.

Aircraft Instruments and Accessories.

Catalogue supplied only to Governments, Airlines and Accredited Government Contractors.

Enquiries to

BRITISH SAROZAL LTD.

(Export Branch)

1 BRISTOL HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1

Telephone: HOlborn 6763/4/5 Cables: Sarozal, London

ALL EQUIPMENT AS ADVERTISED IS AVAILABLE FOR IMMEDIATE DELIVERY FROM STOCK AND IS FULLY CHECKED AND TESTED—PRIOR TO DESPATCH—IN OUR OWN WORKS AND LABORATORY. ARB OR AID CERTIFICATES CAN BE SUPPLIED UPON REQUEST.

We buy for cash American surplus equipment.

H.R.O. SENIOR RECEIVERS. With A.C. P.P., 5 coils, £37/10/-.
D.S.T. 100 RECEIVERS, as new. Coverage is 7 bands from 30 Mc/s. to 50 Kc/s., £30 each.
HAMMERLUND BC772B. Mint condition, rack mtg., £42/10/-.
HALLICRAFTERS SX28, S27, S20R, S41, S38, etc. All in perfect condition.

AR88LF, AR88D, CR100, from stock. **RI155 RECEIVERS,** new. **A.C./D.C. MOTORS,** suitable for sewing machines, 47/6 each. **A.C./D.C. 12 v.-15 v. MOTORS,** long spindle for models, 15/- each. **20 WATT P.A. RACK MOUNTING AMPLIFIERS,** complete with power pack, 200/250 v. A.C., less valves, £6/10/-. Valves—2 type PX25, 1 MH4 and 1 MU14, £2/15/- per set.

NEW M/C MICROPHONES, hand type, with 12 yds. heavy duty screened cable. £3/15/- each.
B.C. 221 FREQUENCY METER, from stock. Many items of American equipment available.

TEST EQUIPMENT. We hold a comprehensive stock. Multi-range meters at 1,000 and 20,000 o.p.v., valvetesters, signal genes. 4,000Ω **EARPHONES,** 11/6 pr.

10,000Ω **POTENTIOMETERS,** large size, by Colvern, enclosed, 8/6 each. 100k, 15w, 9/6 each.

TYPE 73 VELLODYNE UNITS in stock, £4/10/- each.

C.R.100 RECEIVERS, perfect order, £27/10/-.

MAINS TRANSFORMERS: Special offer, not ex-W.D., 200/250 v. input tapped. Output 250-0-250 v. at 100 mA., 5 v. 3 a., 6.3 v. 4 a., 21/6 each.

300-0-350 v. Ellison at 120 mA., 6.3 v. 5 a., C.T. 5 v. 3 a., 37/6. All types in stock.

EVERSHED BRIDGE MEGGERS, 250 v. Special price, £12/10/- each.

D.C./A.C. CONVERTERS, 230 v. D.C. input, 230 v. A.C. output at 140 watts, £9.

MAGNAVOX 12in. P.M. SPEAKERS, snip at £5/10/- each. **G.E.C. 7 WATT V.H.F. MOBILE TX/RX.** Complete with 12 v. rotary p/pack, 80.9, 81.1 and 81.3 Mc/s., special offer, £30.

EDDYSTONE 640 RECEIVER. Perfect, at £22.
6 VOLT (3 at 2 v) BOXED ACCUMULATORS, 24/-.

1.μF 350 v. **METAL CASED TUBULARS,** U.S.A., at 4/6 doz. (minimum 2 doz.).

H.R.O. COILS. .46-.96 Mc/s., etc., at £2/5/- per coil.

LARGE STOCKS OF MOTORS. A.C./D.C. and A.C., 1/16, 1/12, 1/8, 1/4 h.p.

Your past enquiries welcomed. S.A.E. for reply please. Orders, C.W.O. or Pro-forma Invoice, no C.O.D. Prices quoted do not include carriage and packing.

All types of equipment purchased. Top prices paid.

SERVICE RADIO SPARES
4, LISLE STREET, LONDON, W.C.2

Telephone: GERrard 1734

Dept. W.W.

18 TOTTENHAM COURT ROAD, LONDON, W.1

Tel: MUSeum 2453/4539

Business Hours: Monday-Friday 9—5.30. Saturday 9—1.

Late ALEC DAVIS SUPPLIES LTD.

RELAYS

D.C. COIL RESISTANCE

3,000 TYPES: 1.9Ω to 80,000Ω
 600 TYPES: 0.4Ω to 9,200Ω.

ALSO LARGE STOCKS OF DOUBLE & TRIPLEWOUND AND SLUGGED COILS. SIEMENS TYPE HIGH SPEED

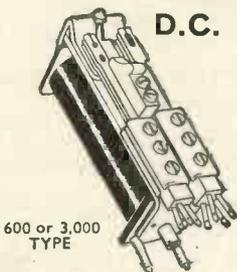
CONTACTS

3,000 TYPES: up to 8 sets.
 600 TYPES: up to 4 sets.

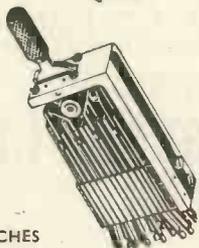
3,000 TYPES: Make (M), Break (B), in Twin-silver Twin-platinum, Dome-silver (2 amp.), Tungsten (5 amp.), and Flat-silver (8-amp.), Change-Over (C), in all but Tungsten: Make-Before-Break (K), in Twin-silver and Twin-platinum.

600 TYPES: (M), (B) and (C), in Twin-silver and Twin-platinum.

KEY SWITCHES. 2 C/O. to 8 C/O. Special types made up to order.



600 or 3,000 TYPE



KEY SWITCHES

MAGNETIC RECORDING

Tape Desks; Record/Playback Amplifiers
 Cabinets: (Console, Table & Portable). Rewind Spools. Tape & Microphones.

Send for Constructor's Envelope

Many Bargain Lines in Radiogram & Record Playing Equipment:—

- Single & 3 Speed Autochangers & Single Playing Units.
 - Plug-in Pick-Ups & Complete Boxed Pick-Ups.
 - Polished Walnut "Standard Console" & Drop Front R.G. Cabinets
- Send for Hints on "Make Yourself a Radiogram at approx. Half Present Day Price!"

We also hold large stocks of "Viewmaster" & Tele-King Components, including many items for the big picture enthusiast. Detailed list available on request.
 15" C.B. Tubes—E.H.T. Boost Circuits—Wide Angle Scanning Components, e.g. 12" Console Model T.V. Cabinet Size 19" wide x 37" high x 16 1/2" deep. Price £7.
 Send now for monthly Bulletin of special bargain lines in Electronic equipment—Export Enquiries welcomed and given immediate attention. **Traders only supplied.**



V.E.S. WHOLESALE SERVICES LTD.

11 GUNNERSBURY LANE, ACTON, W.3. Telephone: ACOrn 5027

L. WILKINSON WHOLESALE AND EXPORT

19, LANSDOWNE ROAD, CROYDON

Phone: CRO 0839 Telegrams: "WILCO" CROYDON

RELAYS—P.O. TYPE 3,000

BUILT TO YOUR SPECIFICATION—EARLY DELIVERY QUOTATION BY RETURN—PLEASE STATE RESISTANCE OF COIL REQUIRED AND CONTACT BUILD UP.

BREEZE SOCKETS. 6 Pole No 10H/408 Elbow type, 20,000 in stock, plugs to match available.

RACKS. Standard 6ft. P.O. type for 89in. panels, steel channel sides correctly drilled, heavy angle base.

WIRE WOUND RESISTORS. Green Vit. 2,000 ohms, 75 watt. 5,000 in stock, also most other values.

POTENTIOMETERS. Wire wound and carbon, best makes, large stocks, low prices, list available.

RECTIFIERS METAL. Prompt delivery given for most types, send us details of your requirements.

JACKS. Short Bakelite type P73, 1/6 each.

KEY SWITCHES. P.O. type 212. 4,000 available.

Wireless World Classified Advertisements

Rate 7/- for 2 lines or less and 3/6 for every additional line or part thereof, average lines 6 words. Box Numbers 2 words plus 1/- (Address replies: Box 000 0/s "Wireless World" Dorset House, Stamford St., London, S.E.1.) Trade discount details available on application. Press Day: September 1953 issue, Wednesday, July 29th. No responsibility accepted for errors.

WARNING

Readers are warned that Government surplus components which may be offered for sale through our columns carry no manufacturers' guarantee: Many of these components will have been designed for special purposes making them unsuitable for civilian use, or may have deteriorated as a result of the conditions under which they have been stored. We cannot undertake to deal with any complaints regarding any such components purchased.

NEW RECEIVERS AND AMPLIFIERS

12-watt high quality amplifiers, bass and treble boost, £12/15; lists.—Broadcast & Acoustic Equipment Co., Ltd., Tombland, Norwich. [1065]

RECEIVERS, AMPLIFIERS—SURPLUS AND SECONDHAND

EDDYSTONE receiver model 750, almost new; nearest offer £45.—Box 8018. [1470]

B.R.T. 400 communications receiver, as new; £60 or near offer.—Box 7808. [1449]

SELLING up, B.C.348, 1155, 1132, Nationals, valves, etc., s.a.e. for list.—47, Grosvenor St., Pendlebury, Manchester. [1505]

SOUND SALES DX+1 tuner, 10gms; Leak pre-amp, £3; both never mounted.—The Radio Stores, Witchampton, Wimborne, Dorset. [1451]

LEAK point one and vari slope pre-amplifier, as new; £28.—Marsh, 15, Lemay Ave., Grove Park, S.E.12. Lee 7304. [1484]

HRO Rx's and coils in stock, also AR88, BC348R, CR100, etc.—Requirements please to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley, 4986. [10053]

1 Williamson amplifier by C.J.R., with tone control stages and pre-amp for GP20 with 2 heads; 1 12in W.B. Concentric Duplex speaker in beautiful vented cabinet; all items in very clean order, little used.—Stanning, 172, First Ave., Low Hill, Wolverhampton, Staffs. [1462]

FOR sale, Philips type 2853R public address amplifier, complete with the following: 2 Philips 15w short, medium angle flat horn loudspeakers, 1 Gramplan box-type loudspeaker, 1 loudspeaker matching transformer, 1 Gramplan M/C microphone and floor stand, 1 Philips microphone, 1 A.C. mains Garrard portable record player, 1 24v D.C. to 230v A.C. rotary converter, 2 30-yd lengths TRS twin screened leads, 100yds twin flexible TRS loudspeaker lead, all in very good condition; £75/10; E.M.I. service all-wave oscillator 75 Kc/s—60 Mc/s, mains model; £10.—Gifford, Ltd., Basingstoke. [1495]

LOUDSPEAKERS—SURPLUS AND SECONDHAND

BARKER 148a speaker, perfect; £8.—Box 8077. [1474]

TREBLE unit Wharfedale Super 8 CS/AL, on oak baffle, with 1,000 c.s. separator; offers.—Box 7792. [1447]

TEST EQUIPMENT—SURPLUS AND SECONDHAND

1948 A.V.O. all-wave oscillator, A.C.; £9.—11, Milne, 12, Fendred Rd., Rugby. [1531]

COSBOR double beam, model 339, oscillograph; £25.—Walters, 396, High St., Lincoln. [1493]

A.V.O. valve characteristic meter, £38; Avo electronic tester, £28; Windsor 30A oscilloscope, £20; all in perfect condition, surplus to requirements.—Cosmic Radio, Ltd., 129, Oxtou Rd., Birkenhead. [1529]

SIGNAL generators, oscilloscopes, output meters, valve voltmeters, frequency meters, multi-range meters in stock; your enquiries are invited.—Requirements to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley, 4986. [10056]

FOR sale, service equipment, electronic fault tracer by Labgear, Cambridge, England; line test alarm by E.M.I. type model Q2563; 2 Taylor model 60 all wave signal generators; Cosbor Oscilloscope model 3332 single beam; all in first-class condition; any reasonable offers accepted for single items or for group.—Morlings, House of Music, Beccles. [1490]

NEW DYNAMOS, MOTORS, ETC.

BATTERY chargers, 4 models, 2-6-12v, 1-2-4 amp D.C.; any mains voltage; also larger types special transformers chokes, test gear, interior car heaters, etc.—The Banner Electric Co., Ltd., Hoddesdon, Herts. [0112]



The P.1292 "HI-FI" OUTPUT TRANSFORMER

SPECIALLY DESIGNED FOR HEAVY NEGATIVE FEED BACK CIRCUITS

This push-pull transformer reproduces the full audio range with the minimum amount of distortion. With a leakage inductance of less than 15 mH, it permits the use of considerable feed back from the secondary being injected three or four stages back. Here is a transformer of moderate cost eminently suitable for use in high-fidelity recording channels and, of course, for "studio quality" reproduction.

The chief parameters are given in Technical Data Sheet No. 4, available on request.

Potted and unpotted types from your usual Radio Dealer.



PARTRIDGE TRANSFORMERS LTD

ROEBUCK ROAD, KINGSTON BY-PASS
TOLWORTH SURREY
Telephone: ELMbridge 6737-8

NEW DYNAMOS, MOTORS, ETC.

ALL types of rotating electrical machinery up to 20kva available, including rotary converters, rotary transformers, motors, petrol and diesel-engine generating plants, alternators and d.c. generators. We are also in a position to quote for power transformers; as actual manufacturers we will be glad to quote for any quantity for home or export. DIESEL Electric generating plants, 30va, 230v, with push-button remote control, starting equipment, ready for use; £240. CHAS. F. WARD, Lordcroft Works, Haverhill, Suffolk. Tel. 253. [10039]

THE Pearce new model diesel alternator plant on welded steel frame, 230/150 3kva plus 32v 15a d.c., Petters latest AVA1, air-cooled diesel engine, alternator, self-energized, automatic voltage control by winding on stator, at governed speed 1,500 rpm d.c. output trickle charges or charges lighting and starter battery up to 15amps, 24v lighting is used when plant is not in use; start and stop by remote control push-button; complete with main switch and fuses, battery cables 24v 72 amp/hr batt., instruction book spares; engine covered by Petters' inspection service; reduced price £260, free delivery; where remote start and stop not required, but only push start on plant, reduction of £8/10; a few from stock, others quick delivery; if you collect, or we deliver, battery is charged and a 10 cu ft concrete bed given free. SEND p.c. for full description and photograms. ALSO above plant fitted Lister slow-speed water-cooled diesel and electric flywheels. ALTERNATORS: 230/150 00VA, self-energized, 3,000rpm, ball bearings, £23/15 del.; also special television model same price; voltage regulator 30/- extra. J.A.P. No. 2A, 1.2hp petrol engine, air cooled, 4-stroke, starting motor, 400l; £17/10 del. SPECIAL rotary converters, guaranteed interference free, fitted radio and television filters, wt. 60lb d.c. input, 12v 200va out, 24v 32v, 230v out, 230v d.c. to 230v a.c. £27/10 del.; also converters for radiogram and general use, inputs, outputs and prices as above; the above also supplied without smoothing, £24/10 del., immediate despatch; trade supplied.

TELEVISION converter was tested on Ekco television, 12in tube, stated consumption 135watts, d.c. current from battery only 9amps, picture and sound were perfect and completely free of interference or flutter.

The above are the latest products of British manufacture, and are guaranteed for one year; fullest details of plant, alternators or 400VA alt. or rotary converters, by return post; state which required; terms c.w.o., pro forma invoice c.o.d. (post goods only). T. W. PEARCE, 66, Great Percy St., W.C.1 (near Angel). [10013]

DYNAMOS, MOTORS, ETC.—SURPLUS AND SECONDHAND

ARE you stuck? Rotary converters, motors, generators, transformers, rectifiers, obsolete valves, testing gear, power units, transmitters, receivers, state requirements.—Lawrence, 134, Cranley Gdns., N.10. (Dept. B.) [1519]

NEW GRAMOPHONE AND SOUND EQUIPMENT

RECORDING equipment to the trade. WEARITE tape decks and special parts, disc recording machines. BLANK discs Scotch-boy tape, Emitape. RADIO feeder units, microphones, etc. ALL from stock.—Sound Discs (Supplies), Ltd, 178, Bisham Rd., Southport, Lancs. [1087]

TAPE recorder motors, 230v a.c., powerful quiet, brand new, 13/11; post, etc., 1/1.—K. W. Logan, Westalley, Hitchin, Herts. [0232]

CINE-VOX disc recording equipments, type C7, for high-quality recordings from existing microphone equipment, price from 28gns; also available as a complete channel inclusive of mic., amplifier and playback equipment, at 70gns; type C7, for highest quality professional requirements.—recorder mechanism at 48gns, or complete channel at 110gns; demonstrations arranged in London. PLEASE write for details to K.T.S., Ltd., 60, Aylward Rd., London, S.W.20 (Liberty 2426). Callers by appointment only. [0209]

MAGNETIC recorders, all types, new and secondhand for sale; hire service in greater London area only; mechanical and electronic repairs carried out by specialists; "Magnegraph" limpet telephone pick-ups, suitable for all types of recorders, 25/-; tape storage racks for 12 reels, 37/6; B. & H. recording wire, new and used, from 15/- reel; tape, accessories, etc.; full details, s.a.e.—The Magnegraph Recording Co., Ltd., 1, Hanway Place, W.1. Tel. Langham 2156. [0236]

FOR SALE AND WANTED ADVERTISEMENT FORM

TURN TO PAGE NO. 119.



TRANSFORMERS

of all types up to 25 KVA for Single or Three Phase operation, Phase Conversion, etc.

MAINS

Output and Special Purpose Transformers for Radio Equipment, Chokes, etc.

COILS

for Contractors E.M. Brakes, Air Valves, etc., and Coil WINDINGS for all purposes.

SOLENOIDS

for A.C. and D.C. Operation

A.I.D. Approved.

W.F. PARSONAGE & CO LTD

INDUCTA WORKS

PARK RD. · BLOXWICH · WALSALL
TELEPHONE: BLOX. 66464

AMERICAN SURPLUS

- **RADAR.** SM, SO, OAP, APA, APN, APR, APQ, APS, ARC.
 - **MINE DETECTORS.** SCR-625.
 - **AMPLIFIERS.** 96-E-11, 57-D-1, PA-4, PA-6, TIQ, BC-605, BC-614, BC-367, MI-2190, MI-2781, BC-686, A-101, 118A, 112A, 107A, etc.
 - **CHESTS AND BOXES.** CH-120, CH-121, CH-89, CS-34, ST-18, ST-19, BG-108, BG-56, etc.
 - **CABINETS.** ET-4332, TG-10, WILCOX CS-390, etc.
 - **CORDS.** CD-501, CD-318, CD-31, CO-272, etc.
 - **CRYSTALS.** FT-241, FT-243, DC-11, etc.
 - **CABLE EQUIPMENT.** LC-60, LC-21, TE-92, I-51.
 - **MORSE APPARATUS.** BC-1016, ML-139, EE-85, McElroy transmitters, Recorders, Pullers, Tapes, TG-10, etc.
 - **JUNCTION BOXES.** JB-18, JB-19, JB-95, 17A, TM-190, TM-206.
 - **LOUD SPEAKERS.** LS-3, LS-7, LS-10, LS-12, MI-6306, 6C-83, etc.
 - **METEOROLOGICAL.** ML-41, ML-117, Freiz Weatherman, etc.
 - **MOUNTINGS.** FT-338, FT-162, FT-253, FT-237, FT-126, FT-250, FT-317, etc.
 - **PHONE EQUIPMENT.** BD-89, BD-91, BD-57, BD-96, T-39, T-46, EE-8, T-26, HS-30, etc.
- Many other items too numerous to mention. Send your requirements. Lists available. All packing and shipping facilities.

H. HARRIS

ORGANFORD DORSET

Telephone: Lychett Minster 212

NEW GRAMOPHONE AND SOUND EQUIPMENT

C.J.R. ELECTRICAL & ELECTRONIC DEVELOPMENT, Ltd., manufacturers of high quality portable and console magnetic tape recorders for professional and amateur use: full details on application. BICKFORD Rd., Witton, Birmingham. 6. East 0822. [1968]

WEARITE tape decks 2A. £35; super 12 watts p-pull amplifiers to suit (Partridge output trans.) freq. res. 20-20,000c/s, miniature valves, m. eye level ind. response from tape 30-15 Kc/s at 7 1/2 in. p.s. ±5db, £30; 9 watts model, £25; quality 4 1/4" watts (EL41) junior with meter level ind., phone monitoring, miniature valves, 21kms; amps to suit Bradmatic, £30; for Truvox, Lane, M. Master, Motek, etc. 18rms 9watts, p-pulls or built to order; all tape decks supplied, prompt delivery.—Harding Electronics, 120a, Mora Rd., London, N.W.2. [1400]

GRAMOPHONE AND SOUND EQUIPMENT—SURPLUS AND SECONDHAND

MOTEK tape desk, Standard Telephone Ball, 2 mike, speaker, as new, £18.—Randall, 52, Peshurst Rd., Thornton Heath, Surrey. [1459]

M.S.S. 33 1/3-78rpm disc recorder, fitted Decca type D P.P. with L.P. and 78 heads, groove ditch variable up to 200 g.p.i., £60.—Box 8256. [1528]

SIMPSONIC tape recorder model 2B new and unused (unwanted gift), crystal-mike and Scotch Boy tape; £35.—Marsh, 15, Lemay Ave, Grove Park, S.E.12. Lee. 7304. [1485]

CONTENTS and equipment of private recording studio: M.S.S. disc recorders, B.S.F. amplifiers, tape recorders, banks, mixer, gramophone, illuminated signs, test equipment.—Box 8255. [1526]

PROFESSIONAL studio disc recording equipment used twice only. M.S.S. manufacture, twin turntables, two "Standard" microphones, storage cases, cost over £400 new, can be inspected; £200.—Danceand, 76, Southwark St., London, S.E.1. [1487]

TWIN portable gram playback unit. B.B.C. type groove location units, pre-fade listen amp., stud-type faders, mic. channel, in strong case, perfect condition.—Hollick & Taylor, 16, Grosvenor Rd., Handsworth, Birmingham, 20. Tel. Birchfields 4246. [1472]

VALVES

21 Philips DCG4/1000(866), 2 RCA866/A, 2 RCA872/A, 7 RCA807, 9 RCA and GE813, 7 RCA845 for sale, offers as one lot.—Thrift & Co., Penn Fields Terminus, Wolverhampton. [1441]

VALVES WANTED

45/- paid for new boxed 813s, 20/- for 7Z40s, 24Gs, 811s; send details other surplus valves.—Box 8242. [1815]

NEW COMPONENTS

CRYSTAL microphone inserts (Cosmocord mic-6), guaranteed brand new, 15/6 each free; Cosmocord mic-30 hand stand microphones, black or white; £4/4 each, post free.—Radio-Aid, Ltd. (Retail Dept.), 29, Market St., Watford. [10036]

MALDEN TRANSFORMER SUPPLIES offer 1.250v 100 ma metal rectx., 9/6; £20k 20w w/w pots 6/6; 2mf 3,000v paper condenser 9/9; metal rectifier 12v 2amp P/W; 8/9; 80w fluorescent choke, 230v, with starter lamp, 14/6; battery charging transformers, 10v 18w at 5amps, 15/6.—Kin. 5501, 200, Cambridge Rd., Kingston-on-Thames. [10058]

FOR really good results you can do no better than use Osamor coils and collpacks, ask anyone of experience. Send 5d (stamps) today for beautifully-drawn free circuits, our new coll data leaflets, and latest lists of matched radio components. A speedy mail order department is at your service, and remember, all Osamor lines are guaranteed. (Trade enquiries invited.) Dept. C.W.3.

OSMOR RADIO PRODUCTS, Ltd., Bridge View Works, Borough Hill, Croydon. Tel. Croydon 5148-9. [10046]

CABINETS

LEWIS RADIO have the best selection and finest finish.—See page 40. [10224]

WALNUT radiogram cabinets; details.—Cabinetware, 1a, Heyes St., Blackburn. [10091]

WALNUT radiogram and television cabinets, soundly constructed; stamp for details.—R. Shaw, 69, Fairlop Rd., Leytonstone, E.11. [1497]

CORNER Reflex Cabinets for Goodmans 12in speakers from £10. (We submitted to Goodmans a Bass Reflex Cabinet, of their design, for testing and this has been approved by them as suitable for the speaker for which it was made.)

STANDARD Bass Reflex Cabinets from 87/6. **BASS** Reflex Cabinets made to your own designs and finish.

RADIO, Gramophone and Record Cabinets made to order. Call or send drawings for quotations.

A. DAVIES & Co., Cabinet Makers, 3, Parkhill Place, off Parkhill Rd., London, N.W.3. Gulliver 5775. [1509]

NEW G.E.C., S.T.C. AND "WESTALITE" SELENIUM RECTIFIERS. Largest L.T. range in Great Britain. Latest Current Products. NOT Surplus.

CURRENT PRICE LIST

S.T. & C. HALF WAVE. 100 v. 4 a., 92/- Post 1/-.

BRIDGE CONNECTED FULL WAVE. 17 v. 1.2 a., 16/4; 1.6 a., 26/-; 2.5 a., 29/-; 3 a., 30/-; 4 a., 34/6; 5 a., 37/6, all post free. 33 v. 0.7 a., 24/3; 1 a., 28/-; 1.5 a., 45/-; 2 a., 51/-; 3 a., 52/-; 4 a., 62/-; 5 a., 67/-; all post 1/- 54 v. 1 a., 38/6; 1.5 a., 62/-; 2 a., 69/-; 3 a., 70/-; 5 a., 93/-; 72 v. 1.5 a., 78/-; 2 a., 81/-; 3 a., 92/-; 5 a., 122/-; 100 v. 1.5 a., 112/-; 2 a., 128/-; 5 a., 174/-; all post 1/2.

BRIDGE CONNECTED HEAVY DUTY 7 1/2 in. SQUARE COOLING FINS. 17 v. 6 a., 49/6; 10 a., 56/-; post 1/6.

BRIDGE CONNECTED HEAVY DUTY Funnel Cooled, also

7 1/2 in. SQUARE COOLING FINS. Revised price, same both types, 17 v. 12 a., 102/-; 20 a., 118/-; 30 a., 164/-; 50 a., £12/15/-; 33 v. 6 a., 91/-; 10 a., 104/-; 12 a., 168/-; 20 a., 188/-; 54 v. 6 a., 120/-; 10 a., 142/-; 72 v. 6 a., 154/-; 10 a., 178/-; 100 v. 6 a., £11; 10 a., £12/15/-; all post 1/10.

"WESTALITE" (BRIDGE), 12-15 v. D.C., 1.2 a., 15/10; 2.5 a., 27/8; 5 a., 31/9; 10 a., 54/6; 20 a., 99/6; 30 a., 144/10; 50 a., 257/-; 24 v. 1.2 a., 15/9; 2.5 a., 27/8; 5 a., 51/-; 10 a., 92/7; 20 a., 176/2; 36 v. 1.2 a., 27/8; 2.5 a., 51/-; 5 a., 69/10; 10 a., 130/9; post extra.

Wholesale and Retail

T. W. PEARCE (Est 21 Yrs.)

66 GREAT PERCY STREET, LONDON, W.C.1
Off Pentonville Rd. Between King's Cross and Angel

D.C./A.C. ROTARY CONVERTER. "Universal"

Model. D.C. input 230/250 v. A.C. output 200/250 v. 12 amps 1-ph., 50/60 c/s.

D.C./A.C. ROTARY CONVERTER. "Electrodynamic"

Dual Input Model. D.C. input (switched) 100/125 or 200/250 v.; fitted with slider resistor for input voltage adjustment. A.C. output 110 v. 8 amps. 1-ph., 50 c/s.

MERCURY ARC RECTIFIER.

A.C. input 200/250 v. D.C. output 29/30 v. at 35/45 amps.

R.C.A. PHOTOPHONE CINEMA AMPLIFIER.

All the above available very cheaply.

WIRELESS SUPPLIES UNLIMITED

264-266 OLD CHRISTCHURCH ROAD, BOURNEMOUTH, HANTS.

Phone: Bournemouth 4567

Telegrams: Limitrad, Bournemouth.

Armstrong

3 NEW TELEVISION RECEIVERS

of extremely economical price.
TELE-GRAM

A 14in. flat faced rectangular Television receiver combined with the very latest three-speed record player, housed within a handsome veneered walnut cabinet 35in. high, 20in. wide, 20in. deep. 19 valves. Aluminised tube with tinted filter, pinpoint focussing coupled with full bandwidth and accurate interlacing ENSURES BRILLIANT DAY-LIGHT VIEWING. 5 Channels—selected instantaneously. 10in. Loudspeaker for magnificent reproduction. A.C. mains 200/250 volts.
Price 78 GUINEAS (inc. P.T.)



T.V.S. 14" CONSOLE

The 14in. Console model is exactly similar in all respects to the Tele-gram, with the exception of the record player as described above.
Price 69 GUINEAS (inc. P.T.)

T.V.S. 17" CONSOLE

Similarly this 17in. model which gives a superb large picture has the same specification as the 14in. model.
Price 79 GUINEAS (inc. P.T.)



FOR REALISTIC RADIO & RECORD REPRODUCTION

- New and Improved tuning scale
- Magic eye tuning indicator
- Bass and treble lifts
- Negative feedback
- 8 watts push-pull output
- 8 valves including tuning indicator

Price £23.13.0 incl. tax

Please send for illustrated details and price list.

ARMSTRONG WIRELESS & TELEVISION CO. LTD.
WALTERS RD., HOLLOWAY, LONDON, N.7

Telephone: NORTH 3213/4

COMPONENTS—SURPLUS AND SECONDHAND

RADIO CLEARANCE, Ltd., 27, Tottenham Court Rd., London, W.1. Tel. Museum 9188.
ELECTROLYTICS, capacity, voltage, size, type of mounting, price, post paid. In that order:
400, 6v, 1x2in. lug, 2/3; 250+250, 6v, 1x2in. lug, 2/6; 500+500 6v, 1x3in. lug, 2/6; 40+40, 150v, 1 1/2x2in. clip, 3/-; 40, 150v, 1x2in. clip, 2/6; 20+20, 275v, 1x2in. lug, 5/6; 16+32, 275v, 1x2in. lug, 5/6; 18+16, 275v, 1x2in. clip, 3/6; 32+32, 275v+50mf, 25v, 1x3in. lug, 4/-; 60+100, 275v, 1 1/2x3in. lug, 5/6; 100, 275v, 1 1/2x2in. clip, 3/9; 32+12, 350v, 1 1/2x2in. clip, 4/6; 16+16+16, 350v, 1 1/2x2in. clip, 5/-; 40+40+20, 350v, 1 1/2x3in. lug, 5/-; 16, 350v, 3/4x2in. lug, 2/-; 40+40, 300v, 1x3in. lug, 4/-; 10, 450v, 1 1/2x2in. lug, 2/-; 16, 450v, 3/4x2in. 3/-; 20, 450v, 1x2in. lug, 2/9; 32, 450/525v, 1 1/2x2in. clip, 4/-; 32+32, 450v, 1 1/2x3in. clip, 5/6; 30+30, 450v+20mf, 25v, 1 1/2x3in. lug, 5/6; 15+15, 450v+20mf, 25v, 1 1/2x3in. lug, 5/3; 200, 6v, 3/4x1 1/2in. clip, 2/-; 100, 12v, 5/8x1 1/2in. wire, 1/9; 8, 450v, 1x2in. clip, 2/3; 50, 12v, 3/4x1 1/2in. wire, 1/6; 150, 25v, 3/4x1 1/2in. clip, 2/-; 250, 12v, 3/4x1 1/2in. wire, 2/3; 350, 25v, 1x2 1/2in. clip, 2/6; 16+16, 450v, 1 1/2x2in. clip, 4/-; 40+40, 275v, 1 1/2x2in. clip, 2/6; 450/525v, 1 1/2x2in. clip, 5/6; 24+24+16, 350/425v, 1 1/2x2in. clip, 4/9; 60+200, 275/350v, 1 1/2x4 1/2in. clip, 6/6; 4, 150v, 5/8x1 1/2in. clip, 1/1; 60+100, 350/425v, 1 1/2x4 1/2in. clip, 6/6; 500, 12v, 1 1/2x2 1/2in. clip, 2/-; 8, 350v, 3/4x2in. 2/-; 6,000 2v, 1 1/2x4 1/2in. lug, 4/6; 100+200, 275/350v, 1 1/2x4 1/2in. 6/6; 100+175, 275/350v, 1 1/2x4 1/2in. clip, 6/6; 8+16+16, 450/525v, 1 1/2x2in. lug, 5/9; 32+32, 350/425v, 1 1/2x2in. clip, 5/-; 2,000, 6v, 1x3in. clip, 3/5; 8+16, 450/525, 1x2in. clip, 4/-; 2, 450/525v, 3/4x1 1/2in. tag, 1/6; 2, 350v, 3/4x1 1/2in. tag, 1/3; 8, 350/425v, 3/4x2in. clip, 2/-; 16+32+8, 450v, 1 1/2x3in. lug, 5/6; all are all cans, some with sleeves. ALL new stock, all voltages W.K.G. with surge v where marked, trade supplied most types.

TELEVISION! Set of 3 components, comprising line output trans., with E.H.T. winding to give 7kV, using EY51 (heater winding for EY51 also included), and fitted with width control scanning coils, low impedance line and frame, focus coil (res. 10,000Ω, current approx. 20 mA.); the set of 3 for 42/-, plus 2/- post, diagram of line trans. supplied.
PERSONAL receivers, 3 valve T.R.F. using IT4s, contained in handsome bakelite case with lift-up lid, size 7x6 1/2x5 1/2in with lid closed, plastic carrying handle, fram. AE in lid, these receivers cover the medium waveband and operate from self-contained dry batts., standard types, W1455 and U2, output to a pair of lightweight 'phones (H.R.) controls, SM tuning and reaction, opening lid switches on, supplied brand new, with valves, batteries, 'phones, an ideal set for invalids hosp., patients, etc., these receivers are not Govt. surplus and are offered ready to play, carr. paid: £4/10.
UNIVERSAL amplifiers, 8-valve 20watt A.C./D.C. black crackle chassis, an ideal set and chrome cover, overall size 15 1/2x7 1/2x7in. First-class components (Partridge O.P.T., and driver, Gardner choke, A.E.E. Mu-Metal input trans. for mike). Valves, 2xEP37, 4xCL33, 2xUR3C. Switched input for high or low impedance top cut, and bass cut switches, V.C. mains switch, mains plug and socket, 220-250v, isolated chassis, 15Ω output. Wired and tested, ready for use, with valves, brand new, £10/19/6, carr. paid. T.V. control panels, 5 adjustable res. on panel, 1 1/2x3 1/2x3 1/2in. 3 wire wound (1K, 5K, 10K), 2 carbon (50K), Welwyn res., slider type, complete with slider knobs, 6/- each, post paid.

RADIO CLEARANCE, Ltd., 27, Tottenham Court Rd., London, W.1. Tel. Museum 9188. [0015]

SOUTHERN RADIO SUPPLY, Ltd., 11, Little Newport Street, London, W.C.2. See our displayed advertisement, page 104. [0016]

PROJECTION television unit, 16in-18in picture, complete with lens system, tube, deflection and focus coils, 25kv e.h.t. unit, absolutely unused, in maker's packing; £25.—Goodenough, 314, Park Ave., Southall, Middx. [1503]

RECORDER Mk. II (camera), less cassettes, 23/-; power unit No. 320, less S130, 15/6; power unit No. 321, 1355 receivers in original wooden cases, 35/-; conversion data (T.V.), 2/8 1/2; chassis with 5Z4, VU120, choke, transformer, etc., 10/-.—Radio Exchange Co., 14a, St. Mary's, Bedford. -1536

WILLARD 20 AH 2-volt unspillable accumulators, built-in hydrometers, transparent plastic cases, measure 5 1/2x4x2 1/4, new, boxed, 15/-; new EF50s, 4/6; 5U4g's, 7/6; multi-tapped transformers, 3/6; amplifiers, complete with three valves (12S37 and 12SH7) and conversion sheet, 15/-; 1355 receivers in original wooden cases, 35/-; conversion data (T.V.), 2/8 1/2; chassis with 5Z4, VU120, choke, transformer, etc., 10/-.—Radio Exchange Co., 14a, St. Mary's, Bedford. [0012]

SPECIAL valves, type 807, brand new, 7/9 each; type 196 unit, brand new, less valves, 22/6; mains trans., 350-0-350, 6v, 5v, 4v, 4v, 80ma, 19/6; Wey-Rad 465kcs I.F. trans., 8/3 pair; midget 465kcs, 9/6 pair; loudspeakers, 3 1/2in, 12/6; 5in, 11/6; 6in, 12/6; 10in, 19/6; 12in, 26/6; 1 1/2amp, 9/9; metal recs., RM1, 4/6; RM2, 4/9; RM4, 15/6; v/controls, semi-midget, all values, 3/-; SP/sw, 4/6; DP/sw, 5/6; electrolytics, 450v, 8mfid, 1/3; 16mfid, 2/6; 8x16, 3/6; 16x16, 4/3; 32x32, 4/9; 500v, 4rd tub, 8mfid, 2/6; 16mfid, 3/6; 8x16, 3/6; 32mfid, 3/9; stock list available.—Radio Unlimited, Elm Rd., London, E.17. Key. 4813. [0062]

A NEW BARKER NATURAL SOUND UNIT AT 12 GNS.!



Our first object has always been to make good units which give really **NATURAL SOUND**

Our second aim is to sell these at a fair price. We believe, and so do very many other people, that Barker Units have since 1947 given maximum lasting pleasure per shilling spent.

Now we introduce a new full 12 inch unit, in some ways even better than its predecessors, but selling at a price comparable with that of ordinary quantity produced units.

The wide range, built-in crossover and feedback, brilliant clear-cut and resonance-free output of this new unit continue and advance our traditional qualities. Yet we have reduced production costs to your advantage.

It can be ordered from any good radio or music dealer, or directly from us. In fairness to yourself, if you want good sound, write to us for details **NOW**, or ask your dealer to do so for you. We shall be pleased to send them by return.

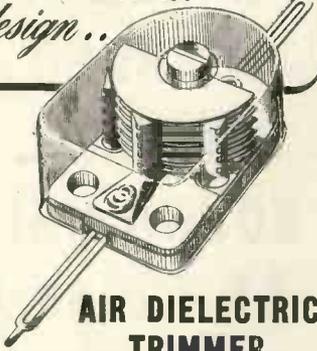
SOME DETAILS

Frequency range	30-15,000 cps.
Peak output	15 watts
Coil impedance	15 ohms
Field intensity	14,500 gauss
Diameter	12ins.
Weight	7 1/2 lbs.
Price 12 gns. H.P. Available.	
Tax Free.	

BARKER NATURAL REPRODUCERS

3 NEWMAN YARD, LONDON, W.1

Excellence in design..



AIR DIELECTRIC TRIMMER

Protected by Acetate Case

Capacities from 4 to 70pf in voltages of 500 and 1,000 D.C. Width 16.5 mm. Length 22 mm. Acetate dust cover optional. Insulation over 10,000 megohms. Power factor less than .001.

Type approved Cat. A. No. 464.

OXLEY DEVELOPMENTS CO. LTD. ULVERSTON, NORTH LANCs.

TEL.: ULVERSTON 3306



THE "FLUXITE QUINS" AT WORK
*"We've never known FLUXITE to fail
 We've finished, in spite of the gale!"
 "Hey look! Down the street!
 Here comes someone's sheet
 Our aerial's now in full sail!"*

See that **FLUXITE SOLDERING PASTE** is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for over 40 years in Government works and by leading engineers and manufacturers. Of all Ironmongers—in tins from 1/- upwards.

TO CYCLISTS. For stronger wheels that will remain round and true, here's a time tested tip. Tie the spokes where they cross with fine wire **AND SOLDER.** It's simple—with **FLUXITE** — but **IMPORTANT.**

FLUXITE

SOLDERING PASTE

A Staunch Companion to Fluxite Soldering Fluid.

SIMPLIFIES ALL SOLDERING

Write for book on the Art of "SOFT" soldering and for leaflets on **CASE-HARDENING STEEL** and **TEMPERING TOOLS** with **FLUXITE.**

FLUXITE LTD.

BERMONDSEY STREET, LONDON, S.E.1.

COMPONENTS—SURPLUS AND SECONDHAND

MAGSLIPS at 1/10 to 1/20 of list prices. huge stocks, please state requirements.

K. LOGAN, Westaley, Hitchin, Herts. 10233
G. A. RYALL, "Utopia," Mayfield Rd.,
 Hørne Bay (Kent); please refer to previous
 adverts. 10205

SUPREME RADIO, 746b, Romford Rd., Manor
 Park, London, E.12. Tel. 111. 1260. Est.
 17 yrs. **ALWAYS "Supreme" for radio/TV bargains**
 at the keenest price.

LIMITED quantity only: 8in P.M. speakers.
 2-3ohm. v/coil, with out/trans for 7k ohms
 load. Eave away price, 13/6 inc. p/packing.
 Wonderful value!! Small vol./controls with long
 spindle and d/p switch, 1 meg. or 1/2 meg.,
 3/- ea.

STANDARD size vol/controls, with long
 spindle and S/P switch, 250k ohms, 100k ohms,
 25k ohms, and 5k ohms, cannot repeat at 2/3
 ea.; also the following values less switch, 2
 megohms, 250k ohms, 100k ohms, 10k ohms and
 5k ohms, 1/6 ea.

MAINS trans. by Parmeko, universal fixing,
 primary tapped, 0-200, 220-240v, sec. 230-0-
 290v, 80 M/A. 6.3v 3 amp. and 6.3v tapped at
 4v 2 amp. with screen, our price 15/11 ea. inc.
 post and packing.

10 HY. 100 M/A smoothing chokes, 7/9 ea.
HEATER trans. primary 0-250v, sec. 6.3v at
 1.5 amp, 5/11 ea.; or 6.3v at 3 amp, 8/11 ea.
IFT/S 465 kc/s in small all. can, 2 1/2in 1x1 1/2in
 dia. with dust cores, 6/6 pair.

ELECTROLYTIC cond., metal can type, 32+
 32+16 mfd, 350v, 3/6 ea.; 16+16 mfd., 350v,
 2/3 ea. 60-50, 25mfd, D.C. working, 4/11
 ea., 200+200 mfd, 25v, 1/- ea.; 8 mfd., 500v,
 tub/card, wire end, small, 2/9 ea.; 100 mfd.
 12v card, bias cond., 1/6 ea.; 25mfd 25v metal
 tag end cond., 1/3 ea.; .001 mfd 12.5 k/v, 7/6
 ea.; 20 mfd. 12v metal wire end, 2/- ea. (all
 cond. listed are brand new stock).

TWIN balanced feeder, 80 ohm, for television,
 4d per yd.

T.R.F. coils for m/w and l/wave. with circuit,
 6/- pair.
.5 amp. vit. enamelled droppers, 800 ohms,
 with slider, 4/- ea.

6V 1 AMP. L.T. reccs., 3/11 ea.; 12v 1 amp.,
 8/6 ea.; 12v 2 amp., 13/11 ea.

TELEVISION reccs. Sentercel type. K3/25,
 650v, 4/7 ea.; K3/40, 3.2k, 7/6 ea.; K3/45,
 3.6 k/v, 2 ea.; K3/50, 4 k/v, 8/8 ea.; K3/100,
 8 k/v, 14/8 ea.

S.T.C. metal rec. R.M.1, 3/11 ea.; R.M.2, 4/3
 ea.; R.M.4, 18/- ea.

METER reccs., 5 m/a, bridge type, 5/- ea.
TERMS: c.w.o., no c.o.d.; send 9/- extra for
 postage orders under £5; 2/4d s.a.e. all en-
 quiries and list. [0021]

MIDGET portable radios. A.C./D.C. two-
 wave, completely self-contained, cream or
 brown plastic, work anywhere without external
 aerial, giving good quality and volume, full
 maker's guarantee, 26/9/6; battery ditto: all
 dry, inc. batts., 26/9/6; trade enquiries invited.
VALVES: CV89, CV578, CV588, CV1946, CV1947,
 9/-; CV90, CV547, CV703, 8/6; GV553, CV1985,
 CV571, CV2500, CV562, CV1988, CV1863, 807,
 8/-; CV1856, 6SA7, 7/6; CV881, CV886, CV875,
 CV875, CV301, CV322, CV000, 12S87, 7/-;
 CV1103, CV785, CV985, 6N7, 12SC7, OZ4, 6/6;
 CV574, CV1978, 6/-; CV1941, CV1932, 4/6; all
 guaranteed; post 6d each; no c.o.d. under £1.—
Radio Facilities, Ltd., 38, Chalcot Rd., N.W.1.
 Primrose 9090. [1426]

NOTICES

NORWOOD TECHNICAL COLLEGE.

TRAINING in radio, radar, television and
 electronics.
DAY and evening classes in preparation for
 Grad.Brit.I.R.E., City and Guilds Examinations,
 P.M.G. Certificate, R.T.E.B. Radio and
 Television Servicing Certificates.

ALSO special courses in radar, television,
 electronics (instrumentation).
LONDON fees for full-time day classes: Free
 if under 18 years, £23 per year (£8 per term)
 if 18 years or over.

FURTHER particulars from Secretary, Nor-
 wood Technical College, West Norwood, London,
 S.E.27. (374) [1085]

WANTED, EXCHANGE, ETC.

WANTED.
 BC610 Hallicrafters, also spares; RCA ET 4336
 series with spares; BC348 receivers, also TCS6,
 TCS12 and components.
McELROY ADAMS MFG. GROUP Ltd., 46,
 Greyhound Rd., W.6 Tel. Fulham 1138-9. [0194
 45/- each offered for 813 type valves.—Write
 Box 7050. [1073]

WANTED. Voigt P.M.2 unit in good
 condition.—Box 8257. [1532]

WANTED, receivers A.P.R.4, also T.N. 16, 17,
 18, 19, etc., and any radio test gear.
LESLIE DIXON & Co., 214, Queenstown Rd.,
 Battersea, S.W.8. Macaulay 2159. [0176]

WILL buy Raytheon Valve RK715B or C in
 good condition.—29, Rooley Crescent,
 Bradford. [1482]

WANTED, R.T.S., Ltd. "Connoisseur" con-
 version of R1135; give details and price.—
 Box 8019. [1471]

WANTED, RCA 4331 transmitters.—P.C.A. of
 Radio, Cambridge Grove, Hammersmith,
 W.6. Tel. Riverside 3279. [0093]

BAKELITE moulding tool required for radio
 cabinets, table model, or midgets; will pay
 outright or pay royalty.—Box 7846. [1452]



E.M.G. STEEP-CUTTING INFINITELY VARIABLE FILTER

No other filter combines all the advantages of this model which are, briefly, to cut response above any desired level between 4,000 and 8,000 c.p.s. at an average steepness of 30 db. per octave, easy fixing (connects between 15 ohm speaker and amplifier output), robust construction, no distortion or appreciable loss of volume. Recommended for reducing surface noise on '78 records, cutting 'edge' on some L.P. records, and eliminating high-pitched interference on radio. Price £4/10/0. Leaflet on request.

E.M.G. HANDMADE GRAMOPHONES, LTD.
 6, Newman St., Oxford St., W.1
 Telephone: Museum 9971-2-3

SOUTHERN RADIO'S WIRELESS BARGAINS

TRANSMITTER-RECEIVERS (Walkie-Talkie),
 Type 38, Mark II. Complete with 5 valves, micro-
 phone, headphones and aerial. Less batteries.
 Guaranteed fully and ready for use. £4/15/-, post
 paid. Extra junction boxes for above, 2/6.

TRANSMITTER-RECEIVERS No. 18, Mark III.
 Complete with all valves but less batteries and
 attachments. Guaranteed ready for use. £7/17/6,
 carriage paid. No. 18, Mark III. **BRAND NEW**,
 complete in original packing cases with ALL
 attachments and full set of spares, including
 duplicate set of valves (less batteries), £15.

TELESONIC 4-valve battery portable. Com-
 plete with 4 Hivac valves. Contained in metal
 carrying case. Easily convertible to personal
 portable. Brand new, £2, including conversion
 sheet and post.

RECEIVERS R109, complete with 8 valves.
 Vibrator pack for 6 volts. Contained in metal case
 with built-in speaker. 1.8 to 8.5 mags. Guarante-
 eed. £7, carriage paid.

MINISCOPES, G.E.C. M861B. Brand new,
 complete in carrying case with plugs, £12/10/-.

RESISTANCES. 100 assorted useful values,
 wire-end, 12/6.

CONDENSERS. 100 assorted mica and tubular, 15/-
 LUBRA HOLE CUTTERS, adjustable 1/2in.
 to 3 1/2in. For use on wood, metal, plastic, etc., 5/9.

THROAT MICROPHONES. Brand new
 magnetic, with long lead and plug, 4/6; American
 type, 4/6.

PLASTIC MAP CASES, 14 by 10 1/2in., 5/6.
STAR IDENTIFIERS, Type I. A-N. Covers both
 hemispheres, complete in case, 5/6.

WESTECTORS W x 6 and W112, 1/- each.
MARCONI AERIAL FILTER UNITS (P.O.
 spec.), 4/6.

CONTACTOR TIME SWITCHES. 2 impulses
 per sec. Complete in sound-proof case. Therm
 control, 11/6.

REMOTE CONTACTOR for use with above,
 7/6.

SPECIAL OFFER TO EXPERIMENTERS.
TWELVE meters and aircraft instruments.
 Only needs adjustments or cases broken. Twelve
 instruments (including 3 brand new aircraft
 instruments), 35/-.

Full list of Radio Books 2/4d.
SOUTHERN RADIO SUPPLY LTD.,
 11, LITTLE NEWPORT STREET, LONDON,
 W.C.2. [GENTR.J. 6653]

For
SUCCESSFUL
wide-angle
scanning
ALLEN
DEFLECTOR COILS



- 70° Scan with minimum deflection defocussing.
- High-efficiency castellated "FERROXCUBE" core.
- Suits any Wide Angle C.R.T. up to 27" double (d) Scan.

LARGE SCREEN TELEVISION

Can only be achieved by using high efficiency components throughout. ALLENS can supply the complete range.

For prices and details of the full range of ALLEN components write to:—
For circuit diagram of Line and Time Base send 9d. and S.A.E. to:—

ALLEN
COMPONENTS LTD
Crown Works, 197 Lower Richmond Road, Richmond, Surrey
Telephone: Prospect 9013

WANTED, EXCHANGE, ETC.
BULK quantities urgently wanted for export ex-W/D radio, telephone, signalling equipment of every description.—Box 6880. [1038]

WANTED, HRO coils, Rx's, etc., A.R.88s, BC348s, S27s, etc.—Details to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4986. [10163]

WANTED, laboratory test equipment, including standard signal generator, watt meter, oscilloscope, bridges, recorders; send price and details to:
HATFIELD INSTRUMENTS, 175, Uxbridge Rd., Hanwell, W.7. Tel. Ealing 0779. [10037]

WANTED, set manufacturers' or ex-Government radio equipment, large or small quantities of valves, electrolytics, speakers, meters, also components.
LOWE BROS., 5, Fitzroy St., London, W.1. Tel. Museum 4389. [9745]

WANTED, power supply units for No. 33 transmitters (Z.A. 10729); call or ring.—P.C.A. Radio, The Arches, Cambridge Grove, W.6. Rlv. 3279. [10081]

WANTED, BC-610 Hallicrafters, R.C.A. ET-4356, transmitters SX-28, AR-88, S-27 H.R.O. receiver and spare parts for above; best prices.—P.C.A. Radio, The Arches, Cambridge Grove, W.6. [10080]

WE purchase all types of domestic or ex-Government radio receivers and equipment; send full details or call and collect cash; large or small quantities.—Walton's Wireless Stores, 48, Stafford St., Wolverhampton. [10146]

ALTHAM RADIO Co. pay highest prices in the trade for all American equipment, including test sets, transmitters, receivers, teleprinting gear, etc.—Jersey House, Jersey St., Manchester, 4. Tel. Central 7834-5-6. [10228]

WANTED, R.C.A. speech amplifiers, type MI-11220, J or K, and Ariel tuning units BC 939A; Eddies' speech amplifiers, BC 614; offers, stating quantity and price, to—P.C.A. Radio, The Arches, Cambridge Grove, W.6. [10079]

WANTED, AN/APR-4 receiver, any units; any other good quality U.S. surplus radio and radar tubes, test sets; laboratory equipments, etc.; give condition and price in first letter.—Engineering Associates, 434, Patterson Rd., Dayton, 9, Ohio, U.S.A. [10234]

WANTED, good quality communication rxs., domestic radios, test equipment, etc.; top prices paid; established since 1937.—Miller's Radio, 38a, Newport Court, 1 min. from Leicester Sq. Tube, Tel. Gerrard 4633. Call or write. Hours of business 10-6 p.m. Open all day Saturday. [10199]

WANTED, surplus ex U.S. Army Signal Corps all frequency wireless sets; transmitter type BC-375-E, receiver BC-348-Q together with converters, etc., in operational condition; alternatively, ex British Government, sets up to 250 watts—V. Oladjins, 35, Hollybush Rd., Kingston-on-Thames. [1481]

WANTED; we will pay 10% more for the following American equipment; test sets with TS prefix, BC221, APR4 receivers, APR4 tuning units, BC342, BC512, power units No. 15 and PE38, teleprinter equipment.—Alldham Radio Co., Jersey House, Jersey St., Manchester, 4. Tel. Central 7834-5-6. [10227]

URGENTLY wanted—VHF test equipment TS47AP, TS174U, TS34, TS148/UP, TSX-4SE, BC221s and any other types; valves, klystrons, magnetrons, 723/AB, receivers, APR4 and TN-16-17-18 tuning units, R.C.A. AR88s, EX28s, S27Cs, call or write any late types; microwave equipment or spares; highest prices given; please write, call or telephone Gerrard 8410; prompt attention assured.—Universal Electronics, 27, Lisie St., Leicester Square, London, W.C.2. [10229]

AERIALS
8 tons of 4ft lengths steel copper-covered aerial.—Offers wanted, to:—
19, Mincing Lane, Blackburn. Tel. 7748-9. [1359]

REPAIRS AND SERVICE
ANNOUNCING a 48-hr transformer rewind service—with a difference. A FIRST-RATE job for a first-rate engineer. E.H.T.s. Mains, Fields, O.P.s, etc. NEW transformers made to suit your requirements, designed on "C" core or conventional methods.
WILLIAMSON'S O.P. to original spec.: 80%—ALL work fully guaranteed.
WOODROW Transformers, Ltd., 28, Balmoral Rd., Willesden, N.W.2. Tel. Willesden 2014. [1427]

24-HOUR service, 6 months' guarantee, any transformer; rewind, mains outputs and I.T.s., etc.; all types of new trans., etc., supplied to specification; business heading or service card for trade prices.—Majestic Winding Co., 180, Windham Rd., Bournemouth. [16520]

ELECTRICAL test instruments repaired and standardized, all types British or American, ammeters, voltmeters, ohmmeters, DC/AC multi-range meters, etc.; meters converted to specification.

THE ELECTRICAL INSTRUMENT REPAIR SERVICE, 329, Kilburn Lane, London, W.9. Tel. Lad. 4168. [11334]

MOTORS and armatures, all types (vacuum cleaners to 100hp), rewound or rebuilt as new; quick, reliable and competitive service; contractors to leading users since 1920; quotes by return.—Halsons, Dover Rd., Works, Bk. pool. Tel. 24774. [1535]



FOR
PROMPT & EFFICIENT SERVICE
CASH or EASY TERMS
NEW EASY TERMS

LEAK
(See Maker's Advert, page 83)
TL/12 'POINT ONE' AMPLIFIER
Cash £28. 7. 0
'VARI-SLOPE' PRE-AMPLIFIER
Cash £12. 12. 0
For the two units: Deposit £9.0.0 with order and 18 monthly instalments of 40/-.
Passenger carriage 10/- extra payable with deposit.

CONNOISSEUR
Three-speed Gram Units and Super Lightweight Pick-ups to match the above can be supplied from stock. Terms available.

LOUDSPEAKERS
The complete Wharfedale and Goodmans range of speakers are available on Easy Terms—please let us have your requirements.

ARMSTRONG CHASSIS
The new FC. 38—RF. 104—and EXP. 125 Chassis can be supplied on Easy Terms. Write for full specifications.

CABINETS
We can supply suitable high-grade radio-gram and loudspeaker cabinets for all the above. Made to special order only.

14 FREE SHAVES
WITH THE NEW
SUPER REMINGTON
CONTOUR 6 ELECTRIC SHAVER

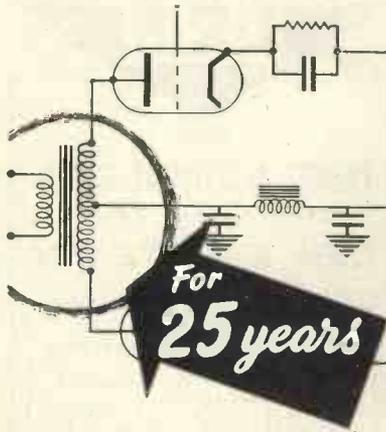
will convince you that this remarkable new shaver really does give a better, more pleasant and far quicker shave than any other method.

OUR 14 DAYS' FREE TRIAL is available on receipt of 20/- deposit (returnable if not entirely satisfactory), with eight monthly instalments of 20/-.
Cash £8. 10. 0.
AC/DC 200/250v.



GUARANTEED 12 MONTHS
Other voltages available. Each shaver is BRAND NEW and despatched in superb silk lined presentation case.

The L.R. SUPPLY CO. LTD.
(LONDON RADIO SUPPLY CO.)
BALCOMBE - - SUSSEX
Telephone: Balcombe 254



For
25 years

Enthusiastic amateur and experienced research workers send testimonials of Savage accuracy and reliability. Here is one of many.

"A transformer and 2 chokes of your make purchased about 1932 are still doing yeoman service. T. F. MacD., London."



SAVAGE TRANSFORMERS LTD.
Nursted Road, Devizes, Wilts.
Telephone: Devizes 536

TELECRAFT
AERIALS ENSURE THE
BEST TELEVISION
TRY ONE AND SEE FOR
YOURSELF

EX-R.A.F. EQUIPMENT

TRANSMITTERS T1154.

RECEIVERS R1155

POWER UNITS

24 volt, 35A and 33B.
12 volt, 34A.

PLUGS for connection.

LOOP AERIALS.

AERIAL SELECTOR SWITCHES.

ALL EQUIPMENT GUARANTEED IN
PERFECT WORKING ORDER AND
READY FOR INSTALLATION.

B.V. CERTIFICATE ISSUED WITH EACH
COMPLETE EQUIPMENT.

J. H. DAKIN,
13 CHURCH RD., EDGBASTON,
BIRMINGHAM, 15

Phone: Edg 2220
Cables: Nikad, Birmingham

REPAIRS AND SERVICE

MAINS transformers rewound, new transformers to any specification.
MOTOR rewinds and complete overhauls: first-class workmanship; fully guaranteed.
F.M. ELECTRIC Co. Ltd. Potters Bldgs., Warser Gate, Nottingham. Est. 1917. Tel. 3855. [0113]

REPAIRS—E.H.T. mains and O.P. transformers, field coils and chokes; also armatures and motors; new transformers designed to any specification; all work fully guaranteed.
WILLESDEN TRANSFORMER CO. Ltd., 2a, Frithville Gdns., Shepherds Bush, London, W.12. Tel. Shepherds Bush 5819. [0076]

MAINS transformers, E.H.T. line outputs, chokes and field coils, etc., promptly and efficiently rewound or manufactured to any specification. 36 hours' service, 12 months' guarantee.
LADEROKE REWIND SERVICE. Ltd., 820a, Harrow Rd., Kensal Rise, N.W.10. Lad. 0914. [0222]

AS professional sound recordists and members of the Association of Professional Recording Studios, we are particularly well qualified to give advice and service on all aspects of sound recording and reproduction. Design of tape equipment a speciality. Circuits designed, repairs and modification carried out quickly. Advice freely given. See also below:—

COMPREHENSIVE service to trade and amateur; design, manufacture and repair of electronic equipment carried out by specialists; equal attention given to small or large orders. See also below:—Autochangers, 48-hour service, cleaning and adjusting at fixed price of 35/- plus carriage; also all repairs carried out; trade enquiries invited.—Ariel Sound, 57, Lancaster Mews, London, W.2. Tel. Paddington 5092 (2 lines). [1514]

MISCELLANEOUS

ELECTRIC welding plant, used and unused for sale; s.a.e. for lists.—Harnsworth, Townley & Co., 1, Brook Rd., Manchester, 14. [1040]

PLYWOOD, hardwood, free list on request, mahogany ply, 12/6 sheet, oak ply, 22/6.—N. Gerver, 10, Mare St., Hackney, London, E. [1432]

CABLES, wires and flexibles, P.V.C. covered, at clearance prices.—R. Lowther, Ltd., 100a, St. Vincent St., Ancoats, Manchester, 4. [0223]

STEEL lattice and guyed radio masts, 100ft high, for sale; delivery from stock; excellent condition.—Bellmans, Terminal House, S.W.1. [19975]

ORGAN, electronic, Baldwin type, partly built, components, data, 2, manual console, s.a.e. details.—Marsden, 3, Lode Lane, Solihull, Birmingham. [1496]

METALWORK, all types cabinets, chassis, racks, etc., to your own specifications; capacity available for small milling and capstan work up to 1in bar.

PHILPOTT'S METAL WORKS, Ltd., (G4B1), Chapman St., Loughborough. [0208]

A HIGH vacuum impregnation unit to R.I.C. A specification 214 or individual requirements; good delivery at competitive prices from Electronic Components and Assemblies, 505, Lordship Lane, S.E.22, Forest Hill 7089. [0316]

YOUR own tape recording transferred to disc.—Write, call or phone Queensway Private Recording Studios, 125, Queensway, W.2. Tel. Bay 4992. Studio recordings, tape recording service. Price list on request. [1409]

PLATED nuts, screws, washers, bolts, soldering tags, hank-bushes, self-tapping screws, grub-screws, socket-screws, wood-screws; large quantities or gross cartons; stamp for list.—Sinden Components, Ltd., Dept. B, 117, Churchfield Rd., Acton, W.3. Acorn 8126. [1415]

ENGRAVING amateurs and trade could take the opportunity of engraving problems in the future by getting in touch with A.G. Engraving, 19a, Windmill Rd., London, S.W.18. Bat. 5793. Brass, bronze, erinoid, Perspex dials; one knob or repetition easily retained. [0034]

COPPER wires enamelled, tinned, Litz, cotton, silk covered, all gauges; B.A. screws, nuts, washers, soldering tags, eyelets, ebonite and laminated bakelite panels, tubes, coil formers; Tufinol rod; headphones, flexes, etc.; latest radio publications, full range available; list, s.a.e.; trade supplied.—Post Radio Supplies, 33, Bourne Gardens, London, E.4. [0138]

DECALS labels for marking radio and electronic equipment, clear permanent lettering 1/4in high, no background, easily applied, permanent, Govt. approved; available in book form, each book containing approx. 750 titles, covering all aspects of radio and electronic equipment; price 4/9 plus 3d post, in black or white.—Alexander Equipment, Ltd., Childs Place, Earls Court, London, S.W.5. [0243]

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is exempted from the provisions of The Notification of Vacancies Order 1952.

DRAUGHTSMEN experienced in radio and television receiver design (and small mechanical details), able to prepare drawings for mfr. of prototype equipment.—Apply in writing to Employment Manager, Ferguson Radio Corpn., Gt. Cambridge Rd., Enfield, Middx. [1476]

THE MODERN BOOK CO.

Radio Designers' Handbook by Langford Smith. 42s. Postage 1s.

Basic Electronic Test Instruments by R. P. Turner 32s. Postage 1s.

Radio Engineers' Servicing Manual by E. Molloy (ed.) 42s. Postage 1s.

Television Faults by N. Stevens. 5s. Postage 3d.

Principles of Radar by J. F. Reintjes and G. T. Coate. 55s. 6d. Postage 1s.

Television Picture Faults by J. Cura and L. Stanley. 3s. 6d. Postage 3d.

The Radio Amateur's Handbook by A.R.R.L. 1953 30s. Postage 1s.

Elementary Telecommunications Examination Guide by W. Perkins. 17s. 6d. Postage 6d.

Television Engineers' Servicing Manual by E. Molloy (ed.) 42s. Postage 1s.

Amplifiers by G. A. Briggs and H. H. Garner. 15s. 6d. Postage 9d.

Sound Recording and Reproduction by J. W. Godfrey and S. W. Amos. 30s. Postage 9d.

Manual of the Admiralty Gyro-Compass (Sperry Type). 25s. Postage 1s.

Magnetic Recording by M. L. Quartermaine. 4s. 6d. Postage 3d.

Brimar Radio Valve and Teletub Manual No. 5. 5s. Postage 6d.

Radio Valve Data compiled by "Wireless World". 3s. 6d. Postage 6d.

We have the finest selection of British and American radio publications in the Country. Complete list on application.

19-23 PRAED STREET,
(Dept. W.8.)
LONDON, W.2
PADDington 4185

We have a large stock of

HIGH STABILITY RESISTORS

Trade enquiries invited: Marris & Cartin Ltd., 42 Brook Street, London, W.1. GRO. 5571.

"TYANA"

SOLDERING IRON 16/9



The Perfect Small Soldering instrument—overall length 11in., diameter of bit 3/16in.

- Adjustable Bit.
- Easy to handle.
- Weight approx. 4 oz.
- Heating Time 3 min.
- 40 Watt economy Consumption.
- Standard Voltage Ranges.
- (Other Ratings Available on Request.)
- Long Life and Efficiency.
- Replacement Elements and Bits always available.

Just the Convenient Iron Required for Intricate and Fine Work.

Repl. Design No. 867804 Soldering.

Maintenance Service for Industrial users. British made by:—

KENROY LIMITED
152/297 UPPER ST., ISLINGTON
LONDON, N.1.
Telephone: Canonbury 4905-4663

GEE RADIO LTD

SELENIUM METAL RECTIFIERS. Full range in stock as per our previous adverts. We can also supply rectifiers to individual requirements from m/a to amps., H/Wave, F/Bridge or 3 phase. Speedy delivery, competitive prices, fully guaranteed. Prices and list on application. Trade supplied.

0-1 mA. FLUSH MOUNTING 3 1/2 in. METER. Brand new, 40/- P.P. 1/6.
CENTRE ZERO 1-0-1 mA. METERS Ditto, 40/- P.P. 1/6.

RII32A RECEIVERS. New and unused. Tested before despatched, 59/6. Carriage 10/-
2 v. 16 A/H. ACCUMULATORS. Size 7in. x 4in. x 2in., 6/6. P.P. 2/-.

100 K. W/W 3-WATT POTENTIOMETERS, with switch, 2in. spindle, 4/6 P. 6d. 48/- doz.

EXIDE HYDROMETERS. New and boxed. Our price 7/6. P.P. 1/-.

ELLISON 5 kV. E.H.T. TRANSFORMERS, at 15 mA. Pri. 200-240 v. Sec. 4 v. at 2 amp. C/T. Tropical finish. Size 3 1/2 x 4 x 3 1/2. Guaranteed, 65/- P.P. 2/-
ELLISON SUPER OUTPUT TRANSFORMER to match PX4, 6L6, 6V6 valves. Pri. rated at 90 mA. D.C. each half. Sec. 50 watts to match. 2-4-8-15 ohm. speaker. Size 3 1/2 x 3 x 4. Price 45/- P.P. 2/-.

12in. SPEAKER CABINETS, with carrying handle, detachable back, handsomely finished. Complete with lead compartment at bottom. Suitable for use as a portable amplifier and speaker cabinet. Brand new. Size: 15in x 17in x 13in. Price £2/19/6. (List price 6 gns.) P.P. 5/-.

BATTERY CHARGERS. Ex-Govt., perfect condition, 200/250 v. A.C. output to charge 2-6-12 v. at 5 amps. Complete with Ammeter, £4/19/6, carriage 5/-

INTRODUCING THE NEW 'SOLON' INSTRUMENT MODEL ELECTRIC SOLDERING IRON. Weight 3 1/2 ozs., length 9in. Suitable for 220/240 v. 25 watts. Best instrument on the market, only 19/8. P.P. 1/-.

WELDING TRANSFORMERS. 230 v. Prim. 50 cycles. L.T. tapped, 1 1/2 v.-13 1/2 v. 60-70 amps., £3/19/6. P.P. 5/-
Or 13 1/2 v. tapped to 16 v. as above. Same price.

PHILIPS NEON TESTER. Screw-driver type, 100/500 v. A.C./D.C., 5/- P.P. 6d.

HELLERMAN TOOL KITS. T.K.2 complete with tool, oil, sleeves, 17/6. Tool only, 9/- P.P. 9d. on either.

MAINS INTERFERENCE SUPPRESSORS. Type No. 5C/870, suitable for radios, motors, etc., size 4in x 4 1/2 in x 2in., 4/11. P.P. 1/-.

MOVING COIL METERS-2 1/2 in. FLUSH MOUNTING. 0-10 mA., 0-30 mA., 0-200 mA., 0-500 mA., any type, 12/6 each. P.P. 1/0.

AMERICAN HIGH FREQUENCY SIGNAL GENERATORS. Type 122A. Complete, brand new, 110 v. Input. 50-230 Mc/s., 8-150 Mc/s., £20, carriage 5/-.

EXIDE 80 v. STORAGE BATTERIES. Brand new, perfect condition. Suitable for bells, telephones, burglar alarms, etc., £15, carriage 5/-.

EXTENSION SPEAKER IN METAL CABINET. 6 1/2 in. Goodmans heavy magnet, ideal for P.A. work, 23/6, carriage 1/6.

MICROPHONE CABLE. 3/16th dia., stranded, screened and insulated, 1/- per yard; 10/- per dozen yards. P.P. 9d.

6in. G.E.C. FANS. 24 v. D.C. Brand new, complete with guard, 30/- P.P. 2/-.

OSRAM PHOTO-CELLS. C.M.G.: 22, brand new, 25/- each. P.P. 6d.

SPEAKERS:
10in. P.M. 3 ohms Speech coil, 25/- P.P. 1/6.
8in. P.M. 3 ohms Speech coil, 15/6. P.P. 1/6.
5in. P.M. 3 ohms Speech coil, 15/- P.P. 1/6.
2 1/2 in. P.M. 3 ohms Speech coil, 18/6. P.P. 9d.
3 1/2 in. P.M. 3 ohms Speech coil, 15/6. P.P. 9d.
INDICATOR UNITS, TYPE 6C. Complete with 3 1/2 in. C.R.T. (VCR 138) mask, base, mu-metal shield. Condensers, resistors, wire-wound volume controls, valves 2-VR91, 2-VR54. Brand new in original crates, £4, carriage paid.

Terms C.W.O., C.O.D. or pro-forma invoice.

15 LITTLE NEWPORT ST., LONDON, W.C.2
GERrard 6794/1453

SITUATIONS VACANT

GUIDED weapons.

ELECTRICAL engineer, or mathematician with relevant post-graduate experience, required for theoretical work on design of automatic control systems; some knowledge of effect of noise on servo-mechanisms an advantage; senior staff appointment, with good salary and prospects; pension scheme.—Write in detail to Personnel Manager, de Havilland Propellers, Ltd., Hatfield, Herts. [1353]

ELECTRICAL Engineers.

WAYMOUTH Gauges & Instruments, Ltd., a subsidiary company of Smiths Aircraft Instruments, Ltd., have vacancies in their Aircraft Fuel Gauge Laboratory for Assistant Engineers, required for development of electronic fuel gauging equipment. They should have an engineering degree or Higher National Certificate. Technical Assistants are also required for experimental work in electrical measurements; preference will be given to applicants holding a technical qualification.—Apply in writing to the Chief Development Engineer, Waymouth Gauges & Instruments, Ltd., Station Road, Godalming, Surrey. [1498]

TECHNICIAN (M2C/30023/WF) and

MAINTENANCE engineer (M2C/30022/WF) required by the **NORTHERN Rhodesia Government Information Department** for one tour of 36 months in first instance; free passages family can accompany; liberal leave on salary.

TECHNICIAN salary, etc. in scale £617 rising to £1,041 a year; gratuity at the rate of £80 or £100 a year; candidates should have a good technical background with a general knowledge of broadcast engineering and a special aptitude for recording.

MAINTENANCE engineer, salary, etc., in scale £830, rising to £1,116 a year; gratuity at the rate of £100 a year; candidates should possess technical qualifications in electrical and/or telecomm engineering of a standard not less than the Grade C examination of the B.B.C.

WRITE to the Crown Agents, 4, Millbank, London, S.W.1, state age, name in block letters, full qualifications and experience and quote reference number against the post for which application is made. [1455]

INSTRUMENT mechanics required to serve as research and experimental mechanics at Ministry of Supply, Sellafeld.

All applicants must have served a recognised relevant apprenticeship.

INSTRUMENT mechanics (Electronic) must have sound theoretical knowledge of electronics (Ordinary National Certificate standard desirable) with practical knowledge of pulse amplifiers, D.C. amplifiers, electronic scalars, discriminations, and general trigger circuits, and in wiring and assembly of electronic apparatus. Experience of test gear and general instrument calibration an advantage.

INSTRUMENT mechanics (physical) must have experience of industrial instruments used in measurements and control of temperature, specific gravity, pH and flow; knowledge of vacuum techniques and measurement of gaseous properties an advantage.

INSTRUMENT mechanics (general) must have experience of relay circuits and automatic telephone exchange maintenance; knowledge of X-Ray and electrical measuring apparatus an advantage.

RATES of pay for 44-hour 5-day week: 155/1 on entry with early assessment for merit pay; merit pay agreed after first assessment will be applied from date of entry; possibility of advancement to 195/1.

HOUSING accommodation will be available within a reasonable period for married applicants.

APPLY, giving details of apprenticeship, training (including Forces training), qualifications and experience, to Senior Labour Manager, Windscale Works, Sellafeld, Cumberland. [1986]

TECHNICIANS, Grade I (Radio) required by **EAST African Posts and Telecoms Administration**, on probation for pensionable employment; salary, etc., in scale £687 rising to £1,050 a year, outfit allowance £30. Free passages. Liberal leave on full salary. Normal tour 4 years. Candidates should possess a thorough practical knowledge of the working and maintenance of radio transmitting and receiving equipment. G.P.O. staff should apply through departmental channels.

WRITE to the Crown Agents, 4, Millbank, London, S.W.1, State age, name in block letters, full qualifications and experience and quote M2C/32424/WF. [1467]

ELECTRICAL ENGINEERING DEPARTMENT Imperial College, London, S.W.7. **LECTURERSHIP** in Vacuum Electronics.

APPLICATIONS are invited for a Lecturership in vacuum electronics tenable in the Department of Electrical Engineering. The Lecturer will be co-responsible for running a Post-graduate Course in Applied Electron Physics, with laboratory exercises comprising the physics and technology of modern vacuum electronic devices. Through knowledge of electron physics necessary, industrial experience desirable but not essential. Salary in the scale £600—£50—£900—£50—£1,150, according to experience.

APPLICATIONS to the Professor of Electrical Engineering. [1501]

New Barker "Duode" L.S. TAX FREE

BARKER SOUND UNITS have an enviable reputation for high fidelity. This new **DUODE** model is superlative in wide frequency range, with clean transients, smooth treble and full firm bass without boom.

At **12 Gns.**—there is no tax—these speakers will be in big demand.

Send stamps for full illustrated leaflet which explains advantages of the **DUODE** design principle.

"The Gramophone" AMPLIFIER

A user writes

"I am immensely delighted with its performance, far superior to others I have tried costing far more... your advertisement regarding the superlative performance of this amplifier is fully justified."

Amplifier 17 gns.

Complete with valves, tested.

Pre-amplifier for Magnetic p.u. 5 gns. Control Unit for Crystal p.u. 45/-

9w. Output, 20dB feedback, only 0.1 per cent harmonic at 5w, 20-20,000 c.p.s., 3/15 ohm output. 200-250 v. A.C. mains. Tone control on pre-amp. gives bass and treble cut or boost, on control unit treble cut alone with anti-rumble circuit.

HOME CONSTRUCTION of the units is simple, aided by our part assembled group boards with resistors and capacitors ready wired in, drilled chassis and complete illustrated instruction manual. Send for this now, 1/8 post free.



PRESSURE TYPE TWEETER UNIT

All-aluminium, M/C., former and diaphragm at rear of 14,000 gauss magnet, centre pole shaped to commence horn. 15 or 30 ohm. Response 2-14 Kc/s. 75/6.

Suitable 3 Kc/s X-over network 26/6.

This unit and X-over combined with neat walnut veneered cabinet in the

Q.M. QUALITY CUBE 6 gns.

The clean extended treble response added to existing speakers of 10 18ins. gives increased realism out of all proportion to modest cost.

The W.B. range includes models of all popular sizes. We also stock a special 18in. model of exceptional performance. £27/10/-.

New Decca LP Pickup

Better quality, less record wear with the new "H" head interchangeable with earlier Decca magnetic heads (3-pin). H.F. response raised to 14 kc/s. 3 grams lighter. Not widely available, but we have a fair stock. 1,600 ohm replaces "C" or "D" heads, 90 ohm the "B" head for Decola, Leak, etc.

Head only with sapphire, 54/9.

With diamond, £6/18/-.

XMS pick-up "H" and 78 heads, £6/9/6.

COLLARO 1953 Turntable Units and Auto-Changers

A new range combining popular price with merits usually found only in more expensive transcription equipment.

Heavy turntables with smooth 3-speed drive giving negligible rumble, a turnover crystal pickup with unusual range tracking at low pressure on the most difficult microgroove record, fully tropicalised, handsome cream enamel units bespeaking confidence by their immaculate appearance.

Stamped addressed envelope brings full specification, prices and extended payment terms.

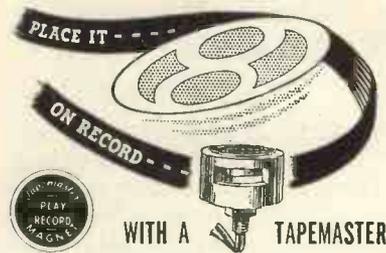
Home and Export Trade Enquiries welcomed.

QUALITY MART

8, Dartmouth Park Avenue, London, N.W.5.

GULIVER 1131.

Order by Mail—Demonstrations by Appointment.



TAPEMASTER RECORDING COMPONENTS
 Suitable for use with either Hardley or
 Culpitts circuits. Retail

JUNIOR MODEL Play/record, imp. 3,000 ohm at 1 Kc. Erase ... at each	£1 19 6
SENIOR MODEL Play/record, imp. 5,500 ohm at 1 Kc. Erase ... at each	£2 5 0
Oscillator Coil in can	10 6
Oscillator Unit, incl. coil and 6V6GT valve	£2 5 0

TAPEMASTER MAGNET FEATURES. Electrically balanced to ensure low "hum" level. Play/Record Model with .0005in. gap ensuring max. top response. Beryllium Copper, non-magnetic gapping. Mu-metal cores for Play/Record models. Track width, Play/Record, .082in., Erase, .110in. to match for gapping. Bias frequency 45 Kc., exactly matching TapeMASTER oscillator units and coils. Output 10 mV. Recording level, 15-20mV. With optimum bias, recording level and suitable correction of Amplifier response in frequency equals tape speed in inches/sec. Full instructions included for oscillator units and amplifier circuits.

AVAILABLE FROM ALL GOOD
 RADIO DEALERS.

WINTER TRADING CO. LTD.
 6, HARROW RD., LONDON, W. 2.

**BRASS, COPPER, DURAL,
 ALUMINIUM, BRONZE**
 ROD, BAR, SHEET, TUBE, STRIP, WIRE
 3,000 STANDARD STOCK SIZES
 No Quantity too Small List on application
H. ROLLET & Co., Ltd.
 6 Chesham Place, S.W.1. SLOane 3463
 ALSO AT
 LIVERPOOL · BIRMINGHAM · MANCHESTER

ELECTRADIX
for Satisfaction

RECTIFIER UNITS. Special offer. Brand new and in original packing cases. Westinghouse Selenium Rectifier Units. Transformer 110/230V. 50w. input. D.C. Rectified Output for charging 16 to 96 cells 10 amps. in vent case £35, carriage extra Write for Rectifier list.

DYNAMOTORS. 12 volts 350 watts, can be used as Motor or Dynamo, fan-cooled 30 amps. output, clockwise rotation. Spline shaft, as new £4/15/- carriage 5/-.

NIFE BATTERIES. 6 volt 50 a.h. 5 cells in wood boxes, £4. 2.4 volts 125 a.h. 2 cells in wood crate £4/15/-, 10 volts 45 a.h. 9 cells in wood crate £12. Single 45 a.h. cells 30/- each. Carriage on all types extra at cost.

CARBON ARC LAMP by Zeiss, 6 1/2in. Mirror reflector, 5 controls and C.I. base fitted Terminals £5, carriage extra. Zeiss Arc Lantern 29in. long 20in. high with slides for arc lamp, front shutter, less lens 65/- carriage extra.

ELECTRADIX RADIOS

Dept. A, 214 Queenstown Road, London, S.W.8
 Telephone: MACaulay 2159

SITUATIONS VACANT

WIRELESS Operator/Mechanics required for the **FALKLAND Islands Dependencies Survey** for tour of 18 or 30 months in the first instance; salary in scale £330 rising to £420 a year plus free quarters subsistence, clothing and liberal anteen stores while in Dependencies. It is possible to save almost all emoluments; liberal leave on full salary; candidates must be able to transmit and receive Morse at 20 words a minute (plain language or code) and be capable of elementary maintenance of wireless transmitting and receiving equipment.—Write to the Crown Agents, 4, Millbank, London, S.W.1; state age, name in block letters, full qualifications and experience and quote M2C/29989/WF. [1523]

THE National Hospitals for Nervous Diseases, Queen Square, W.C.1.
DEPARTMENT of Electro-physiology; technician for the maintenance and construction of electronic equipment; Whitley salary scale for laboratory technicians; workshop ability or knowledge of photography an advantage.—Applications to Secretary. [1446]

SIGNALS Assistant Inspectors of Police (Super-numerary) required by the **GOVERNMENT of Kenya** for one tour of two years with possible extension. Commencing salary, etc., according to previous experience in scale £767 rising to £1,092 a year. Gratuity (at least £162 after two years service) payable on satisfactory final completion of service. Outfit allowance £30. Uniform allowance £10 a year. Free passages. Liberal leave on full salary. Candidates aged 20-30 should be at least 5ft 7 1/2in without footwear, have normal vision without glasses and be of good education. Should possess a sound knowledge of the installation and maintenance of modern low and medium powered V.H.F. static and mobile equipment. H/F transmitters and receivers, petrol generators and diesel electrical sets. Candidates with previous United Kingdom or Colonial Police experience will be considered up to 35 years of age. Write to the Crown Agents, 4, Millbank, London, S.W.1, stating age, name in block letters, whether married or single, full qualifications and experience and quote M1/32820/WF. [1456]

FERGUSON RADIO CORPORATION, Ltd., have vacancies for the following staff.
DEVELOPMENT Engineers, senior and junior, for radio, television and electronics; previous experience of circuit development work absolutely essential.

DRAFTSMEN, experienced in radio and television receiver design (and small mechanical details), able to prepare drawings for manufacturer of prototype equipment.—Apply in writing, Employment Manager, F.R.C., Gt. Cambridge Rd., Enfield, Middlesex.

POSTS are permanent, progressive and pensionable. [1348]

A COMPETENT T.V. engineer wanted, driver, experienced all makes, good prospects right man.—Apply, Supreme Radio, Ltd., 26, Silver St., Edmonton, N.18. [1547]

ELECTRICIANS, experience in servicing radio equipment used for test purposes.—Apply to Personnel Dept., Osram-G.E.C., Hammer Smith, W.6. [1477]

ELECTRONIC engineers—(a) Section Leaders and (b) Assistant Engineers required for working on special experimental field trials of guided weapons.

SECTION Leaders should have at least H.N.C. and 5 years' experience in the development of electronic devices in the micro-wave, nurse or communication field, and be capable of taking responsibility for the serviceability of weapons for trials and of undertaking parallel development work in the laboratory.

ASSISTANT Engineers having a similar background, or considerable experience of small prototype electro-mechanical instruments, are required to work under the section leaders.

APPLICANTS may have the opportunity of carrying out some of the work in Australia at a later date; good salaries; subsistence allowances while working away from base; pension scheme.—Details should be sent to the Assistant Manager (A), The Fairey Aviation Co., Ltd., Dept. W, Research and Armament Development Division, Heston Aerodrome, Hounslow, Middx. [1524]

WANTED, radio and automobile electrical engineers; only first-class men considered; good rates of pay and bonus scheme in operation.—Box 7731. [1440]

RADIO and television engineer required, fully experienced all makes, for bench and outside; good driver, clean licence; good salary, references.

ELECTRICAL SERVICE (EDGWARE), LTD., 117, Edgware Rd., W.2. Pad. 2342. [1407]

EXPERIENCED TV engineers required for retail service; permanent positions at good salary.—Full details to Shenstones (op. Town Hall), Leyton, E.10. Ley 1362. [9266]

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section), have vacancies for Technical Assistants with electrical and radio experience, for compilation of aircraft manuals—both military and civil.

APPLY to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey.

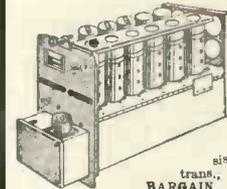
APPLICATIONS, with certain exceptions, are subject to the approval of the Ministry of Labour and National Service. [1358]

TUNING CONDENSERS. Two gang, .0005 mfd., standard size. Store soiled, but all tested. **CLEARANCE OFFER 2/9.** Post 9d. **BARGAIN** of 3 for 7/-.

FIXED CONDENSERS. Mixed parcels of various values, from .001 mfd., 350 V.D.C., to .25 mfd., 350 V.D.C. and 4 mfd. 12 V.D.C. 20 for 5/-, 45 for 10/-, and 100 for £1.

O.P. TRANSFORMERS. **CLEARANCE OFFER** AT 1/9 each. Post 1/- Will match all normal O.P. valves to 2-ohm speech coil.

MICRO SWITCHES. New American miniatures, 250 volts, 3 a., 1/4in. x 1/4in. x 1/4in. Bargain offer. 5/- each.



SUPERHET V.H.F. 6-VALVE RECEIVER. Ex W.D. R1124, but brand new condition. Six channel switching, tuning 30.5 to 40 mc/s. Components include 30 ceramic trimmers, 30 small condensers, 30 resistors (4-1 watt), 2 trans., 3 coils, etc.

complete with valves at 17/6. Post 2/9. Drawings available for suggested conversions to A.C. or A.C./D.C. mains. **BARGAIN PRICE 7/6.** Also

RADIO-TELEPHONE. U.H.F. walkie-talkie type transceivers. 53-75 mc/s, tunable. Visual range. Works off set of internal batteries, or through a vibrator unit from 12 volts. Brand new and boxed. Maker's handbook with each pair. £9/17/6 each, or £18/17/6 per pair. Carr. 5/6 each. Vibrators 27/6 each.

RADIO-GRAM CHASSIS. Brand new 1953 models' Three wave band models at £10/17/6 and £12/12/- Six wave band at £15/15/-. Latest valve line-up. Flywheel tuning, negative feedback, gram sockets and switch. Carr. 4/6.

EXTENSION SPEAKERS. Brand new 6 1/2in. P.M. low impedance speakers, mounted on polished and veneered baffle of modern design. Gold sprayed metal fret fitted. 5 feet of lead ready connected. **GIFT PRICE 19/9.** Post 1/9.

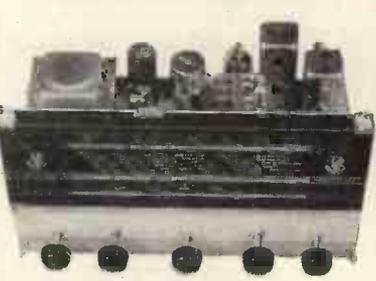
DUKE & CO.,

621 Romford Road, London, E.12
 GRA 6677

C.W.O. or C.O.D. Money back Guarantee

WATERLOO RADIO
 35, TENISON WAY, (Waterloo Bridge Roundabout), London, S.E.1.
 Tel: WATERloo 3014
CRYSTAL OVENS, AP3190, 230 v. complete with 1000 Kc. crystal, as used in the G61 Wavemeter. Price 65/-
 Many other electronic, radio and W.D. special valve bargains.
 Overseas enquiries invited

THE HAYES COMPANY
 TWO NEW MODELS



RG/160. 7-valve chassis with push-pull output. Independent bass and treble controls. 6 watts of audio with negative feedback. 3 wavebands. £20, tax paid.

RG/127. 6-valve chassis. 5 watts push-pull output. Feedback tone control. 3 wavebands. £17/5/- tax paid.

Full details gladly sent on request.
 298, WIGHTMAN ROAD, LONDON, N.8
 Mountview 6864.

GALPIN'S

ELECTRICAL STORES

408 HIGH ST., LEWISHAM, S.E.13.

Tel.: Lee Green 0309. Nr. Lewisham Hospital.

TERMS: CASH WITH ORDER. NO C.O.D.

All goods sent on 7 days' approval against cash.

EARLY CLOSING DAY THURSDAY

METAL RECTIFIERS, suitable for 6/12/24 volts at 10 amps charging with the correct transformer, complete with TX 97/6 each, or Rectifier only 35/- each.

1,000 WATT AUTO WOUND VOLTAGE CHANGER TRANSFORMER tapped 0/110/200/230/250 volts £5/15/- each, carriage 4/6.

MAINS TRANSFORMERS (NEW), suitable for spot welding, input 200/250 volts, in steps of 10 volts, output suitably tapped for a combination of either 2 1/2/4/6/8/10 or 12 volts 50/70 amps. 95/- each, carr. 7/6.

MAINS TRANSFORMERS (NEW), 200/250 volts input in steps of 10 volts, output 0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6. Another as above but 10-12 amps 55/- each, post 1/6; another, as above, but 25/30 amps, 75/- each, carriage 3/6; another, input as above, output 0/18/30/36 volts 6 amps, 47/6 each, post 1/6.

MAINS TRANSFORMERS (NEW), input 200/250 volts in steps of 10 volts, output 350/0/350 volts, 180 m/amps, 4 volts 4 amps, 5 volts 3 amps, 6.3 volts 4 amps, 45/- each, post 1/6; another 350/0/350 volts 180 m/amps, 6.3 volts 8 amps, 0/4/5 volts 4 amps, 45/- each, post 1/6; another 500/0/500 volts 150 amps, 4 volts 4 amps C.T., 6.3 volts 4 amps, C.T., 5 volts 3 amps, 47/6 each, post 1/6; another 425/0/425 volts 160 m/amps, 6.3 volts 4 amps, C.T. twice 5 volts 3 amps, 47/6 each, post 1/6.

TRANSFORMERS SPECIALLY MADE TO ORDER, delivery 72 hours from date of order. Please let us quote you.

MAINS TRANSFORMERS, 200/250 volts input, output a combination of 6, 12, 18, 24, 30, and 36 volts at 6 amps, 45/- each, post 1/6.

METERS, Moving Coil, 0 to 14 amps, 18/6 each. Ditto, Moving Iron, suitable for A.C. 0 to 30 amps, 25/- each. Another moving coil, 100 to 250 amps, D.C., 35/- each, all 4in. scale. (Others in stock, please state your requirements.)

12/24 VOLT RECTIFIERS at 4 amps., with suitable Mains Transformer, 200/230 volts input, 55/- each, except 12/24 volts.

MAINS TRANSFORMERS, input 180/250 volts, output 425/0/435 volts, 250 m/amps, 6.3 volts 10 amps, 6.3 volts 8 amps, 6.3 volts 8 amps, 5 volts 6 amps, 65/- each; another, input as above, output 4,000 volts 2 1/2 m/amps, 4 volts 1 amp, 2 volts 2 amps, 45/- each.

SMOOTHING CHOKES, 4 henries, 250 m/amps, D.C. resistance 120 ohms, 12/6 each.

CONDENSERS, 0.1 mfd., 6,000 volts working, 6/6 each.

LARGE STUD TYPE DIMMER RESISTANCES, 10 ohms, 9/18 amps, 32 studs, 35/- each.

3 KILOWATTS DOUBLE-WOUND VOLTAGE CHANGER TRANSFORMERS, 110/230 volts or vice-versa, as new, weight approx. 100 lbs., £12/10/- each, carriage forward.

ELECTRIC LIGHT CHECK METERS, useful for subletting, garages, etc., all for 200/250 volts A.C. mains, 5 amp. load, 19/- each; 10 amps, 22/6; 20 amps, 27/-; 25 amps, 32/6; 40 amps, 38/6; 50 amps, 46/6; and 100 amps, 57/6 each, all carriage paid.

6 or 12 VOLT RECTIFIERS at 4 amps output, complete with suitable transformer, 200/230 volts input, 45/- each, post 1/6.

MAINS TRANSFORMERS, 200-250 volts input, output 400/0/400 volts, 280 m/amps, 6.3 v. 8 a., 2 v. 3 a., 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., the last two heaters insulated at 8,000 volts, 85/- each; another 200/230 volts input, output tapped 0, 9, 18 volts at 4 amps, 25/- each, post 1/6.

D.C. MOTORS, 230 volts, .3 h.p., 3,000 r.p.m., in good condition, £3/5/- each; ditto Fan Motors, 230 volts D.C., 20/- each; 110 volts D.C., 17/6 each.

MAINS TRANSFORMERS, input 200/250 volts, output 45/50 volts, 70 amps, suitable for arc welding, £15 each; another 70 volts, 50 amps, £15 each.

Ex-W.D. U.S.A. HAND GENERATORS, less winding handle, output 425 volts at 110 m/a., at 6.3 v., 2 1/2 amps, complete with smoothing, 30/- each, carriage 2/6.

ROTARY TYPE RESISTANCES, stud 5/arm type 10 ohms 3 amps, 17/6 each. (Other types in stock, please ask for quotation.)

SITUATIONS VACANT

TELEVISION testers, semi-skilled, required by Baird Television, Ltd., Lancelot Rd., Wembley; rate of pay 3/- to 3/6 per hour according to ability; all applications should be in writing. [1499]

RADIO engineer required, for responsible position by Cambrian Air Services, Cardiff Airport, must hold "A" licence; salary in scale £600-£700 p.a., according to qualifications. APPLY: Chief Engineer. [1385]

TRACER and Junior Draughtsman, electronic, previous experience of preparing drawings for reproduction an advantage; Central London area.—Write age, experience and salary to Box 8254. [1521]

DRAUGHTSMAN or draughtswoman, with electronic experience, required by large London technical journal publishers.—Write fully, previous experience, age and salary expected.—Box 8231. [1522]

RADIO mechanics required for development work on test apparatus.—Write, giving full particulars of experience, etc., to Personnel Manager, S. Smith & Sons (England), Ltd., Bishops Cleeve, Nr. Cheltenham. [1127]

RADIO service mechanics required by Smiths (Radiomobile), Ltd., for all parts of the country.—Write details of experience and qualifications to Personnel Officer, Goodwood Works, North Circular Rd., London, N.W.2. [0342]

TECHNICAL assistant, electronics lab., minimum standard H.N.C. design exp. essen., knowledge of ultrasonics techniques useful, Brixton area; write, giving full particulars, age, exp., sal. reqd.—Box 8005. [1468]

CLERICAL assistant for small research dept., knowledge of technical terms an advantage, typing essential, interesting post for person with initiative, Brixton area; write, giving full particulars., age, exp., sal. reqd.—Box 8006. [1469]

TELEVISION/RADIO engineer, fully experienced, required for old established Eastbourne firm, able to drive, salary £450 to £600 according to ability and experience.—Write full details to Box 8075. References required. [1473]

EXPERIENCED V.H.F. Service Engineer required by old-established London firm specialising in the installation and maintenance of mobile R/T equipment. Excellent opportunity available to right person.—Apply Box 8240. [1506]

TECHNICAL representative required by old-established firm to handle electronic acoustic correction equipment from a London H.Q.—excellent scope for ambitious man to develop and expand completely new field.—Full particulars to Box 7064. [1074]

URGENTLY required, radio mechanics with experience of airborne equipment, job offers good prospects, pension scheme, welfare and sports organisations and facilities for travel abroad.—Replies, giving age and experience to Box 7927. [1458]

RADIO engineer with practical knowledge of R.A.F. or Fleet Air Arm Radio or Radar equipment required, post-war experience an advantage.—Applicants should apply in writing to Chief Inspector, A. J. Whittemore (Aeradio), Ltd., Croydon Airport. [1457]

FIRST-CLASS radio and television engineers required by old-established, expanding business; good salary and prospects; permanent, all leading agencies, including Murphy, Bush, Pye, Ekco, etc.—E. P. Fox, Ltd., East Molesey, Surrey. Molesey 2721. [0442]

TECHNICAL Representative required by old-established firm to handle sale of V.H.F. R/T in London and the Home Counties. Excellent scope for ambitious man of good personality and suitable technical background.—Full particulars to Box 8241. [1507]

AIRCRAFT radio mechanics skilled in workshop practice or aircraft installations to work at Stansted Airport, Essex; hostel accommodation available; minimum hourly rates 3/9.—Write to the Personnel Manager, Skyways of London, 7, Berkeley St., W.1. [0019]

TELEVISION Engineers required, unusual opportunity for men with sound television knowledge to join established organization in the Midlands; permanent position and good salary; must be able to drive.—Apply, giving full details of past experience, to Box 8253. [1500]

EXPERIENCED radio testers and inspectors required for production of communication and radio apparatus, also instrument makers, wiremen and assemblers, for factory test apparatus.—Apply Personnel Manager, E. K. Cole, Ltd., Ekco Works, Malmesbury, Wilts. [0238]

HEARING aid manufacturers require experienced radio engineers for production and design work; must be capable of controlling staff and working on own initiative; give full details of experience and salary required; own staff advised of vacancies.—Box 7926. [1455]

DESIGN Draughtsman with experience of electronic apparatus. Salary in excess of A.E.S.D. rates to suitable applicants. Write giving details of experience and qualifications to—Chief Draughtsman, Pye, Ltd., Colnside Works, Trout Rd., West Drayton, Middlesex. [1508]

MESSRS. PYE, Ltd., Cambridge, have vacancies for senior and junior test engineers, also electronic wiremen on very interesting work in their television transmission equipment department.—Apply in writing to Personnel Department, St. Andrew's Rd., Cambridge. [1395]



A WINDOW WORTH LOOKING INTO

American Valve Testers, Radio City type W.134. Brand new, A.C. mains 230 volt, covering practically the whole range of American valves, full working instructions, £12/19/6 each.

A.C. Mains 200/250-Volt 50-cycle Motor Movements, complete with gear train down to 4 revs. per min., wonderful value, 12/6 each. **25/73 Receiver portion—1196 T/R**. Complete with all valves in new condition, full instructions available for conversion, 25/6 each. **465 I.F. Transformers**, dust core tuned, 465 pairs.

High Stab Resistors. 2 Meg, 2% 1 watt, 1.2 Meg, 2% 1/2 and 1 watt, 1.5 Meg 5% 1/2 and 1 watt, 29.5 K, 2% 1/2 watt, 100 K, 5% 1/2 watt, 150 K, 5% 1 watt, 6/- per doz. min. quantity.

Bleeder Resistors. 100 K, 150 watts, 200 ohms 150 watts adjustable, 800 ohm 150 watts, 350 ohm 40 watts, 40 K, 150 watts, 80 ohm 50 watts, 24 ohm 100 watts, all at 2/- each.

Venner Hour Meters, for operation on 200/250 A.C. 50 cycle, synchronous movement, capacity zero-10,000 hours. 62/6 each, brand new.

Rectifier Units. Ex-W.D. Input voltage 200/250 volts A.C. mains. Output 24 volt 10/12 amps, complete with 2 1/2 in. meter, and fitted with dual output controls, £12/10/- each.

Crystal Microphones. Ex-Deaf Aid Units, 4/6 each.

Midget 1 Meg Pots with switch. Ex-Deaf Aid Units, 1/- each.

Arc Welding Transformers. 200/250 volt A.C. mains. Output 26 volt 120 amps, complete with meter, large scale, reading 120 amps., 4 only available, £14 each.

Welding Transformers. Input voltage 230 volts 50 cycle, output 13/16 volt, 65/75 amps., 82/6 each.

Mains Transformers. Ex-W.D. Input voltages 230 volt A.C., output 500 x 500 volt 170 mA., 4 volt 3 amp., 22/6.

Smoothing Chokes. Ex-W.D. 15 Henries, 275 mA., Resistance 125 ohms, 10/6 each.

Dural Masts, Telescopic 15in. to 7ft. 6in., 2/6 ea., ideal for making own T/V aerial.

Mains Isolation Transformers. 230 volt-230 volt 50 cycle 1,000 watts, ex-W.D. £6/10/- each.

Battery Chargers. Ex-W.D. Input voltage 200/250 volts 50 cycle. Output 12 volt 5/7 amps., tapped at 6 volt, complete with 2 1/2 in. meter, manufactured by Heyberds. Brand new, £6/10/-.

Chokes. Ex-W.D. Heavy Duty, 20 Henries 300/400 mA. Resistance 180 ohms, 17/6 each.

Valves. Brand New and Boxed. VU111 4 volt E.H.T. Rectifiers, 2/6 each.

H.R.O. 6 Volt Vibrator Power Packs. Output 165 volt 80 M.A., using 6 x 5 Rectifier. Brand new, boxed, 39/6 each.

Rotary Converters. 24 volt D.C. input, 230 volt A.C. 50 cycle output @ 100 watts, 92/6 each. Ditto, 12 volt input, 102/6 each.

A.C. Mains Transformers. 200/250 volt input, output 45 volt 4 amp., 19/6 each.

Don't forget your postage.

Open all day Saturday.

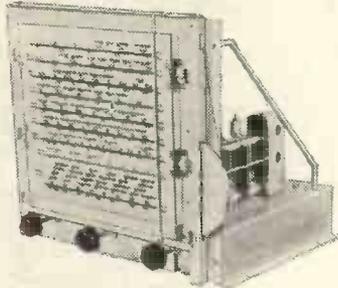
G. W. SMITH & CO.

(RADIO) LTD.

3 LISLE STREET, LONDON, W.C.2

Telephone: GERard 8204/9155

TUNERS



- 5GBS** 9 Band (6 Electrical band spread) with R.F. F.C. 21.F. Delayed Amplified A.V.C. Variable Selectivity. Fly Wheel Tuning. Tropicalised. Suitable for use with any High Quality Amplifier. £44. Tax paid.
- S5** 3 Wavebands. 16m.-2,000m. R.F. Pre-amplifier, variable selectivity I.F. Delayed amplified A.V.C. Very low distortion. £21/6/8. Tax paid.
- S5E** As S5 but 12.5m.-550m. £21/6/8. Tax paid.
- S4** The Standard high-quality Feeder Unit. Specification as S5 but without R.F. amplifier. £16. Tax paid.

A modified version of all models is available for use with Leak or Acoustical Amplifiers.

G. T. CHAPMAN (Reproducers) LTD.
RILEY WKS., RILEY ST., CHELSEA, S.W.10
FLAXman 4577/8

Export Enquiries Invited

ARIEL SOUND

Professional Recording Engineers.

Public Address Equipment.

Electronic Design, Manufacture and Repair.
(Please refer to Repairs and Services Section for details of some of our services.)

57 LANCASTER MEWS, LONDON, W.2

Telephone: Paddington 5092.

LYONS RADIO Ltd.

Bargain **HEAVY DUTY RESISTOR** Parcels. So useful for your experimental work, so seldom to hand when needed. This can now be remedied by the outlay of a few shillings for what would normally cost £2. Our Parcel "A" contains 12 different values from 2 ohms to 50 Kohms. Wattage ratings from 10 to 85 W. **PRICE ONLY 10/-**. Parcel "B" offers even better value with 24 resistors, resist. and wattage range as "A" with tapped and semi-adjustable types included. **PRICE ONLY 18/-**. Post "A" or "B" 1/6.

R.F. UNITS TYPE 27. These popular converter units having a frequency range of 65-85 Mc/s., fitted with a three-gang tuning condenser and three valves (2—VR136's and 1—VR137). In good condition. **PRICE 39/6**, post 2/6.

FREQUENCY METERS. Switchboard mounting type, 7in. dia., for direct connection to 230 v. A.C. mains. Calibrated 40-60 cycles. **PRICE £4/10/-**, post 2/6.

RECEIVERS TYPE R.1132A. These are a top-grade 11-valve super-het receiver having a frequency range of 100-125 Mc. Circuit; R.F. Amplif., Freq. Chang., Osc., Stabiliser, 3—I.F. Amplif., B.F.O., Det., 1st Audio and Output. Valves employed are 4—VRB3's, 2—VRB5's and 1 each of VRB6, VR67, VR70, VR54 and VR57. Fitted with tuning meter, precision slow-motion drive, R.F. and L.F. gain controls, etc. Made for bench or rack mounting, size 18 x 18 x 11in. Circuit diagram provided with each receiver. In new unused condition (interior metal work may be a little stored) and supplied in maker's transit case. **PRICE £4**, carriage 7/6. Used condition, less transit crate, **PRICE £2/17/6**, carriage 17/6 (10/- returnable on packing case).

3 GOLDHAWK ROAD (Dept. M.W.), SHEPHERD'S BUSH, LONDON, W.12
Telephone: Shepherd's Bush 1729

SITUATIONS VACANT

DEVELOPMENT engineers (Senior and Junior) required by Ferguson Radio Corporation, Ltd., Great Cambridge Rd., Enfield, Middx, for radio, television and electronics; previous experience of circuit development work absolutely essential. **POSTS** are permanent, progressive and pensionable. **APPLY** in writing to Employment Manager. [1541]

WIRESMEN, skilled, required for high-grade electronic equipment, ability to undertake prototype work from Schematic drawings an advantage; first-rate workshop conditions, West London area, and pension scheme; write, stating age, details experience and present rate.—Box 8276. [1540]

MESSRS. PYE, Ltd., Cambridge, have vacancies for senior and junior test engineers, also electronic wiresmen on very interesting work in their television transmission equipment department.—Apply in writing to Personnel Department, St. Andrew's Rd., Cambridge. [1978]

TELEVISION testers, fully experienced, required by Baird Television, Ltd., Lancelot Rd., Wembley; rate of pay 3/6 to 4/6 per hour according to ability; basic 5-day week of 44 hours; apply in writing giving details of past experience; applications will be treated in strictest confidence. [1498A]

EXPERIENCED fault-finders wanted by Midlands hand manufacturers of radio equipment; permanent posts located in the Midlands are offered to men with experience of radar range control, V.H.F. equipment.—Write, stating fully experience and salary required, to Personnel Manager, Box 7632. [1414]

RADIO and radar testers; first-class men required for work on V.H.F. communication gear and Government contracts for radio and radar equipment by Midlands manufacturers.—Men with wide experience of radar range in any of the fields mentioned should write, giving full details to Box 7631. [1413]

DESIGNER draughtsman, under 30, with knowledge of design of electro-mechanical instruments; workshop experience preferred; H.N.C. standard.—Apply in writing, with full particulars of age, experience and salary required, to the Personnel Manager, Muirhead & Co., Elmers End, Beckenham, Kent. [1544]

ENGINEER-Mechanic (Electrical) at South-East London Technical College, Lewisham Way, S.E.4. Duties mainly for repair of electronic app., also reqd. to assist with maint. of lab. equip. Trade rate of pay £8/16 for 44-hr. wk. Parties, and application form from Secretary, returnable within 14 days. (695). [1511]

TESTERS required for work on industrial electronic equipment; experience on medium or heavy electrical apparatus; H.N.C. or similar qualifications.—Write giving full details of age, experience and salary required to Phillips Balham Works, 45, Nightingale Lane, S.W.12, or telephone Battersea 8521, for appointment. [1465]

TECHNICAL Representative with sound knowledge electronics and manufacturing experience required by high-class acoustic and equipment manufacturers, London, W.1. Age 25-35. Very progressive position for young man with drive, good education and appearance. Commencing £750 p.a.—Write Box W.W.23, C/O 191, Gresham House, E.C.2. [1517]

WIRELESS Instructor wanted, one able to undertake the complete theoretical instruction for the P.M.G. Certificates. Write, giving full particulars of radio experience, certificates held and salary expected in addition to single/married accommodation which will be provided.—Principal, Wireless College, Colwyn Bay. [1510]

DECCA RADAR, Ltd., invites applications from young graduate scientists and engineers with good Honours degrees; the posts offer first-class careers with excellent prospects in radar engineering; British Nationality essential.—Apply, Ref. OPH/1, Decca Radar, Ltd., Research Laboratories, 2, Tolworth Rise, Surbiton, Surrey. [0246 biton]

ENGINEER required to undertake the development of electronic instruments; the successful applicant must be capable of working substantially on his own initiative; salary will be in accordance with qualifications and experience; degree or equivalent preferred.—Apply in writing to Advance Components, Ltd., Slack Rd., Sherrin Hill St., London, E.17. [1479]

MCMICHAEL RADIO, Ltd., require senior and junior engineers in their equipment division laboratory at Slough; training and experience in the field of applied electronics (including communications) and experience of working with Government Departments are the chief qualifications required.—Write, stating age and full details of training, qualifications and experience, to the Chief Engineer, Equipment Division, McMichael Radio, Ltd., Slough, Bucks. [0198]

RADIO service engineers, Selfridges, Ltd., have vacancies for radio service engineers; applicants must have experience of all makes of radio and television sets, and must be able to drive a car, good starting salary and generous increases; men who show ability; posts are permanent and pensionable to men under 45.—Apply between 9 and 11.30 a.m. Monday to Friday, to Personnel Manager, Provision Building, Orchard St., W.1. [1489]

FOR CATHODE RAY TUBE FAILURES.

Special low capacity secondary winding for Heater/Cathode shorts to restore picture after this fault has occurred. All Primaries tapped, framed and tag panelled, 200/250. 2 v. at 2 a., 4v. at 2 a., 6.3 v. at 2 a., 10.8 v. at 0.3a., at 27/6 each.

For any other voltage, send particulars of voltage and current required. Trade discount to genuine retailers and service men for above only.

T.V. HEATER TRANSFORMER, 200/250.
6.3 v. at 7 a.-0.2-6.3 v. at 2 a., at 19/6.

T.V. AUTO TRANSFORMER. 0.190-210-230-240 v. 6.3 v. at 7 a.-0.2-6.3 v. at 2 a., at 27/6.

T.V. FRAME TRANSFORMER. 60 H. magnetic deflection suitable for most home-constructed sets, at 15/6.

MAINS TRANSFORMER. 200/250, 425/0/425 200 m/A. 6.3 v. at 4 a. C.T., 6.3 v. at 4 a. C.T., 5 v. at 3 a. Fully shrouded, at 50/- each.

We will quote for quantities of any type of Mains and O.P. Transformers and Chokes to manufacturers of electronic equipment, or wholesalers and exporters.

NORTHERN TRANSFORMER CO.

215 BARKEREND ROAD,
BRADFORD, YORKS.

1132a RADIO RECEIVERS

Ex-Air Ministry - Good Condition

£2. 12. 6 each
Carriage Paid Home.

Advertising Manager, STARAVIA,
Blackbushe Airport, Camberley, Surrey.

WOOLWICH POLYTECHNIC

COLLEGE OF ENGINEERING and SCIENCE
WITH TEACHERS RECOGNISED BY THE
UNIVERSITY OF LONDON
PRINCIPAL: J. S. Tait, Ph.D., B.Sc., A.R.T.C., M.I.E.E.

Students read for Internal Degrees and are affiliated to the University of London Union and Athletic Union.

B.Sc. ENGINEERING—Civil, Mechanical, Electrical, Telecommunications.

B.Sc. Special CHEMISTRY

B.Sc. Special MATHEMATICS

B.Sc. Special PHYSICS B.Sc. GENERAL

All the above are Three Year Courses. A preliminary One Year Course available, if not possessing G.C.E. in suitable subjects and levels, making a Four Years Course to the Degree.

FIRST MEDICAL EXAMINATION—One Year Course.

PROFESSIONAL COURSES

HIGHER NATIONAL DIPLOMAS IN ENGINEERING. ASSOCIATESHIP OF THE INSTITUTE OF CHEMISTRY.

Three Year Courses for Students who have attained a suitable standard.

Fees: £28 per Academic Year (no fee if under 18 years of age) plus £2 Union Fee.

Advice and information on Scholarships, Deferment, Entrance standards, etc., available on request to Secretary, Woolwich Polytechnic, S.E.18. (WOOLwich 2856)

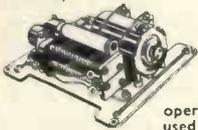
ALL ITEMS CARRIAGE PAID IN ENGLAND & WALES ONLY

-SPECIAL OFFER!

MAINS OPERATED DOOR BELL. At last a door bell without Batteries or Transformers. Operates direct from Mains and Supply. 3in. Magneto type Bell by famous manufacturer completely self-contained. Equally suitable for burglar alarms, etc. 200-250 A.C. Supply only. Unrepeatable at 6/6.

TOGGLE SWITCH. Single hole panel mounting, 250 volt, 2 amp. Single pole changeover on/off. Brand new at 6 for 5/-.

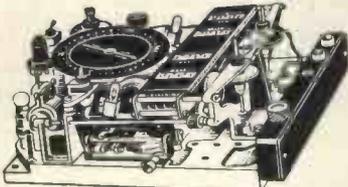
DINGHY TRANSMITTERS. Ex-U.S.A.F. B.C. 778 containing magnificent hand generator, output 28 volt 0.175 amps., 300 v. .04 amps., two valves 12 S.C.7 (V.T.268), 128 A.6 (V.T. 134) with bases. One high quality 0.0005 mfd. variable condenser, 13 fixed condensers, 8 fixed resistors, 3 relays. Small transformer, morse key, two five-way tag boards. Approx. 100 yds. braided copper aerial wire on spool. Indicator lamps, etc., the waterproof case outside is soiled, but the above contents in perfect condition. Limited quantity. Price 42/6.



FLASHER MOTOR UNITS. Containing small 24 V. D.C. Motor approx. 2 1/2 in. x 1 1/2 in. and Reduction Gear Box, driving Cam-operated contacts, originally used for flashing lights on

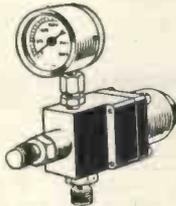
Aircraft. Ideal for Flashing Indicator, Illuminators, etc., Motor and Gear Box useful for all types of models. 25/-.

AIR POSITION INDICATOR



Containing a wealth of gears, drives and shafts, 3 infinitely variable gears, lampholders, repeater motors. Veeder counters, has been used by many Universities as a basis of a calculating machine. 42/7/6.

HIGH PRESSURE REDUCING VALVE. Complete with 0-3,000 lb. per sq. in. pressure gauge. Suitable for compressors, Cylinders of gas, etc. Brand new, 8/6.



FLEXIBLE DRIVES. 4ft. 8/6; 2ft. 4/6. Suitable for small tool remote drives, etc.



EX. R.A.F. GLIDE PATH RADIOS. R.1124 comprises 6 valves, 3/9D2's (VR106), 15D2 (VR107), 8DC (VR108), 4D1 (VR09), N.F.7 Mc/s., 6 switched frequencies, 30.5-40 mc/s., plus a host of valve holders, screening cans, 2 transformers, 35 fixed condensers, 30 trimmer condensers, 35 resistors, 6 coils, 5 wafer rotary switches potentiometers, etc., unrepeatable, each 18/6.

IMPELLER PUMP. Approx. 2 1/4 in. long x 2 in. dia. Adjustable flange fixing, 2 amps. at 24 v. d.c. or will work on 12 v. at 4 amps d.c. Ideal for bilge pumps or for transferring fuel or water to header tanks. Pump is self-cooled by liquid passing through it. Brand new and boxed, 39/6 each.

MODEL MAKER'S MAINS TRANSFORMER. All purpose low voltage. Input 210/250 Volts. Output 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30 Volts. Rating 2 amps. Brand new, fully guaranteed 24/-.

TERMS—CASH WITH ORDER. NO C.O.D.

SHERMAN'S SUPPLY CO. (W.3)
126, KENSAL ROAD, LONDON, W.10

SITUATIONS VACANT

TELEVISION engineer for old-established Bush, Ekco, H.M.V. and Murphy retailers, capable of taking charge service dept. when occasion arises; qualified driver; salary according to capabilities £50-68 an an. Bonus WYCOMBE ELECTRICAL SUPPLIES, Ltd., 51/52, Oxford St., High Wycombe, Bucks. Tel. H.W. 457. [1538]

ENGINEER required for mechanical development of radio and television receivers, applicants must possess good theoretical knowledge of radio and television and have practical machine shop experience.—Write, giving full particulars and salary required, to Philco (Overseas), Ltd., Romford Rd., Chigwell, Essex. [1478]

E. R. COLE, Ltd., Electronics Division, Malmesbury, Wiltshire, require Draughtsmen (mechanical or electrical of National Certificate Standard), aged 21 to 25 years, for interesting and varied work on radar and communication equipments, also for test gear, excellent conditions and prospects.—Apply, in writing, to Personnel Manager. [1099]

DESIGNER required by electrical component manufacturers in N.W. London; applicants must possess some knowledge of radio frequency circuits, pulse forming networks design and preferably have experience in electronic, radio and television industry; superannuation scheme.—Write, stating age, full details of experience and salary required, to Box 8107. [1480]

THE ENGLISH ELECTRIC Co., Ltd., Luton, have vacancies for electronic engineers for work in Australia on V.H.F. sub-miniature equipment with trials applications; assistance with housing will be provided.—Applications, stating age, experience and qualifications, should be sent to Central Personnel Services, 336-7, Strand, London, W.C.2, quoting ref. 456. [1135]

ADDITIONAL senior and junior engineers are required by a small but progressive firm of electronic instrument manufacturers in Surrey for interesting development work on important projects; applicants should possess a degree in physics, and should have industrial experience and a practical mind; both salary and prospects will be good for the right men.—Apply Box 7928. [1460]

DEVELOPMENT Engineers, Marconi's Wireless Telegraph Development Co., Ltd., Chelmsford, have vacancies in their Aeronautical Group for qualified engineers with experience enabling them to make an immediate useful contribution to the work of the group, which includes research into and development of airborne communication and navigational aid equipment.

APPLICATIONS (which will be treated as confidential) are invited especially from engineers having design experience of communication receivers, mobile transmitters or small electro-mechanical devices; the positions offered are permanent and pensionable; good salaries will be offered to suitable applicants, who will be responsible for the particular phase of work on which they are engaged; in certain cases houses may be available.—Please write, giving full details and quoting ref. 875C, to Dept. C.P.S., 336-7, Strand, London, W.C.2. [1525]

SCIENTIFIC instrument makers in North London have a few vacancies for design and laboratory assistants and wire-men for the development and production of high quality electrical and electronic apparatus.—Please apply in writing only, stating qualifications, experience and requirements, to Personnel Officer, Hilker and Watts, Ltd., Hilger Division, 98, St. Pancras Way, London, N.W.1. [9990]

LABORATORY assistants required, male or female, for research work on solid dielectric and electrolytic capacitors; H.N.C. or Inter B.Sc. Chemistry or Physics, or a recognized equivalent essential; salary £425 to £550 p.a. to start, according to qualifications.—Write, giving full details of age, education and experience, to A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, S.W.15. [1542]

MEDICAL Research Council have vacancies at Radiobiological Research Unit, Atomic Energy Research Establishment, Harwell, Nr. Didcot, Berks, for laboratory technicians experienced in physical laboratory practice, nuclear research techniques or operation of high voltage apparatus; salary according to qualifications and experience.—Apply (giving names of two referees) to Director of Unit. [1502]

DEVELOPMENT Engineer, aged 24/35, required by organisation in Lancashire for laboratory work in connection with quartz and synthetic crystal design and manufacture; applicants should have a degree in Physics or Electrical Engineering, or a Higher National Certificate, or equivalent; previous industrial experience and knowledge of high frequency radio circuit technique will also be an advantage.

The post available is permanent, with contributory pension fund and full staff status.—Applicants are invited to write, giving full details of their qualifications, age and experience to Box 214, Dorland Advertisink, Ltd., 18/20, Regent St., London, S.W.1. [1443]

RADIO mechanic required by well-known firm of diesel and electrical engineers in West London, for work on the construction and maintenance of electronic gear; applicants should hold R.T.E.B. certificate, or equivalent qualification, in radio and television and have practical radio experience; salary in the region of £500 p.a., pension scheme.—Reply with full particulars to the Personnel Manager, G.A. Ltd., Acton, W.3.

ALPHA OFFERS

RECTIFIERS

RM1 14/- each; RM2 4/9 each; RM3 5/9 each; RM4 16/- each.

Extension Speaker in Mottle coloured cab., 19/6 each. Headphones CLR High Resistance 10/- pair. Headphones CLR Low Resistance 7/6 pair. Wearite I.F. Transformers 50/1A and 50/2 10/- pair. Block Condenser 4 mfd. 500 v. 1/6 each. Microphone Transformer 60 to 41/11/6 each. Collaro AC37 Gramophone motor 41/12/6 each. Post 1/6.

SPECIAL PURPOSE VALVES

EF8, 6/6; 954, 2/-; 955, 4/9; 956, 3/6; VU111, 3/6; VU120A, 3/6; 6C6G, 6/6; VU133, 3/6; CV71, 1/-; 9001, 6/3; 9002, 6/3; 9003, 6/3; 9004, 6/3; 9006, 6/3; VR137, 5/-; VR116, 4/-; 2X2, 5/6; 6A3, 5/-; 6B5, 5/-; 6F7, 5/-; 6SF7, 5/6; 6ST7, 5/-; 117Z6GT, 7/6; 2BD7, 7/6; VU39, 8/6; VR53, 7/6; VR136, 7/-; VR55, 7/3; VR56, 7/-; VR65, 3/9; VR65A, 3/6; VR91, 6/-; VR91 Sylvania, 7/6; VR102, 7/6; PT15, 10/-.

Throat Microphones—2 in box, 1/8 box. G.P.O. type jack Plugs, 1/3 each. Bell Push with warning light, 1/3 each. Car Bulbs, 6-7 v. 18 watts, 1/3 each. Car Plug Suppressors, 1/2 each. 4 position Rotary Switch, 30 amp., 3/6 each.

CONDENSERS SILVER MICA

PF Sizes available.

1	18	47	190	500
2	20	50	200	610
3	25	58	245	680
6	27	68	300	750
7.5	30	100	330	1,000
8	33	120	360	1,200
9	35	150	370	1,600
10	39	175	375	10,000
15	45	180	470	

All by well-known makers, 3 1/2d. each.

CERAMICONS

5. PF.	12 PF.	50 PF.
6.8 PF.	39 PF.	180 PF.

All 4d. each.

T.V. Slider Resistors

CLR 801 20Ω, 25 KΩ, 20 KΩ, 10 KΩ, 1/3 each. CLR 802, Double 3 K., 5 K., 2/3 each.

Pencil Rectifiers

K3/25, 2 Kv., 1 M.a., 4/3 each. K3/40, 3.2 Kv., 6/- each. K3/45 3.6 Kv., 6/6 each. K3/50, 4 Kv., 7/3 each. K3/160, 12 Kv., 18/- each.

Wire Wound Controls.

1 KΩ, 2 KΩ, 20 KΩ, 10 KΩ, 25 KΩ, 50 KΩ, 7 1/2 each. Yaxley, 3 pole 3 bank 3 way, 1/6 each. Screened Grid Caps. British and Octal 3d. each. 1 Meg. Vol. Controls. Single pole switch. Brand new, 3/- each. Moulded Bakelite, 01 mfd., 4 Kv., 1/6 each. Battery Charger Bulldog Clips. 6d. each. 01 mfd., 1,000 v., 1 mfd., 350 v., 9d. each. .0005 mfd., single gang, 2/6 each. EF50 Type Pre-amplifier, can be tuned, 4/11 each. P.K. Self Tapping Screws, 3 1/2d. doz. Rubber Grommets, Mixed, 6d. doz. 465 kc/s IF Transformers, 6/9 pair. Local Valve Holders. Paxolin, 3/6 doz. 5-pin British Amphenol Type V/Holders, 7d. each. Condenser Clips, all sizes, 3/- doz. 2 Ratio Output Transformers, 1/11 each. Moulded Mica, .0001, .0002, .001 etc., etc., 4/4d. each. Vibrators, 4 pin U.X. type, 6 v. and 12 v., 6/6 each. Ex. Equipment Volume Controls. Black moulded cases, 10 KΩ, 20 KΩ, 25 KΩ, 100 KΩ, 1/2 meg., 1 meg., 1/- each. 1 mm. Sleeving, bright colours, 1d. yard. 4 mm. Sleeving, black only, 4d. yard.

TERMS: Cash with order or C.O.D. Please note minimum C.O.D. fee 2/3.

MAIL ORDER ONLY

Postage. Please add 6d. to 10/-, 1/- to 20/-, 1/6 to 40/- for all orders unless otherwise stated.

ALPHA RADIO SUPPLY CO.

5/6 Vince's Chambers, Victoria Square, LEEDS 1

**THE
BRITISH NATIONAL
RADIO SCHOOL**
ESTD. 1940

NOW IN OUR THIRTEENTH
YEAR AND STILL

**NO B.N.R.S. STUDENT
HAS EVER FAILED**

to pass his examination(s) after completing our appropriate study course.

NOW is THE TIME TO PLAN your AUTUMN STUDIES PROGRAMME

**A.M.Brit.I.R.E. and
CITY and GUILDS Radio and
Telecommunications Exams, etc., etc.**

Please mention this advert. and send for free booklet to:—

**STUDIES DIRECTOR
BRITISH NATIONAL RADIO SCHOOL
66, ADDISCOMBE ROAD, CROYDON**
Phone: Addiscombe 3341

**TRANSFORMERS & COILS
TO SPECIFICATION
MANUFACTURED OR REWOUND**
Filter Coils ± 1% a Speciality.
JOHN FACTOR LTD.
9-11 EAST STREET, TORQUAY, DEVON
Phone: Torquay 2162

**TAPE RECORDERS
&
P.A. EQUIPMENT**

MODEL D/8 PORTABLE RECORDER.
£65. 8 v. twin channel play-record amplifier with 8in. speaker. Truvox Tape Desk. 10-watts Hi-Fi P.P. output. Complete leathercloth covered recorder as supplied to schools, hospitals, etc.

RECORDING AMPLIFIERS (Chassis).
TR/Dual 8, 8 v. 10 w. duo channel £24 0 0
TR/DT, 6 v. 12 w. chassis £18 10 0
TR/4, 4 v. Domestic/office £12 12 0

CONCERT AMPLIFIERS (Port. cased)
AC/15, Mic. and gram., 15 watts... £14 14 0
AC/18 Hi-Fi, incorp. tone amp. ... £17 17 0

GRAMOPHONE CHASSIS
AC/253 Super-linear, 8 watts £16 16 0
With tone var. amplifier.

For Audio Equipment of every description, write for brochures (3d.).
Trade and Export Discounts upon application.

MODERN SOUND EQUIPMENTS
16 Pattison Road, London, S.E.18.
Woolwich 0387.

SITUATIONS VACANT

TECHNICAL assistants required for vibration and shock investigations on guided missiles, previous experience unnecessary, a working knowledge of electrical records together with education to O.N.C. or equivalent standard; varied and interesting work with good prospects.—Write, stating age, qualifications and experience, to Dept. C.P.S., English Electric Company, Ltd., 336-7, Strand, W.C.2, quoting reference 1106A. [1475]

TEST engineers are required to assist in the production of a variety of precision electronic laboratory instruments; previous test department experience essential (preferably in connection with electronic measuring instruments); salaries in the range of £440-£520 p.a. according to qualifications and experience. Apply stating full details to the Chief Engineer, Furzelli Laboratories, Ltd., Boreham Wood, Herts. [0244]

SENIOR and junior engineers required for responsible work in radio and television laboratories; applicants for senior position should be able to undertake development work with minimum supervision; excellent conditions and salary available for applicants who are accepted.—Apply in first case to Personnel Manager (Dept. R.D.), McMichael Radio, Ltd., Wexham Rd., Slough. Applicants must be of British Nationality. [1527]

THE ENGLISH ELECTRIC Co., Ltd., Luton, have a vacancy for a designer of low power (up to 1 k.w.), low frequency transformers and chokes; previous experience very desirable and applicant should be thoroughly familiar with winding and impregnation processes; varied interesting work involving development of a number of designs for small quantities.—Apply, quoting Ref. No. 1137, to Dept. C.P.S., 336/7, Strand, W.C.2 [1444]

PHYSICIST required in the North West for the development of Capacitors for use in Telecommunication equipments, including silvered mica and paper and plastic dielectric types. The posts available are permanent, on full staff status, with contributory Pension Fund, etc. Please write giving full details of qualifications and experience and approximate salary required to Box 260, Dorland Advertising, Ltd., 18-20, Regent St., London, S.W.1. [1512]

MUIRHEAD & Co., Ltd., Precision Electrical Instrument Makers, Beckenham, Kent, require a technical writer to assist in the preparation of technical publications and operating instructions for electrical and electronic measuring instruments, picture telegraph apparatus and Magslips; degree or H.N.C.; some design experience preferable; writing experience essential.—Apply, giving full particulars of age, experience and salary required, to the Personnel Manager. [1545]

ELECTRICAL engineer or physicist, preferably with experience in high frequency measurements required for industrial laboratory in West Midlands dealing with insulation and dielectrics; candidates should have a university degree or equivalent, and be between 24 and 30 years of age; the post is a permanent and pensionable one and carries a maximum salary of £1,100 in the case of a well-qualified and experienced applicant.—Write to Assistant Staff Manager, Box 8174. [1463]

ELECTRONIC engineer, aged 25-30, with Ordinary National Certificate or equivalent required by The Morgan Crucible Co., Ltd., in its instruments laboratory; preference will be given to applicants possessing a wide industrial experience; position is permanent and pensionable; staff canteen on premises with all welfare and recreational facilities, five-day week.—Write, giving details of age, experience, qualifications and salary required, to the Staff Manager, Battersea Church Rd., S.W.11. [1483]

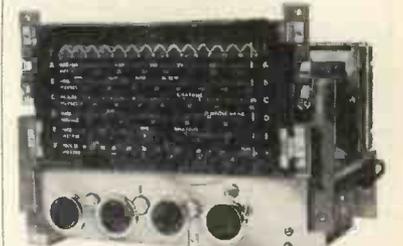
BELLING & LEE, Ltd., Cambridge Arterial Rd., Enfield, Middlesex, require research assistants in connection with work on electronic components, fuses, interference suppressors and television aerials; applicants must be graduates of the I.E.E. or possess equivalent qualifications, together with similar laboratory experience; salary will be commensurate with previous experience; 5-day week; contributory pension scheme. Applications must be detailed and concise, and will be treated as confidential. 10230

DEVELOPMENT engineers with either radio or communication engineering degrees and some practical experience are required for work on oscillographs and associated amplifiers at our new research laboratories; applicants should have good mathematical ability.—Write, giving full details of qualifications and experience, stating range of salary required, to Southern Instruments, Ltd., Oscillograph Division, Fernhill, Hawley, Camberley, Surrey. [1504]

B.B.C. requires technical assistants for career in Operations and Maintenance Department, sound and television broadcasting; knowledge mathematics, electricity, magnetism to G.C.E. Ordinary Level; experience electrical/radio engineering advantage; preferred age 20-25, older if experienced; must be willing to serve anywhere in U.K.; starting salary £350 with annual increments and excellent prospects of promotion to engineer grade with good technical training facilities; possibility promotion after 2 years.—Apply briefly stating (1) Reference "T.A.II." (2) full name, (3) address, (4) nationality, (5) age, (6) details of National Service or exemption (if under 26), (7) qualifications, (8) relevant experience, to E.E.O. B.B.C., London, W.1. [1486]

**DIRECT FROM THE
MANUFACTURER**

Dulci Radio/Radiogram Chassis
A/C 100-120 & 200-250 VOLTS.
All chassis 1 1/4 in. x 7 in. x 8 1/4 in. high. Latest type valves 6BE6, 6BA6, 6AT6, 6BW6, 6X4 Flywheel tuning. Negative feedback over entire audio section. Engraved knobs.



FULLY GUARANTEED

Model B3, Long, Med., Short (5 Valves)	£12 . 12 . 0
B3 Plus Push Pull Stage (6 Valves)	£15 . 15 . 0
B3 Double Feature P/Pull & RF Stage (7 Valves)	£18 . 18 . 0
Model B6 Six Wavebands Med. L, 4 Short (8d-Spread)	£15 . 15 . 0
B6 Plus Push Pull Stage (6 Valves)	£18 . 18 . 0
B6 Double Feature P/Pull & RF Stage (7 Valves)	£23 . 2 . 0

ALL PRICES TAX PAID
Escutcheon for 9in. x 5in. dial, 4/9 extra. Matching speakers P.M. type 3 ohms 8in. or 10in. available. Chassis sent with money back guarantee conditions against remittance. Free particulars from the Manufacturers.

THE DULCI CO. LTD.
97 VILLIERS ROAD, LONDON, N.W.2
Telephone: Willesden 7778

TESTOSCOPE Mains Tester

For high and low voltage testing:—
1/30 and 100/850 volts A.O. or D.O. Write for interesting leaflet 30F.

RUNBAKEN · MANCHESTER I

**Always a good deal at
WEST END RADIO LTD.**

COMMUNICATION RECEIVERS. The famous Marconi CR 100/2 ex-Navy receiver, 11 valves, crystal control, built-in power pack, 200-250 v. A.C. Mains, 6 W/bands, etc., etc. As new, complete with circuit, and fully guaranteed, £29/10/-, carr. £1.

The R.C.A. AR77E, ex-U.S. Army, 10 valves, crystal control, 6 bands. BFO, NFB, AVC, "S" Meter. Noise suppressor, built-in power pack, 110-250 v. A.C., fully reconditioned and guaranteed, £37/10/-, carr. £1.

EDISWAN CHARGING METERS, 0-6 a. Scaled, "OFF-CHARGING-MAX", 7/6. Post 1/-.

RI132 RECEIVERS. 10 valves. 100-127 Mc/s. coverage. As new, 59/6, circuit free, carr. 15/-.

BATTERY CHARGER KITS to give 12 v. 4 a. and 6 v. 4 a. Consisting of: Trans., Selenium Rec., pilot lamp, and switch, in handsome metal cabinet finished black crackle. 8in. x 6in. x 6in. Complete, 59/6, carr. 5/-.

EX-ARMY MINE DETECTORS. Complete with 2 search coils, 1 under-water type, amplifiers, spares kit, etc., etc., complete in transit case, £6/15/-, carriage 15/-.

WEST END RADIO LTD.
Established 25 years
14, LISLE STREET, LEICESTER SQUARE
LONDON, W.C.2. Tel. GER 7341
OPEN ALL DAY SATURDAY
1,000 BARGAINS FOR CALLERS!

TELE-RADIO (1943) LIMITED

BRAND NEW GUARANTEED METAL RECTIFIERS

Volts	Amps.			
12	0.6	F/Bridge	...	5 6
12	1	"	...	6 6
12	1.5	"	...	8 9
12	3	"	...	12 6
12	4	"	...	15 0
12	6	"	...	18 6
12	10	"	...	£1 15 0
6	1	"	...	6 6
6	2	"	...	8 9
6	3	"	...	10 6

Discounts in relation to the above
12—5%, 25—10%, 50—20%.

Metal Rectifiers can be built to your requirements. Enquiries invited.

RM1-125v.	60mA	H/wave		5 3
RM2-125v.	80mA	"		5 9
RM3-125v.	100mA	"		7 0
RM4-250v.	250mA	"	£1	1 0
K3/25	1mA	"		5 8
K3/40	1mA	"		7 6
K3/45	1mA	"		8 2
K3/50	1mA	"		8 8
K3/100	1mA	"		14 8
K3/160	1mA	"	£1	1 6
36EHT35	2mA	"		19 1
36EHT40	2mA	"	£1	1 6
280v.	80mA	"		10 6
T15D133	} Bridge 12 v. 100 mA.			5 4
T15D970				

TRANSFORMERS.

Ellison CT109—				
4v. to charge at 2 v.				
9v. to charge at 6v.				
18 v. to charge at 12v.				
at 2 amps. ...			£1	1 0

Ellison T68—				
6.3v., 4v. at 4 amps. ...				19 6

Ellison SP70—				
12v. tapped at 6.3v. at 3 amps. ...			£1	1 0

Douglas LT Transformer—				
3v., 4v., 5v., 6v., 8v., 9v., 10v., 12v., 15v., 18v.				
20v., 24v., 30v. at 2 amp.			£1	2 6

Ellison FT51—				
6.3v. 1.5 amp. ...				9 0
6.3v. 3 amp. ...				10 6

189 Edgware Rd., London, W.2
 *Phone: PAD. 445/6
 Shop Hours: Mon.-Sat. 9 a.m.-6 p.m.
 Thursday, 9 a.m.-1 p.m.

SITUATIONS VACANT
BELLING & LEE, Ltd. wish to appoint a working chief for their type-test laboratories; these are fully equipped for testing electronic components to R.I.C. and R.C.S.G. specifications, and the applicant must have had experience in this field; this is a permanent position with wide scope for the right man; salary will be in accordance with experience and qualifications, details of which will be treated confidentially; contributory pension scheme.—Secretary, Cambridge Arterial Rd., Enfield, Middlesex. [0231]

RADIO (Meteorological) Mechanics required by meteorological office; qualifications: basic knowledge of radio and experience in maintenance/operation of radar equipment including oscilloscopes; successful applicants serve in U.K. and overseas; commencing London wage £7/17/6 at age 25 or over, rising annually to £9/10/6; deduction of 5/- for each year below 25; overtime, night duty allowances, etc.; promotion prospects.—Apply to Borough Employment Exchange (Dept. W.W.3), 236, Walworth Rd., London, S.E.17. [1518]

A JUNIOR draughtsman is required by the Research Laboratories of The General Electric Co., Ltd., North Wembley, Middx., for work on electronic apparatus design; applicants should have had some practical experience in the layout of electronic equipment; salary should be between 20 and 22 years of age, up to ordinary national certificate standard and must have completed National Service.—Apply in writing to the Staff Manager (Ref. RLO/261/W), giving full details of age, qualifications and experience. [1454]

ELECTRICAL inspectors and testers required for work on important radio and radiotelephone equipment; men 21/45 years of age who are radio amateurs, or have radio inspection experience, or those who have received training in radar in Her Majesty's Forces during recent service will be considered; minimum commencing wage £7/13/6 per 40-hour 5-day week (starting hour 7.15 a.m.).—Apply personally after 9 a.m. or by letter to Personnel Dept., Standard Telephones & Cables, Ltd., North Woolwich, E.16. [1500]

THE GENERAL ELECTRIC CO., LTD. Brown's Lane, Coventry, requires Senior and Junior Electronic Development Engineers for work on Guided Weapons and like projects, particularly in the field of Microwave and Pulsed Applications; Mechanical Development Engineers, Designer Draughtsmen and Draughtsmen, preferably with experience of radar type equipments, also required for the above projects; salary according to age, qualifications and experience; houses available to selected senior staff.—Apply by letter stating age and experience to the Personnel Manager (Ref. R.G.). [0259]

RADAR Systems Engineers.—Decca Radar, Ltd. have a number of senior and junior posts available for radar systems engineers in their Tolworth Laboratories; Candidates must be willing to travel when required and be of British Nationality; Preference will be given to candidates who have H.N.C. or equivalent and who have had experience on the field trials and maintenance of radar equipments; the chances of rapid advancement are good.—Apply Ref. CPH/B, Decca Radar, Ltd., Research Laboratories, 2, Tolworth Rise, Surbiton, Surrey. [0248]

B.B.C. requires limited number of engineers (minimum age 21) of British nationality for operation and maintenance duties at transmitter, studio, recording and television centres; must be willing to serve anywhere in U.K.; essential qualifications: University degree, Higher National Cert. or equivalent in Electrical Engineering, Grad. Brit. I.R.E. (with maths.), or C & G. Final Cert. in Telecommunications; promotion prospects; salary £500 with annual increments to max. £685.—Applications to Engineering Establishment Officer, B.B.C., London, W.1. [1442]

DEVELOPMENT engineer, aged 24/35 required by organisation in Lancashire for laboratory work in connection with quartz and synthetic crystal design and manufacture; applicants should have a degree in physics or electrical engineering, or Higher National Certificate, or equivalent; previous industrial experience and knowledge of high frequency radio circuit technique will also be an advantage; the post available is permanent, with contributory pension fund and full staff status; applicants are invited to write giving full details of qualifications, age and experience, to—Box No. 248, Dorland Advertising, Ltd., 18/20, Regent St., London, S.W.1. [1494]

SKILLED radio and television service engineers who would welcome wider interests and more favourable prospects are invited to apply to a group of companies situated in the Eastern suburbs of London; the diversified nature of Service and Government contracts, together with the manufacture of a wide variety of civil and domestic products, undertaken by the Group provide unparalleled opportunities for advancement to men of first-class ability in work of national importance; conditions are good and average earnings high in a modern factory where adequate canteen and sports and social club facilities are provided; sympathetic consideration will be given to existing holiday arrangements; Saturday morning interviews by appointment. Please write, enclosing full details of past experience, and quoting reference WW/687 to Box 7937. [1461]

Regarding this question of LP

MANY THOUSANDS have already extended their record reproducers to include the revolutionary Microgroove Records, and many thousands more will feel the need to do so now that H.M.V. also have entered the LP field. To these people we wish to point out that there is more in Long Playing Reproduction than meets the eye... There is plenty of scope for buying unsuitable equipment which does not match your existing equipment. We beseech you, therefore, to avail yourself of our Free Technical Guidance Service before spending good money on AMPLIFIERS, RADIO FEEDER UNITS, GRAM UNITS, AUTO-CHANGERS, BASS REFLEX CABINETS, SPEAKERS, etc. It will cost you nothing and will undoubtedly save you time, trouble and money. Our chief engineer is available to callers from 11 a.m. to 6 p.m. daily including Saturdays. If you cannot call let us have your enquiries by post—they will receive immediate attention.

A word in the ears of those who have been used to fibre needles: All the single-record Gram Units and Auto-changers recommended and supplied by us can be supplied with pickup head to take standard or miniature thorns for 78 r.p.m. if preferred.

N.R.S. "SYMPHONY" AMPLIFIERS, fitted with the patent "three-channel system" giving independent control of Bass, Middle and Top, thus affording the maximum possible control of tone and compensation for recording deficiencies. Especially essential when mixing the playing of old and new 78's with the new LP records. Scratch control and negative feedback also incorporated. Woden transformers. 5-watt model only 10 gu. 10-watt model (push-pull triodes), 15 gu. Carr. 5/-. When ordering state output impedance required if known.

"SYMPHONY" BASS REFLEX CABINET KITS, 30in. high, consist of fully-cut 1/2-in.-thick, heavy, inert, non-resonant patent acoustic board, deflector plate, felt, all screws, etc., and full instructions. 8-in. speaker model, 85/-; 10-in. speaker model, 97/6; 12-in. speaker model, £27/7/6. The design is the final result of extensive research in our own laboratory and is your safeguard of optimum acoustic results. Carriage 7/6. Ready built, 7/6 extra.

DECCA 3-SPEED GRAM UNIT, incorporating selected motor and turntable cushion-mounted on brown unit plate with XMS pickup arm to take latest 3-pin plug-in pickup heads. Units supplied with springs for floating plate on wooden motor-board. Our special offer: £7/10/- or complete with two Decca XMS Heads, £12/15/-, or with Acos GP19 and GP19LP, £11/10/- Post and packing 2/6.

GARRARD 3-SPEED GRAM UNITS, Model TA for A.C. In stock at long last. Complete with plug-in turnover Magnetic or Astatic Crystal Pickup Head £10/5/-, post paid.

GARRARD 3-SPEED AUTO-CHANGERS, Model RC80. We consider ourselves very fortunate to be able to offer this finest of all auto-changers, fitted with special pickup arm to take either turnover type Pickup Head or two separate Decca or Acos P.U. Heads. Interchangeable on motorboard with previous models. Finished in attractive beige hammer-finished enamel. Plays up to ten records 7in., 10in., or 12in. at 78, 45 and 33 1/3 r.p.m. Stylus pressure 10 grammes (adjustable). New ultra-sensitive auto-trip mechanism and heavy loaded turntable to eliminate "wow". Price £14/2/6 or with Garrard Magnetic or Astatic crystal Turnover Pickup Head £16/2/6. With two separate Decca XMS Heads, £19/7/6. Carriage 5/-. Optional Extras: 45 r.p.m. Auto Centre Spindle, 20/9; A.C./D.C. Operation, £7/14/-. Fitting in de Luxe rexine-covered Portable Cabinet, £5. Pickup Head to take Fibre Needles, 25/- to 35/-.

COMPLETE RECORD PLAYERS, single-record and auto-change. Send for catalogue giving details of our single-record and auto-changing models at bargain prices combined with technical excellence.

NORTHERN RADIO SERVICES

16 KINGS COLLEGE RD., ADELAIDE RD., LONDON, N.W.3. Phone: PRImrose 8314
 Tubes: Swiss Cottage and Chalk Farm.
 Buses: 2, 13, 113, 31, 187

"AUTOMAT" HOME CHARGERS, CHARGER KITS, SELENIUM H.T. & L.T. RECTIFIERS

New Goods with Full Guarantee
Our selenium rectifiers are new, non reconstructed Gov't. surplus material.



"AUTOMAT" HEAVY DUTY HOME CHARGER, weight 8 lbs., virtually unbreakable, for your car battery or radio cells, selenium rectification, 12 months' genuine guarantee, foolproof operation, damp-proof, std. model for A.C. 220/250, 6 v./12 v. output 2 amp. 59/6, p. & p. 2s. 12 v. 3 amp. 72/-; 6 v./12 v. 5 amp. 115/-, 24 v. 5 amp. £1.

FOOLPROOF CHARGER KITS. Really trouble free and reliable with full data sheet and circuit, standard kit 12 v. 2 amp. selenium rectifier, 45 watt impregnated transformer, ballast bulb for 2 v., 6 v., 12 v. charger, 38/6, post 1/8, or with handsome steel case, 52/-, post 2/-, senior model 12/14 v. 3 amp. Westalite rect., 65 watt trans., ballast bulb for 2 v., 6 v., 12 v., 46/-, post 1/10, or with our latest design steel case, 58/6, post 5/-, also 12 v. 4 amp. rect., 75 watt trans., ballast bulb for 6 v./12 v. charger, 55/-, ditto but 5 amp. S.T.C. rect. and 85 watt trans., with ballast bulb, 75/-, minor kit 6 v./12 v. 1 amp. rect., trans., case, ballast bulb, 42/-, post 1/10.

HEAVY DUTY ELIMINATOR KIT. Large trans., selenium h.t. and L.T. trickle charge recta., electrolytic 12 plus 12, handsome steel case, for 120 v. 20/30 mA. eliminator with 4 amp. trickle charge, for 150 v. no extra, 37/6, post 1/6, or less case, 32/-.

SELENIUM RECTIFIERS. Many 18 mm., 25 mm. and 35 mm. rectifiers various voltages, bridge, h.v. and c.t. types, H.T. and L.T., new stock, not surplus, 2 v./6 v. 4 amp. h. wave, 4/10; 12 v. 1 a.h. wave, 6/-, post 6d.; full wave 6 v. 2 amp., 9/-; 24 v. 0.3 amp., 9/8; 12 v. 2.5 amp., 15/8; 12/15 v. 3 a. to 3.4 a., 16/6, all post 8d.; 6 v. 4 amp., 16/8; 24 v. 1.5 a., 15/-; 12 v. 5 amp., 27/8; 24 v. 5 amp., 54/-; large lined type, 12 v. 6 amp., 33/-; all post 11d. H.T. recta., small space selenium, all new, 260 v. 60 mA., 7/6, post 5d.; 250 v. 120 mA. bridge, 14/6, post 8d.; 250 v. 200 mA. bridge, 24/-; ditto 300 mA., 34/6. Elin. rect. 135 v. 50 mA., 6/6, post 6d.

CHAMPION PRODUCTS
43 Uplands Way, LONDON, N.21 Phone LAB 4457

"CALLBOY"
CARRIES YOUR VOICE
COMPLETE INTER-COM. SYSTEM. FACTORY STORES, ETC.
EASCO ELECTRICAL LTD.
418 BRINGTON TERRACE LONDON, S.W.9
Telephone - - - BRISTON 4961-2-3

HIGH FIDELITY FREQUENCY MODULATION

Enjoy the crystal clarity of FM transmissions up to 50 miles from the Wrotham Kent transmitter. Together with the absence of background noise and great power contrast FM offers the ultimate in contemporary speaker music. We make the latest design in receivers and by utilising clever techniques and new components, a high sensitivity with remarkable fidelity is produced. The design is by Messrs. Amos & Johnstone, as published in the "Wireless World."

Audio Output—2 pin socket—2/10V. Input—coaxial socket—from 5ft. horiz. dipole.

Power Requirements—6.3V. and 220V. 28MA.

Price £11/17/6
Trade enquiries invited.
Demonstrations: 3-4.30 p.m. daily, except Fridays.
BEL SOUND PRODUCTS CO.
Marlborough Yard, Archway, London, N.19
A.R.5078 Nr. Archway (Northern Line) Underground.

SITUATIONS VACANT

DECCA RADAR, Ltd., invites applications from young engineers who are interested in radar as a career and who have taken or are engaged in taking their H.N.C.; the posts available offer opportunities for undertaking intensive development work over a wide field of radar, microwave link, and associated techniques; the chances of rapid advancement are good for men of ability. British Nationality essential; suitable candidates with no radar experience may be accepted for training.—Apply, Ref. CPN/A, Decca Radar, Ltd., Research Laboratories, 2, Tolworth Rise, Surbiton, Surrey. [0247]

ELECTRONIC assistant required for university laboratory in Cambridge, duties will consist mainly of the assembly of components on to chassis and the subsequent wiring and testing of circuits, and preference will be given to applicants also able to make effective use of hand and machine tools in the construction of the mechanical parts of research apparatus designed in the laboratory, initial salary will depend upon experience, qualifications and age but will probably lie between £260 and £310 p.a.; applications, mentioning age and giving a brief description of previous experience and qualifications, should be sent to The Secretary, Research Laboratory for the Physics and Chemistry of Superconductivity, Department of Physical Chemistry, Free School Lane, Cambridge. [1459]

B.E.C. requires qualified radio engineer (engineering degree preferred) as standards engineer in Equipment Department based S.W. London; duties: to assist in standardisation of electrical components and mechanical parts in broadcasting equipment; liaison with departments concerned with design, production, supply; maintaining record of standard components and parts; qualifications: considerable experience of design and production sound and television studio control room equipment and manufacture of Services equipment; intimate and wide knowledge of products of manufacturers of electrical components; salary £795 (higher if qualifications exceptional) with annual increments to £1,065.—Detailed applications to B.E.C.O., B.E.C., London, W.1. quoting ref. E.798. [1466]

VACANCIES are available in the transmission department for: (1) development engineers, experienced in the design of multi-channel carrier telephone systems, or in allied techniques, including amplifiers, filters and radio; (2) equipment engineers, with such knowledge of modern line communication practice as will enable them, after training in the company's methods, to prepare detailed specifications of equipment requirements and to develop arrangements for rack-mounting of the apparatus; (3) draughtsmen to work with the engineers, preferably having experience in the tele-communications industry; the positions available are permanent, on full established staff status, with contributory pension fund and usual staff conditions.—Please write to Personnel Manager, Automatic Telephone & Electric Co., Ltd., Liverpool, 7, giving full details of experience, qualifications and approximate salary sought. [1359]

ADMIRALTY, Royal Naval Scientific Service.—Engineers and Physicists (particularly with electronics) required for appointments in (a) senior scientific officer and scientific officer grades (Ref. A246/52A) and (b) experimental officer and assistant experimental officer grades (Ref. A247/52A) in experimental establishments in London, Portsmouth, Westmouth areas and Scotland. Candidates, British subjects, for (a) must possess first or second-class honours degree in physics or engineering, or high professional attainments such as corporate membership of appropriate professional institution with suitable experience and responsibility and for (b) should possess one of following qualifications: University degree in science, engineering or mathematics, graduate membership of appropriate professional institution, higher national certificate, final certificate of five-year grouped course in relevant subject at City and Guilds of London Institute or comparable institution, higher school certificate with mathematics, or science as principal subject or equivalent qualification. S.S.O.s at least 26 years of age with at least three years' approved experience, London salary (men), £812-£1,022 per annum; S.O.s at least 21 years' age; O.s at least 18 years, 26 years, £681-£838; A.E.O.s at least 17½ years, £274-£607. Rates for women and posts in Provinces somewhat lower. Starting salaries above minima may be granted according to age and experience. All appointments unrestricted (with P.S.U. and S.G.) but with some opportunities to compete for established posts.—Application forms from M.L.N.S., Technical and Scientific Register (K), Almack House, 26, King St., London, S.W.1. quoting appropriate reference. [1450]

SITUATIONS WANTED
QUALIFIED engineer, complete charge radio/television workshop, desires change; present type position or other electronic fields; present salary £600; married; accommodation essential.—Box 8282. [1543]

AGENTS WANTED
MEDIUM-SIZE radio and television manufacturing concern in the North of Eng. and requires additional representation in all areas of the British Isles; enquiries will be appreciated from all interested representatives who are in need of additional lines.—Reply Box 7793. [1448]

LONDON CENTRAL RADIO STORES

GROOVE LOCATING UNITS enabling operator to preselect any point on 10, 12 or 16in. discs for playback purposes. Consists of substantial machined casting with adjustable counterpoise pickup arm fitted with high-fidelity pickup, and instantaneous calibrated groove selector with micrometer adjustment and "velvet touch" lever for dropping pickup. £2/10/-, carr. paid.

SELENIUM FULL-WAVE RECTIFIERS. 80 v. 20a. Approx. 11 x 6 x 6in. Weight 14lb. 80/-.

ELECTRO MAGNETIC COUNTERS. EX-G.P.O., every one perfect, electro-magnetic, 500 ohm coil, counting to 9,999, operated from 25 v.-50 v. D.C., 4¼in. long x 1½ x 1in., many industrial & domestic uses, 15/- P. & P. 9d.

VIBRATORS, 2-volt. Type R76C, 7-pin self-rectifying. Output 200 v. at 60 mA., 7/6, P. & P. 9d.

UNISELECTOR SWITCHES. Have many applications, including automatic tuning circuit selection, etc. Operates on 25-50 v.

Full Wipers, 3-bank, 19/6. 6-bank, 35/-.
Half Wipers, 6-bank, 27/6. Plus 1/6 P. & P. N.B.—We do not issue lists or catalogues. Carriage charges relate to British Isles only

23 LISLE ST. (GERARD 2969) LONDON, W.C.2
Closed Thursday 1 p.m. Open all day Saturday.

MORLEY TRANSFORMERS

QUALITY P.P.O/P TRANS. 20 w. super Silicon lams. Sectionalised low leakage windings, prim. ind. 70H. leakage ind. 0.05H. Secondary Imp. 3 and 15 ohms. Primary Imp. to individual requirements. Fully shrouded and terminated, 3 gns. Ditto 15 w., 24 gns. L.F. CHOKES. 10H. 65 mA., 4/6. 10K. 100 mA., 10/6. 20H. 150 mA., 12/6. 5H. 250 mA., 15/-.

MAINS TRANS. 0-300/250 v. tapped prim. 350-0-350v. 80 mA., 5 v. 2 a., 6.3 v. 4 a., ditto 300 v., ditto 250 v., 21/-. Quotations for specials and rewinds by return. Part post and packing 1/- extra, please.

2, PAWSONS RD., W. CROYDON, THO 1665

ENGINEERS!

Whatever your age or experience, you must read "ENGINEERING OPPORTUNITIES." Full details of the easiest way to pass A.M.I.Mech.E., A.M.I.E.E.C. & G. (Electrical, etc.), General Cert., etc. on **144 PAGES** "NO PASS—NO FEE" terms and details of Courses in all branches of Engineering—Mechanical, Electrical, Civil, Auto., Aero., Radio, etc., Building etc. If you're earning less than £15 a week, tell us what interests you and write for your copy of "ENGINEERING OPPORTUNITIES" today—FREE

B.I.E.T.
387 Shakespeare Hse., 17-19 Stratford Place, London, W.1.
BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

FRAME TRANSFORMER. Ratio 10 to 1. Matches Allen or Denco wide angle Defl. Coils. Size 3in. x 3in. Price 10/- P. & P. 1/-.

MAINS TRANSFORMER. In 200-230-250, out 350-0-350. 6.3 V. 3 A. 80 MA. Half shrouded, 12/6. P. & P. 1/-.

FIL. TRANSFORMERS. In 110-220-240 V. out 6.3 V. 3 A., 12/- P. & P. 1/-.

B7G POLYSTYRENE BASE with Can. Set of 4/6. P. & P. 6d.

T.V. INDOOR AERIALS. Complete with Balance Twin Feeder, 5 yds. Co-Axial Lead-in at Bargain Price of 16/-. P. & P. 1/6. 1-5-10-20-50 K. W.W. POTS. Long Spindle. 3/6. P. & P. 6d.

CABLE AND WIRE STRIPPER. A handy Tool for Home and Workshop with three size Stripping Head. Adjustable Blade Bargain Price 5/-. P. & P. 6d.

VIEWMASTER AND TECKING PARTS in stock. Send for BARGAIN LIST.

JACKSON RADIO SUPPLIES
163, Edgware Rd., London, W.2.



HIGH-FIDELITY Amplifiers such as our own "N.S.P." models are naturally on their very best behaviour when the ancillaries... motor, pickup, speaker, etc. are of comparable excellence. We can confidently recommend the following—available by return post from our stocks of high-quality components:

CONNOISSEUR 3-speed Deck.....	£21 17 3
GOODMANS SPEAKERS	
Axiom 150 Mk. 2.....	£10 5 6
Axiom 60.....	£8 12 6
Axiom 101.....	£6 12 1
Axiom 102.....	£9 18 1
WHARFEDALE SPEAKERS	
W.12.CS.....	£9 15 0
Golden 10 C.S.B.....	£8 6 7
Super 5 and 8 CS/AL.....	£6 13 0
Bronze 10in.....	£4 12 9
Bronze 8in.....	£3 4 0
ACOS PICK-UPS	
G.P.20 (Std. or L.P.).....	£3 6 1
Spare heads for above.....	£2 0 0
G.P.30 L.P./Std.....	£3 6 1
DECCA	
XMS Magnetic.....	£6 9 5
B.S.R. PLAYERS	
3-spd. (Crystal T/O. hds.).....	£9 4 11
3-spd. (with 2 GP20 hds.).....	£10 8 8
3-spd. (with 2 Decca hds.).....	£12 17 8
3-spd. Auto-mixer.....	£16 10 3
GARRARD AUTOCHANGERS	
R.C.80, less Head.....	£15 3 3
R.C.75A, less Head.....	£13 10 0

HIGH-FIDELITY FEEDERS	
VARIABLE SELECTIVITY, 3-BAND,	£16/10/0
SUPERHET, L.M.S., £12/14/0	
S/H PRE-SET, 3-STATION, £8/4/0	
T.R.F. PRE-SET, 3-STATION, £7/0/9	
N.S.P. PRECISION SCRATCH FILTER, 59/6	
REMOTE CONTROL & PRE-AMP UNIT	
Voltage gain of 10. Independent bass and treble controls. LP correction and V/C with on/off switch. Ideal for W/W and Williamson amps. Completely enclosed. Size 1½ by 3¼ by 3in. £5/7/6.	

GARRARD AUTOCHANGERS	
R.C.80, less Head.....	£15 3 3
R.C.75A, less Head.....	£13 10 0

HIGH-FIDELITY FEEDERS
VARIABLE SELECTIVITY, 3-BAND, £16/10/0
SUPERHET, L.M.S., £12/14/0
S/H PRE-SET, 3-STATION, £8/4/0
T.R.F. PRE-SET, 3-STATION, £7/0/9
N.S.P. PRECISION SCRATCH FILTER, 59/6

REMOTE CONTROL & PRE-AMP UNIT
 Voltage gain of 10. Independent bass and treble controls. LP correction and V/C with on/off switch. Ideal for W/W and Williamson amps. Completely enclosed. Size 1½ by 3¼ by 3in. £5/7/6.

NUSOUND PRODUCTS LTD.
 (Dept. W8) 136 WARDOUR STREET,
 LONDON, W.1. Tel.: GERrard 8845
 Hours of business: 9 a.m.—5.30 p.m.
 Saturdays 9 a.m.—1 p.m.

AGENCIES WANTED
MARINE communications equipment; export merchants of first-class reputation and standing would like to act as overseas distributors for smaller firms making marine communications equipment which must be abreast of International Conventions specifications.—Box 8283. [1546]

BUSINESS FOR SALE AND WANTED
VILLAGE near Faversham, Kent; old-established radio and television business for sale; high monopoly value; £3,200 freehold. NEVE & SON, Agents, 45, High St., Maidstone, 51833. [1492]

NEW factory near completion, one floor 5,000 sq ft, toilet and other solid foundation, concrete floor, gas, electricity, water; office; asbestos and glass roof; ideal factory or warehouse; Blackpool.—Box 8141. [1491]

CAPACITY AVAILABLE
A.I.D. approved British subsidiary of well-known American organisation engaged in the whole field of electronics, has capacity available for production, assembly and wiring of electro-mechanical or electronic equipment; highest standards of workmanship and finish.—Box 8118. [1488]

PAINTS, CELLULOSE, ETC.
PAINT spraying handbook 3/6, post free, cellulose and synthetic paints and all spraying requisites supplied; catalogue free.—Leonard Brooks, 55, Harold Wood, Romford. [0207]

TECHNICAL TRAINING
CITY & Guilds (Electrical, etc.) on "no pass no fee" terms; over 95% successes; for full details of modern courses in all branches of electrical technology send for our 144-page handbook—free and post free.—B.I.E.T. (Dept. 388A), 17, Stratford Place, London, W.1. [0117]

INDUSTRY needs trained men; send for free brochure giving details of our Home Study Courses in radio, television and all branches of electronics; we prepare students for the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations; the college backed by Britain's largest electronic industry.—Write to E.M.I. Institutes, Postal Division, Dept. WW33, 43, Grove Park Rd., London, W.4 (Associated with H.M.V.). [0179]

TUITION
NOTHING succeeds like success! What we have done a thousand times we can do again for you—see the B.N.R.S. advt. page 112. [0172]

WIRELESS operating; attendance and postal courses.—Stamp for reply to Manager, The Wireless School, Manor Gdns., London, N.7. [5901]

FULL-TIME courses for P.M.G. Certs. C.G.L.I. Telecommunications, Radar Maintenance Cert. and B.Sc. (Eng.); prospectus free.—Technical College, Hull. [0111]

SEE the world.—Radio officers urgently required; we train most in shortest period; training fees payable after appointment secured; scholarships available; boarders accepted; 2d stamp for prospectus from Britain's leading college.—Wireless College, Colwyn Bay. [0018]

A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, etc. on "no pass—no fee" terms; over 95% successes; for details of exams and courses in all branches of engineering, building, etc., write for 144-page handbook—free.—B.I.E.T. (Dept. 387B), 17, Stratford Place, W.1. [0111]

WIRELESS Telegraphy.—Merchant Navy offers to youths 15½ upwards when qualified, lucrative positions as radio officers.—Apply British School of Telegraphy, Ltd., 179, Clapham Rd., London, S.W.9. Also post courses in theory of wireless for P.M.G. Certificates, and Amateur Transmitting Licence. [0124]

THE Institute of Practical Radio Engineers have available home study courses in every phase of radio and television engineering, specialising in the practical training of apprentices in the retail trade; enrolments limited, fees moderate.—The Syllabus of Instructional Text may be obtained post free from the Secretary, I.P.R.E., Fairfield House, 20, Fairfield Rd., Crouch End, London, N.8. [0088]

THERE is a great future for qualified radio, television and electronic engineers; this is your opportunity to train for a well-paid career; E.M.I. Institutes, who are associated with H.M.V., Marconi-Phone etc., offer a 3-year course in telecommunications engineering (inc. 1 year with E.M.I. factories) commencing August 24th; on successful completion, employment is assured.—Full details from E.M.I. Institutes, Dept. WW38, 10, Pembridge Square, London, W.2. [1398]

OPPORTUNITIES in radio and television servicing. Full-time theoretical and practical 1-year courses at E.M.I. Institutes in London. Job assured on successful completion. Next course commences August 24th. Early enrolment is advised. Free brochures giving details of these and other courses from E.M.I. Institutes, Dept. WW36, 10, Pembridge Square, London, W.2. Tel. Bayswater 5131-2. (Backed by H.M.V., Marconi-Phone, etc.) [1513]

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the hobby enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations. Train with the College operated by Britain's largest electronic organisation; moderate fees.—Write to E.M.I. Institutes, Postal Division, Dept. WW28, 43, Grove Park Rd., London, W.4. (Associated with H.M.V.). [0001]

EQUIPMENT FOR THE AMATEUR

During the past years we have made a special study of the requirements of the radio enthusiast in building receivers and other equipment under "Home Construction" conditions. To make a satisfactory job, the following are essential requirements:

- Sound, reliable circuits.
- Good practical designs.
- Clear, easily followed instructions and diagrams.
- Trouble-free quality components, easily fitted.
- Simple construction.
- Ease of adjustment.
- Professional finish.
- Minimum of tools.
- Economical to build.

With all these points in mind, we have produced a series of detailed constructional LEAFLETS, especially for the amateur. Based on thoroughly tried and tested circuits these leaflets (priced at 1/6 each, 2 for 2/6, 3 for 3/6, etc.), enable anyone with the minimum of radio experience to build first-class sets and equipment.

CONSTRUCTIONAL LEAFLETS NOW AVAILABLE HOW TO MAKE

- NO. EL1 SIGNAL GENERATOR (13 Pre-set frequencies)
- EL2 SIGNAL TRACER.
- EL3 S.V. SUPERHETS (two models, A.C. and A.C./D.C.).
- EL4 6 V. SUPERHETS (two models, A.C. and A.C./D.C.).
- EL5 FEEDER UNITS (two models, with and without R.F. stage).
- EL6 SMALL AMPLIFIERS.
- EL7 PUSH PULL QUALITY AMPLIFIER.
- EL8 T.R.F. RECEIVERS (two models).
- EL9 ECONOMY SUPERHET (1, 2 or 3 Wavebands, A.C. or A.C./D.C.).
- EL10 COIL PACKS (2 w/band and gram., 3 w/band, 3 w/band with R.F. and gram.).

We stock all components for building these designs and are producing new leaflets continually.

Stamp for profusely illustrated catalogue and list to:

SUPACOILS MAIL ORDER OFFICE,
 98, GREENWAY AVENUE, LONDON,
 E.17

YOUR METER DAMAGED?



Leading Electrical Instrument Repairers to the Industry

Contractors to The Ministry of Supply
 Repairs by skilled craftsmen of all makes and types of Voltmeters, Ammeters, Microammeters, Multirange Test meters, Electrical Thermometers, Recording Instruments, etc. Quick deliveries—for speedy estimate sent defective instruments by registered post to:—

L. GLASER & CO.
 Electrical Instrument Repairers
 96-100 ALDERSGATE STREET, E.C.1.
 (Tel.: MONarch 6822)

Radiospares
Quality Parts

THE SERVICE ENGINEER'S FIRST CHOICE

QUARTZ CRYSTAL UNITS



Type B7

The type B7 unit is mounted in the standard B7G valve envelope and is hermetically sealed and fully evacuated.

Available for the frequency ranges from 100 kc/s. to 500 kc/s. and from 3 Mc/s. to 16 Mc/s. Gold electrodes applied by cathodic sputtering give permanence of calibration. Normal adjustment accuracy 0.01% Max. adjustment accuracy 0.003%.

Early delivery can be given of most frequencies, and we will be pleased to quote for your specific requirements.

THE QUARTZ CRYSTAL Co. Ltd.
63-71 Kingston Road,
NEW MALDEN, SURREY

Telephone: MALDEN 0334 Cables, etc. QUARTZCO NEWMALDEN



In the early '20s Horn Type speakers came to be regarded as bad and designers concentrated on battle types, etc.

Mr. Voigt recognised their error and designed for horn loading.

Horn Loaded Voigt Units were selling by 1929.

Lately the return to hornloading has become general, but—

Voigt Designs Led the Way.

VOIGT PATENTS LTD., LONDON, S.E.26

COVENTRY RADIO

Component Specialists Since 1925

189, DUNSTABLE RD., LUTON

Telephone: LUTON 2677.

We have reprinted our

5 Valve Superhet Circuit No. 1.

Also our

4 Watt Amplifier Circuit No. 2.

Price: 1/- each. Plus postage 2d.

Our new comprehensive 50 page Catalogue. Price 6d.

COLLARO GRAM MOTORS. 230/115 A.C. mains. Single speed, new, including Turntable. 50/- each, post 2/- Bargain.

AMPLIFIERS. 1134 A. Less valves, contains transformers, multi-valve key switch, condensers, etc. In transit cases, new, 7/6 each, post 2/-.

PRESS BUTTON RADIO CONTROL UNIT. 6-way. Brand new, usual price 8/6, Our Price 2/6, post 7d. Dozen post free.

GRAM MOTORS by PLESSEY. THREE SPEED. New A.C. Shaded Pole, tappings for 200 to 250 volts, shaft has three diameters from three speeds from friction drive. Price 15/- each, post 1/- £7/10/- dozen, post 3/6. Reduction quantities.

THROAT MIKES. U.S.A. Ref. No. T-30-R, 2/6 each, post 3d. 18/- dozen, post free.

AERIAL COUPLING FOR NO. 11 SET. NEW. Contains 0-350 R.F. Milliammeter Tuning Dial all in neat metal container, 7/6 each, post 1/6. Reduction for quantity.

SPECIAL ATTENTION TO OVERSEAS CUSTOMERS. Send S.A.E. for list.

Callers welcomed at our new showrooms:

353, BEARWOOD ROAD, SMETHWICK.

L. C. NORTALL

16 Holly Road, Quinton, Birmingham, 32

Phone WOO 3168

WORK WANTED

METALWORK assembly and wiring of electronic equipment to aircraft standards. Box 8275. [1539]

TRANSDUCTORS and precise toroidal winding capacity.—Bel, Marlborough Yard, London, N.19. Arc. 5078. [0183]

ELECTRONIC eqpt. made to order, wiring. Ass'y. contractors, prototypes developed.—R.A.E. Mfg. Co., 377, High Rd., London, N.2. [0219]

ELECTRONIC sub-contracts and prototypes. Light assembly, wiring testing to specification, priority to Government work.—Enquiries to office, T-H Products, 92, Leathwaite Rd., S.W.11. Bat. 4889. [9729]

MANUFACTURERS.—As specialists in all types of sheet metal work for the radio and electrical trade we are able to quote you very keen prices for a high quality job.—Intensalite Sign & Fixture Co., Ltd., 89, Leopold St., Birmingham, 12. Tel. Vix. 0065. [9962]

SHERWOOD INSTRUMENTS Ltd., specialise in the manufacture of instrument cases, chassis, complete mechanical assemblies, capstan work to 3/4in dia., lathe and light press work; highest standards at competitive rates. A.I.D. approved; advisory service available.—Rosemont Rd., London, N.W.3. Tel. Hampstead 6655. [1530]

BOOKS, INSTRUCTIONS, ETC.

"W.W." Dec., 1951; good price paid.—Box 7781. [1445]

PROC. I.R.E. (U.S.A.), Jan., 1937 to April, 1948; offers for whole or part.—Box 8258. [1534]

BOOKLETS "How to Use Ex-Govt. Lenses, B and Prisms," Nos. 1 and 2. price 2/6 each; ex-Govt. optical lists free for s.a.e.—H. English, Rayleigh Rd., Hutton, Brentwood, Essex. [0181]

I.P.R.E. technical publications. 5,500 All-entment Peaks for Superheterodynes. 5/9. post free; data for constructing TV aerial strength meter. 7/6; sample copy "The Practical Radio Engineer," quarterly publication of the Institute 2/-; membership and examination data. 1/.—Sec., I.P.R.E., 20, Fairfield Rd., London, N.8. [0089]

SPECIAL offer: "Short Wave Wireless Communication," by Ladner & Stone, 4th edition 1946, published at 55/-, our price 11/6 post free; "Cathode Ray Oscillograph in Industry," 3rd edn. 1948, published at 18/-, our price 6/6 post free; "Radio Technology," by Weller, 2nd edn. 1946, published at 21/-, our price 7/6 post free; "Introduction to Theory and Design of Electric Wave Filters," by Scowen, 1945, published at 15/-, our price 5/6 post free.

THE Modern Book Co., 19-23, Praed St., London, W.2. [1537]

"MOTOR Cycle Sport in Pictures: Action Photographs of British and International Racing Trials, Scrambles and Speedway Events."

Contains over sixty of the finest photographs of motor cycle sport ever taken, each picture having been specially selected by the Editor of "The Motor Cycle." A superb volume, beautifully printed, which at its price represents first-class value. 3/6 net from all booksellers. By post 3/9 from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"MOTOR Cycle Cavalcade." By "Ixion" of "The Motor Cycle." Gives the history of machines from 1884 onwards and tells the story of the men who designed, constructed and rode them. A book every enthusiast should read. 10/6 net from all booksellers. By post 11/- from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"MOTOR Cycle Engines: Famous British Power Units Analysed." First Series. In this book sixteen famous engines are examined by experts of "The Motor Cycle" Staff and the designers concerned, the mechanism of each engine being specially drawn so that even the most complicated can be readily understood. There are also drawings and facts about nine other engines. 3/6 net from all booksellers. 3/9 by post from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"A RACING Motorist: His Adventures at the Wheel in Peace and War." By S. C. H. Davis of "The Autocar," who has driven racing cars for over thirty years. His victories and crashes, Brooklands, Le Mans, the Isle of Man—all are featured in this great book on a great and exciting sport. 216 pages of speed and thrills—an ideal gift for the enthusiast. 10/6 net, from all booksellers. By post 11/- from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"ROADS of France: A Guide to Tourist Routes." By A. G. Douglas Cleave. A handy-size book which enables the France-bound motor cyclist or motorist to find his way to the more popular tourist areas without worry or trouble. It also gives helpful information about hotel charges and tips and other valuable hints for the first-time visitor. 7/- net, from all booksellers. By post 5/2 from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"RALLIES and Trials." By S. C. H. Davis of "The Autocar." Describes in a colourful style the author's many adventures whilst driving in rallies and trials in all parts of Britain and Europe. The Monte Carlo Rally, the exciting Alpine Trials and many other spectacular events are recalled by this world-renowned racing driver. 15/- net from all booksellers. 15/7 by post from Illife & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

SAMSON'S SURPLUS STORES

ADMIRALTY INTEGRATORS TYPE A 501. With very fine Galvo movement coil 40 ohms. Centre Zero to F S D 1 microamp. Small mirrors 1 metre radius, 50/-, Carr. 2/6.

BANKS OF 4 RESISTANCE MATS. 690, 150 and 2 at 80 ohms. Size of each mat, 8x6 1/2, 10/6 per set. P.P. 1/6.

20FT. AMERICAN SURPLUS TELESCOPIC STEEL AERIAL MASTS. Length about 6ft., dia. of first section 1 1/4in., dia. of top section 1/4in., complete with base guys insulated assembly and metal pegs, 24/10/-, Carr. 5/-.

S.T.C. FIELD TELEPHONES. Complete unit built in metal container which can be easily held in one hand, operates from 4 1/2 volt flat battery. Buzzer calling device will work efficiently up to 15 miles on twin cable, or 10 miles earth return. Suitable for offices, farms, building sites, estates, etc., 65/- each instrument. P.P. 2/-.

NIFE BATTERIES. Crates of five cells giving 6 volts at 58 A.H. Size of wood crate 15x5 1/2x11 1/2. In perfect condition, 26/19/6, carr. 7/6. Limited number only. Single Cells, 2.4 volts, 18/20 A.H. Size 4 1/2in. x 6 1/2in. x 3 1/2in., 17/6. P.P. 1/6.

DESYNN TRIMMERS. No. 167, with Desynn Potentiometer, 5/-, P.P. 1/-.

169/171 Edgware Road
London, W.2. Tel.: PAD 7851
125 Tottenham Court Road, W.1.
Tel: EUS 4982

All orders and enquiries to our Edgware Road branch, please. This is open all day Saturday.

THE DESIGN and DEVELOPMENT

of specialised equipment for
Research and Industry.

DUN (electronics) & CO.,

17 Victoria Gardens, London, W.11. Park 6636

THE CHAFFEY CABINET COMPANY

Manufacturers of all types of cabinets for the Radio Trade

Exhibition work invited

50a, CHELTENHAM RD., LONDON, S.E.15

MORSE CODE Training

COURSES for BEGINNERS and OPERATORS, also a **SPECIAL COURSE** for passing the G.P.O. Morse Test for securing an **AMATEUR'S TRANSMITTING LICENCE.**

Send for the **Candler BOOK OF FACTS** It gives details of all Courses Fees are reasonable.

Terms: Cash or Monthly Payments.

THE CANDLER SYSTEM CO.
(55W) 52b ABINGDON RD., KENSINGTON
LONDON, W.8

Candler System Co., Denver, Colorado, U.S.A.



Solons save time, reduce costs. Solon soldering is always clean, reliable and simple. Five models, in voltage range 100-250; each with 6 feet Henley flexible. 65 watt; oval tapered or round pencil bits. 125 watt; oval tapered or round pencil bits. 240 watts; oval tapered bit.

Write for Folder Y.10



W. T. HENLEY'S Telegraph Works Co. Ltd.
51-53 Hatton Garden, London, E.C.1



SPECIAL SERVICE

We are THE specialists in inexpensive test gear, now recognised in this country and overseas as invaluable to the beginner, serious enthusiast and service man alike.

Our famous Kits with their comprehensive assembly instructions, clear diagrams, and helpful operating hints, enable even the most inexperienced beginner to construct, and use, instruments that would previously have cost many pounds.

Only the simplest of tools are required. There is NO metal work to be done, NO calibrating—in fact all the difficult work is already done for you.

All the instruments listed below are operated from a single sixpenny 1½-volt dry battery. There are NO valves to buy or replace.

Each instrument can be constructed by anyone in an odd evening, and when finished is a handsome, professional looking piece of equipment, designed to stand up to hard work and to cover the entire range of useful values.

RES/CAP. BRIDGE KIT, 31/6, plus 1/6 P. & P. 10 ohms—5 megohms. 500 pF—500 mfd. Six ranges.

INDUCTANCE BRIDGE KIT, 42/6, plus 1/6 P. & P. 50 micro/Hy—100 Henry Five ranges.

I.F. ALIGNER KIT, 15/-, plus 1/- P. & P. Tunable over the 465 Kc/s range of I.F. frequencies. Pre-tuned ready for use.

RADIO MAIL

4, RALEIGH STREET, NOTTINGHAM
Stamp with all enquiries please. Cash with order or C.O.D.

BOOKS, INSTRUCTIONS, ETC.

"RADIO Circuits: Step-by-Step Survey of R Superhet Receivers." 3rd Edition. By W. E. Miller, M.A. (Cantab.) M. Brit.I.R.E. Editor of "The Wireless and Electrical Trader." Although this book deals mainly with the superhet receiver it is equally applicable to the straight set. The circuit of the superhet is dealt with section by section up to the complete receiver. 5/- net, from all booksellers, or 5/4 by post, from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"THE Williamson Amplifier." By D. T. N. Williamson. Gives full details of the basic circuit and ancillary equipment recommended by the designer for high-quality reproduction of records and radio programmes. 2nd Edition. 3/6 net from all booksellers. By post 3/8 from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"WIRELESS Servicing Manual." By W. T. Cocking, M.I.E.E. Deals with the location and cure of the innumerable faults which can develop in broadcast receivers and their associated equipment. A special chapter is devoted to servicing with the cathode-ray oscilloscope. 8th Edition. 12/6 net from all booksellers. 12/11 by post from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"TELEVISION Receiving Equipment." By W. T. Cocking, M.I.E.E. An exhaustive description of each stage of the normal television receiver. Other chapters deal with special circuits, faults and their remedies, selectivity, servicing, etc. 3rd Edition. 18/- net from all booksellers. By post 18/8 from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"GUIDE to Broadcasting Stations." Compiled by "Wireless World." Gives details of over 1,400 short-wave radio stations of the world and 550 European long- and medium-wave stations. Specially arranged for easy reference. 6th Edition. 2/- net from all booksellers, 2/2 by post from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"SHORT-WAVE Radio and the Ionosphere." By T. W. Bennington. A new edition of "Radio Waves and the Ionosphere," this book shows how existing ionospheric data can be applied to everyday problems of short-wave transmission and reception. 2nd Edition. 10/6 net from all booksellers. 10/10 by post from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"ADVANCED Theory of Waveguides." By L. Lewin. Sets out various methods of treating problems arising in work on this complex subject. The author has selected for discussion a number of topics as representative of the field in which the centimetre-wave engineer is engaged, many of the examples being concerned with the rectangular waveguide. 30/- net from all booksellers. 30/7 by post from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"TELEVISION Explained." By W. E. Miller, M.A. (Cantab.) M. Brit.I.R.E. Explains and illustrates television reception circuits, aerials and aerial systems, receiver installation and operation, frequency allocations and remedies for faulty reception. Provides a valuable grounding in the circuitry encountered when maintaining television sets. 5th Edition. 5/- net from all booksellers, 5/4 by post, from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"MICROPHONES." By the Engineering Training Dept., B.B.C. Discusses the requirements for microphones in a broadcasting studio, sets out the laws relating to sound waves and their behaviour, and describes the design and characteristics of various types of microphone—with special reference to those used by the B.B.C. 15/- net from all booksellers, 15/5 by post from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"DEVELOPMENT of the Guided Missile." By Kenneth W. Galtman. Presents all the main information now available on the development of guided weapons in Britain, U.S.A., Germany, U.S.S.R., and elsewhere. Other chapters discuss guided missiles as instruments of research into the upper atmosphere and outer space, and as vehicles of inter-planetary travel. An appendix shows the characteristics of 90 powered missiles known to have been designed or constructed. 10/6 net from all booksellers. By post 10/11 from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"SOUND Recording and Reproduction." By J. W. Godfrey and S. V. Amos, B.Sc. A.M.I.E.E., in collaboration with the B.B.C. Engineering Division. Covers in detail the theory and practice of disc, magnetic and film recording with special reference to equipment used by the B.B.C. A number of appendices contains much reference information not readily available elsewhere. The volume is illustrated by over 170 photographs and drawings. 30/- net from all booksellers. By post 30/8 from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

"RADIO Interference Suppression: As Applied to Radio and Television Reception." An up-to-date guide to the various methods of suppressing electrical interference with radio and television reception. Many practical applications are given, particular attention being paid to the problem of interference at television frequencies. Other chapters deal with the design and choice of suppressor components, methods of locating the source of interference, and suppression at the receiver itself. 10/6 net from all booksellers. By post 10/11 from Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1.

Fidelia

HAND BUILT RADIO UNITS



MAJOR 10 VALVE RADIOGRAM CHASSIS £32.8.4.

Advanced Electronic circuitry designed throughout to provide outstanding reproduction. Triode output stages, independent bass and treble controls, hand built throughout. These are some of the salient features of all Fidelia equipment. The price is right too. Demonstrations by appointment any time (except 22nd-31st August). Technical details willingly on request.

- Fidelia Standard, 7 valve model £21 12 0
- Fidelia Plus, 8 valve model £23 18 4
- Fidelia de Luxe, 9 valve model with 7 watt push-pull output stage £24 6 6

All models will give first class gramophone reproduction.



ELECTRO Acoustic DEVELOPMENTS

2 AMHURST ROAD, TELSCOMBE CLIFFS Nr. Brighton, SUSSEX. Tel.: Peacelaven 3156

OPPORTUNITIES IN RADIO



Get this FREE Book!

'ENGINEERING OPPORTUNITIES' reveals how you can become technically qualified at home for a highly paid key-appointment in the vast Radio and Television Industry. In 144 pages of intensely interesting matter, it includes full details of our up-to-the-minute home study courses in all branches of TELEVISION and RADIO, A.M. Brit. I.R.E., City & Guilds, Special Television, Servicing, Sound Film Projection, Short Wave, High Frequency and General Wireless Courses.

We definitely Guarantee

"NO PASS—NO FEE"

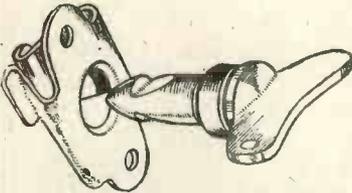
If you're earning less than £15 a week this enlightening book is for you. Write for your copy today. It will be sent FREE and without obligation.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
388b SHAKESPEARE HOUSE,
17/18 STRATFORD PLACE, LONDON, W1



ODDIE FASTENERS

PAT. 507249



THE FASTENER WITH ENDLESS APPLICATIONS—SIMPLE—POSITIVE SELF-LOCKING. MADE IN A VARIETY OF TYPES AND SIZES. SPECIAL FASTENERS TO SUIT CUSTOMERS REQUIREMENTS. WIDELY USED IN THE RADIO INDUSTRY.

Illustrated brochures and other information will be gladly sent on request. DEPT "W.W."

Oddie, Bradbury & Cull Ltd., Southampton
Tel.: 55883. Cables: Fasteners, Southampton

A.W.F. RADIO PRODUCTS

for "VIEW MASTER," "TELE-KING," WIDE ANGLE SCAN, components, valves, cabinets, TRUVOX TAPE DESK, etc., everything for the Service Engineer.

Wholesale only. Send 3d. for our list.

TATLER CHAMBERS, THORNTON ROAD, BRADFORD, Yorks. Tel.: 24098

GOODSELL LTD.

for High Fidelity Equipment

40 GARDNER ST., BRIGHTON, 1

Tel.: Brighton 26735.

COPPER WIRE

ENAMELLED		TINNED	
S.W.G.	2 ozs. 4 ozs.	2ozs.	4 ozs.
16	1/4 2/-	1/4	2/-
17	1/4 2/1	1/4	2/1
18	1/4 2/2	1/4	2/2
19	1/4 2/3	—	—
20	1/5 2/4	1/5	2/4
21	1/5 2/5	1/6	2/5
22	1/6 2/6	1/6	2/6
23	1/7 2/7	1/7	2/7
24	1/7 2/8	1/7	2/8
25	1/8 2/9	1/8	2/9
26	1/8 2/10	1/8	2/10
27	1/9 2/11	1/9	2/11
28	1/9 3/-	1/9	3/-
29	1/10 3/1	1/10	3/1
30	1/10 3/2	1/11	3/5
31	1/11 3/3	2/-	3/6
32	1/11 3/4	2/1	3/8
33	2/- 3/5	2/2	3/10
34	2/- 3/6	2/3	4/-
35	2/1 3/7	2/4	4/2
36	2/1 3/8	2/6	4/5
37	2/2 3/10	2/7	4/8
38	2/3 4/-	2/9	4/11
39	2/4 4/2	2/10	5/2
40	2/5 4/4	3/-	5/6

SEND STAMP FOR LIST. TRADE SUPPLIED

POST RADIO SUPPLIES
33 Bourne Gardens, London, E.4

THE POLYTECHNIC

309 Regent Street, W.1.

Electrical Engineering Department

Head of Department: W. H. DATE, B.Sc. (Eng.), M.I.E.E.

FULL-TIME DAY COURSES are provided in Electrical and Telecommunications Engineering. The courses, which extend over a period of three to four years, prepare for the Higher National Diploma and professional examinations and for the B.Sc. (Eng.) degree of the University of London. Session 1953-54 begins on September 22nd, 1953.

EVENING COURSES in the above subjects and also in Radio and Television Service Work commence on Monday, 28th September. The courses prepare for the Ordinary and Higher National Certificates and for the City & Guilds of London Institute examinations. New students will be enrolled on 23rd September, 5-8 p.m.

Prospectuses may be obtained on application to the undersigned.

J. G. JONES,
Director of Education.

LOCKWOOD

makers of

Fine Cabinets

and woodwork of every description for the Radio and allied trades

LOCKWOOD & COMPANY

Lowlands Rd., Harrow, Middlesex. Byron 3704

QUALITY TELEVISION COMPONENTS



Scanning Coils
6/10 Kv. R.F. E.H.T. Units
E.H.T. and Output Transformers
Line fly-back E.H.T. Units
SEND FOR ILLUSTRATED LIST
(PUBLICATION 75)

HAYNES RADIO Ltd.

Queensway Enfield Middlesex

U.S. WAR SURPLUS WANTED

APR-4, APR-5, APR-1, ARC-3, etc.; TS-12 13, 34, 35, 36, 45, 120, 146, 155, 173, 174, 175, 323 and other "TS-" units, etc., particularly for the MICROWAVE REGION; also U.S. commercial laboratory equipment (General Radio, Ferris, etc.); spare tubes such as 723A/B, 3C22, etc.; spare parts, technical manuals; single units or large quantities.

Sell direct to us, receive the full top price. Describe and price to:

ENGINEERING ASSOCIATES

444 Patterson Road,
Dayton 9, Ohio, U.S.A.

THE NORTHERN POLYTECHNIC

HOLLOWAY ROAD, N.7

Principal: T. J. DRAKELEY, C.B.E., D.Sc., Ph.D., F.R.I.C., F.I.R.I.

Department of Telecommunications Engineering

Full-time Day and Evening Courses in TELECOMMUNICATIONS ENGINEERING in preparation for all recognised qualifications in this subject.

Practical laboratory and workshop experience provided.

New term begins September 28th.

Enrolment for day classes by appointment. Enrolment for evening classes 5.30-7.30 p.m. 21st and 22nd September.

Prospectus free on application to Secretary.

CLEARANCE SALE

Ex.-A.M. RECEIVERS. R1155, £9 each Carriage 10/-.

W.S. 18 TRANS-RECEIVER. £4 each. Carriage 10/-.

R109 RECEIVER. £4 each. Carriage 10/-.
500 VOLT BRIDGE MEGGERS. Fully guaranteed as new, £25 each. Carr. and Ins., 10/-.

VARIOUS TYPES OF TEST SETS. In small quantities. S.A.E. with your enquiries.
38 SET MIC TRANSFORMERS. 1/- each. Post paid. Large quantity available, 9/- per doz., or offer to clear.

VALVES. 8,000 to clear at bargain prices. S.A.E. for list. Our Bargain Parcel: Any two of the following valves (your own choice): together with 3 assorted for 13/- post paid (i.e., 5 valves for 13/- post paid). 807, EF50, VR55, VR53, VR100, VT107.

TRANSMITTING VALVES. A few only 813 and 723A/B £3 each.

J. H. DAKIN,

13, CHURCH ROAD,

EDGBASTON, BIRMINGHAM, 15

Phone: Edg. 2220. Cables: Nikad, Birmingham

RADIO & TELEVISION COMPONENTS

WE OPERATE A PROMPT & EFFICIENT MAIL ORDER SERVICE.

"VIEWMASTER" & "TELE-KING" specialists

Easy terms available.

JAMES H. MARTIN & CO.,
FINSTHWAITE, NEWBY BRIDGE,
ULVERSTON, LANCs.

The John Aldred Reproduction Co.,
36, Marylebone High St., London, W.1
Welbeck 4058

"The logical outcome of wide professional experience in true quality reproduction will shortly be announced."

Before constructing any of the equipment described in this Magazine

*Send to



for prices of components required (no general catalogue available yet).

Price lists still available for:—

"Sensitive T.R.F. Receiver" (Nov. 1951) ("W.W." Reprint 1/-)

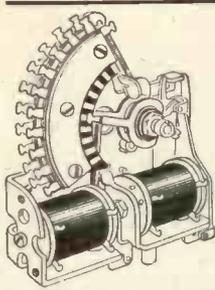
"F.M. Feeder Unit" (Sept. 1952) (Complete Kit of parts less valves and diodes 70/-) *or better still, drop in and see the amazing variety of components available here.

H. L. SMITH & CO. LTD.
287/289 EDGWARE ROAD, LONDON, W.2

Telephone: Paddington 5891

Hours 9 till 6 (Thursday, 1 o'clock)

Near Edgware Road Stations, Metropolitan & Bakerloo



UNISELECTOR
Minor Type 2 banks of 10 contacts, will operate from 24 v. or 12 v. with slight adjustment. Electromagnetic release when wipers reach end of bank. Resistance of drive coil 50 ohms, release coil 70 ohms. Ideal for sequence switching, model radio control, telephone exchanges, etc. Used but new

condition, 25/- Post 1/6.
AMERICAN HEADPHONES. Lightweight type headphones, complete with matching transformer, plug and lead 8/6 per pair, post 1/3.
ROTARY CONVERTER. 11 v. input, 250 v. at 150 m/amps D.C. output, fitted with chokes, condensers for smoothing and contained in a sound-proof metal case, 18in. x 12in. x 8in. deep. Including lid, case black crackle, similar to an attache case, with controls and plugs brought out to side of case. New cond. Price 50/- Carr. 7/6.
POST OFFICE TYPE RACKS. For equipment. 19in. 5ft. 6in. high for accommodating amplifiers, transmitters, receivers, etc., 39/6. Carriage 5/6.
PAXOLIN PANELS. Containing 8 condensers 5 resistances, 1 pot. Tag. board, 3 B7G Ceramic Holders. Price 2/6. Post 6d.
AMP. METERS MOVING COIL. 5in. scale. Pressed steel black enamel cases. Range 0 to 14 amps with fitted external shunts. Basic meter movement 75 milli volt f.s.d. Brand new and boxed 30/- Post 1/9. This is one of the best 5in. meters we have handled for some time.
P.O. TYPE TRANSFORMERS. In grey metal case, type ABG42109-1. Price 2/6. Post 1/3. New List No. 10 is now available, price 6d. inland, 2/- Overseas Air Mail.

A. T. SALLIS

93, North Road, Brighton, Sussex.
Phone: Brighton 25806.

We repair and standardise

TEST METERS



THE ELECTRICAL INSTRUMENT REPAIR SERVICE
329 Kilburn Lane, LONDON, W.9. Tel. LAD 4168

HOLLEY'S RADIO

285, CAMBERWELL ROAD, LONDON, S.E.5

Tel: RODney 4988

Specialists in Hi-fi equipment

All leading makes

Open all day Saturday

EX-G.P.O. TOOLS

Pointed Pliers 2/- pair, 3 for 5/- } Post
Side Cutters 2/- pair, 3 for 5/- } Paid
Duck-billed Pliers 2/6 pair

Secondhand but all serviceable.
Also large quantity of 5 pr., 10 pr., 30, 40, 60 way cable .028. Ideal for wiring. 1/3 yd per 10 wires (60 wires post paid).

C. A. J. CROWE, 99/100 NORTHBROOK STREET, NEWBURY

neo'-MAINTEST
100/700V AC/DC 17/6
SEARCH LEAD TEST PROD 7/6
THE PERFECT FAULT FINDER
NEO ELECTRICAL INDUSTRIES LTD
MANCHESTER 4

BENSON'S BETTER BARGAINS

METERS. New and boxed					
Scale	FSD	Size	Type	Fitting	Price
300	mA (100ma)	2 1/2 in.	MC	Square	7/-
500	mA	2 1/2 in.	MC	Flush R.	9/-
5	A	2 1/2 in.	TC	Square	5/6
1 A or 2 A		2 1/2 in.	TC	Fl. or prof.	8/-
3 or 4 A		2 1/2 in.	TC	Square	7/-
5A		2 1/2 in.	MC	Square	8/-
9 A		2 1/2 in.	TC	Flush R.	9/-
20 A		2 1/2 in.	MI	Flush R.	10/6
30 A		2 1/2 in.	MC	Proj.	8/-
50 A		6 in.	MI	Proj. Met.	30/-
20-0-20 A		2 1/2 in.	MC	Square	8/-
Freq. 45-55c		7 1/2 in.	230 v.	Proj. Met.	75/-
500 uA (5ma)		2 1/2 in.	MC/TC	Flush R.	17/6
15 v.		2 1/2 in.	MI	Flush R.	10/6
15-0-15 v.		2 1/2 in.	MC	Flush R.	10/6
20 v.		2 1/2 in.	MC	Square	8/-
150 v.		2 1/2 in.	MC	Flush R.	10/6
250 v. (25 v.)		2 1/2 in.	AC	Flush R.	12/6
300 v.		2 1/2 in.	MC	Square	8/-
2,500 v.		2 1/2 in.	El.	Flush R.	30/-
3,500 v. (6 mA)		3 1/2 in.	MC	Proj.	17/6
100 uA		2 1/2 in.	MC	Flush R.	30/-
500 uA		2 1/2 in.	MC	Flush R.	20/-
1 mA		2 1/2 in.	MC	Flush Desk	22/6
2 mA		2 1/2 in.	MC	Flush R.	10/6
5 mA		2 1/2 in.	MC	Square	7/-
10 mA		2 1/2 in.	MC	Flush R.	10/6

CONDENSERS, variable, twin 75pF, 4/-; single D.E., 2/-; 75 pF long spindle, 1/6; 25pF, 1/3; 50pF, 1/6; 20pF preset, 1/3; 40 or 65pF linear, 2/-; 25pF twin butterfly, 2/6; 500pF twin, 5/-; 250pF twin, 4/6; single, 3/6; 500pF 3 or 4 gang, 8/6; FIXED, Ceramics, 2.2, 3, 5.6, 6.8, 10, 12, 15, 20, 22, 27, 33, 39, 47, 100pFs, 6d. each. CHOKES RF 4 ple Bx., 9d., Tx 250 mA, 1/-.
MOTORS, Collaro AC37 Gram, 110/250 v. A.C. var. speed, 1in. dia. spindle, 30/-; Hoover Shaded Pole, 8P301 200/250 v. A.C. 1,400 r.p.m. anti clock, 30/-.
R.F. UNITS type 24, 21/-; 25, 25/-; 27, 45/-. Loading Units for these, type 51, 5/6; I.F.T. x 10/13 Mc/s aircored, canned, 1/6.
COILS, Eddy-stone Tx types "P" and "Q" 5 pin hor. base, each 3/6; DYNAMOTORS, solidd case, D.C. 9 v. to 450 v. (approx. 250 v. 80 mA @ 6 v.), 8/8; Co-axial plug Ppe type, 4d.; elbows, 6d.; double ended plug, 9d.; triple plug, 9d.; 3-way pl/akt., 9d.

List and enquires, S.A.E. please!
Terms: Cash with order. Postage extra immediate delivery.

Callers and Post Callers only
W. A. BENSON (WW), SUPERADIO, (W'chapel)
308 Rathbone Rd., LTD., 116 Whitechapel,
Liverpool 13. STO 1604 Liverpool 2. ROY 1130

CLASSIFIED ADVERTISEMENTS

Use this Form for your Sales and Wants

To "Wireless World" Classified Advertisement Dept., Dorset House, Stamford St., London, S.E.1

PLEASE INSERT THE ADVERTISEMENT INDICATED ON FORM BELOW

- RATE: 7/- for TWO LINES. 3/6 every Additional Line. Average six words per line.
- Name and address to be included in charge if used in advertisement.
- Box No. Allow two words, plus 1/-
- Cheques, etc., payable to Iliffe & Sons Ltd., and crossed & Co.

NAME

ADDRESS

REMITTANCE VALUE ENCLOSED

Please write in block letters with ball pen or pencil.

NUMBER OF INSERTIONS.....

INDEX TO ADVERTISERS

	PAGE		PAGE		PAGE
A.B. Metal Products, Ltd.	79	E.M.G. Handmade Gramophones, Ltd.	104	Oddie, Bradbury & Cull, Ltd.	118
Acoustical Mfg. Co., Ltd.	45	E.M.I. Institutes	8, 76	Osmer Radio Products, Ltd.	65
Acru Electric Tool Mfg. Co., Ltd.	56	Engineering Associates	118	Oxley Developments Co., Ltd.	104
Adcola Products, Ltd.	10	English Electric Co., Ltd., The	55		
A.D.S. Relays, Ltd.	100	Enthoven Solders, Ltd.	5, 29	Palmer, G. A. S.	22
Advance Components, Ltd.	15, 38	Excel Sound Services, Ltd.	26	Parsonage, W. F. & Co., Ltd.	102
Aerialite, Ltd.	14	Factor, J., Ltd.	112	Partridge Transformers, Ltd.	101
Aircraft Radio Industries, Inc.	52	Ferranti, Ltd.	51	P.C.A. Radio	96
Aldred, John, Reproduction Co., The	118	Fluxite, Ltd.	104	Pearce, T. W.	102
Allen Components, Ltd.	105	Foyle, W. & G., Ltd.	56	Phillips Electrical, Ltd.	24
All-Power Transformers, Ltd.	54	Frith Radiocraft, Ltd.	26	Polytechnic, The (Regent St.)	118
Alpha Radio Supply Co., The	111	Galpins	109	Post Radio Supplies	118
Altham Radio Co.	61	Garland Bros.	99	Pratts Radio	66
Amplex Appliances (Kent), Ltd.	62	Gee Bros. Radio, Ltd.	97	Premier Radio Co.	58, 59
Amplivox, Ltd.	60	General Electric Co., Ltd.	17	Pye, Ltd.	21
Arcoclect Switches, Ltd.	50	Glaser, L. & Co.	115	Pye, W. G., & Co., Ltd.	66
Ariel Sound	110	Goodmans Industries, Ltd.	22, 41	Quality Mart	107
Armstrong Wireless & Television Co., Ltd.	103	Goodsell, Ltd.	118	Quartz Crystal Co., Ltd.	116
Ashdown, H.	30	Gray, Arthur, Ltd.	48	Radio & Electrical Mart, The	98
Ashworth, H.	40	Grundig (Gt. Britain), Ltd.	66	Radio Mail	117
Associated Cine Equipments, Ltd.	62	Hall Electric, Ltd.	34	Radiospares, Ltd.	115
Astor Boisselier & Lawrence, Ltd.	28	Hallam, Sleigh & Cheston, Ltd.	26	Radio Supply Co.	94
Automatic Coil Winder & Electrical Equip- ment Co., Ltd., The	1	Hanney, L. F.	50	R.C. Services (Radio)	66
Autoset (Production), Ltd.	54	Harris, H.	102	Redifon, Ltd.	26
A.W.F. Radio Products	118	Harvey Electronics, Ltd.	46	Reproducers & Amplifiers, Ltd.	13
		Hatfield Instruments, Ltd.	40	Roding Laboratories	42
Baird Television, Ltd.	16	Hayes Co., The	108	Rogers Development Co.	20
Barker Natural Reproducers	103	Haynes Radio, Ltd.	118	Rola-Celestion, Ltd.	82
Bel Sound Products, Ltd.	114	Henley's, W. T., Telegraph Works Co., Ltd.	117	Rollet, H., & Co., Ltd.	108
Belling & Lee, Ltd.	73	Henry's	95	Runbaken Electrical Products	112
Benson, W. A.	119	Hivac, Ltd.	38, 67	Salford Electrical Instruments, Ltd.	42
Berry's (Short Wave), Ltd.	38	Holley's Radio Stores	119	Sallis, A. T.	119
Bird, S. S., & Sons, Ltd.	19	Homelab Instruments, Ltd.	28	Samsons Surplus Stores	116
Birmingham Sound Reproducers, Ltd.	68	H.P. Radio Services, Ltd.	96	Savage Transformers, Ltd.	106
B. K. Partners, Ltd.	64	Hunt, A. H. (Capacitors), Ltd.	23	Scharf, Erwin	36
Bradmatic, Ltd.	65	Hunton, Ltd.	50	Service Radio Spares	100
Britain, Chas. (Radio), Ltd.	99	Hyndburn Electronics, Ltd.	50	Sherman's Supply Co.	111
British Communications Corp., Ltd.	43	Industrial Electronics	38	Sifam Electrical Instruments Co., Ltd.	63
British Institute of Engineering Tech- nology	114, 117	International Aeradio, Ltd.	12	Smith, G. W. (Radio), Ltd.	109
British Insulated Callender's Cables, Ltd.	Cover ii	International Correspondence Schools	30	Smith, H. L. & Co., Ltd.	118
British Iron & Steel Federation	2	Jackson Bros. (London), Ltd.	63	Solarlon Laboratory Instruments, Ltd.	44
British National Radio School	112	Jackson Radio Supplies	114	Sound Sales, Ltd.	82
British Physical Laboratories	12, 52	Kenroy, Ltd.	106	Southern Radio Supply, Ltd.	104
British Sarozol, Ltd.	100	Keyswitch Co., The	54	Spencer-West	60
Brookes Crystals, Ltd.	46	Koskie, B.	62	Standard Telephones & Cables, Ltd.	71, 78
Brown, S. G., Ltd.	36	Lasky's Radio	92, 93	Staravia	110
Bulgain, A. F., & Co., Ltd.	Edit. 389	Leak, H. J., & Co., Ltd.	83	Steatite & Porcelain Products, Ltd.	33
Bull, J., & Sons	89	Leavers-Rich Equipment, Ltd.	64	Stern Radio, Ltd.	52, 90, 91
Bullers, Ltd.	46	Lewis Radio Co.	40	Sugden, A. R., & Co. (Engineers), Ltd.	18
Candler System Co.	116	Lockwood & Co.	118	Supacolls	115
Chaffey Cabinet Co., The	116	London Central Radio Stores	114	Szymanski, S.	64
Champion Products	114	Lowther Mfg. Co.	24	Taylor Electrical Instruments, Ltd.	54
Chapman, C. T. (Reproducers), Ltd.	110	L. R. Supply Co., Ltd.	105	Telecraft, Ltd.	106
Cinema Television, Ltd.	39	Lyons Radio	110	Telegraph Condenser Co., Ltd.	Cover iii
City & Rural Radio	86	Magnetic & Electrical Alloys, Ltd.	67	Telegraph Construction & Maintenance Co., Ltd., The	56
City Sale & Exchange, Ltd.	89	Magnetic Coatings, Ltd.	60	Telemechanics, Ltd.	34
Classic Electrical Co., Ltd.	57	Mail Order Supply Co.	31	Tele-Radio (1943), Ltd.	113
Clydesdale Supply Co.	98	Marconi Instruments, Ltd.	27	Thermionic Products, Ltd.	37
Cohen, D.	97	Marconi's Wireless Telegraph Co., Ltd.	75, 80	Transradio, Ltd.	10, 28
Cosmocord, Ltd.	72	Marks, C., & Co.	98	Trix Electrical Co., Ltd.	Edit. 387
Cossor, A. C., Ltd.	74	Marris & Cartin, Ltd.	106	Trusound, Ltd.	53
Covertry Radio	116	Martin, J. H.	118	Universal Electronics	88
Crowe, C. A. J.	119	McElroy-Adams Mfg. Group, Ltd.	88	University Electrical Instruments Corp.	96
Dakin, J.	106, 118	McMurdo Instruments Co., Ltd.	59	Valradio, Ltd.	32
Davis, Alec, Supplies, Ltd.	22	Measuring Instruments (Pullin), Ltd.	16	Venner Accumulators, Ltd.	60
Davis, Jack (Relays), Ltd.	64	Minnesota Mining & Mfg. Co., Ltd.	32	V.E.S. Wholesale Services, Ltd.	100
De Havilland Propellers, Ltd.	36	Modern Book Co.	106	Voigt Patents, Ltd.	116
Direct T.V. Replacements	86	Modern Electrics, Ltd.	87	Vortexion, Ltd.	77
Dubliler Condenser Co. (1925), Ltd.	4	Modern Sound Equipments	112	Waterloo Radio	108
Duke & Co.	108	Modern Techniques	44	Wayne-Kerr Laboratories, Ltd., The	9
Dulci Co., Ltd., The	112	Morley Transformers	114	Webb's Radio	87
Dun (Electronics) & Co.	116	M.R. Supplies, Ltd.	42	West End Radio, Ltd.	112
Easco Electrical, Ltd.	114	M.S.S. Recording Co., Ltd.	49	Westinghouse Brake & Signal Co., Ltd.	20
Edison Swan Electric Co., Ltd.	6, 81	Mullard, Ltd.	3, 11, 35, 70	Wharfedale Wireless Works	8
Edstone (Electrical), Ltd.	32	Multicore Solders, Ltd.	Cover iv	Whitaker, G., & Son	56
Egen Electric, Ltd.	14	Murex, Ltd.	18	Whiteley Electrical Radio Co., Ltd.	47
Electradix Radios	103	Neo Electrical Industries, Ltd.	119	Wilkinson, L.	100
Electrical Instrument Repair Service, The	119	Newman, J. & S., Ltd.	44	Willisden Transformer Co., Ltd.	34
Electro-Acoustic Developments	117	Northall, L. C.	116	Winter Trading Co., Ltd.	108
Electro-Acoustic Industries, Ltd.	25	Northern Polytechnic	118	Wireless Supplies Unlimited	102
Electro-Winds, Ltd.	52	Northern Radio Services	113	Woden Transformer Co., Ltd.	30
Electronic Precision Equipment	84, 85	Northern Transformer Co.	110	Wolf Electric Tools, Ltd.	62
		Nusound Products	115	Woolwich Polytechnic	110
				Wright & Weaire, Ltd.	7
				Young, C. H.	96

**FOCUS ON
LEADERSHIP**

WAXED TUBULARS

Repeat Performance

The T.C.C. ranges of wax-protected Paper Dielectric Tubular Condensers have been manufactured in millions for many years. Their reliability has been tested and proved in every conceivable electronic application.

The well-known T.C.C. technique of winding non-inductively two or more layers of paper dielectric to each layer of solid aluminium foil is used, this assembly being protected by a reinforced paper sleeve. The whole is then impregnated under vacuum with petroleum jelly and finally hermetically sealed by being several times immersed in high melting point wax.

The standard compact ranges (Types 343, 543, 743 and 2043) meet the majority of tubular requirements under normal conditions of humidity and temperature (60° C. maximum), at minimum cost, without any sacrifice of reliability. Special miniature types are available for applications where space is restricted.

It is impossible to enumerate here all the many ranges, which extend from 200 to 2000V. D.C. working, throughout temperatures of -30°C. to +60°C. Full technical details will gladly be sent on request.

- **Non - Hygroscopic processing for high performance**
- **Solid foil and paper non-inductive assembly**
- **Sturdy spiral wire connections for maximum contact**
- **High melting point wax coatings**



SPECIALISTS
IN
CONDENSERS
SINCE 1906

THE TELEGRAPH CONDENSER CO. LTD

RADIO DIVISION

NORTH ACTON • LONDON • W.3 • Telephone : ACORN 0061





BUSH. At the Multicore Stand, Radiolympia, 38,500 Ersin Multicore Soldered joints were made in the assembly of Bush radios.



E.M.I. Visitors to the stand at Radiolympia saw E.M.I. operatives precision soldering R.F. units of H.M.V. television receivers.



G.E.C. On the stand at the Castle Bromwich Show, staff from the Radio and Television works, Coventry, assembled sub-decks for the G.E.C. Television Model B.T. 2147.



E.K.O. Complete radio sets were assembled on the Multicore Stand by staff from the Southend works of E. K. Cole..



PYE. On the Earl's Court stand, operatives from the Cambridge factories manufactured Pye television camera apparatus.

Now- ERSIN MULTICORE FEATURES Philips

Projection Television Assembly

AT THE NATIONAL RADIO EXHIBITION, 1953

PHILIPS operatives will construct chassis for use in Projection Television at the

**ERSIN MULTICORE STAND (No. 111),
EARL'S COURT**

Leading Manufacturers in all parts of the world know that efficient equipment depends upon efficient solder, one that acts instantly, securely, without trouble or waste. That is why they use only Ersin Multicore Solder, the **Finest Cored Solder in the World.**



SIZE 1 CARTON 5/- RETAIL

Cat. Ref. No.	Alloy Tin/Lead	S.W.G.	Approx. length per carton
C 16014	60/40	14	21 feet
C 16018	60/40	18	55 feet
C 14013	40/60	13	9 feet
C 14016	40/60	16	38 feet



A section of the main assembly floor of Philips Works at Mitcham. Ersin Multicore Solder is used exclusively in the manufacture of Philips radio and television receivers.