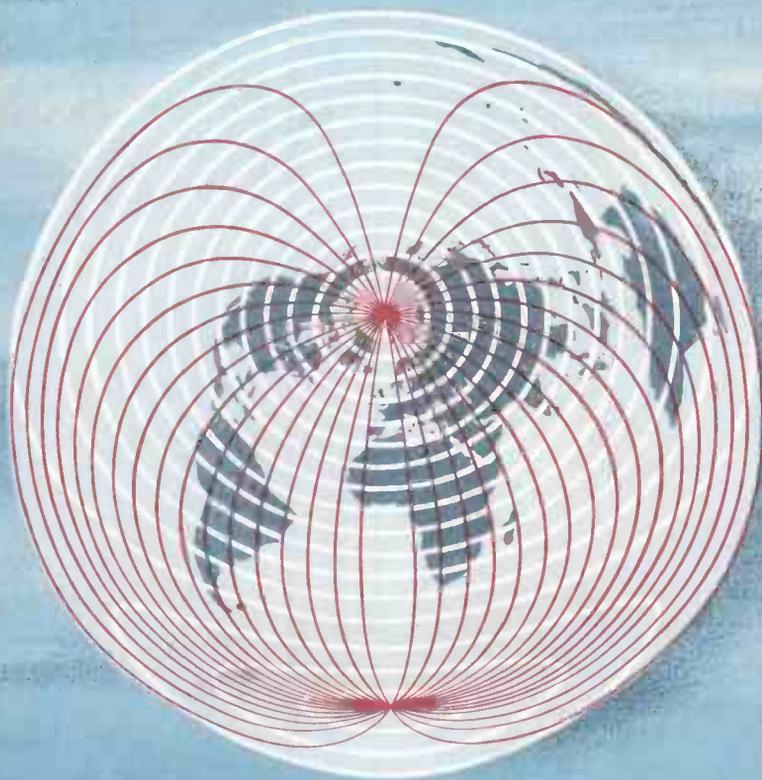


SEPTEMBER 1955 · TWO SHILLINGS

Show Guide

Wireless World

Radio · Electronics · Television



FORTY-FIFTH YEAR OF PUBLICATION

DATA for the Designers' File

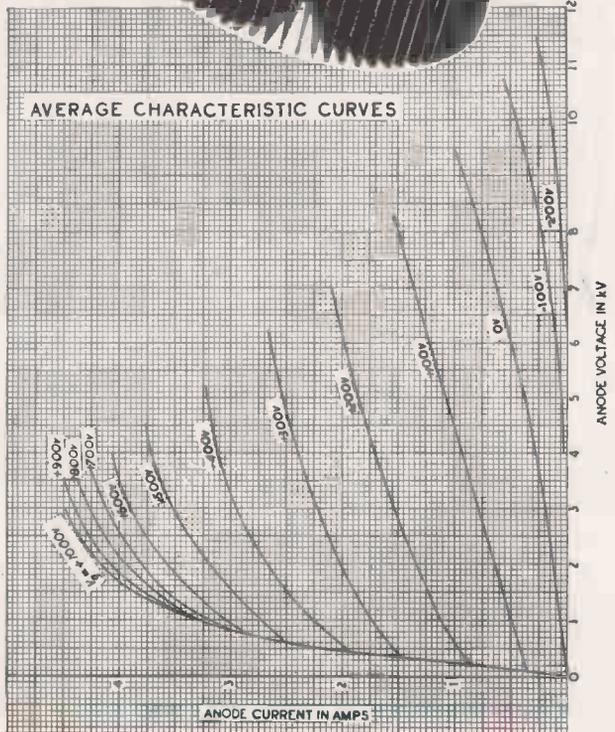
Designers of medium power transmitters will want to know more about the Ediswan ESA.2500. The Ediswan ESA.2500 is a forced air cooled triode designed for use as an R.F. Amplifier or Oscillator. The design of the valve is such that lead inductance is minimised and the valve is, therefore, particularly suitable for H.F. application.



RATING

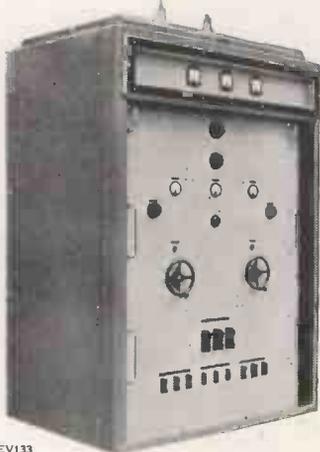
Filament Voltage (volts)	V_f	8.0
Filament Current (amps)	I_f	80.0
Maximum Anode Voltage (volts)	$V_a(\text{max})$	7,500
Average Maximum Filament Emission (amps)	F_{em}	4.5
Maximum Anode Dissipation (kW)	$W_a(\text{max})$	2.5
Mutual Conductance (mA/V)	g_m	* 5.5
Amplification Factor	μ	* 55.0
Anode Impedance (ohms)	r_a	* 10,000
Maximum Operating Frequency at full rating		† 40 Mc/s

* Taken at $V_a=7,000v$; $I_a=400$ mA.
 † At higher frequencies the maximum permissible anode voltages and inputs must be reduced.



REDIFON G.41. SHORT WAVE TRANSMITTER USES THE E.S.A. 2500 IN MODULATOR AND OUTPUT STAGES

This medium power short wave Transmitter can be used for Telegraphy, Telephony or Broadcast services in any part of the world. Power output is 5-7.5kW on Telegraphy. Frequency range 2 to 23 Mc/s.



EV133

EDISWAN

INDUSTRIAL AND TRANSMITTING VALVES

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

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

Wireless World

RADIO, ELECTRONICS, TELEVISION

Managing Editor:

HUGH S. POCOCK, M.I.E.E.

Editor:

H. F. SMITH

SEPTEMBER 1955

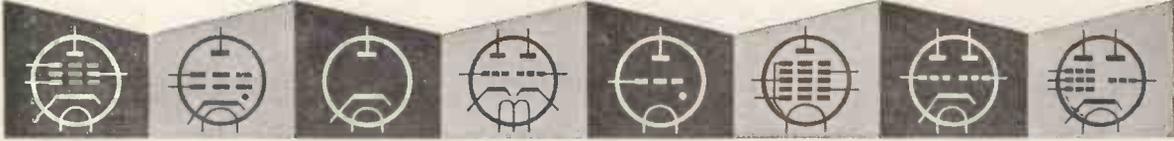
In This Issue

Editorial Comment	405
Rocket Sounding in the Upper Air. <i>By Sir Edward Appleton</i>	406
Differentiating Speech and Music	407
World of Wireless	408
National Radio Show	412
Guide to the Stands	414
Letters to the Editor	427
Neon F.M. Tuning Indicator. <i>By John D. Collinson</i>	428
Toronto Audio Show. <i>By P. G. A. H. Voigt</i>	430
Language Translation by Electronics. <i>By J. P. Cleave and B. Zacharov</i>	433
Etched Foil Printed Circuits. <i>By H. G. Manfield</i>	436
American Oscilloscope Technique. <i>By A. J. Reynolds</i>	441
Transistor Equivalent Circuits—3. <i>By W. T. Cocking</i>	444
Books Received	448
Design of Tchebycheff Filters. <i>By G. H. Burchill</i>	449
Simplified G.C.A.	451
Vertical Pattern of V.H.F. Aerials. <i>By E. G. Hamer</i>	452
Fourier—Fact or Fiction? <i>By "Cathode Ray"</i>	455
Ultrasonic Fish Detection	458
Standard Chassis. <i>By T. K. Cowell</i>	459
Short-wave Conditions	460
Aerial Circuit Magnification. <i>By S. Kannan</i>	461
Rugby Radio Extension	463
Random Radiations. <i>By "Diallist"</i>	464
Unbiased. <i>By "Free Grid"</i>	466

VOLUME 61 NO. 9

PRICE: TWO SHILLINGS

FORTY-FIFTH YEAR
OF PUBLICATION



VALVES, TUBES & CIRCUITS

33. MW53-80: A 90° TELEVISION PICTURE TUBE

REASONS FOR 90° SCANNING

The screen size of direct-viewing picture tubes has grown rapidly since the television service was restarted after the war. The 9-inch circular tube of 1946 has been supplanted by progressively larger tubes, the latest of which has a rectangular face with a 21-inch diagonal. If these larger tubes had been merely expanded versions of the 9-inch tube, the problem of cabinet depth, which was present even in 1946, would have been very much aggravated. Tube lengths, however, have been kept within reasonable limits by the introduction of greater scanning angles. If, for a given screen size, the scanning angle of the electron beam is increased, it follows that the gun and the deflection coils will be moved in towards the screen, and the overall length of the tube will be reduced. The effectiveness of this solution to the problem is shown by the fact that a 21-inch tube with the same scanning angle as a 9-inch tube would be half as long again as it actually is. The new Mullard 21-inch, 90° tube type MW53-80, which is shown in the photograph, is, in fact, about three inches shorter than a 70° tube of the same screen size.



CIRCUIT AND TUBE PROBLEMS

Wide angle scanning eases cabinet design, but it brings problems of its own. The most serious is the disproportionate increase in the deflection coil power requirements. If the scanning angle is changed from 70° to 90°, the power which must be supplied by the line timebase output transformer is increased by 50 per cent. A second complication is that the beam at maximum deflection is liable to be intercepted by the envelope of the tube, producing corner cutting

of the picture. Thirdly, in tubes with approximately flat faces, the deflected beam strikes the screen at increasingly acute angles, and the spot may be markedly defocused at the edges of the screen.

These difficulties have been countered by improving the efficiency of the scanning system and its associated circuits, so that the increase in power drain is not out of proportion to the gain in useful picture size. A practical line scanning circuit, in which the efficiency is improved by the use of the full h.t. line potential in conjunction with tuning of the leakage inductance of the output transformer, will be described in a further advertisement in this series.

Deflection defocusing and corner cutting are overcome by careful tube and deflection unit design. In particular, the scanning coils and the front of the yoke are shaped to fit the cone of the picture tube—giving optimum sensitivity.

A NEW PICTURE TUBE

The Mullard MW53-80 is an indirectly heated direct-viewing tube with a 90° deflection angle and a rectangular screen with a 21-inch diagonal. The metal-backed grey glass screen, with white fluorescence, has a useful area of 378mm by 482mm. The tube incorporates an ion trap, and the electron gun is designed to give uniform focus over the whole screen. Magnetic focusing and double magnetic deflection are used. The capacitance formed by the external conductive coating and the final anode may be used to provide smoothing for the e.h.t. supply. The 6.3V, 300mA heater is suitable for parallel or series connection. The overall length of the tube is 507 ± 10 mm.

Operating data for the MW53-80 will be included in the reprint of this advertisement.

Reprints of all the advertisements in the "Valves, Tubes, and Circuits" series, with additional notes, are available without charge from the address given below.



MULLARD LTD · TECHNICAL SERVICE DEPT., CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON W.C.2

Wireless World

SEPTEMBER 1955

VOL. 61 No. 9

B.B.C. Report

THE past year has been one of great technical development in British broadcasting, and so it is not surprising that the engineering section of the B.B.C.'s Annual Report for 1954-55* provides some interesting sidelights on the Corporation's activities. Only in one place is gloom apparent; that is in dealing with the present position on the medium wave-band. Here, it is evident that things are likely to become worse rather than better, in spite of many efforts to improve the service. "It would appear that the point is now being approached at which little or no improvement in medium-wave reception can be gained by means of additional stations, so long as they must share a wavelength with an existing station."

An enterprising piece of research into v.h.f. propagation at long range over water has been undertaken by installing at Scheveningen in Holland a Band II transmitter which works in conjunction with five receiving stations on the East coast. Apparently the main purpose of this experiment is to collect data on the possibilities of long-distance interference.

A commendably realistic approach is disclosed towards the allied problems of studio acoustics and monitoring control. The Report says: "Improvements in correlating acoustic quality, as assessed by experienced listeners, with the results of laboratory measurements helped towards the improvement of studio acoustics generally. A study was also made of the effect of the acoustics of listeners' living rooms upon the quality given by a particular studio. This study led to a comparison between the conditions under which programmes are heard by listeners and the conditions under which they are heard by the B.B.C. staff in the control cubicles attached to the studios; as a result, further attention will be given to the improvement of the listening conditions in the cubicles."

That last sentence gives food for thought and may well provoke controversy. It might even be argued that the conditions in the control cubicles should be degraded rather than improved. In these matters there are two schools of thought. One con-

tends that the monitoring loudspeaker should match the average listener's mediocre receiving equipment, so that he may be given a signal that "sounds nice" to him. The other point of view, of course, is that the output should allow full justice to be done to it by the best receiver and loudspeaker used under the best conditions.

Velvet Glove or Mailed Fist?

FOR well over a quarter-century there has been talk of compulsory interference suppression. As long ago as 1949 the Postmaster was given the necessary legal powers but, so far, has done little to put them into effect. Up to the present, no user of interfering electrical equipment has been bound to fit suppressors; compulsion has so far been applied only to makers of internal combustion engines.

A big change takes place on September 1st. On that day the P.M.G.'s regulation†, laid before Parliament in March, comes into force. The new order imposes an obligation on all users of small electric motors to keep radiated and conducted interference within specified limits on the bands of frequencies used for television Band I and for medium- and long-wave sound broadcasting. A second regulation (No. 292) imposes similar obligations on manufacturers and sellers of refrigerators. It should be noted that manufacturers of motors are not yet affected; this matter is still under review.

What will be the effect of the regulations just coming into force? Much depends, we believe, on the way they are administered. When they were first issued, an official statement said the Post Office would not use its new powers except when it is necessary "to insist on an appliance being put right because it causes interference and the owner will not voluntarily have a suppressor fitted." A policy of too much velvet glove and not enough mailed fist would, we believe, fail to achieve a significant reduction in the present intolerably high level of interference.

* Cmd. 9533; H.M.S.O., 4s 6d.

† Statutory Instrument No. 291:1955. H.M.S.O., 6d.

Rocket Sounding in the Upper Air

Confirmation of Results Inferred
from Radio Measurements

By SIR EDWARD APPLETON, F.R.S.

RECENT official announcements have made clear that rocket investigations of the upper atmosphere will be conducted by at least four countries during the International Geophysical Year 1957-58. Indeed it is evident that rocket work will provide the main new technique to be used during this year of intensive geophysical investigation, just as the radio sounding of the ionosphere was the novel technical feature introduced in the work of its predecessor, the International Polar Year of 1932-33.

American workers, with their ten years of experience with rockets, have already amply demonstrated their great value for upper air measurements *in situ*—measurements which have confirmed and extended results previously inferred from atmospheric soundings by sound and radio waves. For example, the study of the propagation of sound waves to great distances led to the conclusion that there must be a warm layer of air in the middle atmosphere; while all readers of *Wireless World* are aware that the ionosphere was discovered by experiments on radio wave reflection. Both the layer of warm air at medium levels, and the ionosphere at still higher levels have been detected in rocket soundings; and in this article I propose to deal with the underlying theory of the types of measurements in the two cases.

We naturally wonder how it is possible to measure any atmospheric characteristic during a rocket flight, since the projectile is only at rest at the top of its trajectory. The most obvious air characteristics of interest are the temperatures and pressures at various heights. But clearly the rocket compresses and heats the air through which it hurtles. However, careful experiments have shown that, just ahead of the tail fin of the rocket, there is a place where the pressure is the same as that of the undisturbed air. The recording barometer to measure air pressure can thus be placed there. The first, and basic, relation which has been the object of study by rocket sounding is, therefore, the *air pressure as a function of height* above sea level. Work of this kind has given a precision to this relationship which could not be expected from previous theoretical speculation about atmospheric characteristics. Fortunately, from the pressure-height curve, it is possible also to make a fairly accurate estimate of the temperature-height relationship in the atmosphere. By contrast, direct measurements of air temperature are difficult, if not impossible, because of the heating up of the rocket skin by air friction.

The deduction of air temperature must be made from the values of the pressures observed at two heights which are fairly close together. For example, if Δp is the pressure change over a small range of Δh , then it can be shown that

$$\frac{1}{p} \frac{\Delta p}{\Delta h} = - \frac{1}{H} \quad \dots \quad (1)$$

where p is the average pressure and H is the scale

height of the atmosphere at the average level in question. It is the quantity H which leads to a determination of atmospheric temperature, since, by definition,

$$H = \frac{kT}{mg} \quad \dots \quad (2)$$

where k is Boltzmann's constant, T the absolute temperature, m the mean molecular mass of the atmospheric constituents and g the acceleration due to gravity at the height in question. It will therefore be seen that to determine the temperature by this method, we have to make assumptions concerning the nature of the atmospheric gas constituents and their relative proportions.

As mentioned above, rocket soundings, made by American scientists since 1946, have confirmed the existence of the warm belt in the atmosphere, immediately above the stratosphere, the enhanced temperature of which is due to the absorption of solar ultra-violet light by atmospheric ozone. The atmospheric temperature has been shown to start to rise at a level of 30 km above the ground, reaching a maximum at a level of 50 km, thereafter falling to a minimum at 80 to 85 km, above which it rises again.

I now turn to the subject of the rocket exploration of the ionosphere, which is undoubtedly the most spectacular aspect of this fascinating field of enquiry. The ionosphere was discovered in 1924 by the method of radio sounding. One advantage of such a technique is, of course, that the phenomena investigated by radio means are not appreciably altered by the sounding mechanism. There are, it is true, two effects of such a nature, but they are trifling in practice. The beam of exploring radio waves exerts a small pressure—the pressure of radiation—on the ionosphere and pushes it upwards; also, when the radio waves travel into the ionosphere itself, they tend to warm the ionosphere (as in the Luxembourg effect). The magnitude of radio power used normally in ionospheric radio sounding is, however, so small that these two effects are inappreciable. We can therefore claim to measure things in the ionosphere by radio without changing sensibly the things we measure!

I now turn to consider the nature of the ionospheric quantities which can be measured in rocket sounding. The American method of measuring the electron density at a given height, which is, of course, the basic quantity of ionospheric interest, depends on a very elegant application of the Doppler effect. Let us assume that a radio set in the rocket is emitting a constant frequency f as the rocket climbs upwards. Then it is easy to show that the radio frequency received at ground level will be less than f by the quantity Δf , where

$$\Delta f = \frac{fv}{V} \quad \dots \quad (3)$$

where v is the mechanical upward velocity of the rocket and V is the phase velocity of the radio waves *in the*

vicinity of the rocket-emitter. Now, in un-ionized air, the phase velocity of the radio waves is c_0 , the normal velocity of light in the same medium. But, when the ionization is substantial, V differs appreciably from c_0 . It is, of course, the enhancement of V due to ionization which is the origin of the reflecting power of the ionosphere for radio waves.

If a very high radio frequency is employed the relation between V and the electron density N is given by

$$\frac{c_0^2}{V^2} = \left(1 - \frac{Ne^2}{\pi mf^2}\right) \dots \dots \dots (4)$$

(here e and m are, respectively, the charge and mass of the electron) so that, when V is found, using (3), N may be deduced, using (4). I am here neglecting, for simplicity, the effect of the earth's magnetic field; but equation (4) can be modified to allow for such an influence if desired.

Various elegant methods of measuring the Doppler effect from a rocket radio source travelling through the ionosphere have been developed by American scientists, by means of which the relation between electron density N , and height h , has been estimated. The N values so obtained are of the same order of magnitude as previously measured by radio sounding; but it is already clear that the new technique can supplement, in various important ways, the older radio technique. For example, in the case of the

rocket experiments, it is possible to measure directly the value of N in the upper part of an ionospheric layer, whereas this quantity can only be inferred in the case of radio sounding.

A word of caution should, however, be added concerning the effect of the rocket itself on measurements of ionization density in the ionosphere. These are based on the assumption that neither the rocket nor the exuded gases affect the ionosphere over a range of one radio wavelength in the ionospheric medium. American rocket scientists feel that this condition is likely to be fulfilled in the lower part of the ionosphere—for example, below 140 km—but, at high levels, it is considered likely that gaseous products may spread out to a considerable distance from the rocket itself and so vitiate the accuracy of N determinations.

It is now known that rocket explorations of the upper air will be conducted by the United States, France, Russia, Great Britain and possibly Australia, during the International Geophysical Year. So far such exploration has been pursued mainly at one site, White Sands in New Mexico, and it is therefore most gratifying to learn of its extension to other latitudes and longitudes. Meanwhile the hourly sounding of the ionosphere by the relatively cheaper method of radio goes on constantly at many stations all over the globe, and will indeed be greatly extended in world coverage during the year 1957-58.

DIFFERENTIATING SPEECH AND MUSIC

American Design for a "Commercial Killer"

ALTHOUGH it is to be hoped that commercial announcements in I.T.A. programmes will not initiate the violent urge to get at the "off" switch that such interpolations are said to provoke in America, it is nevertheless interesting to speculate on how the differentiation between wanted and unwanted programmes might be made automatically—and, of course, electronically.

One method, described on page 50 *et seq.* of the August 1955 issue of *Radio-Electronics*, has already reached the stage of commercial production by the Vocatrol Corporation of Cambridge, Mass., and is based on the difference in the rates of decay of the sounds in speech and music. The vowel sounds of speech are said to cut off at a rate of 400 db/sec, whereas decay rates in music are much lower.

In the "Vocatrol" a capacitance-resistance filter of suitable time constant converts the changes of level into pulses, and a diode is used to suppress those arising from rapid rises of level, which can occur in both speech and music. The wanted pulses pass through a potentiometer (sensitivity control) to an amplifier and thence to a parallel CR storage circuit of long time constant. A mono-stable multivibrator controlled by the voltage built up in this circuit is used to switch a large negative potential to the control grid of one of the audio stages in the receiver. A bandpass input filter and a logarithmic amplifier precede the differentiating circuit to remove hum and sibilants and to ensure that changes in general level of the programme do not affect the control.

Borderline transmissions, described in the report as "singing commercials," "patter songs" with light orchestral accompaniment, and announcers who slur

their speech, may call for adjustment of the sensitivity control according to the listener's preference.

No mention is made of studio acoustics and the fact that talks and music studios have widely different reverberation times. It seems likely that most spoken "commercials" are recordings made in a damped studio or commentary cubicle, and that this would account for the difference in decay times. Would the method of control described be proof against a "live commercial" declaimed in an orchestral studio at the end of a concert?

BROADCASTING STATIONS OF THE WORLD

MANY hundreds of additions and amendments have been included in the operating details of the 2700 broadcasting stations of the world given in the latest edition of our book "Guide to Broadcasting Stations." To ensure as high a degree of accuracy as possible the tabulated information, secured from many sources, was checked against frequency measurements made at the B.B.C. receiving station at Tatsfield.

Short-wave broadcasting stations throughout the world are listed both geographically and in order of frequency (with power and call sign). The long- and medium-wave lists include only stations operating in Europe.

Details of European v.h.f. broadcasting stations and television transmitters are again included. The growth in both these spheres is shown by the fact that there are now over 300 and 130 stations respectively, compared with 160 and 40 when the last edition was prepared two years ago. Completely revised and in a new format, the 8th edition is obtainable from booksellers, price 2s 6d, or by post from this office, price 2s 8d.

WORLD OF WIRELESS

Marine V.H.F. Modulation ♦ Import-Export Ratio ♦ The T.A.C.

F.M. at Sea

TUCKED AWAY in a written reply in *Hansard* of July 28th is the announcement by the Postmaster-General that "it is the Government's intention that the United Kingdom should adopt frequency modulation for these [v.h.f. international maritime radio] services."

Dr. Hill stated that other maritime countries in Europe and in the Commonwealth had agreed that in the interest of world-wide standardization f.m. should be used as is already done in North and South America. He added that the majority of the interested parties in this country, including all the shipping interests, are prepared to accept the change which will be made gradually.

Balance of Trade

IT WILL be seen from the following table of radio equipment exported and imported during the first six months of this year and last year that the balance of trade is becoming less favourable. Whereas exports increased by about £0.5M, imports increased by well over £2M, bringing the total imports to nearly 40% of the value of our present exports. Although these figures, extracted from the Board of Trade accounts, do not agree entirely with those issued by the Radio Industry Council, they do give a general picture of the Industry's overseas trade.

	Exports (Jan.-June)		Imports (Jan.-June)	
	1954	1955	1954	1955
Valves and c.r. tubes	1,040,860	1,247,740	1,776,353	1,664,494
Transmitters and nav. aids ...	6,373,705	6,322,315	919,792	801,483
Broadcast receivers:				
(sound) ...	1,376,410	1,393,147	1,161,643	3,553,258
(radiograms) ...	216,648	283,401		
(television) ...	101,019	53,773		
Sound reproducing gear ...	489,351	610,263		
Components ...	3,398,610	3,490,348		
Batteries ...	879,867	1,010,371		
	13,876,470	14,411,358	3,857,788	6,019,235

Television Advisory Committee

THERE have been a number of changes recently in the membership of the technical sub-committee of the Television Advisory Committee. The chair is occupied by the Post Office engineer-in-chief, now Brigadier L. H. Harris. The Post Office representative is Captain C. F. Booth (assistant engineer-in-chief), in place of H. Faulkner, and A. B. Howe, assistant head of the B.B.C. research department, now represents the Corporation in place of R. T. B. Wynn. Dr. Willis Jackson has resigned.

Three additional members have been appointed, they are L. H. Bedford (Marconi's), T. M. C. Lance (Cinema-Television) and E. P. Wethey (Kolster-Brandes).

The inclusion of Mr. Lance may be a pointer to the

subject at present being studied; the terms of reference of the T.A.C. included the phrase "television for public showing in cinemas and elsewhere."

Germanium from Coal

AT THE present time one of the main sources of germanium is the flue dust from coal-fired furnaces. Only a small proportion of the available germanium is deposited and the remainder is lost to the atmosphere as fine dust.

A programme has been initiated by the Fuel Research Station of the Department of Scientific and Industrial Research to survey all possible sources and to investigate the distribution of germanium in the coke, tar and liquor by-products of coal carbonization processes. This, according to the "Report of the Fuel Research Board" (published by H.M. Stationery Office, price three shillings), will lead to the discovery of ways of modifying these processes to increase the proportion of germanium recovered.

PERSONALITIES

Sir George Nelson, Bart., is to be president of the I.E.E. for the 1955-56 session. Sir George is chairman and managing director of the English Electric group of companies, which includes Marconi's W.T., Marconi Marine, Marconi Instruments, English Electric Valve and Scanners. He was recently appointed a governor of the Imperial College of Science and Technology.

H. Stanesby, the new chairman of the Radio and Telecommunication Section of the I.E.E., has been closely associated with radio work in the Post Office since he entered the Dollis Hill laboratory as a "youth in training" in 1924. For two years he was responsible for the direction of the radio laboratory at Dollis Hill. Now staff engineer in the Radio Planning and Provision Branch, he has specialized in the development of crystal filters and cable and radio links for television. He has frequently represented this country at international conferences and is chairman of the C.C.I.R. Study Group IX concerned with general technical questions.



SIR GEORGE NELSON



H. STANESBY

OUR AUTHORS

Sir Gordon Radley, a deputy director general of the Post Office since last October and before that engineer-in-chief for three years, has been appointed director general and so becomes the first engineer to fill the post. Sir Gordon, who is 57, joined the Post Office as a temporary inspector in the research branch in 1920. He received his Ph.D. from London University in 1934 for a thesis on radio interference from power lines and a knighthood in 1954.

The position of deputy director general, vacated by Sir Gordon Radley, is to be filled by **R. J. P. Harvey**, who has been director of radio and accommodation for the past 18 months. Mr. Harvey, who is 50, is chairman of the Mobile Radio Committee set up by the P.M.G. to investigate the problems of clearing mobile radio users from Band III.

Captain K. H. T. Peard, who was captain of H.M.S. *Collingwood*, the naval electrical school, from 1953 until a few months ago, has been promoted Rear-Admiral and appointed director of the Naval Electrical Department at the Admiralty. He is 53. He succeeds **Rear-Admiral Sir Philip Clarke** who had held the position from 1951. Sir Philip has been president of the British Institution of Radio Engineers since last October.

Captain G. C. Turner has been appointed assistant Captain Superintendent, Admiralty Signal and Radar Establishment. He was fleet radar officer, British Pacific Fleet, at one time during the war and has since served in the radio equipment and electrical departments of the Admiralty and as executive officer at the electrical school (H.M.S. *Collingwood*).

Commander J. Forrest, who has recently been appointed to the radio equipment department of the Admiralty, has specialized in air radio matters during his naval career and it is in this field that he will be mainly concerned in his new post.

P. L. Taylor, M.A., A.M.I.E.E., who has been head of the electrical section of the College of Aeronautics, Cranfield, Bucks., since its foundation in 1946, has left the College to join the research department of Metropolitan-Vickers, at Trafford Park, Manchester. His article on servo-mechanisms appeared in our January 1952 issue.

M. R. Gavin, M.A., D.Sc., F.Inst.P., M.I.E.E., vice-principal and head of the department of physics and mathematics in the College of Technology, Birmingham, for the past five years, has been appointed professor of applied electricity at the University College of North Wales. Before going to Birmingham, Dr. Gavin, who received his doctorate from Glasgow University for work on valves for decimetre waves, was for eleven years at the G.E.C. research laboratories, Wembley. Dr. Gavin, who has contributed several articles to our sister journal, *Wireless Engineer*, was appointed an M.B.E. in 1946.

E. Lawrenson, M.A., has been appointed chief engineer of the Wireless Telephone Company, Limited, of Sheffield, a member of the Plessey group. He joined the company last year, having previously been senior engineer in the advanced development laboratory of Standard Telephones & Cables.

A. V. Krause, Grad.I.E.E. recently appointed by 20th Century Electronics, Limited, head of cathode-ray tube development, was formerly senior engineer in the vacuum tube development section of Cinema-Television, Limited. He had previously been on the staffs of Standard Telephones & Cables and Mullards.



A. V. KRAUSE

Professor G. H. Burchill, contributor of the article on the design of Tchebycheff filters, was a designer of synchronous machinery with the Canadian General Electric Company for five years before joining the staff of the Nova Scotia Technical College. He has been teaching for twenty-six years and since 1953 has been professor of electrical engineering at the college.

H. G. Manfield, who describes methods of making printed circuits on page 436, has been at T.R.E. (now R.R.E.), Malvern, since 1946 where for the major part of his service he has been working on printed and potted circuits. During the war he was for some time resident maintenance engineer at several radar stations.

T. K. Cowell, development engineer in the recently formed electronic development division of R. B. Pullin and Company, instrument makers of Brentford, Middlesex, describes in this issue a multi-purpose chassis for experimental work. After six years at the G.P.O. Radio Branch at Dollis Hill, which he entered as a trainee in 1948, he was with Furzehill Laboratories for a few months before joining Pullin in January this year.

S. Kannan, who discusses aerial circuit magnification on page 461, graduated from the University of Madras (India) in 1943 and joined National Ekco Radio and Engineering Company, of Bombay, as development engineer in 1948. Five years later he joined E. K. Cole, Ltd. (Southend), where he is now concerned with the design and development of broadcast receivers.

OBITUARY

Richards W. Cotton, who died recently in Portland, Maine, U.S.A., was well known in the British radio industry, having been controller of signals (communications) at the Ministry of Aircraft Production for some time during his residence in this country from 1934 to 1946. He was at one time chairman of British Rola and was a director of Philco (Overseas), Ltd. In 1952 he was appointed director of the electronics division of the American Defence Production Administration.

IN BRIEF

Television licences in the United Kingdom increased by 52,505 during June (the latest figures available). The total number of **Broadcast Receiving Licences** current in Great Britain and Northern Ireland at the end of June was 14,035,567, including 4,676,422 for television and 275,910 for car radio.

Extended Band III Tests.—Since August 2nd the transmission times of the Belling-Lee Band III experimental transmitter (G9AED) at Croydon have been extended by 17 hours a week. The times are now Monday to Friday, 9.30 to 12.30, 2.0 to 5.30 and 7.30 to 8.30; Saturday 10.0 to 1.0. Transmissions from G9AED will cease at one o'clock on September 3rd when test transmissions from the temporary I.T.A. transmitter at Croydon (opening on September 22nd) are due to start.

The **Monopolies Commission** has now appointed nine investigators to consider and report on the supply of valves and cathode-ray tubes, which was referred to the Commission last December. Written and oral evidence is now being taken and any offers to give assistance should be addressed to the Monopolies and Restrictive Practices Commission at 8, Cornwall Terrace, Regents Park, London, N.W.1.

"Inexpensive Wave Analyser." In Fig. 2 of this article (p. 361, August issue) the value of R7 should be 75k Ω , not 33k Ω .

I.E.E. Council.—Among those elected to fill the vacancies on the council of the I.E.E. at the end of September are: Sir George Nelson, president (see "Personalities"), T. E. Goldup, director of Mullards, a vice-president for the second time, Sir Hamish MacLaren, Director of Electrical Engineering, Admiralty, a vice-

president, and Professors H. E. M. Barlow (University College, London) and J. Greig (King's College, London) ordinary members.

The new committee of the **I.E.E. Radio and Telecommunication Section** (note the new title), which takes office at the end of September, will be under the chairmanship of H. Stanesby (see "Personalities") with Dr. H. S. McPetrie, who is head of the Radio Department at R.A.E., Farnborough, as vice-chairman. The five vacancies among the ordinary members of the committee will be filled by F. S. Barton (principal director, electronics research and development, M.O.S.), Dr. A. J. Biggs (G.E.C. research laboratories), W. Ross (R.A.E., Farnborough), T. B. D. Terroni (manager and chief engineer, transmission division, A. T. & E.) and F. Williams (senior superintendent engineer, B.B.C.).

An **Exhibition of Electrical Standards** has been opened at the Science Museum, South Kensington, and will remain open until October 31st. One of the objects is to show the origin and derivation of the various electrical units. The complete set of the original B.A. Units of Resistance, which were made in 1864 for the British Association and constitutes the oldest set of accurate electrical standards now in existence, are to be seen. The Museum is open on week-days from 10.0 to 6.0 and on Sundays from 2.30 to 6.0.

A new observatory, to be known as the **Mullard Radio-Astronomy Observatory**, is to be set up by the University of Cambridge as a result of an offer from the Mullard Company to provide £100,000 over a period of ten years for radio-astronomy research.

Brit. I.R.E.—The first meeting of the session will be held at 6.30 on September 28th, at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, when G. I. Hitchcox will deliver a paper on "Extending the limits of resistance measurement using electronic techniques."

F.M. Tuner.—Constructional details of a tuner for the v.h.f. service of the B.B.C., which will be available to 83% of the population by the end of 1956, are given in a new *Wireless World* booklet. In it are reprinted the articles by Amos and Johnstone in the April and May issues. It is obtainable from this office price 2s. (plus 2d. postage).

We regret that there is an error in the terms quoted in the bottom left hand panel of the advertisement offering complete equipment by **Stern Radio, Limited**, on page 144 of this issue. That page had gone to press before the error was discovered; the correct figures are:—

	Cash Price	Deposit	Monthly (12)
(a)	£22 19 0	£7 13 0	£1 8 1
(b)	£23 19 0	£8 0 0	£1 9 3
(c)	£28 16 6	£9 12 6	£1 15 2
(d)	£35 7 6	£11 16 0	£2 3 3

(a)	£24 9 0	£8 3 0	£1 9 11
(b)	£25 9 0	£8 10 0	£1 11 1
(c)	£30 17 0	£10 6 0	£1 17 8
(d)	£36 18 0	£12 6 0	£2 5 1

Since publishing the note in our last issue on the **Sound Reproduction Demonstration** to be given in New York, G. A. Briggs has advised us that Columbia Records Inc., and not Capitol Records Inc., will now be making the comparative recordings.

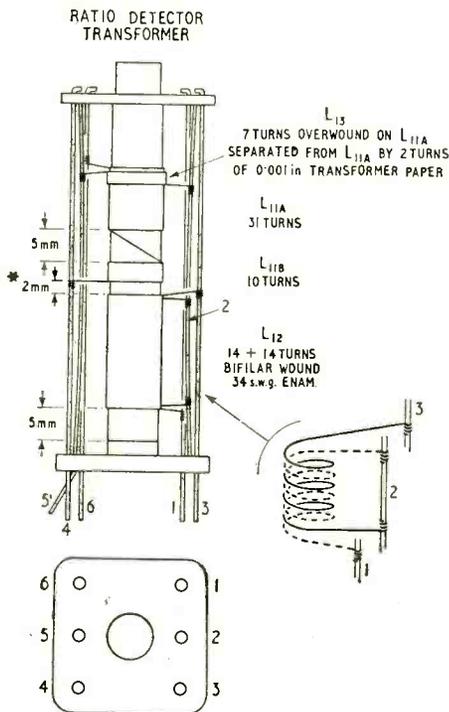
BUSINESS NOTES

An order for the supply of twenty-three 30-kW short-wave transmitters has been placed with **Standard Telephones and Cables** by the Post Office. They are for installation at three stations and will be used for overseas point-to-point telephony and telegraphy services.

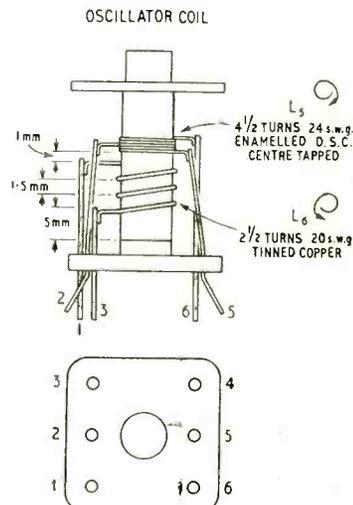
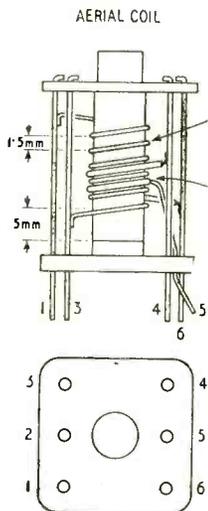
Ace Radio, Limited, receiver manufacturers of Tower Road, London, N.W.10, have opened the first of a series of new factories being built at Basildon New Town, Essex.

(Continued on next page)

F.M. TUNER UNIT: CORRECTIONS



IT is regretted that certain inaccuracies appeared in the drawings of the aerial coil, oscillator coil and ratio detector transformer shown on page 374 in our August issue. Correct drawings are given here together with an additional "perspective" of the bifilar-wound coil L₁₂ and its connections on the ratio detector transformer. It should also be noted that C₂ is 1.8pF, not 5nF as stated in the text and the list of parts.



An acoustical advisory service has been established by **Tannoy**, of West Norwood, London, S.E.27, to deal with problems of excessive noise in factories. Acoustical treatment of existing buildings and collaboration with architects in planning new premises are the main functions of this department.

The design and manufacture of filters with Ferroxcube pot cores to customers' specifications is now undertaken by **Mullard's Components Division**.

Magnetic and Electrical Alloys, Ltd., of Burnbank, Hamilton, Scotland, producers of laminations, cores and stampings, have been acquired by the **Telegraph Construction and Maintenance Co.** J. Ancel Holden is continuing as chairman and W. Randall, a director of Telcon, has been appointed as vice-chairman and managing director. Telcon have recently formed a metals group which embraces **Telcon-Magnetic Cores, Ltd.**, at Chapelhall, Lanarkshire, Temco, Ltd., at Lydbrook, Gloucestershire, **Sankey-Telcon, Ltd.**, at Crawley, and **Magnetic and Electrical Alloys**.

Bakelite, Ltd., is to market polyethylene under an agreement with **Union Carbide, Ltd.**, who are setting up a plant at Grangemouth, Scotland. Until the new factory comes into operation in 1957, polyethylene imported from the **Union Carbide and Carbon Corporation**, of America, will be available from Bakelite.

The merchandizing division of the **Solartron Electronic Group, Ltd.**, of Thames Ditton, Surrey (new telephone number Emberbrook 5522), has been appointed agent for the United Kingdom, Eire and certain parts of the British Commonwealth for the **Consolidated Engineering Corporation**, of Pasadena, California, and its associated companies. The Corporation manufactures a wide range of electronic and other industrial equipment.

To enable the audience to see both the live and televised performance of "The Barber of Seville" from Glyncebourne recently, 17 **H.M.V.** and **Marconiphone** receivers were installed in various parts of the theatre. The signal was taken from the **B.B.C.** at video frequency, passed through an amplifier and then distributed to the receivers on the vision frequency of Channel 4.

Kelvin and Hughes, Ltd., announce that they have entered the component market. Among the components listed are a magnetic record/reproduce head and sine-cosine potentiometers.

The sound reproduction equipment in the new liner **Empress of Britain** is being supplied by **Pye Marine**. In addition to the 150 loudspeakers used for the entertainment of passengers and crew, there are 35 loudspeakers associated with an emergency system with "talk-back" facilities at each speaker position.

For the demonstration of **Pye** underwater television at the recent international trade fair in Toronto, a micro-wave link was used to convey the underwater scenes from the ship stationed some two miles outside Toronto harbour to the receivers in the fair.

Reproducers and Amplifiers, Ltd., the well-known loudspeaker manufacturers of Wolverhampton, celebrated their silver jubilee in July. To mark the occasion a presentation was made to the founder and managing director, H. C. Willson.

Telerection, Ltd., aerial manufacturers, of Cheltenham, Glos., announce the formation of **Telerection Developments, Ltd.**, "to co-ordinate and develop the large expansion plan on hand by the group of nine companies" which includes installation companies in six provincial centres.

Raymond E. Cooke, B.Sc. (Eng.), Grad. I.E.E., joined **Wharfedale Wireless Works, Ltd.**, of Idle, Bradford, at the beginning of August as technical manager and head of the research department.

Edwards High Vacuum, Ltd., announce the formation of an Italian subsidiary, **Edwards Alto Vuoto S.p.A.**, with offices in Milan.

Telcon Africa (Pty.), Ltd., a subsidiary of the **Telegraph Construction and Maintenance Company**, Greenwich, has opened a new factory at Wadeville, Germiston, Transvaal.

Hivac Limited, manufacturers of sub-miniature valves, have transferred their registered office from Harrow to their new factory in Stonefield Way, Victoria Road, South Ruislip, Middlesex (Tel.: Ruislip 3366).

Permanoid, Ltd., formerly **Associated Technical Manufacturers, Ltd.**, cable manufacturers, of New Islington, Manchester, have opened a Midlands branch at 558, Wolverhampton Road East, Fighting Cocks, Wolverhampton, Staffs. (Tel.: Wolverhampton 38367).

The telephone number of the **British Electric Resistance Co., Ltd.**, and the **British Power Transformer Co., Ltd.**, of Queensway, Enfield, Middlesex, is now Howard 2411.

The new telephone number of **Erie's Great Yarmouth factories** is Great Yarmouth 4911.

OVERSEAS TRADE

A further substantial order for equipment for transmitting and receiving stations of the **Canadian Overseas Telecommunications Corporation** has been received by **Marconi's W.T. Company** through its Canadian associate. The contract provides for the supply of six **Marconi-Siemens R/T** terminal equipments and ancillary gear.

Decca airfield control radar (Type 424) is being installed at **Dum Dum** civil airport, Calcutta, where there is already a **Type 41** long-range storm warning radar.

A new overseas radio-telephone and telegraph centre for **Burma** is to be equipped by **Standard Telephones and Cables, Limited**, with single-sideband transmitters (4 to 40 kW), receivers, terminal equipment and beam aerials.

Another contract has been placed with **Marconi's** by the **Gold Coast Posts and Telecommunications Department** for the supply of radio-telephone equipment for the country's internal communication system. It provides for the installation of a twin-path, 24-channel (per path) radio communications service from **Kumasi** to **Takoradi**, via **Mpraeso**, **Koforidua**, **Mampong (Akwapim)**, **Accra**, **Winneba** and **Cape Coast**. The new circuit will eventually link with one already being installed by **Marconi's** between **Kumasi** and **Tamale** in the north.

The **New Zealand Post and Telegraph Department** is calling for tenders for the supply of some **3,500 valves** and cathode-ray tubes of various types. Particulars are obtainable from the **Export Services Branch**, B.o.T., **Lacon House**, **Theobalds Road**, **London, W.C.1** (Ref. **ESB 15177/55**). Closing date for tenders is **September 15th**.

Television in Uruguay.—The commercial department of the **British Embassy** in **Montevideo** draws the attention of U.K. manufacturers to the potential market for **British** receivers which will exist when the first television station in **Uruguay** opens shortly. It is understood that the **Servicio Oficial de Difusion Radio-electrica** is contemplating calling for tenders for the supply of 10,000 receivers to introduce the television service to the public. Interested manufacturers not already represented in **Uruguay** are invited to write to the **Embassy** in **Montevideo**.

South African Representatives.—**Joseph Teer and Son (Pty.) Ltd.**, 5 **Ulster House**, **Kruis Street**, **Johannesburg** (P.O. Box 1630), wish to represent **United Kingdom** manufacturers of trimmer capacitors.

Saudi Arabian Market.—The firm of **Suleiman Bakshwin**, of **Medina**, have informed the **British Embassy** at **Jidda** that they are interested in receiving offers from **United Kingdom** suppliers of battery receivers and batteries.

National Radio Show

Stand-to-Stand Preview of Technical Exhibits

ON Wednesday, August 24th, Dr. Charles Hill, the Postmaster-General, will open the 22nd National Radio Exhibition at Earls Court; overseas visitors and invited guests are having a preview the day before.

In the following pages we give a brief stand-to-stand survey of the technical exhibits prepared from information given to us by the 121 exhibitors. Although there are bound to be some last-minute releases by manufacturers, we feel that this preview will provide visitors with a useful guide to the show and readers unable to visit Earls Court will, we hope, find the survey valuable.

Visitors will have a foretaste of commercial television for the Radio Industry Council has offered time for short films backed by advertisements to be distributed on the network for the demonstration of

Band III receivers. In Television Avenue on the first floor 28 manufacturers will be demonstrating 82 receivers, but they will operate on Band I only; Band III demonstrations are confined to the exhibitors' stands and demonstration rooms.

Instead of the collective displays of electronic equipment being set up in various odd corners of the show, as happened last year, they are this year being combined with the training display to form a large "electronics and careers" section on the first floor. It will comprise "Electronics of To-day," including examples of electronics in air and sea transport, medicine, communications, industry, etc., "Electronics of the Future" and a section devoted to careers in which visitors will have the opportunity of seeing the new I.E.E. training film "The Inquiring Mind."

ALPHABETICAL LIST OF EXHIBITORS

	Stand		Stand		Stand
Acos	201	English Electric	31 (D23)	Plessey	122 (D10)
Aerialite	33	Evening News	67	Portogram	65
Airmec	108	Ever Ready	54	Practical Wireless	107
Alba	21			Pye	30 (D5)
Antiference	64	Ferguson	14, 103 (D4)	R.A.F.	306
Argosy	35	Ferranti	13, 120 (D11)	RCA Photophone	110 (D6)
Army	308			R.G.D.	11 (D13)
Arrell	111	G.E.C.	37 (D31)	R.S.G.B.	310
Assimil	312	Garrard	47	R.T.R.A.	302
Avo...	116	Gibbs	209	Reflectograph	208
		Goodmans	20	Regentone	38
B.B.C.	301			Roberts	117
B.C.C.	217	H.M.V.	48, 49 (D25)	Rola Celestion	17
Baird	52	Hart	210		
Barclays Bank	3	Hobday	220	S.T.C.	119
Belling-Lee	46	Hunt	8	Sapphire Bearings	304
Bernards	314			Simon	10
Bowmaker	106	Invicta	53	Slingsby	112
Brimar	1			Sobell	19
British Radio & Television...	109	J.B. Cabinets	219	Specto	206
British Railways	2	J-Beam Aerials	104	Spencer-West	211
Brown Bros.	9			Star	309
Bulgin	59	K.B.	16	Stella	51
Bush	22, 57 (D24)*	Keith Prowse	69		
		Kerry's	203	T.C.C.	45 (D20)
Champion	62			Tape Recorders	66
Channel	212	Labgear	204	Taylor	6
Collaro	39 (D29)	Linguaphone	207	Tequipment	105
Cossor	23 (D8)	Lloyds Bank	115	Telerection	7
Cossor Instruments	114			Television Society	315
		McMichael	40	Thompson, Diamond & Butcher	4
Decca	32 (D2)	Marconiphone	50 (D27)	Trix	26
Defiant	60 (D9)	Masteradio	36		
De La Rue...	214	Midland Bank	44	Ultra	41
Domain	305	Mullard	18 (D1, D30)	United Appeal for the Blind	316
Dubiller	221	Multicore	63 (D18)		
Dynatron	24	Murphy	29 (D3)	Valradio	118
				Vidor	28 (D19)
E.A.P.	303	National Provincial Bank	68		
E.A.R.	216	Navy	307	Wearite	218
E.M.I.	215 (D26, D28)			Westinghouse	101
E.M.I. Institutes	311	Pam	61 (D22)	Westminster Bank	222
Econasign	113	Pamphonic	34	Whiteley Electrical	25 (D12, D15)
Ediswan	58 (D21)	Permanoid	111	Wireless & Electrical Trader	205
Ekco	12, 121 (D7)	Peto Scott	55	Wireless World and Wireless Engineer	202
Electrical & Radio Trading	102	Philco	15	Wolsey	5
		Philips	27, 42, 43 (D16, D17)		
		Pilot	56		

* Demonstration rooms and offices are prefixed with "D."

National Radio Show

Guide to the Stands

ACOS (201)

Piezoelectric (crystal) pickups and microphones for every purpose are made by this firm, and attention is directed to the recently developed GP59 series of pickups for high-quality radio-gramophones and record players.

The GP59-1 is a turnover cartridge of wide frequency range and medium output, and the GP59-3 has a high output for use with amplifiers having a low overall gain. Both types are fitted with an easily replaceable cantilever stylus.

Microphones range from inexpensive hand and desk types to models suitable for studio work.

Cosmocord Ltd., 700 Great Cambridge Road, Enfield, Middlesex.

AERIALITE (33)

Folded dipoles are used in all the Band III aeriels shown by this firm; they include indoor and outdoor types with from three elements upwards. Metal strip is used in many of the indoor models. There is a selection of adaptors for converting Band I aeriels into dual-band systems and provision is made for orientating the Band III parasitic element, or elements, to meet the requirements where the B.B.C. and I.T.A. stations are differently sited.

There is also a good choice of f.m. aeriels, aerial fittings and a range of Band III converters.

Aerialite Ltd., Castle Works, Stalybridge, Cheshire.

AIRMEC (108)

The Teletv Type 877 is a comprehensive television test set in portable form, but mains operated. It enables alignment adjustment of receivers to be carried out in the absence of a "live" broadcast on Bands I and III; a built-in wobblator and oscilloscope (2½-in tube) facilitate visual adjustment.

The coverage is 8 to 70 Mc/s and 168 to 230 Mc/s in two ranges with a crystal-check oscillator for ensuring accuracy. The wobblator gives a variable sweep at 50 c/s and up to 12 Mc/s bandwidth.

Airmec Ltd., High Wycombe, Bucks.

ALBA (21)

In addition to a range of 14in, 17in and 21in table model and console television receivers with multi-band turret tuners, a Band III tuning adaptor is available for users of the older Alba models.

Two new sound broadcast receivers have been developed, both with provision for v.h.f. reception. The table Model 3211AC covers short, medium and long waves

in addition to the v.h.f. range, for which a built-in aerial is provided. A high-quality output stage feeds an 8in×5in elliptical loudspeaker. Model 6221 is a radio-gramophone version with a 10-in loudspeaker and 3-speed record changer.

A. J. Balcombe Ltd., 52-58 Tabernacle Street, London, E.C.2.

ANTIFERRE (64)

The "Snapacitor" principle of fixing the various elements or rods of a television aerial is one of the principal features of all this firm's Bands I, II and III aeriels. It eliminates actual metallic connection between the elements and the feeder, or elements and structure, and is said to eliminate most of the troubles that arise from corrosion. Greatest prominence is given to Band III aeriels, both as separate items and as adaptors for existing Band I systems. The range includes indoor and outdoor types. The "Exstat" anti-interference aerial now employs high-efficiency ferrite-cored transformers.

Antiferre Ltd., Bicester Road, Aylesbury, Bucks.

ARGOSY (35)

The present range of sound and vision broadcast receivers includes two recently introduced radio-gramophones with 6-watt push-pull output stages which cover four wavebands, including v.h.f. Built-in compressed dipoles are provided, but provision for external aeriels for both a.m. and f.m. reception is made. There is also a table-model broadcast set covering the same ranges, with a ferrite rod aerial for long- and medium-wave reception. A new 17in table-model television receiver is being introduced.

Argosy Radiovision Ltd., Hertford Road, Barking, Essex.

ARMY (308)

Both the Royal Corps of Signals, which operates the Army communication network, and the Royal Electrical and Mechanical Engineers, responsible for the maintenance of the equipment, are participating in the Army's exhibit. Examples of the latest telecommunications equipment, test gear and electronic devices used by the Army are to be seen.

The War Office, Whitehall, London, S.W.1.

ARRELL (111)

This firm specialize in the production of television aeriels and associated fittings. They have no fewer than 15 different models of Band I aeriels for indoor and outdoor use and a dozen Band III models. A

feature of the designs is the use of low-loss polythene insulators on all aeriels.

Arrell Electrical Accessories Ltd., New Islington, Manchester, 4.

ASSIMIL (312)

This company—a division of E.M.I. Institutes—has introduced a system of language instruction by gramophone records, based on a method which was originated on the Continent many years ago. For English-speaking people, courses are offered in French, German, Italian and Russian.

Assimil (England) Ltd, 10 Pembridge Square, London, W.2.

AVO (116)

Two new signal generators covering Bands I, II and III make their debut this year. One, the "Mark III," is a moderately priced instrument covering 150 kc/s to 220 Mc/s in six bands; while the "Wide-Band AM/FM" model provides amplitude modulated signals over the band 5 to 225 Mc/s, and a frequency modulated output over 60 to 120 Mc/s. The modulating frequency is 400 c/s and the deviation ±150 kc/s. Other features include high accuracy of adjustment of the oscillator and provision for either sine-wave or square-wave modulation.

Another interesting Avo product is the Type 160 valve tester. A full range of Avometers is shown also.

Automatic Coil Winder and Electrical Equipment Co. Ltd., Winder House, Douglas Street, London, S.W.1.

B.B.C. (301)

The advantages of v.h.f. broadcasting is the theme of the B.B.C. stand which incorporates a demonstration theatre, seating about a hundred people. In the theatre comparative tape recordings of reception on a v.h.f. receiver and a medium-wave set, made under varying conditions of interference, will be played over. At each demonstration an engineer will be present to answer questions.

B.B.C., Broadcasting House, London, W.1.

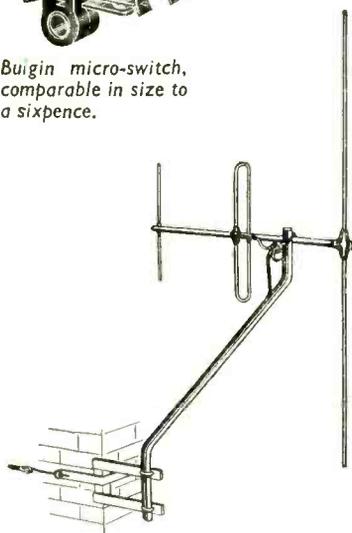
B.C.C. (217)

This firm manufacture v.h.f. radio-telephone equipment for mobile, portable and fixed-station uses. Mobile equipments are generally of 5 watts r.f. output; fixed station sets are of 5 watts and 25 watts output while portable, or pack sets, give about 120 mW output. The latest addition is a motor-cycle installation with selective calling facilities.

British Communications Corporation Ltd., Second Way, Exhibition Grounds, Wembley, Middlesex.



Bulgin micro-switch, comparable in size to a sixpence.



Aerialite Model 800 twin-band aerial.

BAIRD (52)

Television receivers with 14in and 17in tubes are shown in both table models and consoles. An unusual feature is the use of electromagnetic focus. A 12-channel tuner is included in which two channels only are initially operative.

As a console model there is a new set with a 21in tube.

Hartley Baird, Ltd., Princess Works, Brighouse, Yorks.

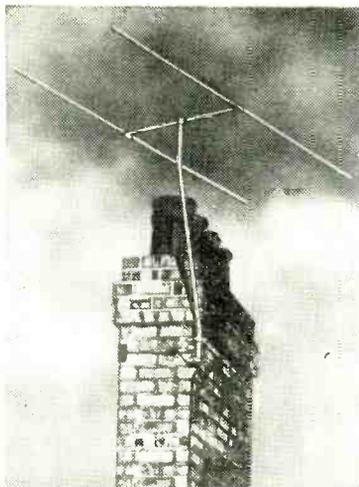
BELLING-LEE (46)

Combined aerials, separate aerials and adaptors for existing aerials are shown in profusion on this stand. An unusual combination is a Band I-Band II aerial (t.v./f.m.) which should be very satisfactory in areas of relatively high signal strength. It consists of one vertical and one horizontal dipole fitted to a single insulator and sharing a common downlead.

They have a diplexer combining unit for coupling two different (i.e.,



Airmec "Televet" television receiver alignment and test equipment.



Belling-Lee Junior "H" FM aerial.

Band I and Band III) aerials into a single feeder without measurable loss in efficiency of either, or it could be used to split the output from a dual-band aerial designed for a common feeder into two output channels for separate Band I and Band III inputs at the receiver.

Their display of aerials, while physically overshadowing their other items, should not be allowed to attract all the visitors' attention. The firm make a wide range of plugs and sockets, fuse holders, connectors and interference suppressors. They are specialists in the latter business.

Belling and Lee Ltd., Cambridge Arterial Road, Enfield, Middlesex.

BRIMAR (1)

So far as valves for domestic applications are concerned, this year's exhibit concentrates attention on types introduced to meet present-day demands in the design of sets for broadcast reception in Bands II and III. Brimar television tubes are now fitted with an improved tetrode gun. A special display of transistors is to be made.

"Special quality" valves figure more prominently than in previous years. The cost of these valves has been considerably reduced, thus attracting designers to their use in wider fields of application.

New "Brimistors" include special types for insertion in valve-heater chains and for the suppression of switching surges. A miniature pattern is made for the protection of filaments in mains/battery portables.

Standard Telephones and Cables, Ltd., Footscray, Sidcup, Kent.

BULGIN (59)

The design and manufacture of micro-switches have been an important activity of this firm in recent years; one of the newest additions to their range takes the form of a sub-micro-switch comparable in size to a sixpence, yet which will handle 1.5 A peak current at up to 250 V a.c. or 50 V d.c. Micro-switches can be used either singly or banked for operation by a single multi-cam spindle.

The present range of miniature and standard toggle switches is very wide and most of the numerous types are available with or without insulated operating dollies.

Another important activity is the



Baird TV17CD with 17in tube.

production of signal lamps; these are made in single or multiple types, large, small and Lilliputian. Sharing the same stand will be a wide range of knobs and dials, terminals, test prods and chassis fittings, including twin and multi-way connectors with floating contacts.

A. F. Bulgin and Co. Ltd., Bye Pass Road, Barking, Essex.

BUSH (22, 57)

Television sets with 12in, 14in, 17in and 21in tubes are made by this firm and all cover Bands I and III. Except in the 12in models, the tuning system comprises cam-operated slug-tuned coils, with band-switching, controlled by a multi-position knob and a clicker mechanism. A fine tuning control is provided. These sets also have a.g.c. on sound and vision, the control voltage for the latter being derived from the sync separator.

Several sound broadcast receivers equipped for f.m. reception will be on view, including a radio-gramophone. One model, the VHF54, has a magic-eye tuning indicator.

Bush Radio Ltd., Power Road, London, W.4.

CHAMPION (62)

Four new sound broadcast receivers with v.h.f. ranges form the basis of this season's programme. Another set, the Model 836 "Fidelo," is for 88-95 Mc/s only, works from a.c. or d.c. mains, gives 3 watts output into a 6in elliptical loudspeaker and costs £19 19s (including tax).

In the Model 840 console and 841 table model, two electrostatic loudspeakers are used in conjunction with a moving coil unit. Internal dipoles for v.h.f. and ferrite rod aerials for other wavebands are provided in addition to sockets for external aerials. These sets are for a.c. mains only and have three wavebands—88-95 Mc/s, 200-550 metres and 800-2,000 metres.

An additional short-wave range (15-50 metres) is included in the Model 880 table model and Model 856 radio-gramophone.

Champion Electric Corporation Ltd., Drove Road, Newhaven, Sussex.

CHANNEL (212)

A recent addition to this firm's products is a 9-channel television converter providing one channel in Band I and eight in Band III; coils for all are included and aligned.

Other items of interest include a Band III pre-amplifier giving a gain of 24dB and a dual-band waveform generator giving a composite bar pattern and all sync pulses for alignment of a receiver in the absence of a "live" transmission.

Channel Electronic Industries Ltd., Princess St., Burnham-on-Sea, Somerset.

COLLARO (39)

The mechanical techniques of high-grade gramophone turntable design have been applied in the "Tape

Transcriptor" mechanism with which Collaro have entered the magnetic tape recording field. A heavy flywheel with a ground and lapped spindle and single-ball thrust bearing ensures speed constancy, while a retractable drive to both capstan and take-up spool prevents the formation of flats on the intermediate friction wheels when the machine is switched off. The tape transport system is symmetrical with two motors and four heads (two to each track). Track changing is effected by switching heads and reversing the functions of capstan and take-up spool motors.

Items concerned with disc reproduction will include the "Studio" range of pickups, the 2010 transcription turntable, the RC54 record changer and the AC3/554 gramophone unit.

Collaro Ltd., Ripple Works, Bye-Pass Road, Barking, Essex.

COSSOR (23)

All this season's television receivers are tunable for alternative programmes: a typical specification is that of the 17in Model 937 with 21 valves. Features include turret tuning, flywheel sync, and automatic contrast control. There is also a "three-in-one" equipment embodying television, all-wave sound broadcasting and an automatic record changer.

Emphasis is placed on a.m./f.m. sound sets, of which there are three models, including a radio-gramophone.

A. C. Cossor, Ltd., Cossor House, Highbury Grove, London, N.5.

COSSOR INSTRUMENTS (AND EXPORT) (114)

This year's exhibit is concentrated largely on equipment for test and alignment of sound and vision broadcast receivers, both for use in production and maintenance. A typical instrument is the "Telecheck and Marker Generator" which, connected to a standard oscilloscope, will present the overall response curve of a television receiver. There is also an alignment generator for f.m. receivers which will be demonstrated at work.

There is also to be a comprehensive display of oscilloscopes ranging from a miniature single-beam instrument to specialized double-beam wide-band models.

A range of export receivers is to be shown.

Cossor Instruments, Ltd., Cossor House, Highbury Grove, London, N.5.

DECCA (32)

The combination of a pre-tuned three-programme f.m. receiver and a multi-channel 17in television receiver in the Model DMC/D18 gives a choice of all forms of entertainment broadcast in this country. Five Band I, three Band II and two Band III channels are provided and there are two blank positions.

In the new Models RG100 and RG103 radio-gramophones the normal short-, medium- and long-wave ranges are retained as an alternative to v.h.f. with continuous tuning over Band II. Internal resonant dipoles are provided for v.h.f. and a ferrite rod aerial for the a.m. stations. External aerials can also be used on all ranges where necessary. The RG100 has a Garrard RC111 record changer and a single pentode output valve, while the RG103 has a push-pull output stage and uses the Garrard RC80 record changer.

These new models will be supplemented by a choice of four other television receivers, four radio-gramophones and two portable record reproducers.

The Decca Record Co. Ltd., 1-3 Brixton Road, London, S.W.9.

DEFIANT (60)

A feature of the 17in television set is an electrical shift control; the 14in retains the more usual mechanical arrangement. In other respects the sets are similar. Bands I and III are covered with switch selection and trimmer; separate aerial feeders are used for the two bands.

A radio-gramophone, the RGS-756, has a push-pull output stage and covers Band II as well as short, medium and long waves. There is a built-in Band II aerial and an internal ferrite-rod aerial for medium and long waves. This can be rotated by a panel control.

Co-operative Wholesale Society Ltd., 1, Balloon St., Manchester.

DE LA RUE (214)

The many plastic materials shown by this firm will include a range of improved insulating boards, and "Delaron Copper Clad," a composite board specially produced for the making of "printed" circuits by offset litho, silk-screen or photographic processes. This laminate is made to withstand the etching process and subsequent dip soldering and also has good characteristics for the punching of holes.

Thomas De La Rue and Co. Ltd., 84-86 Regent Street, London, W.1.

DOMAIN (305)

This exhibit comprises display stands, tables and trucks. There are 10 models of tables for television sets. They are of tubular metal construction with a shelf.

Domain Products Ltd., Domain Works, Barnby Street, London, N.W.1.

DUBILIER (221)

The wide range of capacitors and resistors required by the radio and electronics industries today is well exemplified by the many different types displayed on this stand. Prominence is given to two types of high-voltage capacitors for use in fly-back e.h.t. circuits. Alternative types with screw terminals or soldering

lugs are available. The maximum working d.c. voltage is 20 kV for a ceramic- and 30 kV for a plastic-tube type.

For v.h.f. circuitry Dubilier have a range of miniature silvered ceramic capacitors in normal, feed-through and bushing patterns.

Resistors also cover a wide field of application; one of their latest additions is a dual "Q" type with concentric spindles and mains switch.

Interference suppression is a speciality of this firm and they now have a wide range of suppressors for domestic and industrial apparatus.

Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

DYNATRON (24)

One example of the range of elaborate apparatus being shown on this stand is the Ether Pathfinder a.m./f.m. chassis. It is a tuner covering two s.w. bands, medium and long waves and the v.h.f. band. It has an r.f. stage, frequency-changer and two i.f. stages on all bands. The output is 0.2V r.m.s. for 40 per cent modulation and the

tuner is intended for use with the (separate) LF10 a.f. amplifier. This is a four-valve amplifier with push-pull output giving 12W for under 0.1 per cent distortion.

A television set, the Condor, has a 21in tube and a 13-channel tuner. Flywheel sync is fitted and a.g.c. is provided on both sound and vision.

Dynatron Radio Ltd., The Firs, Castle Hill, Maidenhead, Berks.

E.A.P. (303)

The portable "Elizabethan" magnetic tape recorder has a response on playback which conforms to C.C.I.R. standards and can be used for the reproduction of E.M.I. and other tape records made to these standards. The amplifier may be used independently for other purposes with a level response from 30 c/s to 15 kc/s.

A new console model and two new portable versions will also be shown.

E.A.P. (Tape Recorders) Ltd., 546 Kingsland Road, London, E.8.

E.A.R. (216)

Record reproducing equipment is the principal concern of this firm. Port-

able and console models range from the "Mascot Miniature" to a "High Fidelity F.M.-Gram." The "Armchair Console" is provided with a special stand, or it can be used as a table model.

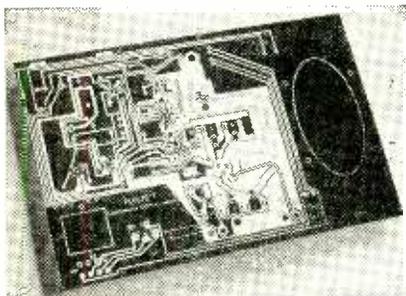
Equipment for the demonstration of gramophone records will also be exhibited.

Electric Audio Reproducers Ltd., 17, Little St. Leonards, London, S.W.14.

E.M.I. (215)

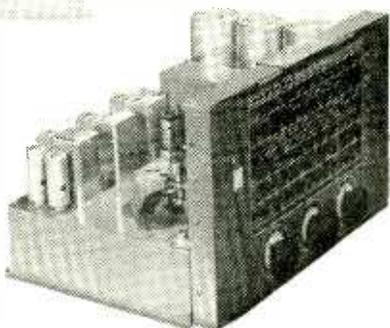
Equipment for tape recording at a "professional" level is to be a prominent feature of the E.M.I. exhibit. In this category is the high-quality recorder Type BTR/2, designed for record-making companies and broadcasting organizations. Different models provide for choice of tape speeds up to 30in/sec. Other recorders include a portable battery-operated model weighing only 14½lb.

Other E.M.I. activities are also represented in the exhibit. The design and installation of relay distribution systems for both sound and vision broadcasting is undertaken, while another department deals with sound amplification for public build-

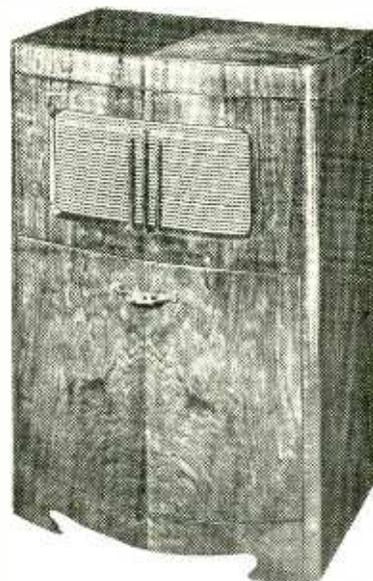


Printed circuit on De la Rue copper laminate.

Right: Dynatron a.m./f.m. tuner of Ether Pathfinder.

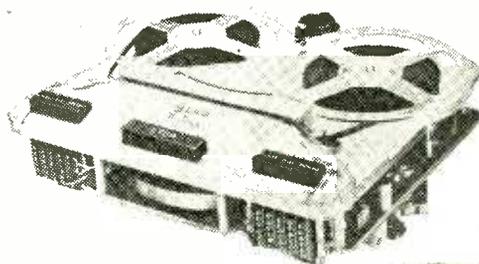


Above: Cossor Instruments f.m. signal generator.



Decca RG100 radio-gramophone with v.h.f. range.

Left: Bush VHF54 covering long, medium and v.h.f. bands.



Left: Collaro "Tape Transcriber."

ings, hotels, factories and similar places.

E.M.I. Sales & Service, Ltd., Hayes, Middx.

E.M.I. INSTITUTES (311)

This institute offers home training in the various branches of applied electronics. Emphasis is on the practical side, and students are provided with experimental outfits on which to work. However, there are also courses on theoretical principles.

E.M.I. Institutes, Ltd., 10 Pembridge Square, London, W.2.

EDISWAN (58)

Broadcast receiver valves include recently introduced types for Bands II and III; among the latest productions are earthed grid triodes for both parallel and series connection. A new 12in cathode-ray tube, Type CRM124, has an ion trap tetrode gun fitted as standard. Industrial transmitting and special-purpose valves include the "Vapotron" with a novel cooling system; the valve is cooled by water vapour. Air cooling is used in a new 1-kW valve for r.f. heaters.

Among the many components and accessories shown by Ediswan will be a 12-channel turret tuner for television receivers. A new co-axial television feeder has cellular polythene insulation; attenuation at 200 Mc/s is given as 3 and 3.2dB per 100ft for the rigid and flexible types respectively. Components in-

clude a number of parts moulded in high-performance fluorocarbon resins.

Edison Swan Electric Company, Ltd., 155 Charing Cross Road, London, W.C.2.

EKCO (12, 121)

Tube sizes in the television sets shown on this stand are 14in, 17in and 21in. Turret tuning is used for the two bands and some models also include provision for f.m. reception on Band II. One of these, the TC267, with a 17in tube, has spot wobble, flywheel sync and a.g.c. The 21in model (TC220) also has these features.

Quite a large number of the sound broadcast sets are now provided with facilities for Band II reception. The smallest is the U243 for a.c./d.c. operation; it has built-in aerials and a tuning indicator. The largest is a radio-gramophone, ARG256, which covers long, medium and short waves as well as Band II. There are a push-pull output stage feeding a pair of loudspeakers, a three-speed automatic record changer, bass and treble tone controls, while provision is made for feeding the radio output to a tape recorder.

Car radio sets are also on view, on stand 121.

E. K. Cole Ltd., Southend-on-Sea, Essex.

ENGLISH ELECTRIC (31)

The television sets shown on this stand are available in two forms—

with and without provision for the reception of the three f.m. Band II stations. The vision side is switched off in the Band II positions of the selector switch. All sets cover Bands I and III. There are 17in table and console models and a 21in console in which the tube operates at 15kV. Permanent-magnet focusing is used with electromagnetic deflection and flyback c.h.t. The set is designed for a.c./d.c. operation and a control barretter is fitted. The power consumption is 170 W.

The English Electric Co. Ltd., Marconi House, Strand, London, W.C.2.

EVER READY (54)

Though dry batteries for every conceivable application in the radio and allied field comprise the main Ever Ready exhibit, there is also a range of six battery-operated broadcast receivers. These comprise light- and medium-weight portables and transportables and two table models.

The Ever Ready Company (Great Britain) Ltd., Hercules Place, Holloway, London, N.7.

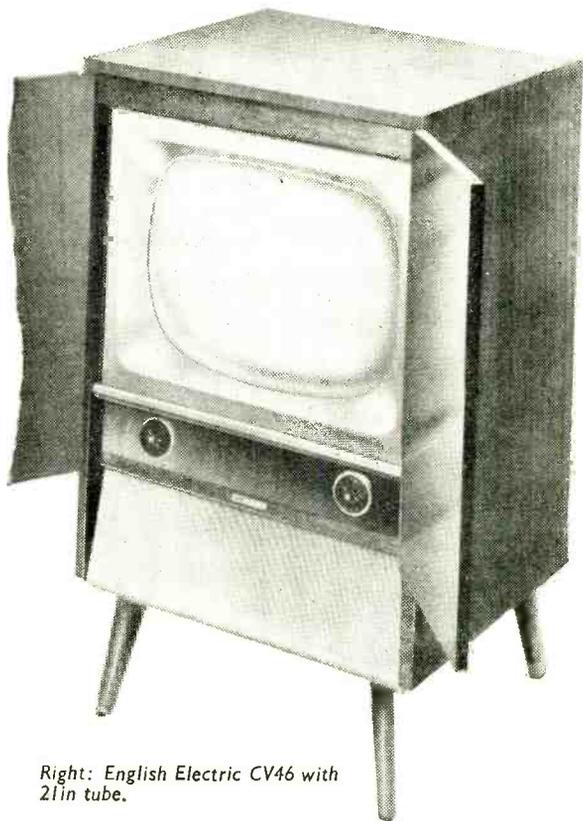
FERGUSON (14, 103)

A large range of television and sound broadcast receivers is being shown. The "nine-star" television sets are fringe-area models and include an a.g.c. circuit in which the user has a choice of two time constants. The "new standard" sets are for normal

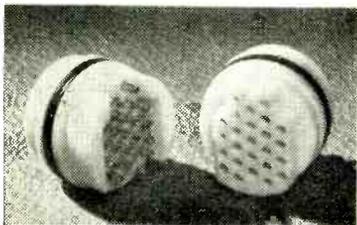
(Continued on page 419)



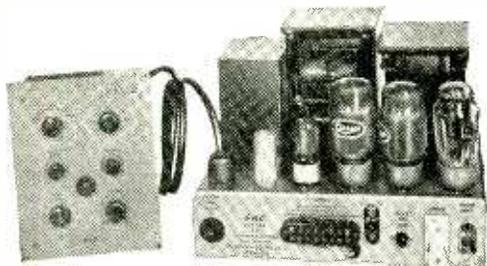
Ekco TC220 with 21in tube.



Right: English Electric CV46 with 21in tube.



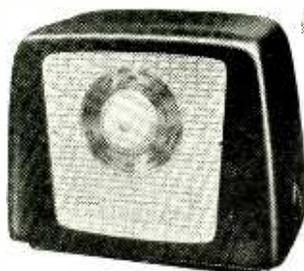
Left: Ediswan multi-way plug and socket in PTFE.



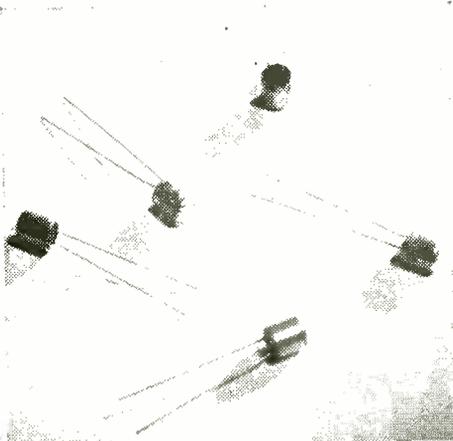
G.E.C. 25-watt general-purpose amplifier.



Ever Ready "Brief Case" portable.



Ferguson 352U a.c./d.c. portable.



Ferranti silicon junction diodes.

GIBBS (209)

Television and radio tables and other furniture are exhibited here. Record cabinets are shown in sizes up to the U568, holding 340 records.

Herbert E. Gibbs Ltd., First Avenue, Montague Road, Edmonton, N.18.

GOODMANS (20)

Once again this stand will take the form of a demonstration theatre—this year with a seating capacity of eighty. The "Axiom" and "Audiom" high-quality loudspeakers will be shown working in a new range of enclosures (types Axiom 180, 280, 480 and 172) which have been designed to give good transient response and a smooth bass in cabinets of comparatively small size.

The Axiom 80 loudspeaker unit, which has hitherto been made for export, is now available in this country, and will be demonstrated. It has a free-edged cone with cantilever suspension, and has a fundamental resonance of 20 c/s.

Goodmans Industries Ltd., Axiom Works, Wembley, Middlesex.

H.M.V. (48, 49)

High sensitivity and ease of tuning are design features of the new H.M.V. television receivers, which have all main controls at the front. Electrostatic focusing is used; the line scan and e.h.t. unit is completely sealed.

There is a range of sound receivers covering the long, medium and v.h.f. broadcasting bands. The Model 1252 tuner for connection to the pick-up terminals of a receiver provides reception of v.h.f. transmissions; the unit is self-contained, with its own power supply.

Equipment for the "Stereosonic" twin-channel sound reproduction system, described in *Wireless World* last May, can be heard working in the H.M.V. demonstration room. This equipment can also be used as a

reception conditions. In each range there are 14-in, 17-in and 21-in tube models, and an earlier 12-in design is retained in table-model form.

The sound receivers include the model 329A, for a.c. operation, which includes Band II f.m. reception. There is a range of radio-gramophones, some of which cover Band II. An adaptor to enable f.m. to be received with any existing Ferguson set having pick-up sockets is shown.

Ferguson Radio Corp. Ltd., 105-109 Judd Street, London, W.C.1.

FERRANTI (13 & 120)

Broadcast receiving valves specially designed for operating at around 200 Mc/s have recently been added to the Ferranti range. Cathode-ray tubes up to 21in will also be shown.

A series of silicon junction diodes have recently been introduced. These are of the hermetically sealed type with very low reverse current, designed to withstand high operating temperatures. An important part of the exhibit comprises industrial valves such as trigger tubes, miniature stabilizers, thyratrons and high-voltage rectifiers. Specialized c.r. tubes for industrial use include flying spot scanners.

A demonstration unit will present a picture on a long-afterglow c.r. tube by means of a flying spot scanner system.

Ferranti, Ltd., Hollinwood, Lancs.

G.E.C. (37)

Among the latest Osram valves is the KT55, a relatively high-power output valve for a.c./d.c. operation on

restricted h.t. voltages. A range of recently introduced miniature receiver valves has been designed for operation at around 200 Mc/s. There is a new 21-in cathode-ray tube with a 90° scan angle.

Three new p-n-p junction transistors, Types EW53, EW58 and EW59 cover many different applications, including use in r.f. circuits up to about 0.5 Mc/s. Both germanium and silicon diodes are to be shown, as well as photo-electric devices and cold-cathode trigger tubes.

The present G.E.C. range of television receivers is very wide; all have switch selection of alternative programmes and fully automatic gain control. Fringe-area models are produced. Sound receivers for the present season include a table model and a radio-gramophone with provision for v.h.f. reception.

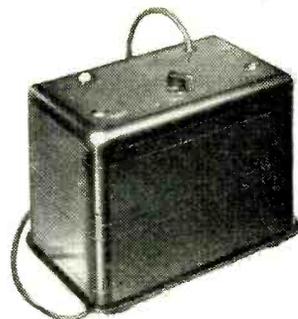
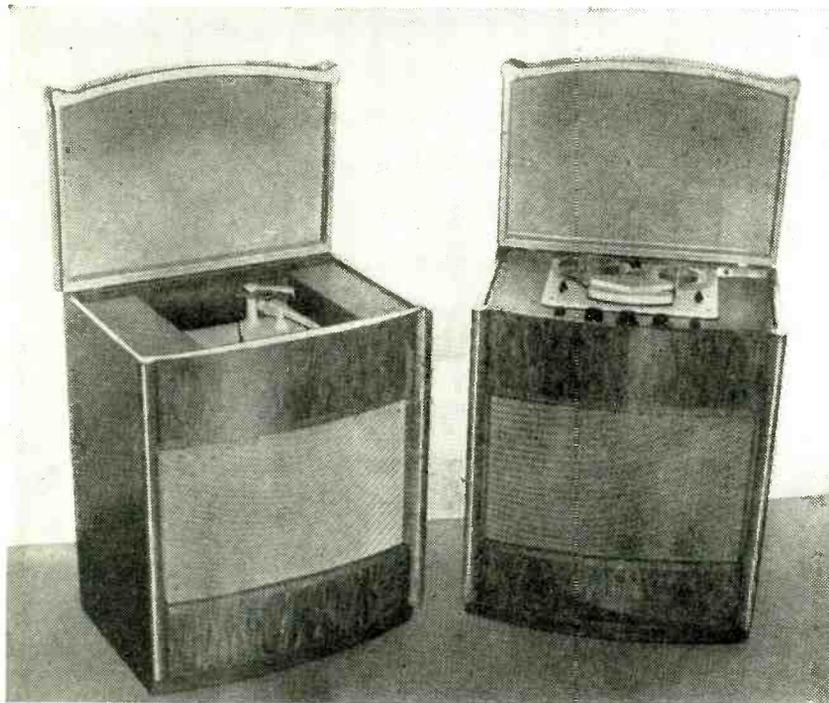
An interesting 25-watt general-purpose amplifier just produced has a wide range of application. Flexibility of control is a feature.

General Electric Company, Ltd., Magnet House, Kingsway, London, W.C.2.

GARRARD (47)

Principal interest centres on the 3-speed record changers and record players which form the foundation of many proprietary radio-gramophones. For the connoisseur there is the Model 301 "transcription" motor with minimum "wow" and flutter, and a wide range of alternative pickups and record-playing accessories.

Garrard Engineering and Manufacturing Co. Ltd., Swindon, Wilts.



Invicta Band III convertor.

Left: Twin-channel reproducers for H.M.V. "Stereosonic" system.

single-channel high-quality reproducer of tape records or discs of all characteristics.

E.M.I. Sales & Service Ltd., Hayes, Middx.

HART (210)

On this stand is to be found a wide range of record cabinets and television tables. The last are of wood construction and have shelves and castors.

Alfred Hart & Co. Ltd., 249 Upper Street, Highbury Corner, Islington, London, N.1.

HUNT (8)

With the addition of ceramics and capacitors designed especially for use in printed circuits, the range of capacitors now produced by Hunt is most comprehensive. It includes electrolytics in a wide variety of types, metallized paper, of which the W97 (Thermetic) midget has a nominal working temperature range of -100°C to $+100^{\circ}\text{C}$, metal foil and paper types, silvered mica, stacked foil and mica and ceramics.

A capacitor test set is also produced; it covers resistance measurements as well.

Printed circuits is another activity of this firm.

A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, London, S.W.18.

INVICTA (53)

The new Type 126 television receiver with a 14-in tube, like all this year's Invicta models, has a 13-channel tuner. There is also a convertor unit for adapting Band I sets for reception of Band III.

A range of table model sound receivers and radio-gramophones providing both a.m. and f.m. reception will also be shown.

Invicta Radio, Ltd., 100 Great Portland Street, London, W.1.

J.B. CABINETS (219)

The production of radio and radio-gramophone cabinets for the trade comprises the main activities of this firm and their exhibit consists of a selection of the more interesting models produced recently.

J.B. Manufacturing Co. (Cabinets) Ltd., 86 Palmerston Road, Walthamstow, London, E.17.

J-BEAM AERIALS (104)

The television aerials made by J-Beam have always followed a very distinctive pattern, the feeder being joined, via a suitable matching section, to the end of the dipole in place of the more general centre connection. They have recently evolved an even more novel aerial for Band III fringe areas. It consists of a skeleton slot combined with twin yagis.

J-Beam Aerials Ltd., Cleveland Works, Weedon Road Industrial Estate, Northampton.

K.B. (16)

Although there are several 14-in tube television sets shown on this stand, in the main the new models have 17-in or 21-in tubes. They all have turret tuners for Bands I and III. Among the 17-in models there is one specially designed for fringe areas.

Many of the broadcast sets now include v.h.f., the sets in general covering medium and long waves

and Band II. Radio-gramophones are also shown. The MG.30 has three loudspeakers mounted in angular planes.

Kolster-Brandes Ltd., Footscray, Sidcup, Kent.

LABGEAR (204)

The production of television aerials is a new departure for Labgear; the models shown include indoor and outdoor types and a novel design is a dual-band system comprising a single dipole for Band I and a two-element system with a fork-like attachment to the Band I dipole for Band III. A single feeder is used.

One of the Band III 4-element outdoor aerials intended for areas of poor reception (not necessarily fringe) has wide spacing between elements and it is claimed this provides a somewhat better signal than usual. A broadside array consisting of two wide-spaced 4-element yagis is said to serve for most fringe areas.

Labgear (Cambridge) Ltd., Willow Place, Cambridge.

LINGUAPHONE (207)

This company provides courses of instruction in a great number of languages; teaching is through the medium of gramophone records. Various kinds of reproducing equipment are available, including a headphone attachment enabling the student to listen without disturbance.

Linguaphone Institute, Ltd., 207-209 Regent Street, London, W.1.

MCMICHAEL (40)

Particular attention is paid in this season's television receivers to inter-

lace so as to ensure high-quality definition under all conditions of reception. Another feature of the new sets is the omission of a line output transformer; one reason is to eliminate one potential cause of breakdown, another is to restrict temperature rise in the set. In the absence of an output transformer e.h.t. is derived from a separate generator.

Table and console television sets with from 14-in to 17-in tubes are shown and are available with or without a radio chassis. Twelve-channel turret tuners are used throughout the McMichael range. Sound radio sets include a standard chassis for fitting to television sets and several table models, consoles and radio-gramophones.

McMichael Radio Ltd., 190 Strand, London, W.C.2.

MARCONIPHONE (50)

Four new television receivers have been introduced; these give the choice between 14-in and 17-in tubes, and table or console cabinets. All are for a.c./d.c. supplies and embody switched coil tuning for 13 channels. Automatic vision gain control is fitted and a wide-range tunable filter is provided for mitigating the effects of diathermy or similar kinds of interference. An 8-channel Band III converter unit for fitting to earlier Marconiphone sets is to be shown.

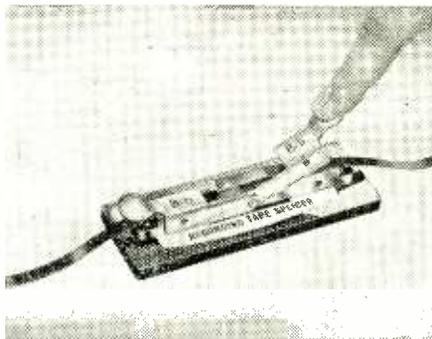
Most of the new sound receivers provide for v.h.f. reception as well as for medium and long waves, and are also available as radio-gramophones.

There will be a comprehensive display of cathode-ray tubes and valves.

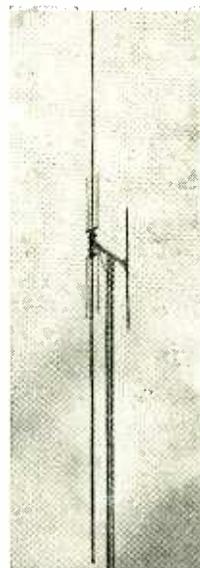
The Marconiphone Company, Ltd., Hayes, Middx.

MASTERADIO (36)

Without exception all Masteradio television receivers provide 13-channel tuning, embody an ion trap



New "Bib" (Multicore) tape splicer.



Two-band television aerial made by Labgear.

and are housed in cabinets designed especially for wide-angle viewing. All are superhets and, with the exception of Model TE21C, which is for a.c. mains, they operate on either a.c. or d.c. supplies. Tube sizes range from 14in to 21in.

One of this season's sound broadcast sets is an a.m./f.m. model covering four wavebands; it is known as the "Elstree" and is a table model.

Masteradio Ltd., Fitzroy Place, London, N.W.1.

MULLARD (18)

This year's exhibit aims at providing visitors with easily assimilated explanations of the functioning of various electronic devices, particularly of valves, cathode-ray tubes and transistors. There will also be a demonstration showing the advantages of f.m. broadcasting.

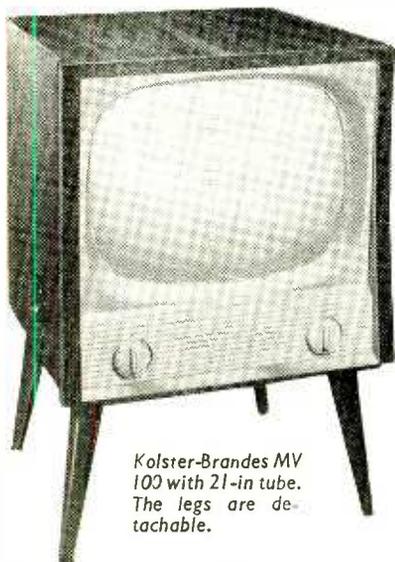
In one of the demonstration rooms

a specimen 20-W amplifier built around the new EL34 pentode valve will be working. The design of this amplifier was discussed in detail in *Wireless World* for May and June this year. Another demonstration room will show the uses of devices intended primarily for the equipment manufactured, including picture tubes and components for 90° scanning, transistors for hearing aids, Ferroxcube ferro-magnetic cores and a new grade of Ticonal permanent magnets for loudspeakers. Some of the newer applications of transistors are also demonstrated.

Mullard, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

MULTICORE (63)

The main exhibit here will show by practical demonstration how Ersin Multicore wire solder is used in the manufacture of radio receivers.



Kolster-Brandes MV 100 with 21-in tube. The legs are detachable.



McMichael Model 555 bureau radio-gramophone. It has a v.h.f. band.

Though most radio needs are met by six different tin-lead alloys in nine gauges, it is interesting to know that as many as 400 different specifications are available with, for example, melting points ranging from 145°C to 296°C. Another Multicore exhibit shows a complete soldering process that has been developed for printed circuit techniques of manufacture.

The Bib splicer for magnetic recording tape is now being produced in the modified form described in our February issue.

Multicore Solders, Ltd., Maylands Avenue, Hemel Hempstead, Herts.

MURPHY (29)

One of the features of this exhibit is a range of broadcast receivers which include Band II in their frequency ranges. The sets all cover medium and long waves and one short waveband and have a double-triode v.h.f. tuner in which one section acts as an earthed-grid r.f. amplifier and the other as a mixer-oscillator. There is an internal dipole for Band II and this also functions as a plate aerial on the other bands. One model, the A242R, is a radio-gramophone.

Television sets are of 14-in and 17-in types and have turret tuners with a cascode r.f. stage to cover Bands I and III. A direct-drive scanning circuit is used and the sets are available both as table models and as consoles.

Band III converters for older Murphy sets are available.

Murphy Radio Ltd., Welwyn Garden City, Herts.

NAVY (307)

Among the examples of marine radio-communication equipment and electronic aids to navigation to be seen on this stand are the transmitter-receiver supplied to members of the Royal Naval Volunteer (Wireless) Reserve for use in their own homes and equipment for the facsimile transmission of weather maps.

The trend of progress in marine radio equipment is exemplified by replicas of the W/T office in a small

ship of the 1920's and in its modern counterpart.

The Admiralty, Whitehall, London, S.W.1.

PAM (61)

Three table-models and one console comprise the television receiver range. The 17in Model 752DL is notable for its use of twin loudspeakers. All models are for a.c./d.c. operation with provision for 13 channels on Bands I and III.

The new a.m./f.m. sound receivers will be shown: Model 701 with c.r. tuning indicator in a table cabinet and Model 702RG, a radio-gramophone in a bureau cabinet.

The Pam "Pixie" portable is made by the printed circuit technique.

Pam (Radio and Television) Ltd., 295 Regent Street, London, W.1.

PAMPHONIC (34)

High-quality amplifiers, loudspeakers and microphones for both p.a. work and domestic sound reproduction will be shown, as well as magnetic tape sound delay mechanisms for sound reinforcement in large auditoriums.

One of the principal items is the "1002" 25-watt amplifier for which only 0.05% distortion at 15 watts (1 kc/s) is claimed. The pre-amplifier, in addition to a wide range of variable tone controls, gives compensation for the main groups of recording characteristics and has provision also for radio, microphone and magnetic tape inputs. The frequency range of the equipment is 2 c/s to 100 kc/s with 28 dB of negative feedback.

Among the p.a. equipment an all-weather "Loud Hailer" with self-contained rotary converter designed to run from 12-volt accumulators is well worth close inspection.

Pamphonic Reproducers Ltd., 17 Stratton Street, London, W.1.

PERMANOID (111)

Two low-loss coaxial cables suitable for use in Bands I and II fringe areas and in most areas of Band III are now manufactured by Permanoid. One, the Type 308, is largely air-spaced with a spiral of polythene cord

surrounding the centre conductor. It has a loss 3.5 dB at 200 Mc/s. An even better performance is exhibited by the Type 308EP with an attenuation of only 3.3 dB at 200 Mc/s; for 100ft in every case.

Permanoid Ltd., New Islington, Manchester, 4.

PETO SCOTT (55)

Television receivers are shown on this stand in both 14-in and 17-in models, the sets being otherwise substantially the same. A turret-tuner is fitted and a form of a.g.c. is used on both sound and vision. The video amplifier has a cathode-follower output stage. The c.r. tube is operated at 14 kV.

The sets are for a.c. only and both table and console models are listed.

Peto Scott Electrical Instruments Ltd., Addlestone Road, Weybridge, Surrey.

PHILCO (15)

The range of Philco receivers for this season is wide, including as it does a.m. two- and three-band sets, portables and transportables and a.m./f.m. models. All the Philco television receivers have 13-channel tuners. Car radio receivers with push-button control are also produced.

Emphasis is placed on the comprehensive series of fully tropicalized sound receivers and car radio sets for export.

Electronic training units are also to be shown.

Philco (Overseas) Ltd., Romford Road, Chigwell, Essex.

PHILIPS (27, 42, 43)

Broadcast and sound-reproducing equipment to be shown for the first time includes a car radio receiver, a table model television set, a portable record player with built-in amplifier and automatic changer and a new record changer unit. There is also a new range of high-quality sound reproducing units.

The new television receiver has a 17-in tube and is fitted with an all-channel turret tuner. Flywheel sync and a.g.c. are included.

Among the sound receivers is an a.m./f.m. model embodying a rotatable ferrite rod aerial for long and medium wave reception and a dipole for v.h.f. Push-button controls are provided.

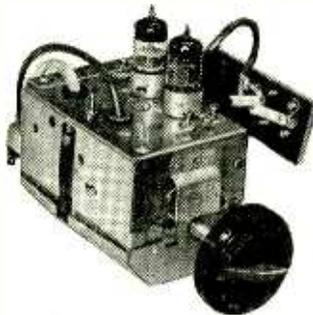
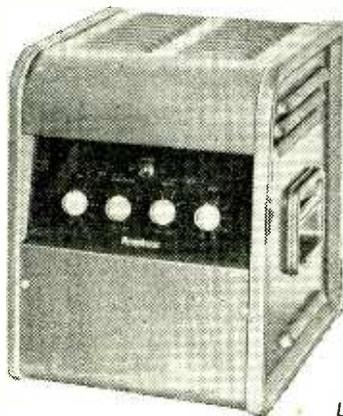
The new Philips car set is a two-unit model with separate speaker and is permeability tuned.

Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

PILOT (56)

This exhibit includes a new range of television receivers with 13-channel turret tuners to which coils are ready fitted for four channels in Band I and three in Band III. Automatic gain control and flywheel sync are embodied in all sets.

The range of sound receivers
(Continued on page 423)



Pilot turret tuner adaptor kit.

Left: Pamphonic 10-watt amplifier, type 600V.

includes a mains portable with ferrite rod built-in aerial and a battery-mains set. There are also two new receivers and one radio-gramophone which cover the v.h.f. band.

Pilot Radio, Ltd., Park Royal Road, London, N.W.10.

PLESSEY (122)

This firm manufacture a very wide range of components and accessories exclusively for the radio and electronics industries. Their exhibit consists of a selection of components and parts illustrating the vast scope of their activities. Many new items are in evidence and particular attention has been given to meeting the requirements of overseas visitors.

The Plessey Co. Ltd., Vicarage Lane, Ilford, Essex.

PORTOGRAM (65)

Record reproducers of the portable type have for many years been the speciality of this firm, and a wide choice of specifications is offered.

In addition, two interesting new console reproducers have been developed. The HF65 is for record reproduction and incorporates a high quality amplifier and twin loud-speakers arranged to radiate from the sides of the cabinet to give wide sound diffusion. There is ample record storage space and provision for the addition of an f.m. feeder unit. Model TR100 is primarily a console tape recorder and reproducer with space for the inclusion of a gramophone turntable or record changer and an f.m. feeder unit. In this model a large bass-reflex enclosure is associated with the loud-speaker.

Portogram Radio Electrical Industries Ltd., Preil Works, St. Rule Street, London, S.W.8.

PYE (30)

Details of the Pye exhibit were not available at the time of going to press. In addition to the normal range of television and sound broadcast receivers a special display of high-quality sound reproducing equipment is to be staged.

Pye, Ltd, Radio Works, Cambridge.

R.A.F. (306)

Amongst the equipment being shown by the R.A.F. is the "sonobuoy"



R.C.A. Photophone 12-watt "High-Fidelity" amplifier.

used by aircraft for the detection of submarines. The cylindrical buoy, 6 inches in diameter, houses a transmitter which is automatically switched on when dropped into the sea. All underwater noises in the vicinity of the buoy are picked up by a microphone and radiated by the aerial which is automatically erected when the transmitter is switched on.

Examples of air traffic control equipment, ground and air-borne transmitters and a pictorial display of telemetry as used in guided missiles will also be seen on this first-floor stand.

Air Ministry, Whitehall Gardens, London, S.W.1.

RCA PHOTOPHONE (110)

Inputs for magnetic and crystal pickups, radio, tape and microphone are provided in the control stages of the RCA "High Fidelity" 12-watt amplifier. The microphone input can be mixed with the radio/tape input.

Disc playback characteristics conform to the 1955 R.I.A.A. recommendations, and are supplemented by a high-pass filter (cut-off 20 c/s) and optional low-pass cut-offs at 10, 7 and 5 kc/s with slopes variable up to 35 dB/octave. Variable bass and treble controls give up to ± 15 dB at 30 c/s and 15 kc/s.

The main amplifier is stated to be flat within 0.2 dB between 20 and 25,000 c/s, to have total harmonic distortion less than 0.1 per cent at 10 W, 700 c/s, and a noise level 85 dB below the rated output of 12 watts.

RCA Photophone Ltd., 36 Woodstock Grove, London, W.12.

Portogram HF65 record reproducer incorporating twin loud-speakers.



R.G.D. (11)

Two new television receivers (1756T and 1756C) employ "Synchrolock" circuits for line timebase stability under adverse conditions of reception.

The new "Three-Fifteen" radio-gramophone includes a v.h.f. band, and this feature is also provided in the "One-Twelve" table-model receiver.

Other new models to be seen are the "Three-Twelve" console automatic radio-gramophone with 2½-watt output, and the "Five-O-Five" automatic record reproducer.

Radio Gramophone Development Co. Ltd., Eastern Avenue West, Mawneys, Romford, Essex.

R.S.G.B. (310)

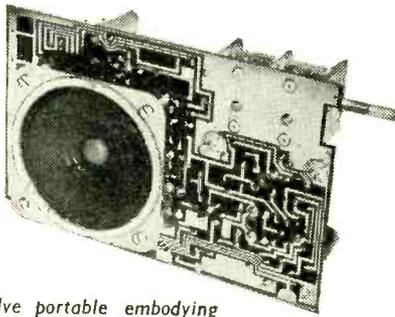
Amateur television transmission, demonstrated on a closed circuit, a low-power portable transmitter, typical of those used for field days, and an automatic morse sender are features of the Society's stand.

The "R.S.G.B. Amateur Radio Call Book" and "A Guide to Amateur Radio" are among the Society's publications available on this stand.

Radio Society of Great Britain, New Ruskin House, Little Russell Street, London, W.C.1.

R.T.R.A. (302)

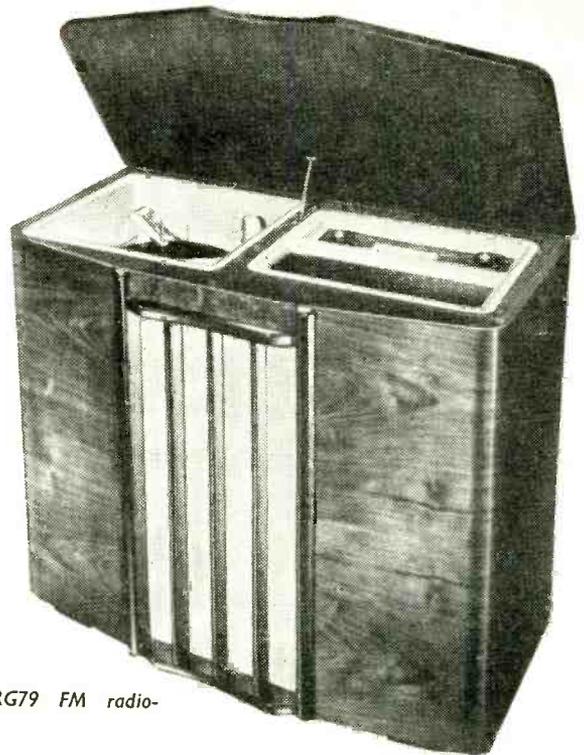
As would be expected this stand is devoted exclusively to the requirements of the dealer. On it will be found details of the various services offered by the Association to its members; in particular the receiver maintenance-insurance scheme oper-



Four-valve portable embodying T.C.C. printed-circuit element.



"Editor Super" (Tape Recorders) (Electronics) Ltd.



Regentone ARG79 FM radio-gramophone.

ated by Telesurance through R.T.R.A. dealers.

Radio and Television Retailers' Association Ltd., 26 Fitzroy Square, London, W.1.

REFLECTOGRAPH (203)

In the tape mechanisms which form the basis of this firm's magnetic recorders and reproducers, a unique continuously variable speed control is employed. Models are available for industrial and scientific applications as well as for domestic high-quality sound reproduction.

The latest development is the Model RR100 which has separate amplifiers with facilities for monitoring during recording. Four transistors are employed in the playback amplifier with the object of reducing residual hum below the level possible with valves.

Rudman, Darlington (Electronics) Ltd., Wednesfield, Staffs.

REGENTONE (38)

A new table-model sound receiver (A155FM) and two radio-gramophones (ARG79FM and ARG89FM) provide facilities for v.h.f. as well as long, medium and short waves. These will be supported by a wide choice of popular models, including the ARG77 and the Multi 99 table radio-gramophone.

The established television range of five models, two table, two console and a combined television-radio-gramophone, continues unchanged.

Regentone Radio and Television Ltd., Eastern Avenue West, Romford, Essex.

ROBERTS (117)

Efficient circuitry and meticulous attention to finish and external appearance characterize the portable sound receivers made by this firm. There is a choice of types for battery, mains or mains/battery operation and more recent models are fitted with "Ferroxcube" aerials.

Roberts' Radio Co. Ltd., Creek Road, East Molesey, Surrey.

ROLA CELESTION (17)

In addition to representative examples of loudspeakers for set manufacturers, a number of special types will be shown to illustrate the versatility of the company's manufacturing resources. P.A. units for covering large areas, sources for underwater communication and flame-proof types for use in mines and oil refineries will be included in the display.

Rola Celestion Ltd., Ferry Works, Summer Road, Thames Ditton, Surrey.

S.T.C. (119)

A range of selenium rectifiers, including h.f. types, is to be shown. There will also be a series of rectifiers for sound and vision broadcast receivers as well as e.h.t. tubular rectifiers and "Q" type unistors. Three groups of high-voltage lightweight aluminium rectifiers, including types for aircraft and other uses, will also be shown, as will germanium junction power rectifiers and photo-electric cells.

A demonstration is to show the manufacture of tubular rectifiers, including electronic counting of the

components used in assembly. Other displays will illustrate the use of germanium power rectifiers and servo-motor control through a photo-electric cell.

Standard Telephones & Cables, Ltd., Connaught House, 63 Aldwych, London, W.C.2.

SAPPHIRE BEARINGS (304)

As one of the industry's principal manufacturers of gramophone reproducing styli, this firm will be showing examples of "flame-fashioned" surface finish under the microscope. A modern type of shadowgraph will also demonstrate the method of checking the radius of the point to 0.0001in.

Sapphire Bearings Ltd., 96a Mount Street, London, W.1.

SIMON (10)

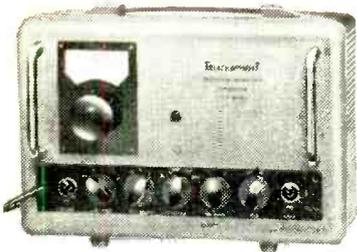
Magnetic tape recorders for domestic and professional use are represented by the recently introduced portable Model SP/2 and by a replica of the long-duration tape monitoring equipment installed in the control tower at the Royal Aircraft Establishment, Farnborough.

The Model SP/2 is notable, among other things, for the ready accessibility provided by the re-designed case, and for the fact that it includes an independently available 10-watt reproducing amplifier.

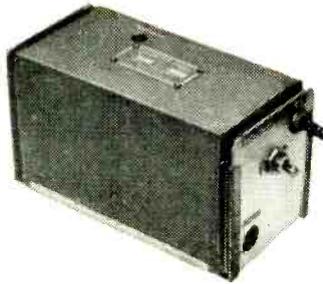
Simon Equipment Ltd., 48-50 George Street, London, W.1.

SOBELL (19)

The range of sound broadcast sets includes models covering the f.m. Band II and radio-gramophones.



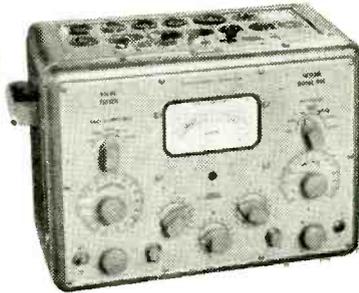
Telegroup 2-band television pattern generator, Model WG44.



Spencer-West Band III converter.



Reflectograph Series RR100 tape recorder.



Taylor Model 45C valve test set.

Television models include 14-in and 17-in types and are for a.c./d.c. operation covering Bands I and III with turret tuning.

Radio & Allied Industries Ltd., Langley Park, Slough, Bucks.

SPECTO (206)

This firm is showing a magnetic tape reproducer for tape records having the C.C.I.R. characteristic. The output has 15 W output with a response within ± 0.5 dB from 10 c/s to 20 kc/s. The harmonic distortion at 10-W output is claimed to be under 0.4% at 40 c/s and less at higher frequencies. Treble and bass tone controls are provided.

The reproducer and amplifier are available together or separately.

Specto Ltd., Vale Road, Windsor, Berks.

SPENCER-WEST (211)

In addition to pre-amplifiers for television and distribution amplifiers for Bands I, II and III, this firm is showing a range of converters. The Type 30 is a simple model to permit reception of one station in Band I and one in Band III, while the Type 33 provides two channels in Band III. This has a neutralized-triode r.f. stage with a pentode mixer and triode oscillator. A feature of the unit is that remote switching for station selection is provided.

The "Adder" is a more elaborate converter for 13 channels and provides an output at intermediate frequency.

Spencer-West Ltd., Quay Works, Great Yarmouth.

STELLA (51)

Models making their first appearance include a portable mains/battery broadcast receivers in a plastics case; a ferrite rod aerial is fitted. A new console radio-gramophone includes provision for v.h.f. reception, for which a built-in dipole is provided.

A new table-model television receiver, fitted with a 17in tube, is designed for use within the service areas. It embodies a.g.c. on both sound and vision and is fitted with a turret tuner.

A record player with a built-in three-valve amplifier has been introduced; this is additional to the model ST50A portable record player for use with existing amplifiers.

Stella Radio and Television Company, Ltd., Oxford House, 9-15, Oxford Street, London, W.1.

T.C.C. (45)

A special feature is made this year of capacitors designed especially for television receivers covering Band III and, with an eye to the future, Band IV also (470-585 Mc/s). These are all ceramics and consist of lead-through and stand-off bypass capacitors constructed from "Hi-k" (high dielectric constant) ceramic and small pre-set trimmers made from "Low-k" ceramic.

For circuits where high capacitance couplings are wanted in a reasonably small physical size T.C.C. have a range of "Superlitics"; these are electrolytics with leakage resistances comparable to many paper types.

A new development is a sub-miniature electrolytic of high capacitance and low-voltage rating for use in transistor circuits.

Printed circuits are becoming an important activity of T.C.C. and the many different specimens shown exemplify the various applications now found for these assemblies in radio and electronic equipments.

Telegraph Condenser Co. Ltd., Wales Farm Road, North Acton, London, W.3.

TAPE RECORDERS (66)

The "Editor" and "Playtime" series of tape recorders have been augmented by the "Editor Super Hi-Fi" and the "Playtime Plus." In the former a large-diameter loudspeaker is mounted in the detachable lid, and in the "Playtime Plus" a playback amplifier has been included. The new "Playtime Plus" weighs only 20lb.

Tape Recorders (Electronics) Ltd., 3 Fitzroy Street, London, W.1.

TAYLOR (6)

Prominent among the new pieces of test equipment introduced this year is a versatile valve tester known as the Model 45C. Valveholders to accommodate all valves in current use, English, Continental and American, are disposed about the top with the controls on the front. Charts give test conditions for over 4,000 valves.

Other items of particular interest at the present time are a signal generator covering Band III television wavelengths, a 20-k Ω /V test meter and a television/f.m. receiver alignment frequency-modulated oscillator; the range is 5 to 250 Mc/s.

Taylor Electrical Instruments Ltd., 419-424 Montrose Avenue, Slough, Bucks.

TELEQUIPMENT (105)

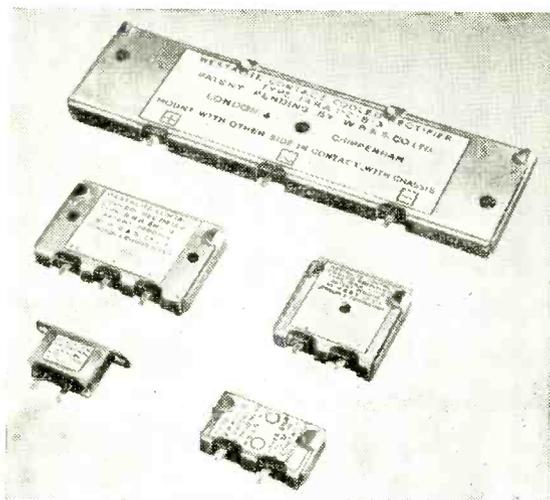
The WG44 television pattern generator made by this firm covers both the Band I and Band III television frequencies and gives the choice of several combinations of horizontal and vertical bars for testing a receiver in the absence of a "live" broadcast. They make, also, factory-type test equipment and a high-grade oscilloscope.

Telequipment Ltd., 1319a High Road, Whetstone, London, N.20.

TELERECTION (7)

A distinctive feature of this firm's multi-element Band I television and f.m. aerials is that a "delta" matching system is employed for the feeder. Some aerials are also given a slight upward tilt; this is particularly noticeable in the "Multimus" series of 4-element fringe area types; which incidentally now includes one for f.m. broadcasting.

Between the fringe area types and single dipoles comes a considerable number of intermediate patterns for all three v.h.f. bands for use at various distances from the transmitters. Indoor and outdoor types are included. Fringe area



Westinghouse contact-cooled rectifiers.

Band III aerials are now available with six or more elements, and in general folded dipoles are used.

Telerection Ltd., Antenna Works, St. Paul's, Cheltenham, Gloucester.

TELEVISION SOCIETY (315)

In addition to providing a rendezvous for members and visitors, the stand of the Television Society also serves as an information bureau. Reprints of some of the papers read before the Society during the past year or so, including Gouriet's "Introduction to Colour Television," will be available.

Television Society, 164 Shaftesbury Avenue, London, W.C.2.

TRIX (26)

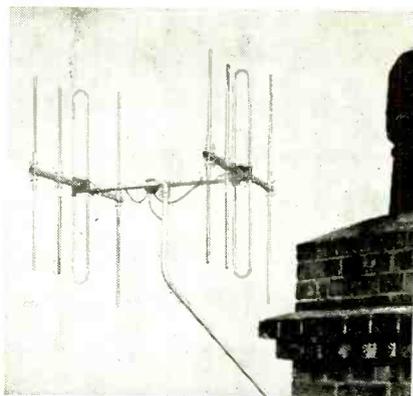
A wide variety of sound reproducing equipment for high-quality domestic and public address applications is made by this firm. The "Recital" console gramophone, which incorporates the Model T41 amplifier, has been improved in detail finish, and a new series of cases and improved amplifier performance are to be found in the "Trixette" range of portable gramophones.

For p.a. work a new 150-watt amplifier (Model T152) has been developed which can be duplicated and operated from a single drive unit (Model T152ID) to give 300 watts for large installations. A new moving-coil microphone (Model G7871) and general-purpose p.a. loudspeaker (Model G7073) are available, and for motor coaches a small, simplified battery-operated amplifier (Model B65/MX) provides an output of 5 watts.

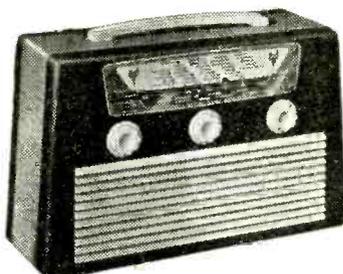
Trix Electrical Co. Ltd., 1-5 Maple Place, London, W.1.

ULTRA (41)

Television receivers with tubes of 14in, 15in and 17in are shown by this firm and all provide for reception in Bands I and III. The



Wolsley Model BAY4 Band III fringe-area television aerial.



Vidor "Marquisa" all-purpose mains portable.

VT9-17 is for a.c./d.c. operation and has a.g.c. on both sound and vision.

Broadcast sets covering the f.m. Band II as well as medium and long waves are also shown. One such model forms part of a radio-gramophone in which the automatic changer can deal with 33 $\frac{1}{3}$, 45 and 78 r.p.m. type records.

The "Ultra Twin," an a.c./d.c./battery portable, is now available in a cabinet with sliding doors.

Ultra Electric Ltd., Western Avenue, Acton, London, W.3.

UNITED APPEAL FOR THE BLIND (316)

At the invitation of the Radio Industry Council, the "United Appeal," which acts on behalf of a number of associations for the blind, is again staging a live demonstration to show how blind people can take their place in the radio industry side-by-side with their sighted colleagues. The equipment for the demonstration is provided by Philips Electrical.

United Appeal for the Blind, 28 Manchester Street, London, W.1.

VALRADIO (118)

The tuner produced by this firm, and used in their television receivers, provides for sound reception in Band II as well as for television in Bands I and III. It covers the range 40-100 Mc/s in four steps and

170-225 Mc/s in two steps. Continuous tuning between the steps is effected by the permeability method.

Valradio, Ltd., New Chapel Road, High Street, Feltham, Middx.

VIDOR (28)

Two new 12-channel table-model television receivers have been introduced this year; they are the Models CN4230 and CN4231; both embody the same receiver chassis, but the former has a 14-in tube and the latter a 17-in. A small but important point is that the tube protecting glass is easily removable for cleaning.

Among the many portables is a new 4-valve, 2-waveband model, the CN432. It is a very small "upright" style, all-dry battery operated with low-consumption valves, a 5-in loudspeaker and a ferrite rod aerial.

The display of receivers is supported by a full range of dry batteries, including hearing-aid types.

Vidor Ltd., Erith, Kent.

WEARITE (218)

One of the pioneers in this country in the design of tape mechanisms for magnetic recording, this firm will be showing the versatility of their "Tape Deck" as applied in industrial and Service equipment as well as in the "Ferrograph" portables for sound recording and reproduction.

The Wearite range of audio and radio components is supplemented by new coils and transformers for v.h.f./f.m. receivers.

Wright and Weaire Ltd., 131 Sloane Street, London, S.W.1.

WESTINGHOUSE (101)

Contact-cooled rectifier units in a wide choice of ratings have recently been introduced for use in television and sound broadcast receivers. These units are designed for mounting in close contact with a metal chassis, and, by dissipating their heat through it, allow a reduction in bulk, cooling fins being no longer

quired. The emphasis of the Westinghouse exhibit will be on the more specialized types of rectifiers such as germanium crystal, copper-xide units for measuring instruments, "Westectors" and some miniature high-voltage units.

Sealed tubular rectifiers with quadruple-voltage elements are shown for providing c.h.t. for cathode-ray tubes.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, London, N.1.

WHITELEY ELECTRICAL (25)

The new WB12 high-quality amplifier and feeder unit makes use of the "ultra-linear" method of con-

nection in the output stage and has switched selection of pickup matching. A new f.m. tuner has also been developed.

A 15-in concentric duplex unit and a ready-to-assemble corner reflex cabinet kit for 10-in and 12-in units have been added to the loud-speaker range, which includes cambric cone types from 2½ in to 18 in in diameter.

Representative examples of the wide range of components supplied to industry and the Government departments will be shown.

Whiteley Electrical Radio Co. Ltd., Victoria Street, Mansfield, Notts.

WOLSEY (5)

This year a special feature of Wolsey Band-III television aerials is that the insulators on the aerials are made of polythene specially moulded to provide a good waterproof junction between the dipoles and the insulator.

The range of aerials has been greatly extended and, while the main emphasis is on Band-III types, both existing television requirements and v.h.f. sound are fully provided for. Pre-assembly in the factory is still one of the main features of this firm's products.

Wolsey Television Ltd., 43-45, Knight's Hill, West Norwood, London, S.E.27.

LETTERS TO THE EDITOR

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

"Tape Bookmark"

A METHOD I have been using for "finding the place" on magnetic tapes is to impose a large amplitude subsonic on the tape—about 2c/s from a dippy oscillator for 30 sec. I find about 20V into the recording amplifier, which normally requires 50mV mean, is ample. Where the recording head is fed from an output pentode via a high resistance, shunting the resistance with a 4µF paper capacitor should be effective.

On fast wind or rewind, although the tape is about ¼ in from the playback head, a loud note is heard in the 100-400c/s range, according to the tape speed. By counting these markers, which are placed between each item, I can find the right place on the tape.

A simple switching circuit could be made to operate a device like the selector shown in the article by Price and Frewer in your April, 1955, issue.

The only drawback is that the indexing can only be done on one track, as, although it does not affect the adjacent track in any way, it comes through on fast rewind whichever track is in use. If difficulty is found with erasure, a permanent magnet can be used to remove the last traces of the subsonic.

Coventry.

R. G. WICKER.

FOR office dictation and telephone recording, where it is only necessary to mark the interval between messages, I have found it useful to inject into the head for a second or two a small voltage at 50c/s, derived from the filament circuit, which gives a recognizable signal on fast wind.

Manchester.

E. S. RUSHTON.

Magnetic Tape Characteristics

IT is refreshing to read the article "Does the tape characteristic matter?" in your March issue and still more to note the conclusions you reach. The fact that "it depends on the machine" is only too well known to tape manufacturers but not all machine manufacturers realize it as yet and very few of the users.

It is perhaps going too far to suggest that, if a tape has, in its own right, a characteristic, then so has a mu-metal stamping but the underlying idea is quite logical. There are one or two factors, in addition to those mentioned in the article, which may possibly have influenced some of the characteristics shown, such as optimum bias current (query: were all the runs on any one machine carried out with a fixed bias current?), surface smoothness and tape thickness, although this last factor is perhaps implied at

the end of the first paragraph. Differences in top response between machines could, of course, be due in part to different air-gap width of the playback head.

As regards the one specific anomaly you mention, tape No. 4 may be of lower coercivity than tapes 5 and 7 and the bias field strength may be lower on machine (C) than on the other two. As a result the bias value may be nearer the optimum on machine (C) for tape 4 but too low for tapes 5 and 7. At the same time tapes 5 and 7 show good top response on machine (C) as might be expected if they were of higher coercivity and under-biased.

What is puzzling is the pair of curves on machine (C) for tape 6. Were they taken with the tape running in opposite directions or—horrible thought—with the coating in contact and remote from the head?

Slough, Bucks.

H. G. M. SPRATT.

The Cascode

"CATHODE RAYS" statement on page 399 of your August issue that a.g.c. would be ineffective if applied to Fig. 1 is incorrect. In fact, the required voltage for any given control is roughly one half that required by Fig. 2. When the valve is used as in Fig. 1, the characteristics approach that of a "straight-mu" type and in Fig. 2 that of a "variable-mu" type.

The circuit shown in Fig. 2 is usually preferred since its cross-modulation characteristic is superior. This point is fully discussed in *RCA Review*, March, 1951, in an article "Use of new low-noise twin triode in television tuners."

G. R. WOODVILLE.

M.O. Valve Company.

Cathode Ray writes:—My apology to readers for my misstatement about the cascode, and thanks to Mr. Woodville for correcting it.

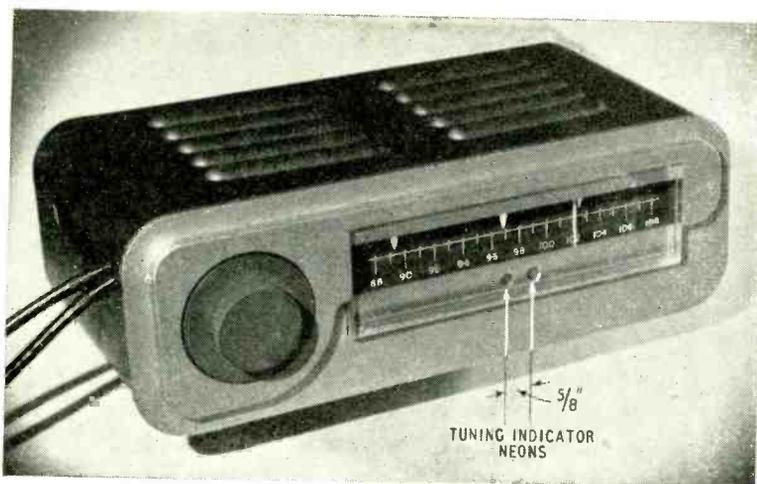
Battery-mains Short-circuits

I HAVE had in for repair many battery-mains receivers, and in several cases filament and/or dropping resistor breakdowns have been the result of partial short-circuits due to the battery leads, where batteries are not *in situ* and mains operation is used, contacting with the metal chassis or components underneath.

Surely it would be a simple matter for manufacturers of these sets to provide dummy sockets in the cabinet material to take these leads, and thereby prevent many unnecessary breakdowns and other complaints?

Stowe, Buckingham.

W. H. JARVIS.



NEON F.M. TUNING INDICATOR

By
JOHN D. COLLINSON

High Sensitivity with Indication of + or -

TO the listener interested in high-quality sound reproduction a frequency-modulated v.h.f. broadcast system approaches the ideal. In contrast to the medium-wave a.m. service, it is difficult to design an f.m. receiver with a poor audio-frequency response. A wide frequency response in itself, however, is of little value if impulse noise is allowed to obtrude on the programme, or if non-linearity distortion in the receiver mangles the signal before application to a "D_{tot} ≤ 0.01%" high-fidelity amplifier.

Both noise and distortion can be kept to low values in well designed and aligned receivers, but the user must play his part in getting the best performance from any given set by tuning it in correctly.

If a receiver is correctly designed and aligned so that the i.f. passband and the discriminator characteristic are symmetrical, and the i.f. signal produced by the received unmodulated carrier is exactly in the middle of the passband, impulse noise will be fully rejected.

The phase-modulated components of the noise, being evenly distributed throughout the passband, correspond to a signal whose mean frequency is that of the midpoint of the passband, so that the discriminator output is zero. If the carrier is mistuned a standing d.c. will appear at the discriminator output which reduces to zero for the duration of the noise. Thus an audio signal will appear proportional to the amount of standing d.c., which in turn is proportional to the amount by which the carrier is mistuned.

Sources of Distortion

Non-linearity distortion can arise both in the i.f. amplifier and the discriminator. If the carrier is mistuned, large deviations can swing the signal past one side of the flat top of the i.f. amplifier passband. Amplitude variations are removed in the limiter stage, but phase changes occur at the same time. When demodulated the audio signal will be asymmetrical, showing the presence of added even harmonics. The discriminator will add its quota of distortion as it is only linear over a limited range

on either side of zero output, so that if the carrier is mistuned it must deviate more into the non-linear region.

From the foregoing we may conclude that in the absence of a tuning indicator, the user may resort to two stratagems:— (a) await the passage of an unsuppressed motor-car, then hurriedly tune out its ignition noise, or, (b) tune for minimum intermodulation during loud passages in the programme. With either method, the correct tuning point tends to be elusive, and some form of indicator is essential, if only to stop doubt gnawing at the mind of the technical purist.

As the negative voltage at the limiter grid is proportional to the signal strength, it would appear that it might be applied to a "Magic Eye" in the same manner as the a.g.c. voltage in an amplitude modulation receiver. Tuning for minimum shadow angle should then give the correct tuning point. However, the main requirement of an i.f. amplifier in a

* The Acoustical Manufacturing Co., Ltd

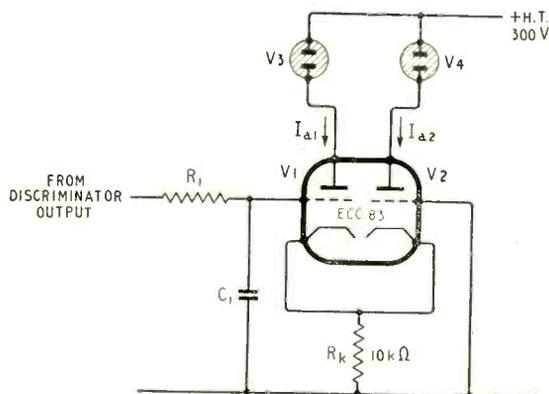


Fig. 1. Complete circuit diagram of neon tuning indicator. V3 and V4 are miniature uncapped neons (Hivac, type CC11L). These are also available with M.E.S. cap and designated CC10L.

frequency-modulation receiver is that it shall have a flat frequency response over some 200 kc/s bandwidth; thus the mid-point is indeterminate. Any attempt to get a well-defined peak at the limiter grid will degrade the phase response of the i.f. amplifier, which introduces odd-order distortion in the audio signal. It is therefore necessary to provide a separate high-Q circuit, tuned exactly to the middle of the i.f. passband, to rectify the resultant signal and to feed that to the indicator. This throws a heavy responsibility on the stability of the auxiliary tuned circuit, and such an indirect approach seems unwise.

A better method is to indicate zero d.c. output from the discriminator. Indicating nothing, however, presents its own problems. One of the best solutions is to use a centre-zero meter. This not only shows the correct tuning point, but whether the set is off-tune, and the direction in which it is off-tune, without having to alter the tuning control. It has the disadvantage that as the demodulator currents are small, a valve voltmeter circuit has to be used, which together with the cost of the meter movement itself is uneconomical, not to speak of the difficulties of finding a meter which "blends with the *décor* of one's home."

A simple and reliable circuit has been developed (Fig. 1) that gives a visual indication of the correct tuning point which may be interpreted in the same manner as a meter. It consists basically of a cathode-coupled amplifier in which one grid is taken to a reference potential, in this case zero d.c. or earth. The other grid is taken to the output of a Foster-Seeley discriminator. If both potentials are equal, then equal currents flow in both valves. If the potentials are not equal, e.g. V1 grid is positive to earth, then I_{a1} increases, making the common cathodes more positive. The negative potential between V2 grid and its cathode is increased, and I_{a2} decreases. The current flowing in each valve is indicated by the brilliance of the two miniature neon lamps in series with each anode. With the type of neon specified, the light output is approximately 0.25 lumens per mA.

The human eye is not particularly good at estimating absolute light output, but it is very much better at estimating the relative output between two lights closely spaced. This ability is aided in the circuit arrangement used, as the eye has not merely to compare the brilliance of a light against a fixed reference, but against one varying in the opposite direction (Fig. 2). Thus, by tuning the receiver until both neons are of equal brilliance, a very sensitive indication is given of zero output from the discriminator. In practice the sensitivity of the system can be such that provided both neons are obviously alight, the tuning error has negligible effect on the receiver performance.

The indication given by the plain neon lamps is not ideal as the glow surrounds only one of the parallel electrodes on d.c., and when viewed from the side, the random change of glow position is distracting. For this reason it has been found better to view the neons end-on via a low-loss diffusing screen. A suitable material is $\frac{1}{16}$ in opal Perspex (I.C.I. Colour No. 030). When mounted close together the glow from one neon may be screened from the other by a light-coloured opaque sleeve over the body of the bulbs, the light colour helps to reflect the light forward through the diffusing screen.

The performance is determined by the choice of valve, the common cathode resistor, and the h.t. supply. The standing bias on the valve grids must be

chosen so that the current through the neon is limited to about 0.7 mA in the unbalanced condition. The cathode load resistor determines the see-saw action which takes place when the receiver is mistuned. With finite values of μ and R_k the anode current changes will not be equal and opposite, but unbalance is immaterial as it reduces to zero at the working point. In practice the small current demand allows a high value of R_k to be used and this performs the dual function of bias and cathode load resistor.

The components C_1R_1 , whose time constant is comparable to the period of the lowest frequency likely to be encountered, are used to filter the audio

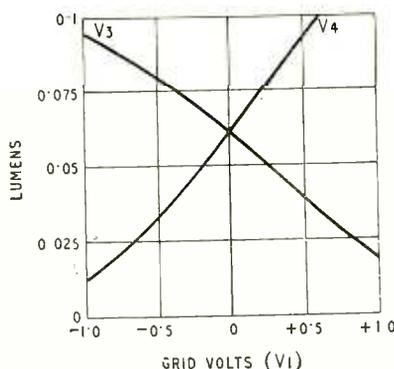


Fig. 2. Light output of neons plotted against discriminator output voltage for circuit of Fig. 1.

signal from the discriminator output. Without this filtering both neons will appear to brighten simultaneously with a heavily modulated signal, thus obscuring the d.c. component.

With the typical circuit shown in Fig. 1 connected to the output of a Foster-Seeley discriminator, there is a clear indication of the correct tuning point within ± 3 kc/s. The only difficulty anticipated was the fact that as the indicators show equal brilliance in the absence of a carrier, it was thought that steps would have to be taken to suppress the indicators when the limiter grid current was low. However, this proved unnecessary as one or other indicator is extinguished before the wanted carrier is heard.

There is no reason why this indicator should not be used with a ratio detector *provided that it is of the balanced type*, but the d.c. output per kc/s of deviation will be considerably less than that of a Foster-Seeley discriminator.

"Band II F.M. Tuner Unit"

ALL the coils specified on p. 374 of this article in last month's issue can also be supplied by Wright and Weaire Ltd. The "Wearite" type numbers are:—

Aerial coil L_1, L_2	757
R.F. choke L_3	758
R.F. coil L_4	756
Oscillator coil L_5, L_6	755
1st i.f. coil L_7, L_8	751
2nd i.f. coil L_9, L_{10}	752
Ratio detector transformer L_{11}, L_{12}, L_{13}	753
I.F. traps L_{14}, L_{15}	759

The escutcheon for the EM80 tuning indicator can be supplied by McMichael Radio Ltd.

Toronto Audio Show

Some Personal Impressions

By P. G. A. H. VOIGT,* B.Sc., A.M.I.E.E.

ON the North American continent, audio fairs tend to run to a pattern. The recipe appears to be quite simple. Take one or more floors of a suitable hotel. Give the inmates of any of the rooms accommodation elsewhere. Remove the beds and some of the other furniture. Collect several dozen manufacturers, agents, importers, distributors, wholesalers, retailers and others commercially interested in "hi-fi," and persuade them that taking space would be to their advantage. Prepare a catalogue with all appropriate information you can lay hands on, including information which the above manufacturers' agents, etc., will supply. Have a few tons printed and on hand. Advertise on the radio (including television), in the Press and by every other publicity method you can think of, and then, by opening day, you will find that you have an Audio Show on your hands.

It is a fairly safe bet that something unexpected is sure to happen, so it is well to have all routine matters under control well in advance. The Toronto Audio Show was no exception to the general rule.

That part of Canada which includes Toronto looks like the foot of Italy and sticks down into the U.S., is supplied with "the Hydro"—a rather special type of alternating-current at 25 c/s which was adopted when the hydraulic power stations were built at Niagara Falls in the early days of electricity. New sources at 60 c/s are being built rapidly, but are claimed for new outlets in an expanding economy, with the result that many parts of Toronto, including the Prince George Hotel, where the Show was held, are still on 25 cycles.

The problem was tackled by disconnecting the wiring of the two floors used for the Show at the distributing box, and connecting temporary leads to a large frequency converter hired for the purpose. Excellent, all set and the Show ready to open.

Naturally each exhibitor had to be rationed as regards the power he could draw, for every converter has its limits. For some unknown reason, however, the total demand exceeded the safe loading of the converter. Perhaps it was that some exhibitors did not count their illumination as part of the load, or their equipment took more watts than it should, according to its specification. We shall never know exactly what the cause was, but it did not take that converter long

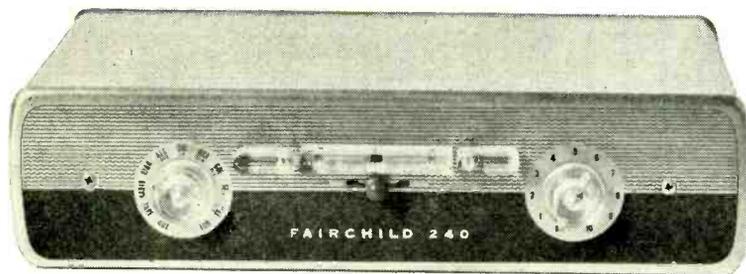
to become very hot. The result was that after running for a while, the power would shut off, stay off for five minutes or so and then come on again. The matter was coped with by the second day, but on the first one's most vivid recollection was of waiting in the dark for the power to come on again and give the equipment a chance to continue its performance!

The test of the value and success of an exhibition is measured in terms of how many paid for admission, and even if some of the approximately 4,700 paid admissions represent repeat visits, it seems that on average over 1,000 new visitors came to the Show each day. For many, there can be little question but that this was the first occasion on which they heard reproduced sound of vastly better quality than that from the average radio. From this point of view alone, namely educating the public, the show must be counted a success. What the balance sheet worked out at is none of our business, what matters is that at the first such show in Toronto the public showed a lively interest.

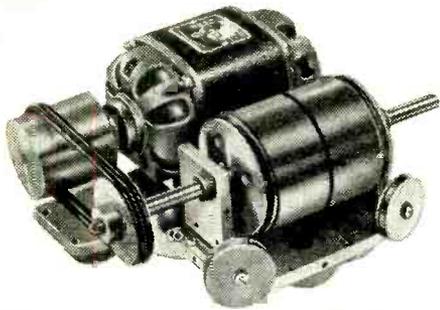
Canadian "Hi-Fi"

Canada, with its population of less than 1/10th that of the U.S., has, by comparison, only a small market without crossing frontiers and getting tangled up in customs complications, etc. The number of truly Canadian firms on the manufacturing side of the "hi-fi" game is consequently very small. McCurdy Radio Industries do custom work, manufacturing and installing broadcast studio control equipment, etc. Microlab Devices make transcription-type turntables for 25 and 60 c/s supplies, originally for broadcast stations, and now increasingly for "hi-fi" addicts. Dominion Electrohme Industries and the Kelton Company are attacking the domestic "hi-fi" market.

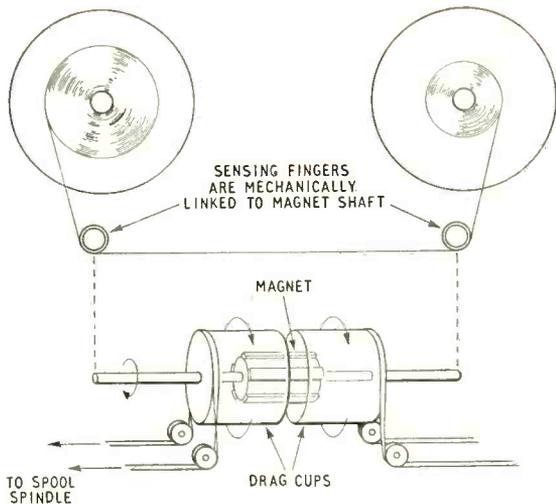
The Kelton speaker system is out of the usual rut and is described as using an acoustic bandpass at low frequencies. The low-frequency speaker has a completely enclosed cavity behind, and another cavity in front from which the sound is radiated via a number of spaced holes. The design is based on a development of the method described by J. J. Baruch and H. C. Lang of the Massachusetts Institute of Technology at a meeting of the Radio Club of America on May 22nd, 1952, and reported on page 30 of the Radio-Electronic Engineering section of *Radio and Television News* for



Fairchild Model 240 pre-amplifier showing "balanced bar" tone controls.



"Isimetric" tape drive mechanism in the magnetic recorder designed by the International Scientific Industries Corporation. The sketch on the right indicates the principle of operation.



July 1952. Both the front cavity and the speaker are tuned to the same resonant frequency, and are over-coupled so as to obtain a bandpass effect. Quite a surprising amount of bass was obtained from a small volume, but it is noteworthy that in their best reproducer two of these were used together, two more speakers were used for the middle and also a tweeter, making five in all.

There is no need to discuss the many British components displayed, for *W.W.* readers will know about these already. Practically all the "hi-fi" household names, Goodmans, Wharfedale, Acoustical (Quad), Leak, Ferranti, Garrard, Connoisseur, etc., are effectively represented here. Williamson-type amplifiers, too, either according to the original circuit, or with the Hafler & Keroest† "Ultra Linear" modification are very popular.

Those readers familiar with U.S. magazines would also recognize the many U.S. "hi-fi" products which were being demonstrated. There are in Canada no currency exchange regulations which make the purchase of U.S. goods difficult; all you need is money!

The majority of U.S. manufacturers still tackle the problem of quality speakers for home use on the same basis as one tackles it for high-power p.a., namely to use different speakers for different frequency ranges. The various possible combinations of "tweeters," "woofers" and mid-range speakers that can now be put together could only be calculated with an electronic computing machine. Since, in most of the 50 or so rooms used for demonstrations, there was a variety of combinations to listen to, it will be understood that the writer came away with no very clear picture. He still remains convinced that there is more in loudspeaker design than just getting the widest possible frequency response.

The biggest speaker at the show was undoubtedly the U.S. Electro-Voice "Patrician IV." The writer cannot really quarrel with the idea that a speaker should be 62in high, for he designed one of exactly that height two decades ago, but this "Patrician" is 39in wide across the front! It uses one "woofer" driving a folded horn, two speakers for the next range, one for the next, and then a "tweeter," i.e., a total of five, all horn loaded. There is much that can be done with about 35 cu ft in hand. The writer can vouch for the floor-shaking ability of this speaker with suitable organ music, for he was on duty in the room set at the disposal of the Society of Music Enthusiasts, while a firm demonstrating a tape machine with organ music had one of these speakers operating in the room immediately below! Incidentally the price here,

allowing for customs duties, 10 per cent sales tax, etc., is just over \$1,000 or about £364 at the present rate of exchange.

There were speakers in all kinds of cabinets and enclosures. In some cases panel resonances were killed by damping and in some by rigidity of construction. In one case, this rigidity was achieved in a very simple manner indeed, by using a barrel with the speaker set in the side, and some internal damping material to diminish air resonances. The fact that the name of the distributor of this item is Mr. Bier is purely coincidental!

Amplifiers and pre-amps. of all kinds and with varying numbers of knobs were to be seen. In some cases, notably Quad (British), Philips (Dutch, branch plant in Toronto), National, and Fairchild (U.S.), considerable trouble had been taken to make their product look attractive and not like some piece of experimental equipment out of the lab. The Fairchild pre-amp. used an exceedingly neat way of disguising two of the knobs. Part of the decorative trim is a transparent horizontal strip divided into three parts. The two ends are attached to the bass and treble tone control spindles and the recommended procedure is to find by experiment the preferred setting for these controls, then to withdraw the levers and replace them so that they are in line with the horizontal strip. If for any reason the controls are altered, this is obvious, for they are then no longer in line, and in fact indicate the change in the response curve.

On the Philips amplifier there was also an indicator of response. It consisted of a horizontal white line behind a transparent panel. As the bass and treble control knobs were turned, the appropriate end of the line curved up or down to show how the response had changed.

New Tape Drive

Tape machines were there in great variety. With but one exception, they seemed to be along the orthodox lines. The exception, by International Scientific Industries Corporation, a U.S. organization, was not then in commercial production. The designer of this machine must, at some time, have said to himself, "I don't like the mechanics of ordinary tape machines, let us throw the book away and start again."

Most tape machines also have something which slips

† Audio Engineering, Nov. 1951.

in the drive to the take-up reel though when this "slip" occurs in an electric motor it may not be obvious. Fundamentally the take-up reel needs a low torque, higher speed drive when empty and a higher torque, lower speed drive when full, with a smooth automatic transition from one to the other as the reel fills up. At the time when the take-up reel is empty, and the supply reel is full, the pull of the tape there acts well away from the reel axis and so exerts maximum torque. The brake also has to be stronger at this stage than later on when the reel is not so full. As the supply reel unwinds its speed increases, while the torque due to the tape tension drops. The ideal brake should adjust itself to suit these continuously varying conditions.

The "Isimetric" drive provides both the varying torque and the varying brake action in an elegantly simple way. The primary drive is a toothed permanent magnet rotor, driven from the main capstan motor. The magnet is enclosed by two "drag cups" which are coupled to the spool turntables by driving belts. Eddy currents induced in the cups tend to make them follow the rotation of the magnet, and the torque exerted depends upon the degree of overlap between cup and magnet. The position of the magnet relative to the two cups is controlled by "sensing fingers" which take up positions depending on the angle at which the tape leaves and enters the supply and take-up spools.

An additional manual control puts in extra motional "bias" of the magnet position, so that when both reels are half full one reel, the take-up reel, has more torque than that on the braked reel. To reverse the tape direction the bias is applied in the opposite direction. Torque is thus maintained all the time on both reels, but superiority of torque can be transferred from one reel to the other by moving the control. Very rapid reversals of tape direction are therefore possible without "spilling" tape all over the place; this should please those who need this facility for editing work. They will also appreciate the control over the tape by operating with the bias knob in a nearly balanced position when the tape can be made to move very slowly, the instant reversal feature still being retained.

A separate motor is used to drive the capstan, and is of "inside out" construction, in that the inner part is stationary while the outer part rotates. The motor thus acts as its own flywheel. These are the main features, but other minor ones have been worked on with equal care, in fact the writer was told that the last year has been spent on simplifying the machine. It is most certainly out of the rut, and we may wish those responsible the best of luck, for there are not enough enterprising people in this world.

"Second Thoughts on Radio Theory"

OUR contributor "Cathode Ray" needs no introduction to regular readers of *Wireless World*, for he has been writing in the journal now for over twenty years. To others it should be explained that he is an author who adopts a sympathetic and informal approach to radio theory, expounding in his own way the sort of things the textbooks either miss out altogether or deal with in a dry and stereotyped manner.

A book has now been produced containing a selection of over forty of "Cathode Ray's" articles—and many of our readers will say it has been long overdue. It constitutes an entertaining textbook for the beginner in radio and a first-class refresher course for others. The selected articles are mostly on elementary topics dealing with basic electrical ideas, circuit elements and techniques and circuit calculations; but, as the author himself says, the more elementary the subjects are, the more important it is to get clear ideas of them. Any errors or obscurities in the original articles have been removed and there are additional summaries, diagrams, cross-references, questions to work out and, of course, an index—making in all a total of 409 pages and 266 illustrations.

"Second Thoughts on Radio Theory" can be obtained from any bookseller at 25s or direct from our publishers at 25s 8d by post.

CLUB NEWS

Birmingham.—"High Fidelity Sound Equipment" is the subject of the talk to be given by C. H. Young (G2AK) to members of the Slade Radio Society on September 2nd. At the next meeting (16th), which will be held at the Aston Technical College, Ettington Road, Birmingham, 6, and for which tickets must be obtained from the secretary, the Osram 912 amplifier will be demonstrated. On September 30th Dr. P. D. Whitaker, of Birmingham University, will speak on "The Application of Electronics to Research in Nuclear Physics." Except where otherwise stated the meetings are held at 7.45 at Church House, High Street, Erdington. Sec.: C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

Bradford.—A joint meeting of the Bradford, Leeds and Spenn Valley clubs will be held on September 27th at Cambridge House, Bradford, when Dr. M. J. Heavyside (G2QM) will speak on aerials for short spaces and short-waves.

Coventry.—The annual general meeting of the Coventry Amateur Radio Society will be held at 7.30 on September 26th at the Society's H.Q. at 9, Queens Road, Coventry. Sec.: J. H. Whitby (G3HDB), 24, Thornby Avenue, Kenilworth, Warwicks.

Edgware.—Meetings of the Edgware and District Radio Society are held on Wednesdays at 8 o'clock at 22, Goodwyn Avenue, Mill Hill. The next session's programme includes talks on a variety of subjects and practical evenings especially for beginners. Sec.: E. W. Taylor (G3GRT), 99, Portland Crescent, Stanmore, Middlesex.

Edinburgh.—The opening meeting of the 1955/1956 session of the Lothians Radio Society will be held at 7.30 on September 8th at 25, Charlotte Square, Edinburgh, 2. Meetings are held on alternate Thursdays. Sec.: J. Good (GM3EWL), 24, Mansionhouse Road, Edinburgh, 9.

Glasgow.—An effort is being made to start a group of the British Amateur Television Club in Glasgow. Interested readers should communicate with J. W. Bruce, 15, Downhill Street, Partick, Glasgow, W.1.

B.A.T.C.—As already announced, the British Amateur Television Club is holding a convention at the Bedford Corner Hotel, Tottenham Court Road, London, W.1, on October 1st. Admission is 5s. Particulars are obtainable from D. Reid, 4, Bishops Road, Chelmsford, Essex.

QRP.—The closing date for entries for the portable equipment contest, organized by the QRP Society, is September 30th. Details of the contest, which is open to non-members, are obtainable from John Whitehead, 92, Rydens Avenue, Walton-on-Thames, Surrey.

Language Translation by Electronics

Novel Application of Digital Computing Machines

By J. P. CLEAVE,* B.Sc., Grad. Brit. I.R.E., and B. ZACHAROV,* B.Sc., Grad. Inst.P.

The idea of using digital computing machines for the translation of languages was first suggested by Dr. A. D. Booth of Birkbeck College in 1946. An automatic translation project is now under way at the college research laboratory, and this article discusses the problem in the light of the experience gained so far. It illustrates the present trend towards the use of computers more for processing information than for straightforward calculation alone.

WITH the advent of mechanical calculating machines it became possible to obtain solutions of problems other than mathematical in an automatic fashion. One such problem was the automatic translation of language—the general idea being to code the words into numerical form and cause the machine to operate on these numbers in a certain routine to which the translation process can be reduced. It was only with the development of electronic digital computers, however, that results could be obtained in a reasonably short time and without excessive reference to data stored externally to the machine. In principle a computing machine is capable of automatically translating languages to any required degree of refinement, although at present there are severe limitations owing to the small amount of internal storage space for information that is generally available in the machine.

The obstacles that limit the scope and refinement of electronic translation are not, however, insuperable. We can, for example, by employing a human agent to edit the material passing into and out of the machine, obtain results which could only have been obtained automatically with a more complex mode of operation

Essential features of the Birkbeck College computer to be used for translation. Containing some 400 valves, it works on the serial principle and has a basic p.f. of 80 kc s. Operations equivalent to addition and subtraction are done in about 400 microseconds.

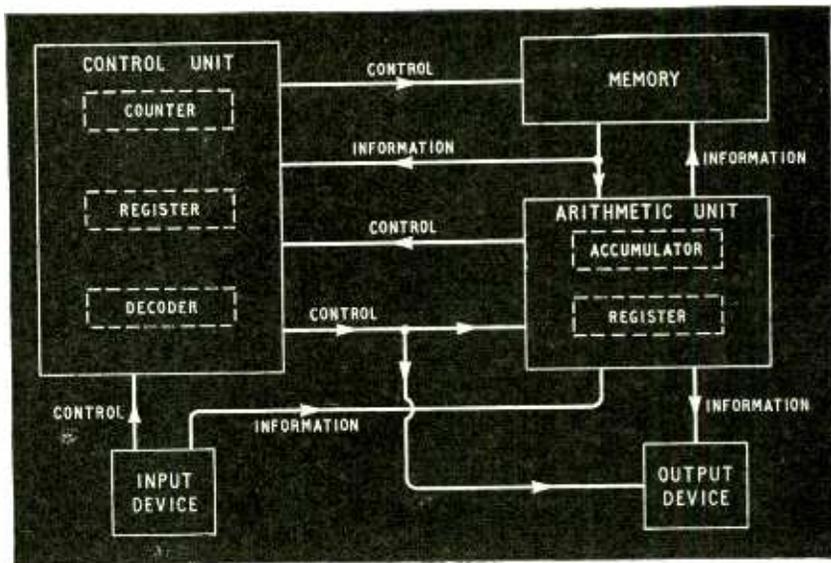
or on a computer of more advanced kind than exists at the present time.

The aim of electronic translation is not to produce a literary masterpiece (though this is theoretically possible with a large enough machine) but to give a more or less semantically and syntactically correct translation of the input text, and in particular to render the vast amount of foreign scientific literature now available intelligible to the scientist. Even very rough translations can be of value here, since they allow the specialist to examine briefly the documents in his particular field of study and to pick out those of special interest. These can then be submitted to a human translator for a more exact rendering.

Restricting the aim of electronic translation to the provision of scientific information simplifies the process by removing questions of style (and so reducing the difficulties of idiom) and by limiting the size of vocabulary. The practicability of the scheme depends, first, on the extent to which the process of translation can be formalized, and secondly, on whether the formalized translation process can be adequately expressed in terms of the "orders" available for controlling the computing machine. It is necessary, in fact, to compile a complete "program" of machine instructions that will carry out sentence analysis and selection of words.

To translate a foreign language it is necessary to have a knowledge of the syntax of the foreign language, a dictionary, and a knowledge of the syntax of the "target" language (meaning, of course, English in this country). The dictionary is a list of foreign

* Birkbeck College Electronic Computer Laboratory.



language words and their "target" language equivalents, together with grammatical notes indicating possible syntactical functions of the foreign language words. It should also contain a list of contexts in which the foreign language word has a special meaning; for example, the German "unter" is entered in a standard German-English dictionary as follows:

- unter (1) preposition: under, below.
~ uns: among ourselves.
nicht ~ ein Pfund: not less than one pound.
(2) adjective: lower, under, inferior.
(3) prefix: under, among.

A knowledge of the foreign language syntax enables one to decide what are the grammatical functions of the foreign words (whether the nouns, verbs, prepositions or what) and hence which blocks of words function as subject, direct object, indirect object, etc. in a sentence or clause. The knowledge of the "target" language syntax permits the rearrangement of the translated foreign words blocks into the appropriate "target" language order and the appending of necessary syntactical word endings.

Mechanized Translation Procedure

With these basic sources of information, then, it is possible to lay down in outline a definite procedure for the translation in terms of mechanical operations. First, it is necessary to determine the grammatical functions of the foreign language words. This is done by reference to the dictionary and is easy to systematize in a computer. The dictionary information about the possible grammatical functions of the word under consideration can be made to initiate an examination of a small context, say one word on either side, to resolve the ambiguity. For example, suppose "unter" (see above) occurs in a German sentence and we wish to decide whether it is an adjective or a preposition, then the words immediately following will settle the point. Thus, if following "unter" there is a group comprising an article or possessive adjective, an adjective, and a noun, with accusative or dative case endings, the "unter" is used here as a preposition.

The second part of the translation procedure is to determine the meanings of the words. Here we meet the problem of ambiguity in its largest form. It is closely connected with the problem of idiomatic usage, but this narrower difficulty is more easily disposed of, for a note in the dictionary can indicate that there is an idiomatic use of the word and thus lead to a set of operations for searching the context to see whether the conditions for the idiomatic use are present.

The next step is to identify groups of words which behave as one unit in a sentence. For instance, a noun together with its modifiers behaves as one unit. To determine these blocks of words the context of each word of the foreign language must be examined for grammatical patterns, and two blocks in juxtaposition will have to be distinguished by considering case endings. Then, with the word blocks found it is relatively simple to decide which are the clauses of the sentence on the basis of the occurrence of punctuation marks, conjunctions, etc. and also by the order of the word blocks.

Finally, the last stage of the procedure is to give the "target" language equivalents of the foreign language words in accordance with the analysis described above. This involves two things. First, adding the correct word-endings. This is a simple procedure

according to the rules of the "target" language since the sentence structure and grammatical function of each foreign language word have already been determined. Secondly, arranging the "target" language word equivalents in the conventional word order of that language. This is an entirely mechanical operation once the clauses of the sentences have been identified.

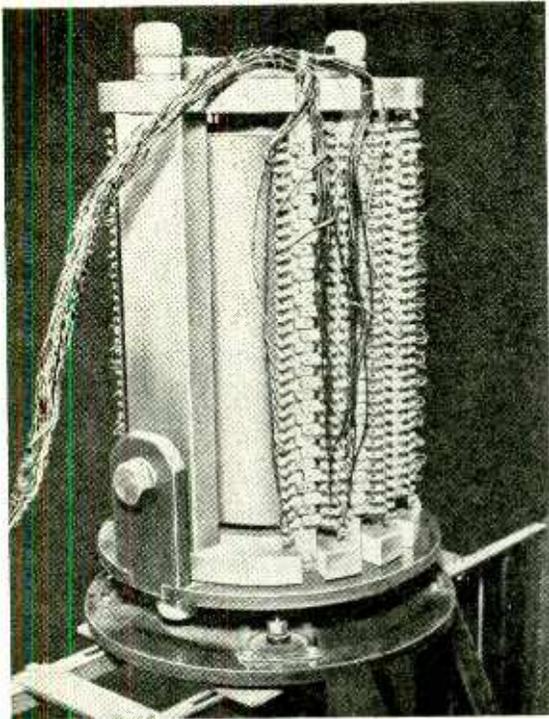
Computer Facilities

To summarize all this briefly, the basic operation involved in translation can be reduced to: (a) comparing incoming words with the dictionary entries, (b) recognizing patterns of words or characters (as in idioms, word blocks, etc.) and (c) transferring information to and from a store (as required in the operation of searching the context of a word to find the presence of the other words used in the idiom). The next question to consider is how these operations can be achieved with the facilities available in a computing machine.

Despite variations in detail, all electronic computers have the following three main types of facility: (1) information manipulation (such as the ability to shift information to and from the various storage systems), (2) arithmetic operations (such as addition and subtraction) and (3) what is known as "conditional transfer" (to be described below). These facilities are quite adequate to perform the basic operations of translation. In terms of actual "hardware," the digital computer has, in general, four distinct sections: a "memory" in which information can be stored; an arithmetic section in which operations are performed on the stored information; a control section which specifies what operation is to be performed (and, just as important, when); and terminal devices which enable data to be fed into the machine and by which the machine can display the results of its operations.

The first problem is how to code the words to be translated into numerical form and feed them into the machine. One convenient way is to deal with each letter of the words separately. It is then possible to use a teleprinter as the input device, for as each letter key is depressed it produces a pattern of holes and spaces in a paper tape corresponding to the "0" and "1" digits of a number in binary notation. The paper tape can then be fed through a "reading" device which converts the holes and spaces into corresponding sequences of pulses and blank periods suitable for use in the computer. Decoding the translated text from the output of the machine is simply the reverse of this process, and here it is possible for a "receiving" teleprinter to be operated directly from the emerging sequences of pulses.

Once having decided how the words are to be coded in numerical form it is easy to see that they can be stored as groups of binary digits in the computer "memory" system, for example as states of magnetization on oxide media or as states of operation in flip-flop devices. This "memory" can be a magnetic drum, a system of acoustic delay lines, an electrostatic store or any other device, but the major requirement is large capacity; very quick access to any word is not necessary. At the moment only one type of store, bearing in mind the question of cost, fulfils these requirements. It is the magnetic drum, and this is in fact used on the digital computer in Birkbeck College Electronic Computer Laboratory. Here approximately 8,000 words may be stored, and clearly several such



This magnetic drum storage system of the computer will contain the dictionary information necessary for translation.

drums could be used. It is this "memory" system of the computer which contains the dictionary used in translation. All the foreign language words likely to be required are stored in one set of positions on the drum while their "target" language (or English) equivalents are stored in another related set of positions. The "memory" also contains the complete set of instructions (known as the "program") for the translation process, each instruction being represented by a group of 32 digits recorded on the drum.

"Arithmetic" Operations

To see how the arithmetic unit operates in the translation process we can examine how an incoming word is compared with words stored in the dictionary incorporated in the "memory." The stored words can be fed out sequentially from the "memory" and subtracted from the incoming word. When zero is sensed from the result the incoming word is clearly coincident with the word just subtracted, and the signal so produced can be used for initiating the next part of the program, which in the simplest case is the selection of the appropriate "target" language word from the "memory" dictionary. This operation is a very easy and rapid one for a computer. Another way in which the arithmetic unit may be used is in either separating "stems" from "endings" (subtraction) or joining them. This process would be particularly useful when dealing with highly inflected languages, such as Russian and Latin, where it would be convenient to store stems and endings in the mechanized dictionary.

A very useful facility is the "conditional transfer" mentioned above. This is a control method which allows the program sequence to proceed in one of two

channels, depending on whether the most significant binary digit of an incoming number is a "0" or a "1." This can be very usefully applied in translation processes in which the sequence of operations depends on recognizing any given configuration of digits in the number representing a word or part of a word. Many machines have other conditional control facilities which are similar in that they allow the sequence of operations to proceed in either of two channels provided a given condition is satisfied or not. Such a system could recognize, for example, whether a certain storage device had all "0s" or all "1s" filling it.

Specialized Dictionaries

The size of store necessary to contain the total vocabulary for a non-technical translation would be extremely large. The number of terms used in specialized branches of science, however, is considerably smaller than that required for general literature. Consequently, by limiting the automatic translation to a particular branch of science, the dictionary can be reduced to a size manageable by present techniques of storage. Besides reducing the size of vocabulary, concentration on technical literature reduces the problem of ambiguity. And by further specialization on, say, a particular branch of mathematics, ambiguity of technical terms within that branch is lessened. For technical translation, then, a mechanized dictionary must be compiled in two stages: first by collecting together the general language of mathematics, that is, the language common to all or most branches of mathematics, and secondly by assembling a glossary of all the technical words in the particular branches of mathematics. The translation of a paper, on, say group theory would thus be preceded by feeding into a computer a dictionary of the general language of mathematics and a glossary of group-theory terms.

Not every case of ambiguity with a word can be resolved simply by reducing the vocabulary or referring to a small context. For instance "Ableitung" in German means "derivative" or "deduction." The first translation occurs so frequently in many branches of mathematics that it would be safe to consider it a general mathematical term along with the second meaning. And it will not always be possible to decide by reference to the immediately preceding word which meaning is intended, for example, "zweite Ableitung" can mean "second derivative" or "second deduction" and both these phrases could occur in mathematical literature. Resolving this type of ambiguity is difficult and could possibly be done by reference to the context of the complete sentence. Failing resolution of ambiguity, all possible meanings could be printed, leaving the specialist in that particular branch of mathematics to decide the issue.

Enough has been said now to show the nature of the problem. Various projects are under way in America and in England, notably at Birkbeck College. On the engineering side research is directed towards the construction of "memories" which are large and also permit quick access to the stored data. At the same time, devices for the automatic recognition of printed and spoken material are being developed. On the linguistic side, the problems are to construct a "program" for each language to be translated into English and to build glossaries of suitable technical terms for the various interested branches of science.

Etched Foil Printed Circuits

With Particular Reference to Photomechanical

Methods of Production

By H. G. MANFIELD*

FOR the production of identical circuit patterns in large quantities, printed wiring is becoming increasingly popular. At the time of writing, only wiring is being attempted; the printing of component parts, with the exception of r.f. coils and low-value capacitors, is still a long way off.

The etched foil method appears to offer more advantages than other methods, and is more easily scaled down for use in laboratories and in pilot plant production. Basically, this system uses a thin copper foil, usually between 0.001 and 0.002in thick, bonded to an insulating material; this may be practically any type of laminate but, as it needs to be machined, cut and punched, synthetic resin bonded paper (s.r.b.p.) is almost universally used. Special circuits may need either a base material suitable for use at higher temperatures than s.r.b.p. or one possessing better dielectric properties (lower permittivity and power factor). The printed circuit pattern is impressed on to the copper in acid-resisting ink (the resist) and all the unwanted copper is removed by etching in a weak acid.

Methods of Printing.—The word "printing" is used in a loose way when discussing "printed" circuits. Sometimes real printing methods are used, such as the offset-litho or the silk-screen, but photography is often used to produce the same result, and, although this is hardly "printing," the method is very similar to that used in making printing plates of the "line" or "half-tone" variety.

A few words about the non-photographic methods will show the relative merits of each.

Offset-Litho Methods.—When a large quantity of printed circuits is required, the offset-litho method is probably the most suitable way of producing them. The work is done by specialist printers using a flat-bed machine over which a roller travels from end to end. The printing plate is made by a method very similar to the one to be described in detail, but it is made on an aluminium sheet which has been lightly roughened or "grained." The prepared plate is placed on the bed of the press where it is first inked and then traversed by a blanket roller, usually of rubber, which transfers its inky pattern to the copper-clad laminate. The layer of ink transferred from the printing plate to the laminate is very thin and would not in itself stand up to the acid which is later used to remove all the unwanted copper, leaving the pattern alone on the insulated base. A layer of powdered bitumen or resin is brushed or blown on to the inky pattern and adheres to it. This is fused by heat to form a reinforced layer that will resist the acid etchant.

This process is carried out by skilled printers using standard methods and equipment, as used in the

quantity production of nameplates, etc. It is not possible to scale it down to laboratory proportions.

Silk-Screen Methods.—The silk-screen method of printing is extensively used for the production of large-sized prints, e.g., posters. It is attractive for printing circuits because of its general use in the radio and electronic industry for the printing of dials, scales, etc. Circuit and nameplate printing both use non-absorbent base materials—an essential difference to printing on paper. The method of production may be scaled down for use in the laboratory and it is quite economical for the making of a few prints, but several hundred may also be made in the same way.

The silk-screen consists of a fine woven material either of silk or fine wire, which is stretched tightly over a wooden or metal frame. The pattern is made into a stencil by photographic means and this is attached to the silk, leaving holes only where the pattern is required, all the rest being blanked out. The laminate is placed under the screen, ink is poured on one end and transferred to the other by means of a square-cut rubber squeegee. In this way the ink is forced through the holes in the stencil and forms a pattern on the laminate. The inks used for silk-screen work are very viscous and, as a thick layer can be applied, they are, when dry, good acid resists.

Limitations of Offset-Litho and Silk-Screen Methods.—Apart from difficulties in production which have already been mentioned, there are technical reasons why both the methods discussed are unsuitable for certain electronic circuits. The most serious limitation is in the degree of fine detail that can be obtained by their use.

In a large number of circuits, fine detail is not necessary and it should be part of the design to eliminate unduly narrow lines and spaces, but when these cannot be avoided, or when coils must be printed, photographic printing methods must be used.

Photomechanical Methods.—Printing on metals is not done by the same means as is used in portrait or landscape photography, neither are emulsions stripped from plates and transferred to metal surfaces. The process is to deposit a photo-sensitive material on to the plate, then expose and develop it.

When making printing plates or blocks, the base material is metal and is able to withstand heating, which hardens the coating material and greatly improves its acid resistance. In addition, the etching is only carried on for a fraction of a mil (thousandth of an inch)—in the trade a "deep etch" is 0.0005in. For circuit printing, the copper must be etched right through and, as it is usually about 0.0015in thick, this may take 10-15 minutes or more, according to the density of the etchant and its temperature, and on the degree of agitation.

* Radar Research Establishment, Ministry of Supply

Numerous ways are available for producing the image. Some are wrapped in trade secrecy, others use proprietary methods—often called “cold-tops” to distinguish them from the processes where heat is required. Many of these have been tested over a period of several years and some have proved unsatisfactory; others are temperamental and require rigid control of room humidity. Two methods will be described; neither uses proprietary materials, and both have given consistently good results over a period of time.

Preparation of Drawings and Negatives.—Before printing on the laminate a negative is required, and this is made from a drawing of the circuit pattern which is to be produced. A drawing in Indian ink on white cardboard has been found reasonably satisfactory. It is made four times the size as this allows the draughtsman to draw thick lines and when working to his normal tolerance of ± 0.005 in, the final result will be within ± 0.00125 in, which is sufficiently accurate for all but the most intricate designs.

To avoid work in the drawing office a novel method of producing master prints has been developed, which is only applicable when the circuit is to be printed on a standard-sized board with terminations in fixed places. When used it enables the circuit designer to

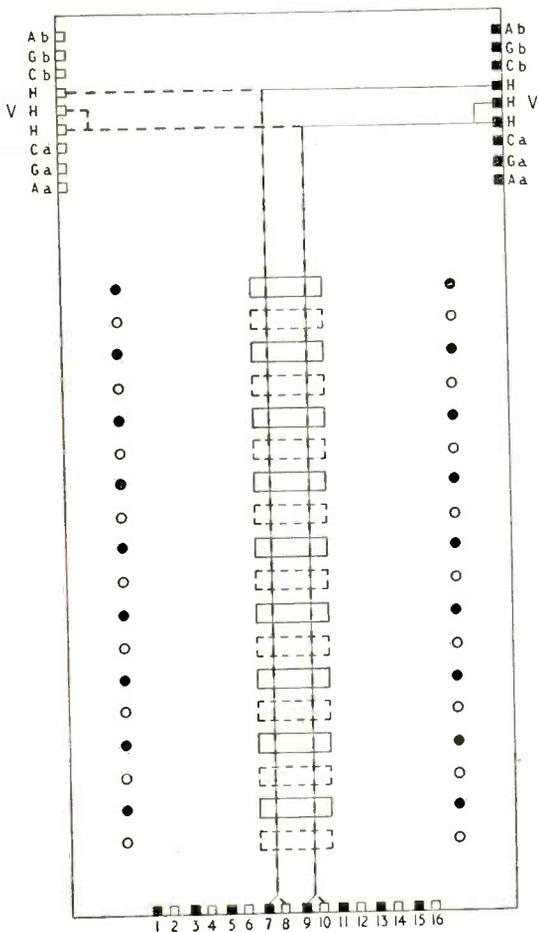


Fig. 1. Typical foundation pattern for use with white-on-black laminated paper for producing master circuits by engraving.

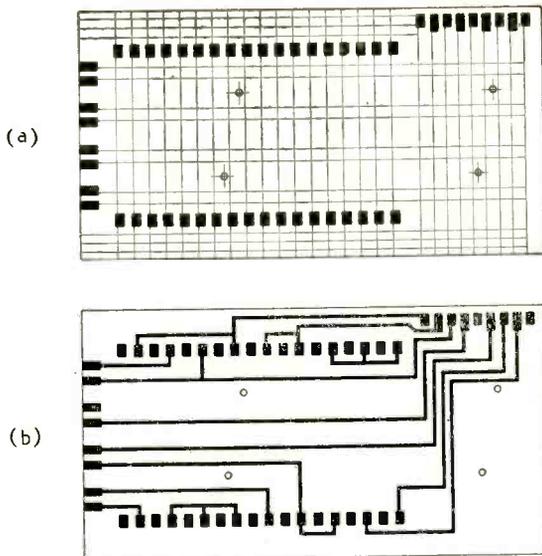


Fig. 2. Engraving sheet (a) with terminations and grid pattern cut to receive “wiring” in the form of tape strips, (b).

lay up a master in a short time, knowing that when photographed it will be precisely to size and that the terminations will be correctly placed. With the double-sided board, registration between opposite sides is very important and is quite difficult when using drawings, as paper and cardboards are dimensionally unstable.

The circuit layout is made on a sheet of paper on which a standard basic pattern is printed by a duplicator. The lines are pencilled in, either in different colours for each side or in solid and broken lines (Fig. 1).

The system is to use engraving sheet, a three-ply laminate of a black sheet between two white or a white sheet between two blacks. The former is generally used and the standard terminations are engraved out, leaving dense black squares or circles on a white background. Surface shine is eliminated by rubbing down with fine glass paper to a matt finish. A grid pattern is marked on the surface to guide the tapes which are used to produce the wiring pattern (see Fig. 2 (a)). The whole sheet is marked out and engraved on a milling machine; the work can be done very accurately. The pattern is four times full size.

When completed, the pattern is transferred to the engraved sheet by means of adhesive cotton tape, known as photographic masking tape. This has a dull, unglazed finish that prevents shine on the photograph. It is obtained one inch wide and slit to 0.2in as the wiring is of 0.05in width, four times up in size. This tape adheres well to the engraving sheet and can be used over and over again as it retains its adhesive properties. The engraved sheet complete with its pattern of wiring is shown in Fig. 2 (b).

A circuit made by the method described is shown in Fig. 3. It consists of a double-sided laminate on which the standard components are assembled and held in turret lugs. Two double-triode wire-ended valves are fixed to the board with special clips. The whole sub-unit has been designed especially so that it can be made by semi-automatic means, and all the

joints are made by dip soldering. Only the edges of the board are immersed in the solder, joining the copper foil and the components to the tags.

Photography.—The drawing on engraved sheet, when completed and checked, is mounted on an easel and photographed to correct size. This is easily done with a process or studio camera as the image is projected on to the ground glass focusing screen and measured with a ruler. If a special process camera is not available and a studio type is used, it will be important to ensure that the drawing, lens and focusing screen are all perfectly square and parallel to each other or the pattern will be distorted.

The choice of negative is limited by the need of a very "contrasty" picture giving complete transparency of the pattern on a completely opaque background. Two photographic suppliers have recently introduced a range of extremely contrasty negatives which are available in various sizes both on film and on glass. These negatives (Kodak "Kodalith" and Ilford "Formalith") are developed in special developers (known by the same name as the plates). They require a long exposure as the emulsion is very slow, but the result is ideal for photomechanical purposes as the whites are transparent and the black very dense, needing no reduction or intensifying as do most process plates and films.

The choice of plates or films is governed by the final requirements and the available equipment. For maximum stability and the maintenance of close tolerances, glass plates are preferred, but these often fail to make intimate contact with the laminate, when making the contact print. Films can be backed up close to the base and if a vacuum printing frame is available, intimate contact is made, giving the finest reproduction of the original pattern.

We will assume that the plate or film negative has been made and has been retouched where necessary to fill in any pinholes.

Printing on the Laminate.—The copper-clad laminate is usually made of paper impregnated and bonded with phenol-formaldehyde (s.r.b.p.) but it may be of glass cloth impregnated with polyester, epoxy or silicone resins. In any case, the copper foil is bonded to one or both faces by various proprietary methods, some patented by the laminators.

The poorness of the bond was largely responsible for the long delay in realizing the initial basic ideas behind etched foil. Modern materials have the copper foil bonded well enough to withstand a peel test on a 1-in strip of up to 25lb at room temperature, and stable enough to withstand dipping for 3 or 4 seconds in a bath of solder heated to 250°C.

When received from the manufacturers the copper faces are greasy and oxidized. They are cleaned either by wet abrasion with a brush, water and pumice powder or, if the surface is not pitted or porous, by chemical means with or without the passage of current (cathodic etching). The surface must be clean enough to maintain an unbroken film of water when wetted. When thoroughly clean and degreased, the board is ready for the application of the photo-sensitive coating.

Coating Solutions.—Two types of photo-sensitive coatings will be discussed. One, a single coating, requires reinforcing with ink before it becomes a sufficiently strong acid resist. The other, a double coating, stands up to the etching bath without reinforcement. Each has its advantages and disadvantages, which will be discussed later.

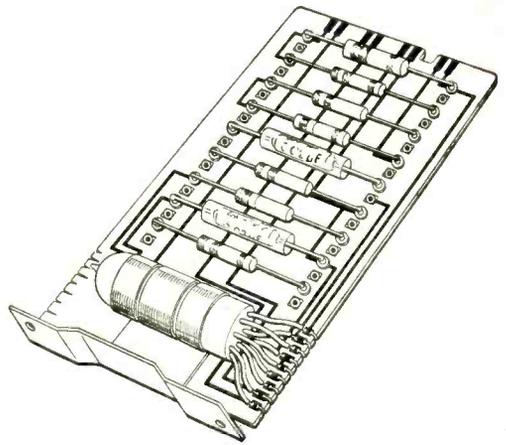


Fig. 3. Sub-unit using printed wiring and dip soldering, made from the master diagram of Fig. 2.

Single Coating Method.—The solution, which is water soluble, is made as follows: Take 70 grams of egg albumen and dissolve in 250 c.c. of warm, distilled water at about 35°C. When dissolved, add 111.5 grams of ammonium dichromate followed by 7 grams of ammonia, 0.88 specific gravity. Make up mixture with distilled water to 560 c.c. Filter through a No. 41 filter paper to remove particles.

The filtered solution is poured on to the clean copper face of the laminate and whirled until dry. The whirling may be done with a hand-operated tool like a hand drill with a rubber suction cup instead of a chuck, or on a modified gramophone motor and turntable, rotating at about 100-120 r.p.m. Commercial whirling machines are available for production quantities. The motor-driven types are best as the rotation is at a controlled and repeatable speed. If it is required to speed up the process, slightly warmed air may be applied from a hair-dryer or by other means, but it is important that the coating should not be overheated at this stage.

As there is a build-up of the coating at the edges of the plate an oversized plate is used; in other words, the pattern is smaller in size than that of the board which is being coated.

When dry the coating presents the appearance of a glossy yellow film that is even and non-tacky. It is not sensitive to any normal lighting except strong sunlight and to ultra-violet light, so the coating may be made in a well-lit room excluding sunlight.

The plate is placed in contact with the negative, emulsion to coating. Both are put in a printing frame—preferably of the vacuum type, but good work has been done with the ordinary type used to make contact prints. The exposure is made to ultra-violet light from either an arc-lamp or a high pressure mercury vapour lamp. If the negative is really opaque it is impossible to over-expose it, but as lamps produce heat, it is possible to overheat it. Four to six minutes with an arc lamp and 10 to 12 with a mercury vapour lamp are generally correct. Under-exposure must be avoided or the image will peel off during development.

On removal from the frame, the image will be seen as a dark pattern where the light has hardened the coating in those places not covered by the lines in the negative. The laminate is placed face upwards

on a flat surface and a small pool of lithographic developer ink (a black, oily liquid) is poured on its centre. The ink is swabbed over the surface as quickly as possible with cotton-wool several pieces of which could be used in order to get a very thin film of ink remaining on the copper surface. The object is to remove as much ink as possible in the shortest time as it is quick-drying, and too thick a film will make the subsequent development very difficult.

The inky film is dried with warm air and thoroughly wetted under running water. Those parts of the image that were covered by the opaque parts of the negative will wash away leaving the pattern showing in the copper base. Sometimes, parts of the coating require light rubbing with cotton wool to clean up the surface, but when the process has been carried out satisfactorily the running water will suffice to develop out the image. When fully developed, the plate is dried by hot air; this time the heat is beneficial as it hardens the ink layer and so increases its acid-resisting properties.

As described, the ink layer will stand up to the etching solution long enough to remove all the unwanted copper, but as it never really dries and if both sides of a board are to be prepared for etching further initial treatment of the first side is necessary. This is quite simple, merely being the pouring over its surface of a powdered bitumin or resin (the latter known as Dragon's Blood). The powder adheres only to the sticky ink and by tapping smoothly on the side of a bench or by washing in water, all the surplus is removed from the copper. This layer of powder must be fused by heating. The resin requires about 2-5 minutes' treatment at 100°C, either in an oven or by the application of infra-red heat; the bitumen fuses at a higher temperature, which is found by experiment.

When the process is complete, the resist pattern is very hard and practically scratch-proof so the reverse side of the board may be coated and processed exactly as for the first side. When finished, the placing of the board edgewise into the etchant will remove the unwanted copper from both sides at once.

Circuits treated as described have withstood 4-5 hours in a bath of ferric chloride of 1.38 s.g. at 25°C.

Double Coating Method.—In the method already described, the single coating must be light-sensitive and also acid-resistant; this limits the choice of materials that can be used—most of them are based

on a colloid such as albumen, fish glue, gelatin or gum arabic.

The separation of the light-sensitivity and acid-resistant properties allows a stronger base to be used, whilst the light-sensitive material has only to resist the solvent for attacking the base—in other words, the first layer is acid-resisting and the second is made into a stencil through which a solvent removes the underlayer where required. The process is carried out as follows:—

A cellulose nitrate lacquer is coated on the cleaned copper face of the laminate. Whirling is unnecessary as the solution, thinned to double its volume with acetone, is poured on to the centre of the plate and allowed to flow over its entire surface. It dries quickly and as it is dyed red, the smoothness of the coating is easily checked.

When dry, the plate is coated with the albumen solution exactly as used in the single-coating method. It is exposed to the arc or ultra-violet mercury vapour lamp through the negative and is developed in water after exposure, instead of being inked up as described previously. As the albumen solution is almost colourless, it is difficult to see it on the surface of the lacquer, but as it is dried with hot air the image appears, only to disappear when it is completely dry. The albumen coating solution could be dyed but the need for this has not occurred in the experience of the author.

The lacquered plate is now covered by a stencil of albumen in the circuit pattern. If a solvent is now poured on its face, all the lacquer will be removed except where it is covered by the albumen coating. Many solvents may be used—propyl alcohol is effective but most are too quick in action and some attack the stencil. A slow acting and very effective solvent is polyethylene glycol—a liquid rather like glycerine in appearance and consistency. A small quantity of this is poured on to the plate and lightly swabbed with cotton wool. All the unwanted coating comes away, leaving the image ready for acid etching. No heating is required or is desirable, as the lacquer is easily crazed by overheating.

This method is satisfactory for single-sided circuits but it is impracticable to coat one side of the laminate without getting any of the lacquer on the reverse. It provides a stable image that is non-tacky and quite tough and so able to withstand handling without being easily damaged.

Etching the Copper.—Although nitric acid has

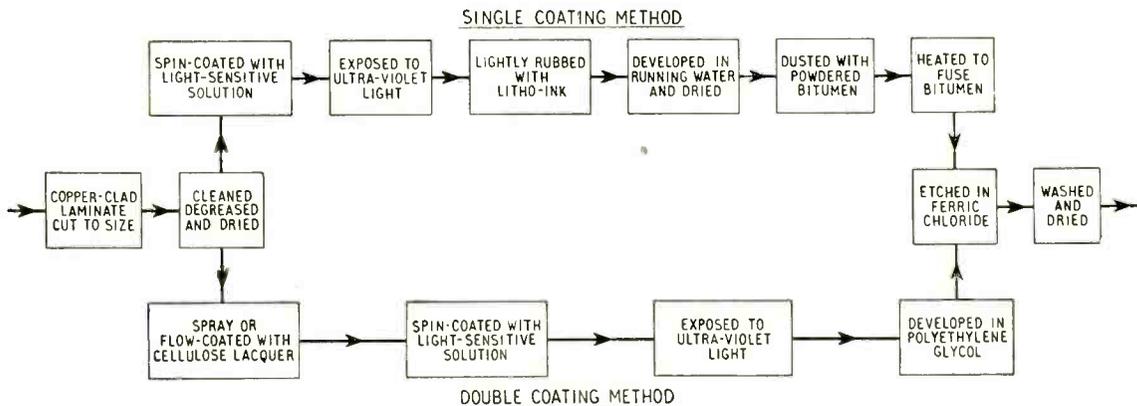


Fig. 4. Comparison of single- and double-coating photographic methods.

been used by a few people, most use ferric chloride as an etchant. Practically all workers in the printing trade use it because it gives a slower, more easily controlled etch without bubbling. When copper is attacked by nitric acid, hydrogen is liberated; this bubbling through the liquid can lift the acid-resistant pattern.

The ferric chloride may be obtained as lumps which are dissolved in water by the user or, more conveniently, as a liquid of about 1.38 s.g. When making a new bath, some 5 per cent or so of old etching fluid should be added to it as this increases its cutting speed.

Etching machines are available for large-scale work, but for laboratory purposes a photographic developing dish made of china is adequate. The single-sided board is immersed face downwards so that the copper silt which is cut away by the etchant falls to the bottom of the bath. Double-sided boards are, as already stated, placed edgewise in the bath and in each case the dish is agitated in a similar way to that used in developing a normal photographic plate.

Warming the bath to about 30-35°C speeds up the process, which can often be completed in about 7-10 minutes. Some machines will etch through 0.001in of copper in three minutes, but the resists that have been discussed are extremely durable and, when necessary, the boards may be left untouched, if the bath is at room temperature and unagitated, until the final cleaning of copper which may take about an hour.

After etching, the board is thoroughly washed in warm water to remove all traces of acid and then the resist pattern may be removed with a solvent—turpentine or white spirit for the bitumen or resin, acetone for the cellulose lacquers. Where the bitumen or resin has been well fused, abrasion of its surface, with water and scouring powder, may be necessary to clean up the exposed copper circuit. It is advisable to dry the laminate in an oven for about half an hour at 100°C to remove any water that has been absorbed during processing. This is particularly important when low-grade punching materials have been used as a base for the copper foil.

Comparison of Single- and Double-coated Methods.—It has already been stated that the double coating would be difficult to apply to double-sided boards, but apart from this fact, the following points should enable a choice to be made between the two methods.

There are more operations when using the single than when using the double coating (see Fig. 4) and it requires less manipulative skill to carry out the latter. The application of the cellulose lacquer is very simple and the albumen coating is applied in each case, so the process is common to both methods. A certain dexterity is required when inking up the albumen-coated plate; too thin a layer makes a poor acid resist and too thick a layer makes the development of the image difficult. Following up with powdered bitumen or resin is probably best done by dipping the board into the powder and washing away the surplus under a tap which, although simple, requires practice to perfect it.

On the other hand, the thinners and solvents for the ink—white spirit or turpentine—are pleasant to use, whereas acetone as the solvent for the cellulose lacquer is unpleasant, also the red cellulose is much more difficult to remove from the skin and from clothing than the simple oily liquids.

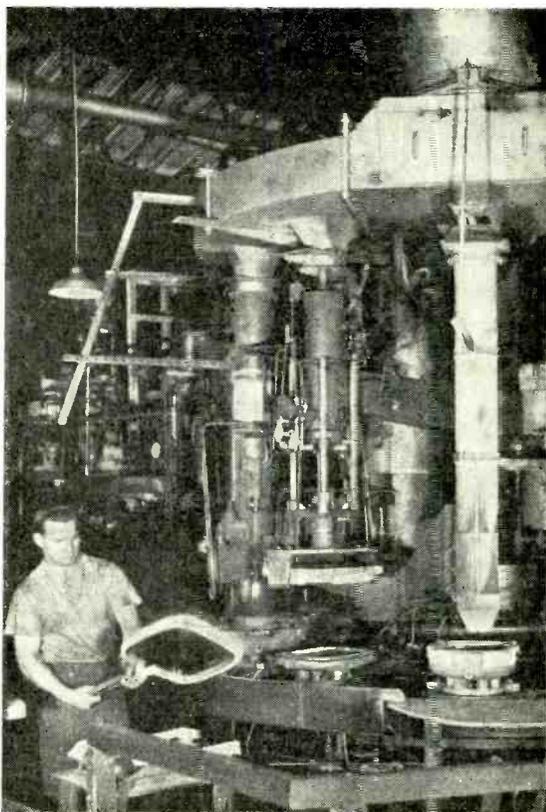
With a little practice, the single coating with its reinforcing materials gives consistently good results under all conditions of temperature and humidity. It produces a resist pattern which is very much more durable than most cold top enamels, it is made up by the user from harmless chemicals, easily obtained. The solution, when kept in a well-stoppered coloured bottle (so that it is unaffected by light) has been used over a period of three months without deterioration.

Given a good negative, thorough cleaning of the copper, adequate exposure followed by development in cold, running water, and careful inking up of the image, very satisfactory results can be achieved with a definition that is good enough for the finest detail such as is needed on miniature circuits and coils.

Acknowledgement is made to the Printing and Allied Trades Research Association, Leatherhead, and to Kodak, Ltd., Kingsway, London, for help and advice on circuit printing over a period of five years.

(Crown copyright reserved. Reproduced by permission of the Controller, H.M. Stationery Office.)

Glassware for C.R. Tubes



Cathode-ray tube glass parts (cones and face-plates) are turned out at the rate of one every six seconds by a new automatic plant put into operation by Pilkington Brothers at St. Helens this year. The firm came into the business at the Government's request in 1948 and now, with the new equipment, are able to produce at least two million components a year. In this machine, large blobs of molten glass from a furnace are fed into moulds on a rotating table, and this passes under a plunger which descends and presses out the glass to the required shape. Annealing follows, then inspection, and grinding and polishing where necessary.

American Oscilloscope Technique

With Some Remarks on Anglo-American Divergencies

By A. J. REYNOLDS*

THOSE readers who were in the radio industry in pre-war days will remember the very high regard in which instruments by such American companies as General Radio, Boonton, Ferris and Measurements Corporation were held. In the early and mid 'thirties the British Instrument as we know it today hardly existed. We had, of course, famous companies such as Cambridge, Muirhead, Sullivan and Tinsley, but they were fully occupied making what can be regarded as laboratory standards, bridges of extreme precision, potentiometers and variable air capacitors of exquisite workmanship. Little was then available, British made, for those awkward characters who required to generate few microvolts at many megacycles or who cherish a notion to measure the Q of the Litz-wound glass-former inductors in their super short-waver.

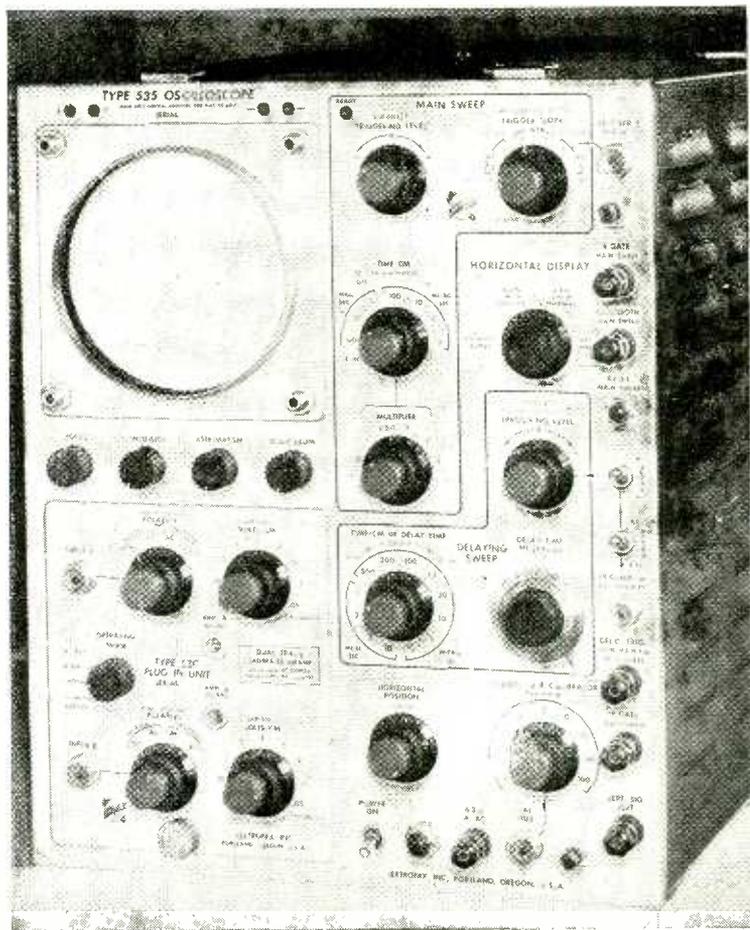
The founder member of the new brigade of instrument firms was undoubtedly Marconi-Ekco who, in the late 'thirties, began to make American-style instruments in this country. Having a relatively clear field they expanded rapidly, but when war broke out most of the serious work in British laboratories was still being done with instruments of American manufacture. During the war few American instruments found their way into the country and the small British industry expanded enormously. It had to: in pre-war days the Standard Signal Generator was an object of awe and veneration enshrined amongst the polished teak and lacquered brass binding-posts of the standards room, one per factory being about the number required. In the Services thousands were necessary, and such old favourites as the Marconi TF144 were bounced across the desert in 15-cwt trucks and dragged across the gooey mud of forward airstrips by sodden "erks."

After the war Britain found herself with a new industry—electronic instruments. New names appeared: Advance, Airmec, Cintel, Dawe, Solartron, Wayne Kerr and a whole host of others. The well-publicized dollar shortage precluded the entry of American instruments and as a result the styling, electrical and mechanical design of the products of the two countries have moved steadily apart. A somewhat similar state of affairs exists to that in the motor industries of the two countries.

Across in the States conditions were very similar to those at home. The war gave the instrument industry a tremendous fillip and while the old-established companies grew enormously, and along lines that could have been fairly easily predicted, a horde of new companies shot up overnight. (Some of them also snot down again pretty quickly.) Amongst these were two destined to become the giants of the industry. They are Hewlett-Packard, born in the garage of one Dave Packard just before the war and now the largest instrument company in the world in terms of turnover, and our heroes on this occasion Tektronix.

Company Organization

Tektronix Inc. was organized as an Oregon corporation in January, 1946, for the purpose of developing



Front panel of Tektronix oscilloscope Type 535, giving some idea of the facilities available.

* Livingston Laboratories.

and manufacturing cathode-ray oscilloscopes. The owners all had extensive wartime electronic experience in either military or civilian capacities. The president, Howard Vollum, actually worked in this country on radar development during the war.

The company and its products form a useful guinea pig for a miniature study of current American thought in light current engineering. It is a successful company; from small beginnings as late as 1946 it now dominates the American wide-band oscilloscope market and is by far the largest producer of these instruments in the world. Before going on to the instruments let us look at a few points concerning the general organization and see how they tie up with your own conception of an American company and normal British practice.

First, the president, Howard Vollum, is a distinguished engineer, completely *au fait* with the performance of his company's oscilloscopes and the designer of some of them. This is a theme constantly reiterated in the new generation of U.S. instrument companies. Bill Hewlett and Dave Packard designed all of their company's original products. Rarely is the accountant-cum-financier type of director found over there. On enquiry you will be told "You can always take an engineer and train him as a business man, but rarely does the converse apply."

Secondly, at Tektronix they are more nearly self-sufficient than any other comparable company in the world. The only bought-out components are those such as valves and resistors. When the commercially available article is not good enough there is no hesitation in setting up a department to improve on current practice. Commercial capacitors could not be bought that were sufficiently good for use in their time bases, so they wind their own to $\pm 0.25\%$. Bought-out c.r. tubes were insufficiently linear for the sort of accuracy sought—so they made their own, incidentally solving a major tube manufacturing problem in the process. The new Tektronix tube uses a helical post-deflection accelerator ring that starts at the top of the tube neck and runs helically right up the flare to the screen. This, of course, is an old idea and obviously the right way to make a p.d.a. tube, but up till now no manufacturer has succeeded in holding the resistivity of his material sufficiently constant to achieve a uniform potential gradient down the tube. Hating the conventional tag-strips and group-boards, they developed and manufacture their own ceramic group-boards that contribute greatly to the internal appearance of the instruments. This may surprise those who thought, as I tended to, that the American manufacturer produced a set of drawings that were effectively a stock list enumerating the bought-out parts that merely had to be assembled in the parent works. This philosophy, once prevalent, is now regarded with disfavour by the most progressive companies.

A third feature is the generosity of the electrical performance compared with the specification. Many experienced observers in this country have been forced to apply a "transatlantic factor" to written specifications emanating from the U.S.A. It has sometimes even appeared that in the Great Democracy the output watts were larger than ours and input watts smaller. (Something to do with the size of the U.S. gallon no doubt.) Here, however, is a conservatism of claim at least equal to the best of the British firms. On the type 535 oscilloscope, for example, the claimed Y amplifier bandwidth of 10 Mc/s measures as 3 dB down at 13.5 Mc/s.

The last point, which I am sure has a sizeable bearing on the company's success, is its method of payment. Every month 22½% of the company profit is divided amongst the employees in the ratio of their salaries and a further 7½% added to the pension fund. A simple enough payment by results system, but one which ties an individual's earnings to the performance of the company as a whole. Under this system what matters to each employee is that the customer is satisfied. Surely all men should be working to please the customer rather than to put one over on an inspector three benches away!

Two Outstanding Models

As examples of the instruments themselves we have space to deal with but two, the fabulous type 517 and the latest of the line, the type 535.

The 517 is a wide-band high-voltage oscilloscope designed primarily for the observation and photographic recording of very fast rising waveforms having a low duty cycle. The use of 24 kV accelerating potential on a metallized cathode-ray tube permits photographic recording of single sweeps at the maximum writing speed allowed by the Y amplifier and sweep circuits. Distributed-type Y amplifiers provide a rise time of 7 millimicroseconds with a maximum sensitivity of 0.1 V/cm. Both amplitude and time calibrators are provided. Sufficient time delay is incorporated in the Y amplifier to permit viewing the leading edge of the waveform which triggers the sweep.

In order to provide sufficient vertical deflection voltage with a rise time as short as 7 millimicroseconds for a cathode-ray tube using 24 kV accelerating potential, a distributed amplifier is employed. This amplifier consists of five distributed stages plus a phase inverter and trigger valve. The first two stages use six 6AK5 valves each, next a stage of seven 6CB6 valves and a phase inverter of three 6CB6s. The signal then goes to a push-pull driver stage having six 6CB6s each side and finally to the output stage with twelve 6CB6s on each side.

The performance on the X axis is just as impressive. Since many fast-rising pulses are either non-repetitive or non-uniformly spaced, it is essential to have a sweep which can be triggered by the observed pulse itself. To enable the type 517 to trigger from fast rising signals of small amplitude, a wide-band, distributed amplifier is incorporated. Signals of 0.3 V amplitude with a rise time of 1 millimicrosecond will easily trigger the sweep. When using the observed signal as a trigger, any signal giving a deflection of 2 mm is adequate.

The time base on its fastest speed runs at 10 m/μ sec/cm, that is, a complete sweep of 8 cm in 80 m/μ sec. Although their invariable practice, and one well suited to the method of calibration, this style of specifying time base speed strikes me as slightly ludicrous. It is rather like saying "Poor old Charlie was nicked for failing to exceed 0.033 hours per mile in a built-up area." Come to think of it, they are in effect quoting the time base slowness rather than time base speed.

That then is type 517, a slightly fabulous beast in that few of us could live up to it. Owning a 517 must be rather like owning a 4½ Ferrari or being married to Marilyn Monroe. Let us examine another model, just as outstanding in its own sphere but more applicable to everyday problems, the type 535.

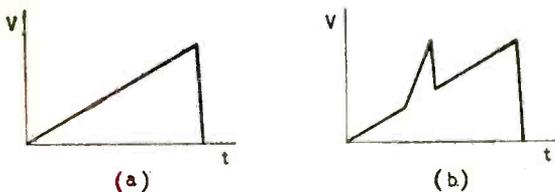


Fig. 1. Waveform of a conventional time base sweep (a) and with a second sweep superimposed on it (b).

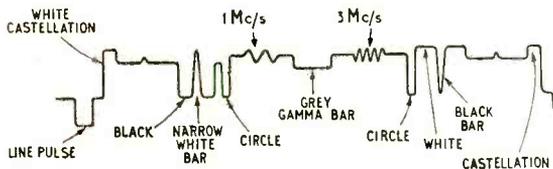


Fig. 2. Television waveform from one line of Test Card "C."

The 535 is a most unusual instrument for two reasons. First, it is the best example to date of that oft-attempted oscilloscope, the Y amplifier characteristics of which can be varied by means of a series of plug-in pre-amplifiers. The main ones of these are the 53B, with a frequency response of d.c. to 10 Mc/s and a sensitivity of 5 mV/cm, and the 53C, with a response of d.c. to 8.5 Mc/s and a sensitivity of 50 mV/cm. A double beam facility is provided by means of an electronic switching system. This beam switch can be triggered by alternate sweeps or allowed to run free at 100 kc/s. A d.c. and low frequency pre-amplifier is available, giving deflection sensitivities of 50 μ V/cm. When these are allied to a time base having continuous coverage from 0.02 μ sec/cm to 12 sec/cm, it will be seen that even without any other features the 535 would still be an outstanding instrument.

The second unusual facility is one that obviously springs from the firm's association with radar, as it is a well-established radar technique applied for the first time to oscilloscopes. This is the use of two time bases, one of which strobos the other. For those not familiar with this trick a word of explanation. Consider the two time bases in Fig. 1, one of which, at (a), is pictorially quite familiar. It can be so arranged that the linear rise of voltage in (a) will trigger a second time base, running much faster, at a pre-determined voltage level, as shown in (b). It will be obvious that if the first sweep is triggered by a pulse, then varying the voltage at which the second sweep fires will slide this sweep up and down the slope of the first one and so provide a variable delay between the trigger pulse and the start of the second sweep. In practice no such waveform as (b) appears in the instrument, this having been simplified to establish the general principle.

Selective Observation

Let us take a practical example. We will feed into the type 535 oscilloscope a television waveform, Test Card "C" in fact, and arrange for the first sweep to be triggered by the line pulses and to have a duration of some 100 μ sec. The resultant display will then consist of a jumble of all 405 lines. If, however,

a rudimentary sync separator, consisting of a CR network with the correct time-constant, is included in the trigger circuit, then the time base will trigger from the frame group and permit a display on one line which looks something like Fig. 2.

Now supposing it is arranged that when the second sweep fires it applies a "bright-up" to the beam, then a portion of this display will appear brighter than the rest. The length of the bright patch can be varied by adjusting the duration of the second sweep and its position along the picture by varying the delay (point on the first sweep at which the second sweep fires). In our example we could arrange the bright portion of the trace to coincide with the 3-Mc/s bars. This done, by switching the input of the X amplifier the second sweep can be applied to the plates of the tube and a picture of the 3-Mc/s portion of one line made to occupy the whole screen, permitting detailed examination. The beauty of this system is that a complex waveform can be displayed *in toto* on the screen, a portion of it selected for detailed observation and that portion viewed on a greatly increased time scale with absolute certainty that it is the desired part of the waveform.*

This has perforce had to be a rather sketchy treatment of a complete range of instruments, but I hope it has at least shown that, during the years when American instruments have been absent from this country, oscilloscope design at any rate has been progressing along lines rather different from our own.

* * *

Since this article was written a further development of the 535 oscilloscope has taken place, bearing the type number 545. It is based on a new cathode-ray tube developed by Tektronix which has the fantastic deflection sensitivity of 7V/cm with 10kV on the p.d.a. ring. Use of this tube gives the new oscilloscope the following Y amplifier performance: frequency response, d.c. to 30 Mc/s; rise time, 12m μ sec; sensitivity at full bandwidth, 50mV/cm. The amplifier is 6dB down at 45 Mc/s and 12dB down at 60 Mc/s.

* Although this example deals with the use of the type 535 as a line selecting monitor, this function is performed equally well by the simpler type 524, an oscilloscope that has been a standard instrument in American television circles for over four years.

AMATEUR COURSES

IN preparation for next year's radio amateur examination, to be held by the City & Guilds in May, a large number of educational establishments up and down the country are arranging evening courses of instruction. Among those from which we have received specific details are:—

Bradford Technical College; classes are being arranged by the Bradford Amateur Radio Society (Sec. F. J. Davies, 39, Pullan Avenue, Eccleshill, Bradford, 2).

Brentford (Middlesex) Evening Institute; Wednesdays (fee 10s).
Glasgow, Allan Glen's School; theory will be taken on Tuesdays and Morse on Thursdays (fee 10s.)

Huddersfield Technical College, where the lecturer will be C. W. Oakley (G3IPD).

Holloway, Grafton School; theory on Mondays and practice on Wednesdays with Morse instruction after each evening's class (fee 10s).

Iford (Essex) Literary Institute; both theory and practical courses on Wednesdays (fees 10s per course).

South-East London Technical College; theory Wednesdays.

Wembley Evening Institute; Mondays, Morse 7 to 8, theory 8 to 10.

Transistor Equivalent Circuits

3.—Earthed-Base Transistors

By W. T. COCKING, M.I.E.E.

SUMMARY:—Equivalent circuits for the earthed-base transistor are derived from the earthed emitter circuits of Part 2. The different forms of transistor constants are discussed and the relations between the more common ones are tabulated for easy reference.

SO far, transistors have been considered only in the earthed-emitter form of connection. The published characteristics of transistors, however, are usually for the earthed-base connection rather than for the earthed-emitter. The constants of transistors are also usually quoted for the earthed-base connection.

It might be thought, therefore, that it would have been better to start in Part 2 with this arrangement and so to follow the customary practice in transistor literature. We have here deliberately avoided this, however, in order to bring out the basic similarity of the transistor and the thermionic valve, so far as external matters are concerned. If it were not for certain difficulties with the point-contact transistor, we might even take the view that the earthed-emitter circuit should be regarded as the fundamental one,

just as the earthed-cathode circuit is so regarded for the valve.

A difficulty arises with the point-contact transistor, however, for it can have negative input and output resistances when its emitter is earthed. These negative resistances cause certain difficulties of measurement which can make it awkward to obtain the characteristic curves and constants. Because of this, it is much more convenient to make measurements on the point-contact transistor in the earthed-base condition than in the earthed-emitter and, for uniformity, it is

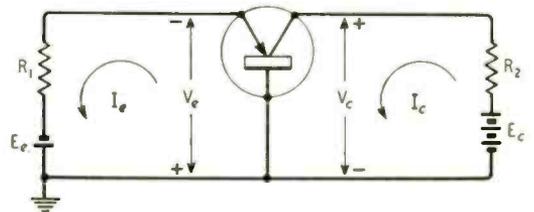


Fig. 1. Amplifier stage using an earthed-base n-p-n transistor.

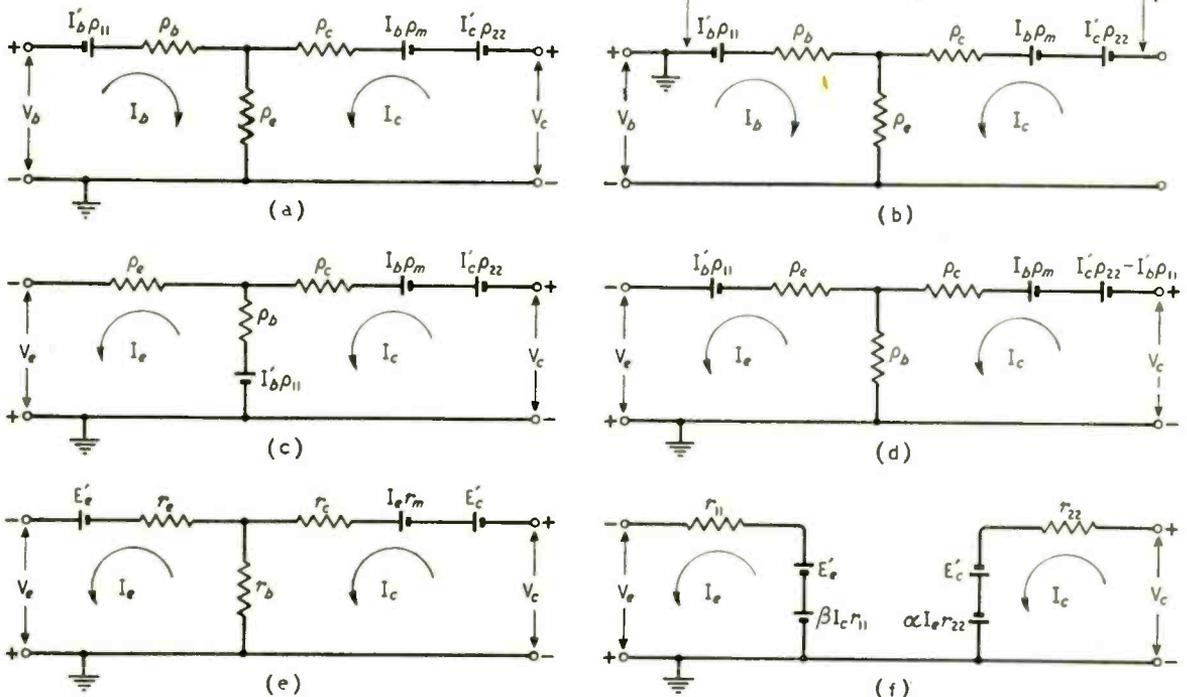


Fig. 2. An earthed-emitter equivalent circuit is shown at (a) and, with its connections altered for an earthed base, at (b). The successive transformations to an earthed-base equivalent circuit are shown at (c), (d) and (e). A two-generator form appears at (f).

customary to measure junction transistors in the same way. It seems desirable, therefore, that our final transistor constants should be ones based on this circuit.

It should not be thought that the earthed-emitter equivalent circuit developed in Part 2 has been wasted, however. So far from that, we regard it as an essential stepping-stone from the valve to the earthed-base transistor. Further, the earthed-emitter circuit is being increasingly used with junction transistors and all that is necessary to employ the equivalent circuits of Part 2 with transistor constants for the earthed-base connection is to have some conversion formulae so that ρ_b, ρ_e, ρ_c and ρ_m or ρ_{11}, ρ_{22} , a and b can be derived from them.

Our next step must be to develop an equivalent circuit for the earthed-based transistor. The circuit has the form shown in Fig. 1 for an $n-p-n$ transistor. Let us first of all derive an equivalent circuit from the one for the earthed-emitter circuit Fig. 5(b) of Part 2. This is repeated in Fig. 2(a). For the earthed-base connection it becomes Fig. 2(b) which can be re-drawn as in (c). The essential change is that the collector voltage is measured between collector and base instead of between collector and emitter. There is, therefore, a change in the meaning of V_c between (a) and the other diagrams.

Fig. 2(c) can be changed to (d) by removing $I'_b \rho_{11}$ from the ρ_b arm and inserting it in both the ρ_e and ρ_c arms. In (b), (c) and (d), V_b has become V_e . The two are numerically equal but of opposite polarity, when measured from earth. In (c) and (d), too, I_b has disappeared and the path of I_c has been changed. It is plain from (a) that $I_e = I_b + I_c$, so that the currents in all the resistances are unchanged by this re-distribution and re-naming.

We now require this equivalent circuit to be brought to the form of Fig. 2(e) in which the quantities are derived from the earthed-base characteristics instead of the earthed-emitter. The relations between (d) and (e) are easily established by comparing their mesh equations. For the emitter loop

$$V_e = I_e(\rho_e + \rho_b) - I_c \rho_b - I'_b \rho_{11}$$

$$= I_e(r_e + r_b) - I_c r_b - E'_e$$

which gives us $r_e = \rho_e, r_b = \rho_b$ and $E'_e = I'_b \rho_{11}$.

For the collector loop we have

$$V_c = I_c(\rho_c + \rho_b) - I_e \rho_b - I'_c \rho_{22} + I'_b \rho_{11} - I_b \rho_m$$

$$= I_c(r_c + r_b) - I_e r_b - E'_c - I'_e r_m$$

Substituting $I_e = I_b + I_c$ for the coefficient of r_m in the second part

$$V_c = I_e(r_c + r_b - r_m) - I_e r_b - E'_c - I_b \rho_m$$

TABLE 1

<i>Given $r_{11}, r_{22}, \alpha, \beta$</i>		
$r_b = \beta r_{11}$	$\rho_b = \beta r_{11}$	$\rho_{11} = r_{11}$
$r_c = r_{22} - \beta r_{11}$	$\rho_c = r_{22}(1 - \alpha)$	$\rho_{22} = r_{22}(1 - \alpha) + r_{11}(1 - \beta)$
$r_e = r_{11}(1 - \beta)$	$\rho_e = r_{11}(1 - \beta)$	$a = \frac{\alpha r_{22} - r_{11}}{r_{22}(1 - \alpha) + r_{11}(1 - \beta)}$
$r_m = \alpha r_{22} - \beta r_{11}$	$\rho_m = \alpha r_{22} - \beta r_{11}$	$b = 1 - \beta$
<i>Given r_b, r_c, ρ_e, r_m</i>		
$r_{11} = r_b + r_e$	$\rho_{11} = r_b + r_e$	$\rho_b = r_b$
$r_{22} = r_b + r_c$	$\rho_{22} = r_e + r_c - r_m$	$\rho_c = \frac{r_e - r_m}{r_b + r_e}(r_e + r_c - r_m)$
$\alpha = \frac{r_b + r_m}{r_b + r_e}$	$a = \frac{r_m - r_e}{\rho_{22}}$	$\rho_e = r_e$
$\beta = \frac{r_b}{r_b + r_e}$	$b = \frac{r_e}{r_b + r_e}$	$\rho_m = r_m$

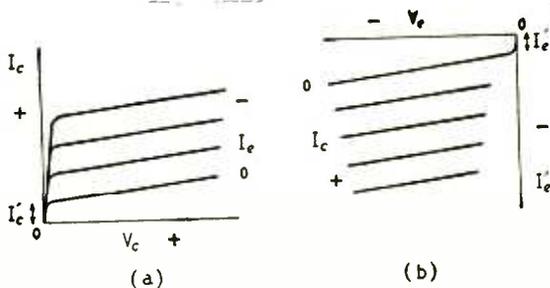


Fig. 3. General form of $n-p-n$ transistor characteristics for the earthed-base connection.

Comparing the first and last equations for V_c , we have $r_e = \rho_c + \rho_m, r_m = \rho_m$ and $E'_c = I'_c \rho_{22} - I'_b \rho_{11}$.

We can now go a stage further and transform Fig. 2(e) to the form (f), which is like the equivalent circuit that we first derived for the earthed-emitter transistor. For this we have

$$V_e = I_e r_{11} - \beta I_c r_{11} - E'_e$$

$$V_c = I_c r_{22} - \alpha I_e r_{22} - E'_c$$

Comparing these with the ones for Fig. 2(e) we get $r_{11} = r_e + r_b, \beta r_{11} = r_b, r_{22} = r_c + r_b, \alpha r_{22} =$

$r_b + r_m$, so $\alpha = \frac{r_b + r_m}{r_b + r_c}$ and $\beta = \frac{r_b}{r_b + r_e}$. If we

remember how we derived the corresponding terms of the earthed-emitter circuit from the transistor characteristic, it is now plain that these terms have similar meanings for the earthed-base characteristics. We can say therefore, that r_{11} is the emitter a.c. resistance

$$r_{11} = \delta V_e / \delta I_e$$

for I_c constant. Also r_{22} is the collector a.c. resistance

$$r_{22} = \delta V_c / \delta I_c$$

for I_e constant.

The other terms are the current amplification factors α and β , and

$$\alpha = \delta I_c / \delta I_e$$

for V_c constant while

$$\beta = \delta I_e / \delta I_c$$

for V_e constant.

The characteristics for the earthed-base connection are shown in Fig. 3. We could have started with these and derived r_{11}, r_{22}, α and β from them in accordance with the above definitions and in exactly the same way as we did for the earthed-emitter transistor in Part 2.

We should then have obtained Fig. 2(b) directly and found $E'_e = I'_e r_{11}$ and $E'_c = I'_c r_{22}$ where I'_e and I'_c are the zero-current intercepts as in Fig. 3. Following the same argument as in Part 2 we could have found Fig. 2(e) and then established the relations with the earthed-emitter circuit (d).

The relations between the values for the equivalent circuits are summarized in Table 1.

The complete equivalent circuit can be reduced to its a.c. form by omitting the d.c. parts as we did before. The result is Fig. 4. One great advantage of this form of circuit is that three of the elements r_e, r_b and r_m have the same values as their earthed-emitter

counterparts ρ_e, ρ_b and ρ_m . It is only r_e that differs from ρ_e .

At this stage it is desirable to consider what four constants should be used to represent the transistor. So far, we have based everything upon a pair of a.c. resistances and a pair of current amplification factors because they are somewhat analogous to valve constants and are easily determined from the transistor characteristics. There are quite a lot of alternatives, however. We have already met a, b, ρ_{11} and ρ_{22} with the derived quantities ρ_b, ρ_c, ρ_e and ρ_m for the earthed-emitter connection and α, β, r_{11} and r_{22} with the derived quantities r_b, r_c, r_e and r_m for the earthed-base.

Choice of Constants

The thermionic valve operating with a negative grid requires only one family of curves to describe its characteristics and two constants, derivable from these characteristics, to describe it in an a.c. equivalent circuit. Because the transistor passes current at all its three electrodes, two families of curves are needed to describe it and four constants are needed for an equivalent circuit. This raises difficulties, because neither the two families of curves nor the four constants are unique. There are four possible families of curves and twelve possible constants!

This applies to the earthed-emitter connection and there are the same number again for the earthed-base arrangement. We need only four constants out of twenty-four possible ones! In the valve we have only three—amplification factor μ , a.c. resistance r_a , and mutual conductance g_m ; they are related since $\mu = g_m r_a$ so we need two only out of a possible three and, if we ever want the third, the relation is a very simple one.

In the case of the transistor, the relations between the twenty-four possible constants are much more complex and are not readily performed mentally. It is rather important, therefore, to choose the best four constants. Unfortunately, opinions differ about which are the best and different writers use different ones. This accounts for much of the difficulty of transistor literature.

We regard it as essential that whatever four constants are chosen they should be determinable from the transistor characteristics which are most readily available. This at once rules out earthed-emitter constants, for the usual characteristics are the earthed-base type. We have, therefore, to choose four out of twelve possible ones.

There are three groups of four which are particularly common in the literature and which are

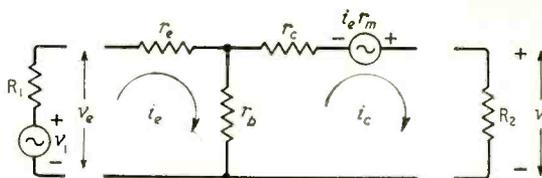


Fig. 4. A.C. equivalent circuit corresponding to Fig. 2 (e).

defined in Table 2. The symbols following the square brackets indicate which voltage or current is to be regarded as constant. The twelve constants listed are not all distinct; for example, $y_{11} = 1/h_{11}$, $r_{22} = 1/h_{22}$, $h_{12} = r_{12}/r_{22}$, $h_{21} = y_{21}/y_{11}$. There are more possibilities than are shown in Table 2, therefore.

According to Shea¹ the h group is the most suitable, because the constants are the easiest to measure and vary less with temperature and operating point than the others. However, h_{11} and h_{12} are not obtainable readily from the ordinary characteristic curves. In fact, no single group is!

There is one serious objection to the nomenclature of the h group, which is that the same letter serves sometimes for a resistance, sometimes for a conductance and sometimes for a ratio. This is very bad practice, because it prevents the ready dimensional checking of equations. It is likely to cause errors. In this respect, both the r and y groups are satisfactory, because all the r constants are resistances and all the y constants are conductances.

Measurement of Constants

When the constants are obtained by measurements on an actual transistor, some are easier to measure than others. The output resistance of a junction transistor is usually rather high, 1–2 MΩ, and it is difficult to employ a high enough external impedance to obtain constant-current conditions. It is much easier to make the impedance low and so to operate under constant-voltage conditions. It is, therefore, easier to measure quantities which need V_e kept constant than those which require I_e to be constant. At the input, the reverse applies. If the input resistance is very low, it is difficult to obtain a voltage supply of low enough internal resistance to operate under constant-voltage conditions, but it is quite easy to operate at constant current. Thus it is easier to measure quantities which need I_e kept constant than those which must have constant V_e .

The h group constants of Table 2 are thus admirably suited to the requirements of measurement.

When one wants to derive the constants from the characteristic curves, however, the h group is quite unsuitable. The most convenient ones are r_{11} , r_{22} , α and β , that we have used hitherto. They are all easily determined from the characteristic curves, which is why we selected them in the first place.

It does not seem practicable, therefore, to have a single set of primary constants which is suitable both for evaluation by measurement and from the characteristic curves. It seems best, therefore, to adopt one set for measurement purposes and another for derivation from the valve

TABLE 2

$r_{11} = \delta V_e / \delta I_e] I_e$	$y_{11} = \delta I_e / \delta V_e] V_e$	$h_{11} = \delta V_e / \delta I_e] V_e$
$r_{22} = \delta V_c / \delta I_c] I_e$	$y_{22} = \delta I_c / \delta V_c] V_e$	$h_{22} = \delta I_c / \delta V_c] I_e$
$r_{12} = \delta V_e / \delta I_c] I_e$	$y_{12} = \delta I_e / \delta V_c] V_e$	$h_{12} = \delta V_e / \delta V_c] I_e$
$r_{21} = \delta V_c / \delta I_e] I_e$	$y_{21} = \delta I_c / \delta V_e] V_e$	$h_{21} = \delta I_c / \delta I_e] V_e$
$r_b = \frac{h_{12}}{h_{22}}$	$= \beta r_{11}$	$= r_{12}$
$r_e = \frac{1 - h_{12}}{h_{22}}$	$= r_{22} - \beta r_{11}$	$= r_{22} - r_{12}$
$r_e = h_{11} - (1 + h_{21}) \frac{h_{12}}{h_{22}}$	$= r_{11} (1 - \beta)$	$= r_{11} - r_{12}$
$r_m = - \frac{h_{12} + h_{21}}{h_{22}}$	$= \alpha r_{22} - \beta r_{11}$	$= r_{21} - r_{12}$

¹ "Transistor Audio Amplifiers," by Richard F. Shea. (Chapman & Hall).

characteristics. The h group seems best for the first and, for the second, the r_{11} , r_{22} , α and β groups that we have used hitherto.

Whichever is adopted, it can be transformed to the other or to the r_e , r_b , r_c and r_m group if it is desired to use this type of equivalent circuit. This circuit is very commonly used in the literature and its outstanding advantage is that three of the four resistances are the same for both the earthed-base and the earthed-emitter connection. Only one needs to have its value altered.

Transformation of Constants

For general use in circuit work, no single equivalent circuit is necessarily always the best. Often, a particular form best suits a given problem. It is, therefore, very necessary to be able to pass readily from one form to another and Table 1 enables this to be done. Sometimes, the transistor constants are quoted somewhat differently; instead of having r_{11} , r_{22} , α , β or r_b , r_c , r_e and r_m , for instance, one might have r_b , r_c , r_e and α . The quickest way of finding r_m is then to find r_{11} , r_{22} and β from the relations in the first column of the second group of transformations in Table 1 and then to compute r_m from the equation in the first group. It works out at $r_m = \alpha (r_b + r_c) - r_b$.

Table 2 gives the definitions of the r , y (or g) and h groups of constants which are found in the literature. In addition, it gives a transformation from the h group to the r_b , r_c , r_e and r_m form so that, with the aid of Table 1, a transformation to any other group can be effected. The transformation from the r group to the r_b , r_c , r_e and r_m form is also included, since this is also commonly found in the literature. The derivation of the r group is treated in the Appendix.

One or two comments on the relations of Table 1 may be helpful. In the first place, some of the relations can be simplified in practice with negligible error; for example, r_b is often very small compared with r_e and can be neglected in comparison. Secondly, the relation for a , the current amplification factor for the earthed-emitter transistor, is different from the one usually quoted, which is $a = \alpha/(1 - \alpha)$. The equation given reduces to this simple form when $r_{11} \ll \alpha r_{22}$ and $r_{11} (1 - \beta) \ll r_{22} (1 - \alpha)$, which is usually the case.

Before we conclude this part, it may be helpful to quote some actual figures for transistors to get an idea of the order of magnitude of the quantities involved and how the transformations are effected. Turning to the *Wireless World* "Radio Valve Data", we find the Mullard OC70 listed as having $r_b = 750 \Omega$, $r_c = 1.5 \text{ M}\Omega$, $r_e = 35 \Omega$ and $\alpha = 0.97$, so

$$r_m = 0.97 \times 1.5 = 1.455 \text{ M}\Omega$$

since r_b is negligibly small in comparison with r_c . For the earthed-base connection we have (see Table 1):— $\rho_b = 750 \Omega$, $\rho_e = 35 \Omega$, $\rho_m = 1.455 \text{ M}\Omega$ and

$$\rho_c = \frac{1.5 - 1.455}{1.5} = \frac{0.045}{1.5} = 0.03 \text{ M}\Omega = 30 \text{ k}\Omega.$$

For the two-generator earthed-base equivalent circuit we have:—

$$\begin{aligned} r_{11} &= 750 + 35 = 785 \Omega \\ r_{22} &= 1.5 \text{ M}\Omega \\ \alpha &= 0.97 \end{aligned}$$

$$\beta = \frac{750}{785} = 0.956$$

while for the two-generator earthed-emitter circuit we get:—

$$\begin{aligned} \rho_{11} &= 785 \Omega \\ \rho_{22} &= 1.5 - 1.455 = 0.03 \text{ M}\Omega = 30 \text{ k}\Omega \\ a &= \frac{1.455}{0.03} = 48.5 \\ b &= \frac{35}{785} = 0.0446 \end{aligned}$$

Using Table 2, we can evaluate the quantities in terms of the r and h group and we get:—

$$\begin{aligned} r_{11} &= 785 \Omega \\ r_{12} &= 750 \Omega \\ r_{21} &= 1.455 \text{ M}\Omega \\ r_{22} &= 1.5 \text{ M}\Omega \\ \text{and } h_{11} &= r_e + r_b \frac{r_c - r_m}{r_c + r_b} = 35 + 750 \frac{1.5 - 1.455}{1.5} \\ &= 35 + 750 \frac{0.045}{1.5} \\ &= 35 + 750 \times 0.03 = 35 + 22.5 = 57.5 \Omega \\ h_{12} &= \frac{r_b}{r_b + r_c} = \frac{750}{1,500,000} = 0.0005 \\ h_{21} &= -\frac{r_m}{r_c} = -\frac{1.455}{1.5} = -0.97 \\ h_{22} &= \frac{1}{r_c} = \frac{1}{1.5 \times 10^6} = 0.66 \times 10^{-6} \text{ mhos} \end{aligned}$$

Point-contact Transistor

For a point-contact transistor, the values are quite different. Krugman² quotes:— $r_{11} = 250 \Omega$, $r_{12} = 100 \Omega$, $r_{21} = 24 \text{ k}\Omega$, $r_{22} = 12 \text{ k}\Omega$. From Table 2 we then have:—

$$\begin{aligned} r_b &= 100 \Omega \\ r_c &= 11.9 \text{ k}\Omega \\ r_e &= 150 \Omega \\ r_m &= 23.9 \text{ k}\Omega \end{aligned}$$

From Table 1, $r_{11} = 250 \Omega$, $r_{22} = 12 \text{ k}\Omega$, $\alpha = 24/12 = 2$ and $\beta = 100/250 = 0.4$. Notice particularly that α is greater than unity. This is typical of a point-contact transistor; with the junction type, α is always less than unity. Proceeding, we have $\rho_{11} = 250 \Omega$, $\rho_{22} = 0.15 + 11.9 - 23.9 = -10.85 \text{ k}\Omega$, $a = (23.9 - 0.15)/(-10.85) = -21.8$, $b = 150/250 = 0.4$. Notice that ρ_{22} and a are both negative for the point-contact transistor in the earthed-emitter circuit. Taking the remaining form we have,

$$\begin{aligned} \rho_b &= 100 \Omega, \rho_e = 150 \Omega, \rho_m = 23.9 \text{ k}\Omega, \\ \rho_c &= \frac{11.9 - 23.9}{12} = \frac{-12.05}{12} = -1.004 \text{ k}\Omega. \end{aligned}$$

What is the meaning of α greater than unity? In terms of a.c., we have defined it as i_e/i_c and we have $i_e = i_b + i_c$. If α is greater than unity, it means that the collector current is greater than the sum of the base and collector currents and, in turn, this means that the base current must be in the opposite direction to the collector current. We derived our equivalent circuit for the junction transistor and took the positive directions of current flow as the actual directions. With the point-contact transistor, however, one of these is reversed. We cannot yet say which.

However, we find ρ_{22} is negative and this means that i_e is reversed compared with the junction transistor.

² "Fundamentals of Transistors," by Leonard M. Krugman. (Chapman & Hall).

We can say, therefore, that in the two types i_b flows in the same direction but i_c in the opposite and we have the curious result that the emitter current of a point-contact transistor is smaller than the collector current.

(To be concluded)

APPENDIX

IN American literature, the equivalent circuit of a transistor is usually derived from the arrangement of Fig. 5. The transistor is represented as a box with four terminals 1, 1 and 2, 2, two of which are internally joined. The voltages v_1 and v_2 are applied externally and, as a result, the currents i_1 and i_2 flow with the directions shown. Four resistances are named arbitrarily r_{11} , r_{12} , r_{21} , r_{22} and the following equations are written:—

$$\begin{aligned} v_1 &= i_1 r_{11} + i_2 r_{12} \\ v_2 &= i_2 r_{22} + i_1 r_{21} \end{aligned} \quad (A1)$$

The meaning of the four resistances is then determined by putting the currents each in turn equal to zero. Thus,

$$\begin{aligned} r_{11} &= v_1/i_1 \text{ for } i_2 = 0 \\ r_{21} &= v_2/i_1 \text{ for } i_2 = 0 \\ r_{12} &= v_1/i_2 \text{ for } i_1 = 0 \\ r_{22} &= v_2/i_2 \text{ for } i_1 = 0 \end{aligned} \quad (A2)$$

The equivalent circuit of Fig. 6 is then drawn with $v_e = v_1$, $i_e = i_1$, $v_c = v_2$, $i_c = i_2$ for the earthed-base transistor and the same current directions as for Fig. 5. The equations for Fig. 6 are:—

$$\begin{aligned} v_e &= i_e(r_e + r_b) + i_c r_b \\ v_c &= i_c(r_c + r_b) + i_e(r_b + r_m) \end{aligned} \quad (A3)$$

Comparing these with (A1), we have

$$\begin{aligned} r_{11} &= r_e + r_b \\ r_{12} &= r_b \\ r_{21} &= r_b + r_m \\ r_{22} &= r_c + r_b \end{aligned} \quad (A4)$$

If we write $v_c = 0$ in (A3) any current in the collector circuit flows as a result of v_e . Then

$$i_c = -i_e \frac{r_b + r_m}{r_b + r_c}$$

and the minus sign indicates that the current i_c flows in the opposite direction to that shown in Figs. 5 and 6. In our derivation in the text, we assumed this opposite direction of current flow from the start and our v_e was a voltage developed by i_e in a load resistance even if this was not always specifically shown. Here v_e is an externally applied voltage.

The current amplification factor is

$$\alpha = \frac{r_b + r_m}{r_b + r_c}$$

= $-i_c/i_e$ in the American convention.

We defined α in relation to the static characteristics of the valve as $\delta I_c/\delta I_e$, which is equivalent to i_c/i_e in terms of alternating current. The minus sign arises in the American definition because they have assumed i_c to flow the other way round. There is no real difference in the meaning of α .

The backward current amplification factor, which we are calling β , is defined in American literature as

$$\begin{aligned} \beta &= -i_e/i_c \text{ for } v_c = 0 \\ &= \frac{r_b}{r_e + r_b} \end{aligned}$$

from (A3).

We originally defined b as $-\delta I_b/\delta I_e$ and later obtained β as $1 - b$ or $1 + \delta I_b/\delta I_e = (\delta I_b + \delta I_c)/\delta I_e = \delta I_c/\delta I_e$ which is i_c/i_e in terms of alternating current. Again, there is a difference of sign in the definition which is again brought about by the different direction of current flow assumed initially. Again, there is no difference in the real meaning of β .

The American derivation of the equivalent circuit is

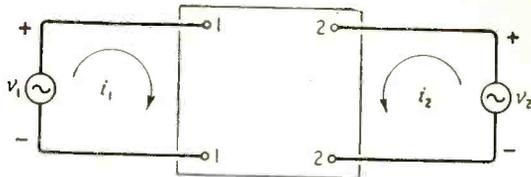


Fig. 5

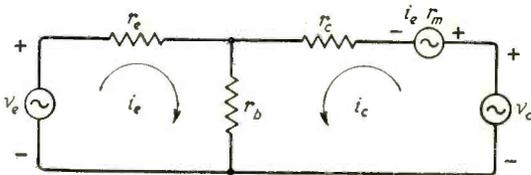


Fig. 6

simpler than ours and leads to the same result, but it is intellectually less satisfying, because the initial constants r_{11} , r_{12} , r_{21} , r_{22} are obtained in an apparently arbitrary manner. Our constants r_{11} , r_{22} , α , β are derived directly from the characteristic curves and have an obvious physical meaning.

BOOKS RECEIVED

Linear Feedback Analysis by J. G. Thomason, B.Sc. Treatise covering basic principles and their application in electronic circuits and servo-mechanisms, with special reference to the causes of instability and methods of stabilization, with practical illustrative examples. Pp. 355+x; Figs. 236. Price 55s. Pergamon Press, Ltd., 4-5, Fitzroy Square, London, S.W.1.

Powder Metallurgy. Report of Technical Assistance Mission No. 141 on European and American manufacturing techniques. Pp. 309; Figs. 15. Price 20s. Organization for European Economic Co-operation, 2 rue André-Pascal, Paris, 16.

Thermionic Valves, 1904-1954. Souvenir reprint of the lectures and photographs of the exhibits at the celebrations to mark the jubilee of the thermionic valve (16th November, 1954). Pp. 69. Price 9s. The Institution of Electrical Engineers, Savoy Place, London, W.C.2.

Practical Wireless Servicing Manual by F. J. Camm. Revised tenth edition, including additional chapters on the construction of test instruments. Pp. 284; Figs. 221. Price 17s 6d. George Newnes, Ltd., Southampton Street, London, W.C.2.

Points on Pickups by F. Wilson. Replacement guide to stylus types and cartridges, illustrated for ready identification. Pp. 34. Price 3s. A. C. Farnell, Ltd., 15, Park Place, Leeds, 1.

Théorie des Réseaux de Kirchhoff by M. Bayard. Analysis and synthesis of linear networks under sinusoidal conditions. Pp. 414+xv; Figs. 315. Price F.fr. 3,200. Editions de la Revue d'Optique, 3 et 5, Boulevard Pasteur, Paris, 15.

Cours de Radioélectricité Générale. Volume 4 Propagation des Ondes by Pierre David. General survey of radio wave propagation. The influence of the ground, the troposphere and the ionosphere. Applications to the selection of wavelengths for long-distance communication. Pp. 223. Editions Eyrolles, 61, Boulevard Saint-Germain, Paris, 5.

A Guide to Electricity by J. H. M. Sykes, Assoc.I.E.E. Elementary treatise on everyday electrical engineering practice for the general reader. Pp. 275; Figs. 90. Price 21s. Hutchinson's Scientific and Technical Publications, Stratford Place, London, W.1.

Design of Tchebycheff Filters

Experimental Verification of the Basic Formulæ

By G. H. BURCHILL,* B.Sc.

THE following notes are offered as a corollary to the series of articles on filter design by Thomas Roddam (*Wireless World*, Aug., Sept., Nov., Dec. 1954). Filters of the third order will be discussed and the results given of measurements on experimental filters.

Data for constructing Tchebycheff third-order (π -section) filters are given by Fig. 1, and the configurations and characteristics of these filters are shown by Fig. 2. Curves are plotted for the case where source and load resistances R_1 and R_2 are equal, and for the case where R_2 is infinite. The curves were calculated on the assumption that losses in the filter components could be neglected.

These filters have relatively high insertion loss beyond cut-off, but they also have appreciable loss at certain frequencies in the pass band. The loss is to some extent under the control of the designer, and depends on the value chosen for the factor "t" in the Tchebycheff polynomial which describes the insertion loss characteristic. As indicated by Fig. 1, the greater the value of t the greater the loss beyond cut-off; but also the greater the loss at some frequencies in the pass band. Thus with reference to Fig. 2, the greater the value of t the greater the slope of the

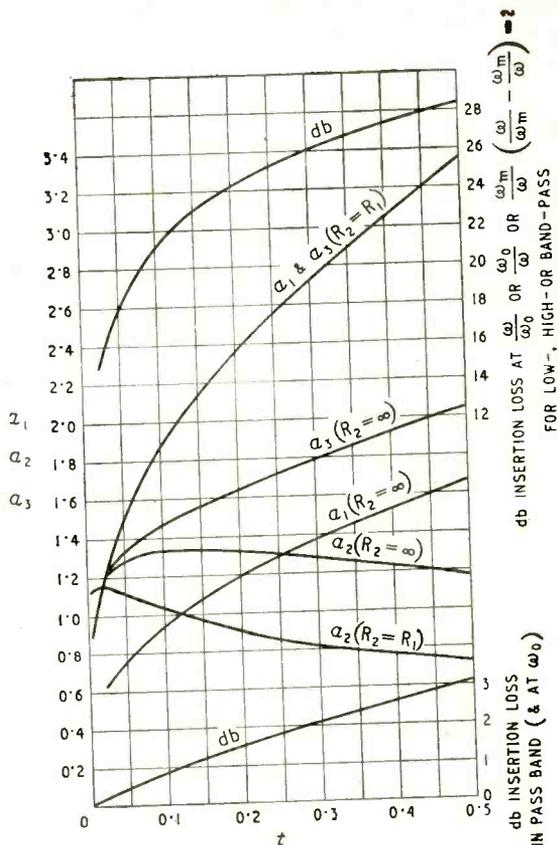


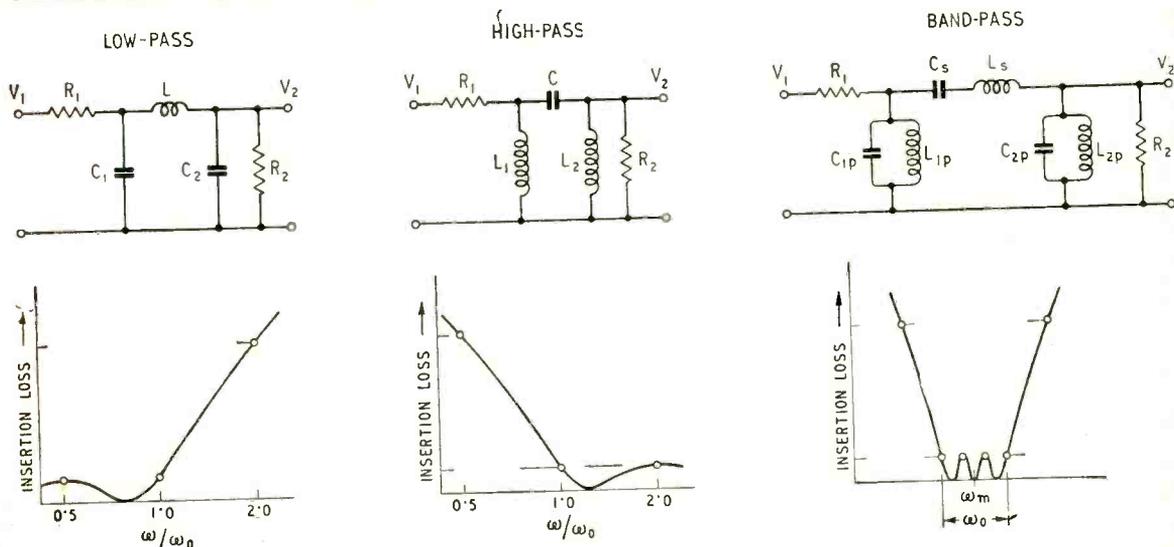
Fig. 1. Basic data for use in design formulæ.

insertion loss curve beyond cut-off, and also the more pronounced the "ripple" in the pass band.

To design a filter it is first necessary to choose a value of t. The choice may be made either by consideration of the allowable loss in the pass band, or of the desirable loss beyond cut-off. The lower "db"

Below: Fig. 2. Third-order (π -section) Tchebycheff filters and their characteristics.

* Professor of Electrical Engineering, Nova Scotia Technical College.



curve is used in the first case, the upper "db" curve in the second. When a value of t has been chosen the corresponding values of a_1 , a_2 and a_3 are read from their respective curves for the specified termination, $R_2 = R_1$ or $R_2 = \infty$. The filter components are then calculated as follows:

For a low-pass filter with cut-off angular frequency ω_0

$$C_1 = a_1/\omega_0 R_1 \quad L = a_2 R_1/\omega_0 \quad C_2 = a_3/\omega_0 R_1$$

For a high-pass filter with cut-off angular frequency ω_0

$$L_1 = R_1/a_1 \omega_0 \quad C = 1/a_2 \omega_0 R_1 \quad L_2 = R_1/a_3 \omega_0$$

For a band-pass filter of band width ω_m and mean angular frequency ω_m

$$C_{1p} = a_1/\omega_m R_1 \quad L_s = a_2 R_1/\omega_m \quad C_{2p} = a_3/\omega_m R_1$$

$$L_{1p} = 11 \omega_m^2 C_{1p} \quad C_s = 1/\omega_m^2 L_s \quad L_{2p} = 1/\omega_m^2 C_{2p}$$

The curves were plotted after a number of filters had been designed and tested. The method of design was based on the articles "Filters without Fears" by Thomas Roddam in the August and September 1954 issues of *Wireless World*. The filter components were determined from cut-and-try solutions of the Tchebycheff filter equations, for which Mr. Roddam did not give a solution. Following Mr. Roddam's method, but in more general form, the desired insertion loss characteristic for the low-pass case, based on the appropriate Tchebycheff polynomial, is: $db = 10 \log [1 + 18t(\omega/\omega_0)^2 - 48t(\omega/\omega_0)^4 + 32t(\omega/\omega_0)^6]$. The expression in brackets may also be derived in terms of the filter components, as explained by Roddam. When $R_1 = R_2$ it is:

$$1 + \omega^2 \left\{ \left[(C_1 + C_2) \frac{R_1}{2} + \frac{L}{2R_1} \right]^2 - L(C_1 + C_2) \right\}$$

$$+ \omega^4 \left\{ \frac{L^2(C_1 + C_2)^2}{4} - 2LC_1C_2 \left[(C_1 + C_2)R_1 + \frac{L}{R_1} \right] \frac{R_1}{4} \right\}$$

$$+ \omega^6 L^2 C_1^2 C_2^2 \frac{R_1^2}{4}$$

Writing $C_1 = a_1/\omega_0 R_1$, $L = a_2 R_1/\omega_0$, $C_2 = a_3/\omega_0 R_1$ and equating the two expressions term by term gives:

$$\frac{(a_1 + a_2 + a_3)^2}{4} - a_2(a_1 + a_3) = 18t$$

$$\frac{a_1 a_2 a_3}{2} (a_1 + a_2 + a_3) - \frac{a_2^2(a_1 + a_3)^2}{4} = 48t$$

$$a_1^2 a_2^2 a_3^2 = 128t$$

The first equation may be simplified to $a_1 + a_3 = \sqrt{72t} + a_2$ and the third to $a_1 a_2 a_3 = \sqrt{128t}$. If these are substituted in the second equation there results $a_2^3 + 2\sqrt{72t} a_2^2 + 72ta_2 - 8\sqrt{32t} = 0$. Values of a_2 for particular values of t were obtained from this equation. The corresponding values of a_1 and a_3 were then obtained from the simplified forms of the first and third equations.

When $R_2 = \infty$ the filter equations become:

$$\omega^2(C_1 + C_2)^2 R_1^2 - 2\omega^2 LC_2 = 18t(\omega/\omega_0)^2$$

$$2\omega^4 LC_1 C_2 (C_1 + C_2) R_1^2 - \omega^4 L^2 C_2^2 = 48t(\omega/\omega_0)^4$$

$$\omega^6 L^2 C_1^2 C_2^2 R_1^2 = 32t(\omega/\omega_0)^6$$

Substitution of a_1 etc. gives.

$$(a_1 + a_3)^2 - 2a_2 a_3 = 18t$$

$$2a_1 a_2 a_3 (a_1 + a_3) - a_2^2 a_3^2 = 48t$$

$$a_1^2 a_2^2 a_3^2 = 32t$$

further manipulation leads to:

$$a_3 = \frac{\sqrt{32t}}{2a_1^2} + \frac{48t}{2\sqrt{32t}} - a_1$$

$$a_2 = \frac{(a_1 + a_3)^2 - 18t}{2a_3}$$

$$a_1 a_2 a_3 = \sqrt{32t}$$

These were solved for particular values of t , using a slide-rule and systematic computing form, by trying values of a_1 , finding the resulting values of a_3 and a_2 , and comparing $a_1 a_2 a_3$ with $\sqrt{32t}$. About six trials usually gave the solution.

In *Wireless World*, December 1954, Mr. Roddam explained the transformations which give high-pass and band-pass filter designs from low-pass calculations. The examples he gave were second-order filters, but the expressions he derived were general, and apply also to third-order filters. The high-pass and band-pass design formulae given above were obtained by writing these expressions in terms of R_1 , a_1 , a_2 and a_3 .

A comparison with other types of filter is interesting. Mr. Roddam gives the solution for Butterworth response, low-pass, with $R_2 = \infty$. For our purpose it may be written $C_1 = 1/2\omega_0 R_1$, $L = 4R_1/3\omega_0$, $C_2 = 3/2\omega_0 R_1$. Evidently in this case $a_1 = 0.5$, $a_2 = 1.33$, $a_3 = 1.5$. The insertion loss at $\omega = \omega_0$, 3 db, is the same as that of a Tchebycheff filter having $t = 0.5$, but the Butterworth filter does not have the 3-db loss at $\omega = 0.5\omega_0$ and it has about 10 db less insertion loss at $\omega = 2\omega_0$. If $R_2 = R_1$ a Butterworth filter has $a_1 = 1$, $a_2 = 2$, and $a_3 = 1$, giving the same component values as the conventional image-impedance method.

When $R_2 = R_1$, $a_2 = a_1$, and $C_2 = C_1$, there is no obvious difference between the proportions of Tchebycheff and Butterworth filters. It is therefore instructive to determine the conditions that lead to these different types of response. If the low-pass design equations are multiplied together, there results:

$$LC = \frac{a_2 R_1}{\omega_0} \cdot \frac{a_1}{\omega_0 R_1} = \frac{a_1 a_2}{\omega_0^2}; \text{ or } \omega_0^2 = \frac{a_1 a_2}{LC}$$

and if they are divided:

$$\frac{L}{C} = \frac{a_2 R_1}{\omega_0} \cdot \frac{\omega_0 R_1}{a_1} = \frac{a_2}{a_1} R_1^2; \text{ or } R_1^2 = \frac{a_1}{a_2} \cdot \frac{L}{C}$$

Evidently it is possible to operate a given filter, having fixed values of L and C , at any value of the Tchebycheff factor t , and the corresponding values of a_1 and a_2 , if the resulting values of ω_0 and R_1 are acceptable. Further, it is possible to operate with $a_1 = 1$ and $a_2 = 2$ to obtain Butterworth response. As an example, a filter made up of a 46-millihenry inductor and two 0.1-microfarad capacitors operates

(a) Butterworth, with $f_0 = 3320$ c/s, if $R_1 = R_2 = 480$ ohms.

(b) Tchebycheff, $t = 0.125$, with $f_0 = 3320$ c/s, if $R_1 = R_2 = 960$ ohms.

(c) Tchebycheff, $t = 0.5$, with $f_0 = 3650$ c/s, if $R_1 = R_2 = 1460$ ohms.

There is another mode of operation which is useful at radio frequencies. If t is chosen as 0.0185, $a_1 = a_2 = a_3 = 1.15$. If a filter having these proportions is operated at the frequency $\omega = 0.866\omega_0$, so that $a_1\omega/\omega_0 = 1$ (etc.) the reactances of all its components be-

come numerically equal to R_1 . Then if it is terminated with an arbitrary load resistance R_L , the rather complicated general expression for the input impedance becomes simply R_1^2/R_L . The value of R_1 may be chosen to make this input resistance any desired value, so the circuit can act as an impedance-matching network, as well as reducing harmonic radiation. The low-frequency filter of the previous example operates in this fashion if $R_1 = 680$ ohms. When tested between a 340-ohm source and a 1360-ohm load (or vice versa) it showed a response resembling the Tchebycheff, but with insertion gain in the region near $0.866\omega_0$ (2350 c/s). The measured gain was slightly less than 1.9 db, the theoretical value for perfect matching.

Measurements have been made on a number of experimental filters, of the three types, some designed for $R_2 = R_1$ and some for $R_2 = \infty$. Two r.f. filters were also set up and tested in the equivalent lattice form for matching balanced to unbalanced lines.

In general the agreement between measurements and calculations was close. The greatest discrepancy occurred in the pass band where the calculated insertion loss was zero or very small. In this region typical high- and low-pass filters showed 1- or 2-db loss, and band-pass filters (with three coils) as much as 5-db loss. The discrepancy is presumably due to the neglect of component losses in calculations. The loss has the effect of reducing the ripple in the pass band, and several band-pass filters designed with $t = 0.5$ showed only 1- or 2-db variation over the pass band, instead of the expected 3-db. One filter, designed for $R_2 = \infty$ and with $t = 0.41$ was tested with a value of $R_2 = 5000$ ohms ($R_2 = 10R_1$). It showed about 0.6 db more insertion loss in the pass band than it had without the resistor, and no measurable difference in loss outside the pass band. Evidently R_2 need not be extremely high to be considered "infinite."

Simplified GCA

A NEW precision approach radar known as SPAR has been developed in the U.S.A. which provides all the facilities of a full-scale ground controlled approach (GCA) system for landing aircraft in poor visibility and at the same time is simple to operate and can if required be moved quickly from one site to another. The total weight is under one ton and the various parts break down into conveniently sized units for handling and for transport by aircraft if necessary. The whole equipment can be dismantled in six man-hours and re-erected in the same time.

The illustration shows the type and arrangement of the aeriels; each measures 8ft x 2ft and they scan mechanically in azimuth and in elevation respectively, the former over an arc of 30° and the latter 10° (-1° to $+9^\circ$).

What is thought to be a unique feature of this GCA is that both glide and approach paths (elevation and azimuth information) are displayed on a single 17in extra-long-persistence c.r. tube. "B" scans are used in both cases with glide path information shown on the top half of the tube and approach path information below. A logarithmic scale of range is employed, which is appropriate since it gives the greatest expansion of the trace at the most critical stage of the talk-down descent; just before the actual touch-down.

Predetermined glide and approach paths are applied electronically to the screen of the tube and it is only necessary for the controller to keep the two elongated echoes astride these displayed paths to bring the aircraft down safely. Relevant flying instructions are passed by v.h.f. radio-telephone.

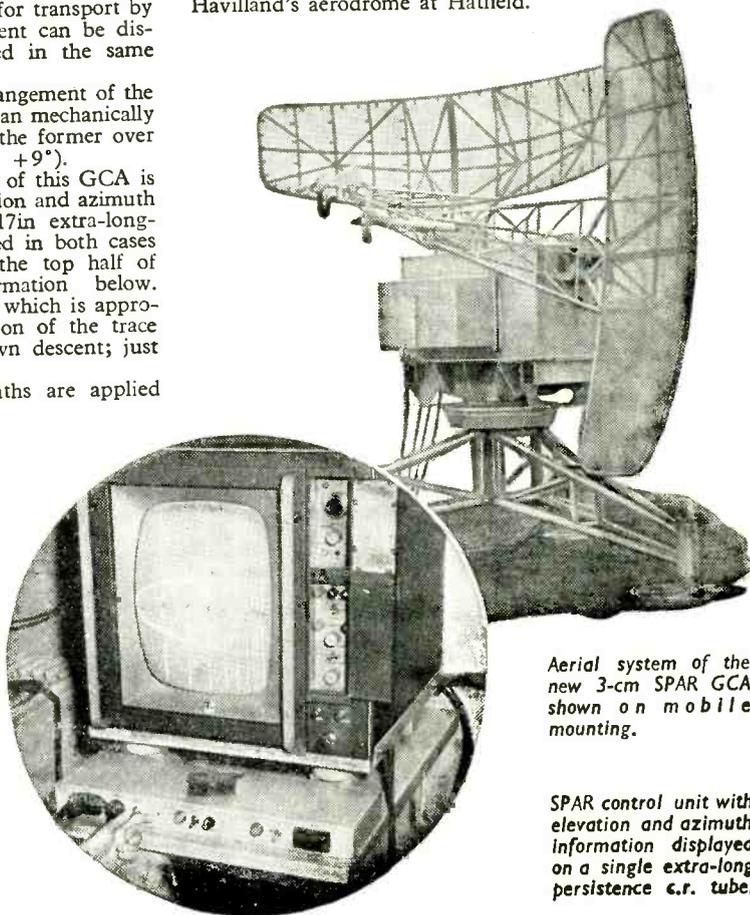
A high degree of accuracy is claimed for this system; ± 20 ft at touch-down, just before which the pilot takes over for a visual landing, and 0.5% of the range are the figures given.

The aerial unit can be positioned either on the centre line of the runway or to one side of it, the maximum displacement off centre being 1,000ft.

Brief technical details of the installation are as follows: operating frequency, 9,080 Mc/s $\pm 1\%$; pulse width, 0.5 μ sec; peak power 50 kW; range, 10 nautical miles; aerial scan rate, 2 per sec azimuth and ele-

vation. Provision is made for optional circular polarization to combat any clutter or degradation of the system by rain droplets. The power input required is 3.5 kVA at 115/230 V a.c. 50/60 c/s single phase.

The equipment is a Bendix product and is handled in the U.K. by Elliott Bros., Century Works, Lewisham, London, S.E.13, who recently demonstrated it on De Havilland's aerodrome at Hatfield.



Aerial system of the new 3-cm SPAR GCA shown on mobile mounting.

SPAR control unit with elevation and azimuth information displayed on a single extra-long persistence c.r. tube.

Vertical Pattern of V.H.F. Aerials

*New Method of Measurement Dispensing
with the Need for High Towers*

By E. G. HAMER,* B.Sc.(Eng.) Hons., A.M.I.E.E.

THE increasing use of v.h.f. equipment for mobile services, both of the business radio and public utility types, has called for intensive development to improve the performance of all the various units involved. In the case of the transmitter the maximum power output is restricted by regulations laid down by the local licencing authorities, and to some extent by the economic maximum power consumption of the mobile equipment. The output signal-to-noise ratio of modern receivers is controlled mainly by the noise factor of the input circuits when the thermal noise is predominant. The noise factor varies between individual designs but is usually as low as 4 db up to 100 Mc/s, and 6 db up to 180 Mc/s. The main items which remain, and which could possibly give improved performance are the aerial systems and feeders. A small improvement say 1 to 2 db could be made by using low-loss air-spaced feeders, but this improvement would be outweighed by the large increase in initial cost of the improved feeder cable.

Many types of aerials have been used in the past both for the fixed and mobile stations, and each system designer has had his own particular favourite. The performance of several types of aerials has been suspect in the past, their failings becoming apparent during the course of trials or demonstrations. This in many cases has led to conflicting opinions on the suitability of various types of aerials for different uses, and it has not been possible to recommend on technical grounds the best aerial for various types of service. It has been thought for some time that the vertical polar diagram of the various types of aerial varied considerably, and it is possible that the diagram changes rapidly with small changes of frequency, this being of importance where double frequency working, or

common aerials are in use (Ref. 1²). The lack of information in the past has been due to the practical difficulties involved in the measurement of the true vertical polar diagram of an aerial, as even with the use of a high tower only part of the diagram can be measured. To some extent the vertical polar diagram of an aerial will depend upon its location and method of mounting, so that any measurements made will only apply to the particular equipment used, or some idealized case, say that of free space. In most aerials used for mobile services the desirable factor of a low standing-wave ratio, and lack of energy fed back down the outside of the feeder are sacrificed in the interests of low initial cost; and a "live feeder can have a pronounced effect on a vertical polar diagram, or on the symmetry of both the horizontal and vertical diagram, usually giving a degradation of performance in the required directions.

With a view to checking this last unknown factor of system performance (i.e. the aerial) it was decided to measure the approximate vertical polar diagram of various types of aerial. It has been shown in the past that the vertical polar diagram of simple aerials comprised only of vertical elements could be obtained by laying the aerial horizontally above a large ground plane and either rotating the aerial itself, or moving the receiving test aerial around at a fixed radial distance from the aerial being measured. But this method has not been justified in the past for more complex aerials consisting of mixtures of horizontal and vertical elements. The techniques used have been discussed in a previous paper (Ref. 5) and provided certain precautions are taken reasonably accurate results will be obtained. The results obtained compare favourably with part diagrams taken when using a high tower to move the receiving aerial in a vertical direction. This to some extent may be fortuitous as the measured true vertical diagram will vary according to the height at which the aerial under test is mounted and also to the surrounding terrain.

Fig. 1 shows a block schematic diagram of the equipment used; the aerial under test was mounted on a wooden turntable which itself was set on a large metallic ground plane laid on the roof of a wooden hut. The aerial was connected by a suitable feeder to an oscillator through a long slotted line. The pick-up dipole was mounted 100 feet away and connected to a bridge rectifier, the resulting direct current being fed by a screened lead to microammeter 2. When measurements were made the radio frequency power into the aerial from the oscillator was adjusted to give a constant field strength at the pick-up dipole as measured by microammeter 2, and the power fed to the aerial measured by use of the long slotted line and microammeter 1. Fig. 2 is a sketch of the pick-up dipole head, a resonant circuit with the centre earthed was

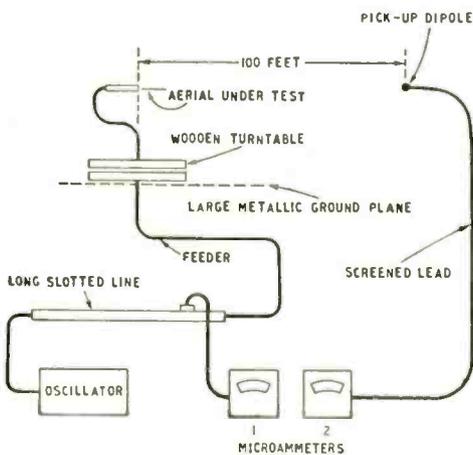


Fig. 1. Block schematic diagram of the equipment used for the measurements described in the text.

* Research Laboratories, General Electric Company, Wembley.

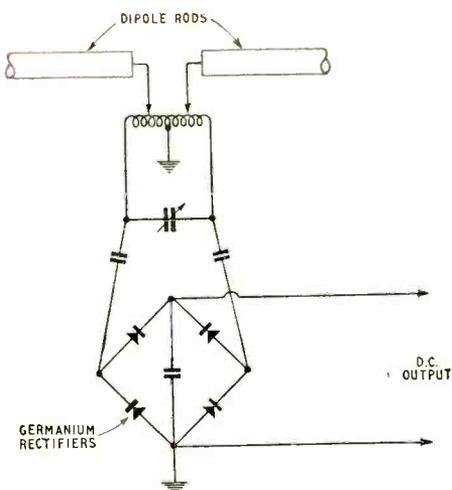


Fig. 2. Pick-up dipole head.

used to eliminate stray and unwanted pick up from powerful medium wave stations. A bridge formed of four germanium rectifiers was tapped on to the coil *via* isolating capacitors. A pick-up circuit of this kind, although insensitive, has the advantage of long-term stability, and requires no returning or power supplies; it was mounted at the top of a plywood telescopic mast on a level with the aerial under test. By plotting the inverse of the power fed into the aerial under test to give a constant field strength at the pick-up aerial the polar diagram of the aerial was obtained.

The product of the maximum and minimum relative voltages as measured by the long slotted line is directly proportional to the power being fed into the aerial (Ref. ³), and by obtaining this product at various positions the polar diagram is obtained. For any given aerial setting as the standing-wave ratio is constant the aerial power is proportional to V_{max}^2 and the field strength at the pick-up aerial to V_{max} where V_{max} is the relative voltage at a maxi-

mum position along the slotted line. It is convenient only to measure V_{max} and V_{min} at a few positions to obtain the standing-wave ratio, and at all other positions only to measure V_{max} . This obviates the need to keep moving the probe of the slotted line, thus reducing the time taken to make a series of measurements, which in itself tends to increase the accuracy as the effect of drift of measuring equipment is minimized.

The average time to take a complete polar diagram of an aerial with a mechanically driven turntable, and with 10-deg intervals is thus reduced to 10 to 15 min. These individual diagrams are rescaled to a basis of equal radiated power, and hence direct comparisons of the performance of various types of aerials tested may be made (Ref. ⁵).

Figs. 3, 4 and 5 are photographs of some of the aerials tested and Fig. 6 shows a comparison of the performance of various types of aerial when radiating the same power, and plotted on a basis of relative field strength. The Aerial Table shows the relative gain of the various types of aerial in a horizontal direction when compared with the equivalent omnidirectional source.

It will be noted that in the case of asymmetric

AERIAL TABLE

Type of Aerial	Gain over Omni-directional Source
Standard Dipole	2.2 db (theoretical 2.15 db)
Sleeve Dipole	1.5 db
Ground Plane	-0.5 db
Wide band Ground Plane	-0.4 db
Simple "J"	2.6 to 2.9 db depending on direction
Ground Plane "J" $\lambda/4$ (rods)	0.5 to 1.5 db depending on direction
Ground Plane "J" $\lambda/2$ (rods)	1 to 2.5 db depending on direction

Gain of various types of aerial in the horizontal plane.

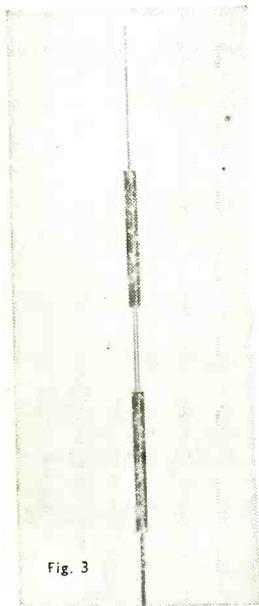


Fig. 3

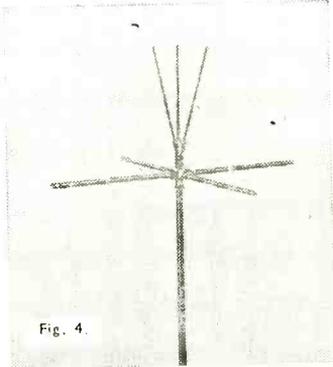


Fig. 4.

Fig. 3. Type of standard dipole used.

Fig. 4. Details of the wide-band ground-plane aerial.

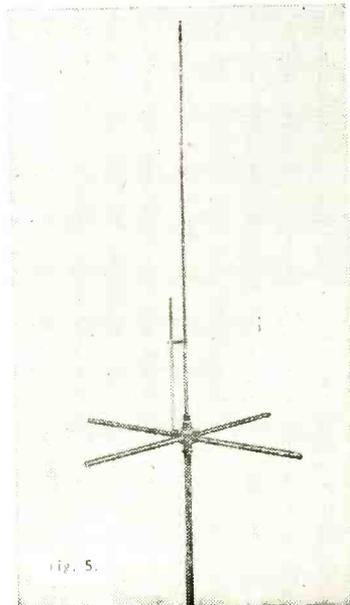


Fig. 5.

Fig. 5. The ground-plane "J" aerial employed in the tests.

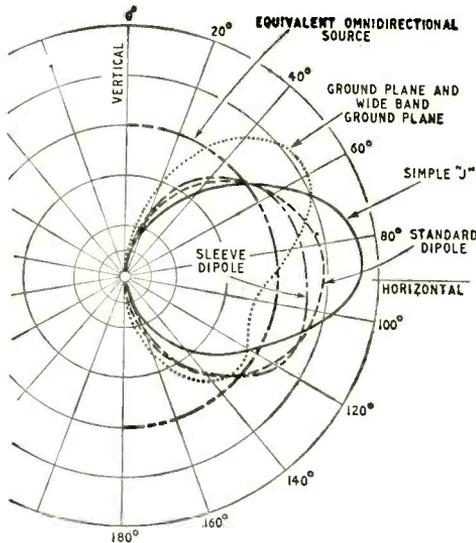


Fig. 6. Comparison of various aeriels.

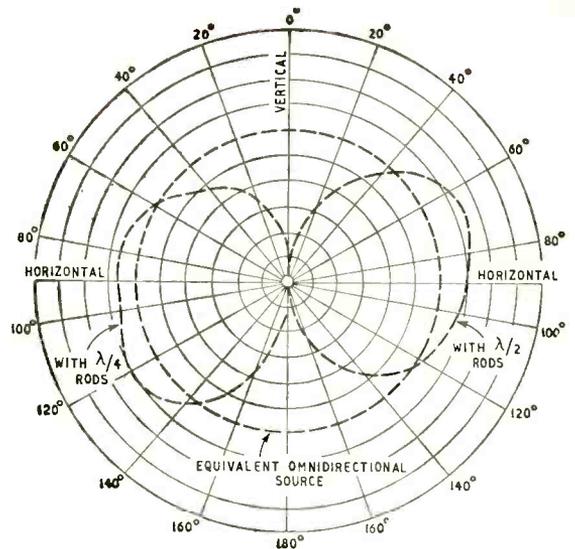


Fig. 7. Average polar diagrams of ground-plane "J" aeriels.

aeriels the gain varies according to the actual direction in the horizontal plane; also although in Fig. 6 the ground-plane aerial and wide-band ground plane are shown as having the same diagram small differences do exist and these account for the variation of horizontal gain as shown in the Aerial Table. Fig. 7 shows the average vertical polar diagram of the ground plane "J" aeriels. These aeriels are asymmetric and the polar diagram depends upon the actual direction of measurement. These average figures are taken by combining the diagrams taken in various planes so as to give a representative answer. This effect is also shown in the Table where the horizontal gain is seen to vary according to the direction of measurement.

In the case of aeriels which are asymmetric in both horizontal and vertical planes, the average of the "Rousseau" diagram (Ref. 4) in several directions should be taken. By applying this construction to the results obtained for the different aeriels under test, they may all be scaled to have the same mean spherical intensity, and hence directly compared. This is probably the most accurate method but in the case of complex aeriels where the mean of many "Rousseau" diagrams would have to be taken; the actual relative power fed to an aerial can be quickly obtained by dividing the V_{max}^2 reading by the standing-wave ratio as measured at the slotted line. For any given aerial the standing-wave ratio will be constant and hence need only be measured once.

This is seen to be true as

$$\text{Relative Power} = V_{max} \times V_{min}$$

$$\text{to aerial} = V_{max}^2 \times \frac{V_{min}}{V_{max}}$$

$$= \frac{V_{max}^2}{\text{s.w.r.}}$$

The reciprocal of this value is plotted, as the pick-up voltage has been kept constant.

The comparative power at the pick-up dipole if the radiated power is kept constant is proportional to

$$\frac{\text{s.w.r.}}{V_{max}^2}$$

and the field strength at the pick-up dipole if the radiated power is kept constant is proportional to

$$\frac{\sqrt{\text{s.w.r.}}}{V_{max}}$$

This method is of course subject to errors due to drift of the measuring equipment, and other errors of measurement.

For normal communication services it would appear that the best aerial to use is the simple "J" aerial, or dipole aerial with or without sleeve suppressor. The ground-plane "J" aeriels offer little if no technical advantage despite their additional complications. Ground-plane aeriels would appear definitely unsuitable for land mobile services, although they would have an advantage if used in mobile services to aircraft. These conclusions are based on tests conducted at a single frequency and where the aeriels are to be used for multiple frequency working this may not be true. It is possible that an aerial which at a single frequency gives a slightly inferior performance, may hold this performance over a wide band of frequencies; whilst another initially superior aerial may have its performance seriously degraded by slight changes of frequency. This will probably be shown very markedly in special types of stacked aeriels used to give omnidirectional gain in the horizontal plane.

REFERENCES

- 1 Watson, Jones and Owen, "Common Aerial Working for V.H.F. Communication" *Proc.I.E.E.* 94, Part IIIA pp. 644-648.
- 2 E. G. Hamer, "V.H.F. Common Aerial Working," *Electronic Engineering*, XXIII, No. 281, July 1951, pp. 244-249.
- 3 E. G. Hamer, "Slotted Line Techniques," *Electronic Engineering*, Dec. 1951.
- 4 B. W. Golding, "Electrical Measurements and Measuring Instruments" (Sir Isaac Pitman & Sons, Ltd., Third Edition, 1948), page 406.
- 5 E. G. Hamer, "V.H.F. Aerial Radiation Pattern Measurements," *Electronic Engineering*, October 1953, Vol. 25, pp. 427-431.

FOURIER—Fact or Fiction?

Why Sine Waves?

By "CATHODE RAY"

YEARS ago—around 1930 if I remember rightly—there arose a great public controversy, the like of which, regrettably, never emerges nowadays to gladden our dull lives. Everybody has become too sophisticated to proclaim, with any show of authority, that mathematicians are wrong, or that the earth is flat, or television is a hallucination. But at the time I mentioned there were a number of persons well known in the radio world, including no less an authority than the late Sir Ambrose (Valve) Fleming, who said—and stuck to it—that sidebands were imaginary; a mere mathematical fiction. The dispute reached such a pitch that actually a Government-sponsored Committee was appointed to go into the thing, and the result was Special Report No. 12 of the Radio Research Board, published by H.M.

for granted that a single-frequency wave must be a sine wave*, and that Fourier has no competitors. A more thorough search revealed some clues, but not much that could be considered to be crisp answers. Perhaps you would like to try answering the above questions yourself before reading on.

Fundamental Frequency

To clear the ground, I would remind you that the Fourier theorem applies only to *periodic* waveforms; i.e., those that repeat exactly and for ever. In practice, "for ever" can be interpreted rather freely, without making a great deal of difference, as "a considerable number of periods" (or cycles, as they are more often called). One period is the shortest time required for a showing of the complete programme, before it starts to repeat. Fig. 1 shows three identical copies of each waveform; and if what it shows occurred during one-thousandth of a second the fundamental frequency would be 3kc/s. In (a) there would be (according to Fourier) other frequencies, whole-number multiples of 3 kc/s; but (b) being a sine waveform has (it is generally assumed) no other frequency.

Look now at Fig. 2, which is the kind of thing

* Throughout here, "sine wave" includes the cosine wave, which is the same thing advanced quarter of a cycle in phase.

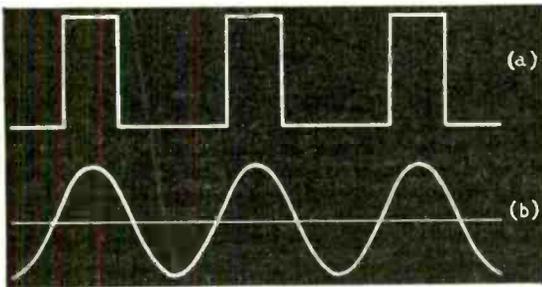


Fig. 1. Is it true that waveforms such as (a) are really and inevitably made up waveform (b) at various frequencies?

Stationery Office in 1932. But by then the subject had gone cold.

The same kind of doubts about the reality of what is represented by mathematical processes must often visit the minds of students faced with the Fourier theorem—the one that says that periodic waves of any and every shape can be regarded as made up exclusively of pure sine waves having frequencies that are whole-number multiples of the fundamental frequency of the wave. It certainly is difficult to believe that waveform (a) in Fig. 1 can be constructed entirely from smooth waves of form (b). There is some excuse for the feeling that this can be no more than a "mathematical fiction"—an ingenious device to help with calculations, but not a physical reality.

Other questions may well be asked. What is it about waves of the particular shape (b) that they and they alone have only one frequency? How did they come to have the special privilege of being the sole ingredients of all other waveforms? Did Fourier confer it, or is it an immutable law of Nature? Is there any other waveform that could be substituted?

When I started looking up a few books to see what they said on such questions, I found that they didn't even ask, much less answer them. They just took

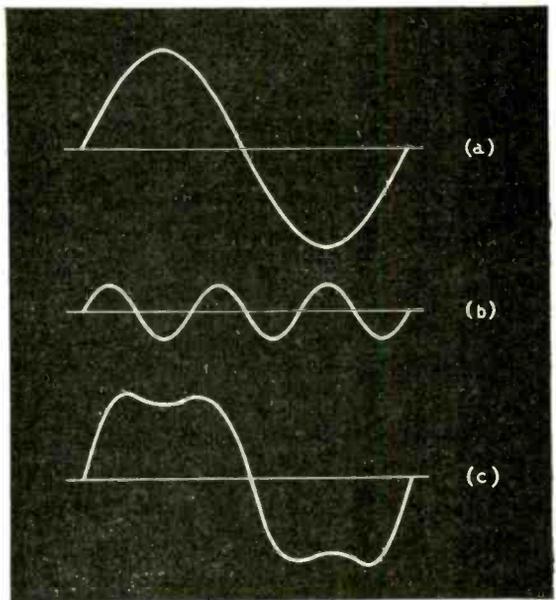


Fig. 2. Example of how a fundamental sine wave (a) and a harmonic (b) add up to a different waveform (c).

commonly used to demonstrate Fourier. First, at (a), is one cycle of sine waveform. Next (b), three cycles of the same form in the same time and therefore three times the frequency. If (b) is added to (a), its first and second positive half-cycles augment the lower slopes of the positive half-cycle of (a), and its first negative half-cycle flattens the positive peak of (a), so the result is something like (c). Among other things, this demonstration is supposed to convince everybody that (c) is necessarily a composite wave, made up of a fundamental (a) and third harmonic (b), both of these of course being of sine form.

But what if somebody, just to be awkward, comes along and draws Fig. 3 showing that adding together the non-sine waves (a) and (b) gives a sine wave (c), so (c) must be a composite wave, made up of a fundamental and third harmonic? Would you be able to explain why Fig. 2 must be accepted rather than Fig. 3?

Credentials in Doubt ?

Of course, if some mathematician should chip in with a neat proof that a perfect sine wave cannot in fact be constructed in this way from any one other waveform, it would give us some ground for believing that the sine waveform had a special claim. (I have failed to find any such proof, and would be glad to receive offers.) Still more would the prestige of the sine wave be boosted if a Fourier series (of sine waves) could be shown to be the *only* one that can be used for constructing other wave forms. There, at least, I have authoritative mathematical guidance, and it is to the effect that waveforms *can* be constructed from series other than sine. So the sine wave is still, as it were, confined in our mental guard-room, unable so far to produce complete evidence of its intitlement to the very special status commonly granted to it.

Thinking over the thing, I eventually arrived at several reasons why the sine should be selected in preference to all others, but nothing to rule all other

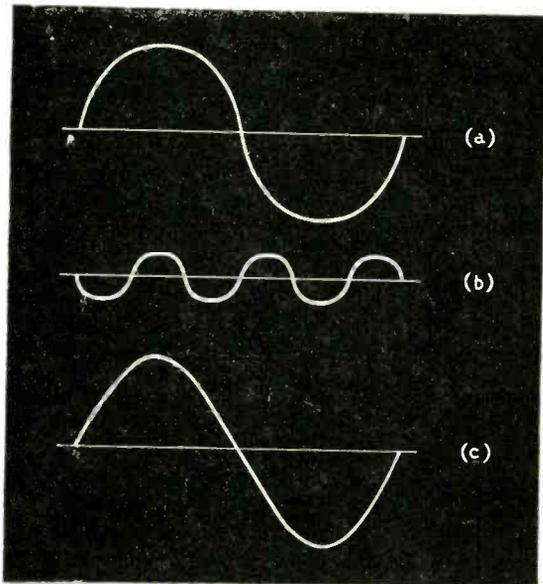


Fig. 3. Here, a non-sine waveform (a) and its harmonic (b) add up to a sine wave (c).

forms completely out on principle. The further book search I mentioned tended to support these reasons, so here they are.

They can be divided into two lots: mathematical and physical. Suppose we were to start absolutely from scratch to choose some function of time that would make the most suitable basis for expressing repetitive events. The simplest for this purpose would be something that goes on continuously at a steady rate and yet repeats itself identically in definite periods. Nothing that I—or apparently anybody else—can think of fits this description so simply and well as what in the physical world appears as steady rotation. Mathematically, it is change of angle at a constant rate. Suppose OA in Fig. 4 is a fixed line to mark the start of an angle, and the angle between it and OB (labelled θ) increases at a constant rate. When the angle has changed by one whole revolution, or 360° , or 2π radians (all of which are the same thing), the position is exactly the same as at the start, and what happens during the next 2π radians is exactly the same as during the last. So it fits perfectly with the definition of “periodic.” Call the number of periods or cycles or revolutions per second f . The angle traced out per cycle is 2π radians, so the angle traced out per second is $2\pi f$, written ω for short; and consequently the angle between OA and OB (i.e., θ) at t seconds from the start (when $t=0$) is ωt . So we have

$$\theta = \omega t$$

Now for many purposes (as we shall see) the significant thing about this circular motion is the height of B above the horizontal (OA). That height, in relation to the maximum it can attain—obviously equal to the length OB—has been named the sine of the angle AOB, abbreviated to $\sin \theta$. It is what the length OB has to be multiplied by to give the height of B above OA. When $\theta=0$ (or 180°), $\sin \theta$ is obviously 0; when θ is 90° it is 1, and when θ is 270° it is -1 . Plotting $\sin \theta$ against θ from 0 to 360° (or 2π radians) we get the familiar curve of Fig. 2(a). Suppose the maximum height, equal to the length of OB, is denoted by H . Then the height at any time t must be $H \sin \omega t$. So if we plotted height against time we would get a curve just the same shape as Fig. 2(a), of maximum or peak height H , and with f complete waves per second. Mathematically, there is nothing to equal this for simplicity and clearness in expressing uniform periodic motion or change. But from our point of view the more important thing is that it ties up perfectly with so many of the technicalities to which *Wireless World* is devoted.

Elementary A.C.

Take, for example, the generation of alternating current by the most elementary arrangement we can think of—a loop of wire rotated at constant rate in a uniform magnetic field. The vertical lines in Fig. 5 represent the direction of the field, and B is an end view of one of the two horizontal parts of a square loop of wire rotated about O. When the loop is horizontal, the wire is all moving along the field, so has no e.m.f. generated in it. When vertical, the wire B is cutting directly across the field, so e.m.f. is a maximum. At all positions, the e.m.f. is proportional to the sine of the angle, so the waveform of the e.m.f. is a sine waveform.

A still more significant thing is what happens when

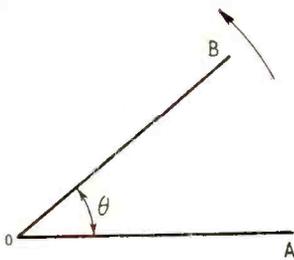


Fig. 4. How a sine wave is derived from a steadily increasing angle.

Fig. 5. Side view of an elementary a.c. generator consisting of a square loop of wire rotating about *O* in a uniform magnetic field.

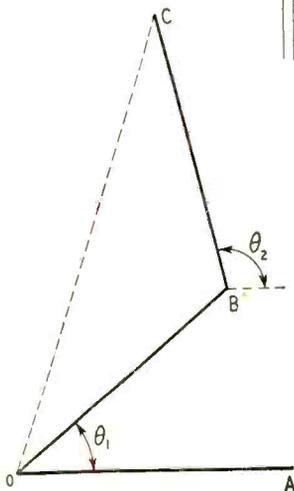
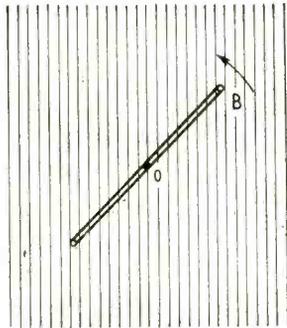


Fig. 6. If to *B* rotating steadily around *O* is added *C* rotating at the same speed around *B*, then the angle *CBO* remains constant, so *C* also rotates steadily in a circle around *O*. This shows that if two sine waves of equal frequency are added together the total is also a sine wave.

we use this sine-wave e.m.f. to drive current through a circuit. No matter how complicated the circuit—provided only that it is linear—the waveform of the current is the same. It may be shifted backwards or forwards relative to the voltage wave, but the shape is identical. This is not true of any other waveform. Lord Rayleigh put it rather nicely in his *Theory of Sound*: he said that a simple tone (by which he meant one having sine waveform) “is the only one capable of preserving its integrity among the vicissitudes it may have to undergo. Any other kind is liable to a sort of physical analysis, one part being differently affected from another.”

This is bound up closely with the very significant and important fact that electrical and mechanical arrangements that give rise to periodical or to-and-fro or wave motion, called oscillation or vibration, tend, when conditions are reduced to the simplest or ideal, to cause the waveform to be of the sine pattern. The “arrangements” referred to include, as the essential minimum, capacitance and inductance in the electrical systems, and their analogues, compliance and inertia, in the mechanical systems. Now our electrical theory teaches us that while the current through

a linear resistance is proportional to the e.m.f. across it (Ohm’s law), the current through a capacitance is proportional to the rate of change or “differential” (nothing to do with engine drivers or motor cars) of the e.m.f., and the current through an inductance is proportional to the opposite of the differential—the “integral”—of the e.m.f. The differential of a curve on a graph is represented by the slope of the curve, and if you draw a graph of the slope of a sine wave you find that it has exactly the same waveform as the sine wave, subject to a phase advance of quarter of a cycle. So obviously if you perform the reverse operation—draw the integral curve, the graph of whose slope is a sine wave—you get another sine wave, shifted quarter of a cycle the other way. The sine waveform is the only one of which that is true, and it accounts for the fact that the current waveform in capacitive and inductive circuits, as well as resistive, is only the same as the voltage waveform when that has the sine shape. It accounts for a lot of other things, too, such as the tendency for oscillation to have a sine waveform, the more nearly the conditions that cause it are reduced to simple inductance-and-capacitance.

Another interesting point is that the wave formed by adding together any number of sine-wave variables of equal frequency but different phase has itself a sine form. So if there are two or more sine-wave currents flowing in the same circuit, even if they are out of phase with one another, the total current has sine waveform. This may not be obvious if you draw the separate waveforms, and it is laborious to add them up point-by-point on a graph; one can much more easily see it by slightly elaborating Fig. 4—adding another “vector” line like *OB*, but at a different angle (Fig. 6), and then noting that the tip of it (*C*) performs a circular motion around *O*, just as if it were the tip of a single vector *OC* representing the total of the other two. But if you try adding together any other out-of-phase waveforms you will find that the total has a different form. So if electrical engineering (for example) were based on any other waveform, the whole thing would be unbearably complicated and difficult.

A Tricky Question

Even without detailing all the significant consequences of the foregoing significant facts about sine waves (which could easily take up thousands of pages) the most sceptical reader may be willing by now to concede that the sine wave has the best claim to its proud position in science. But besides the question of the realities of harmonics (which we shall have to leave till next month), we still have the question of why only sine waves have a single frequency. It would not do, however, to start a murder trial by asking the accused *why* he murdered his wife. His lawyer would be very quick to object that it had not been established that he *had* murdered his wife. We have not yet established as a fact that the waveform of a single-frequency oscillation is necessarily sine.

Your first reaction may be that this is a frivolous question—of course a sine wave has only a single frequency and is the only single-frequency waveform; if it weren’t the Fourier theorem would be complete nonsense, and so would most—anyway, a lot—of our basic theory. Yes; we may be quite sure it is true, but can we prove it? Obviously if it can be proved that a single-frequency waveform is

necessarily a sine waveform, it will be a still more decisive fact with which to justify our enthronement of the sine wave. But let me point out that the Fourier theorem doesn't prove it; it only shows that any waveform can be regarded as made up of sine waves having frequencies that are 1, 2, 3, 4, etc., times the fundamental frequency. It doesn't prove that there is no other waveform of which this is true.

Of course, all hinges on what we mean by "frequency." Are we not—perhaps unconsciously—relying on the admittedly strong status of the sine wave to define the frequency of any waveform as the frequency of the sine waves into which Fourier analyses it? Are we not, in fact, committing the logical fallacy called (don't ask me why) "begging the question," i.e., basing a "proof" of something on the assumption of that something? Have we any absolutely independent scientific ground for saying that if an oscillation occurs at only one frequency its waveform must be sine? Is "frequency" a basic characteristic of Nature that we are bound to accept, or is it one of those things, like "offside," that could mean different things, and can only be made to mean one thing alone by people agreeing to accept an arbitrary definition? If we define frequency as (for example) the rate at which identical events occur, can we show why Fig. 1 (b) has been chosen, rather than (a)—or any other of a variety of waveforms—as having only a single frequency?

I suppose you will say at once that it can be per-

fectly easily demonstrated; if a transmitter puts out a pure sine waveform it can be picked up on only one frequency—the fundamental—but if it has any other waveform it can be tuned in on harmonic frequencies. What more proof could one want?

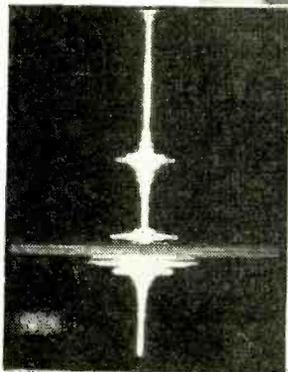
Well, I may be a bit awkward, but I must point out that the tuning-in is done by an arrangement that by its nature responds to sine waves. But in a single cycle of a pure sine wave, the variable attains 70.7% of its peak value four times, at evenly spaced intervals, and if some device responded to this condition it would respond four times per cycle and would reckon the frequency accordingly. It might be that a system could be devised that would respond to square waves only at their fundamental frequency, and would interpret sine waves as composed of an infinite series of harmonic square waves. That may sound rather fantastic, and anyway, I am not proposing that in practice our usual concept of frequency based on sine waves should be abandoned; but it is an interesting thing to consider whether we can prove that frequency is necessarily and inevitably based on sine waves, or whether that is merely a matter of convenience, because it fits in with the way tuning circuits and ears happen to work.

Next month we shall consider whether all non-sine waves are really composed of sine waves, or only mathematically; and how square waves, sawteeth, etc., are analysed, and what they contain.

Ultrasonic Fish Detection

Depth Sounding Equipment Based on Radar Technique

Complete equipment (right) with typical response from a concentration of herring off Denmark (below).



A NEW echo-sounding device recently introduced by Pye Marine as an aid to trawler fishing is notable for being all-electronic in operation and is claimed to be more sensitive than previous equipments of this kind. The transmitter consists of a 30-kc/s oscillator working into a magnetostriction transducer which sends pulses of ultrasonic energy from the bottom of the fishing vessel towards the sea bed. Reflections from shoals of fish and the sea bed are received by another transducer and, after amplification, are applied to the deflection plates of a c.r.t. display system. They appear on the screen as horizontal deflections on either side of a vertical timebase which represents the depth to which the equipment is sounding (see picture).

The speed of the timebase can be varied by a control knob which also moves a pointer on a calibrated scale showing the depth corresponding to the finish of the trace. (Depth, of course, determining the transit time of the ultrasonic pulse.) This ensures that as the sounded depth is decreased the trace is expanded to increase its scale. The variable timebase actually provides the means of triggering the transmitted pulse. Thus, as the timebase speed is increased for decreased sounding depth so also is the p.r.f. of the transmission, to the maximum possible for that depth. Successive echoes combine to form a steady picture as soon as the p.r.f. is high enough and in practice this occurs at depths less than 100 fathoms.

Another control knob calibrated in depth enables a marker to be moved up and down the trace. This actually deflects a portion of the trace, equivalent to a depth of seven fathoms, bodily to the right, and it can be placed over any echo that one wishes to investigate. By means of a secondary timebase the selected seven fathoms can then be expanded to fill the whole screen for examination in detail. In the circuit this secondary time base and the marker are both triggered from the start of the main timebase through a variable delay circuit, the control knob of which carries the depth calibration.

The design has taken into account the variations present in ships' power supplies, and a 10% voltage change is permissible.

Standard Chassis

Versatile System for the Experimenter and the Development Laboratory

By T. K. COWELL*

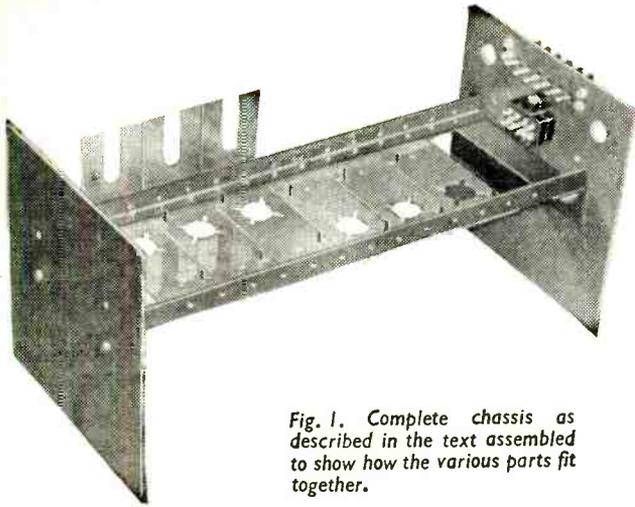


Fig. 1. Complete chassis as described in the text assembled to show how the various parts fit together.

FOR some years, the author has been concerned with the construction and development of various small experimental units up to the prototype stage. The units usually embodied not more than half a dozen valves and their associated components and in general, the chassis, panels, etc., used for one job were not suitable for further use. Accordingly, they were either scrapped, or put in a cupboard and forgotten until the next "open day" when they would be hastily stripped of components and crushed into a bulging scrap metal bin.

It was with a view to reducing this wastage of time and material that the author set about devising a chassis that would possess the often conflicting features of simplicity and versatility.

It was felt that the chassis should provide the following facilities:—

(1) Be capable of assembly for a particular need from a small number of "standard parts."

(2) Be capable of accepting a circuit containing up to six valves of B7G or B9A type, a lesser number of valves with somewhat larger bases, or a mixture of any such types in any order.

(3) Positions of valves, potentiometers, switches, etc., should be capable of alteration without difficulty.

(4) Assembly should be capable of standing upright (i.e., with the valves base downwards) or inverted to

facilitate wiring, alterations, voltage checking, etc.

(5) Be possible to join one chassis to another for larger layouts, without reducing the flexibility of the system.

Dimensions of Parts

As bench supplies of h.t. and l.t. are usually available in development and research establishments, it was felt that a plug and socket connection would suffice together with simple facilities for switching and metering. The chassis described here fulfils the requirements outlined and the dimensions given in the sketches have been found to be satisfactory in practice.

* R. B. Pullin and Co., Ltd.

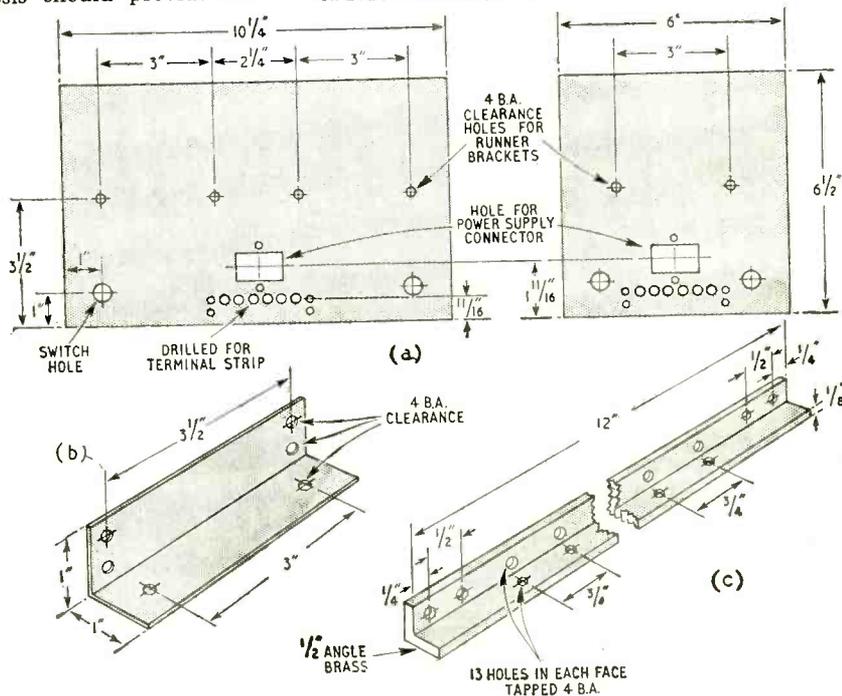


Fig. 2. Details of two alternative end plate are given in (a) while (b) shows the end-plate bracket and (c) one of the long runners.

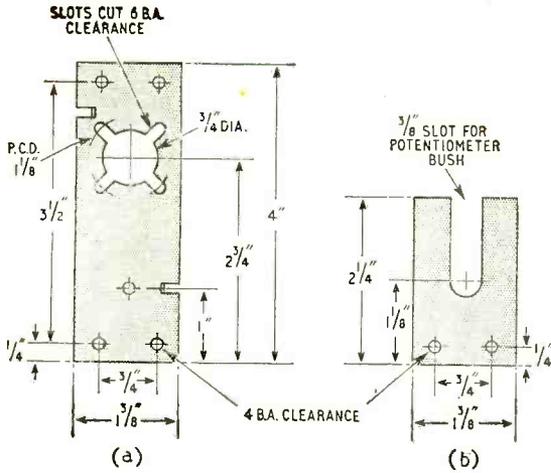


Fig. 3. Details of (a) the valveholder plate and (b) the potentiometer plate.

Reference to Fig. 1 will show that the chassis is made up of component plates (for valveholders, potentiometers, etc.) mounted on two rails, or runners. The runners are supported by a pair of end plates. One of the end plates carries a power supply connector, switches and a terminal strip to facilitate supply metering and control. The runners are fixed to the end plates by a simple bracket, Fig. 2 (b), which ensures adequate rigidity.

As illustrated in Fig. 2 (a) the end plates are made in two sizes, so that a simple doubling of chassis width is possible, using the standard runners and component plates.

One of each pair of end plates is drilled and cut to accept two small toggle switches, an eight-way chassis mounting plug, and a terminal strip. The other plate of each pair is left plain, except for the fixing holes for the runner bracket.

Only one runner is shown in Fig. 2 (c) as the two are identical. By making the component plate fixing hole spacing equal to $\frac{1}{2}$ in, it is possible to mount long tag-strips of either the miniature type ($\frac{1}{2}$ in spacing), or the larger type with $\frac{3}{8}$ in spacing, along the runners.

Component Plates

The plates illustrated in Fig. 3 are those found to have been most generally useful, and may be very easily fabricated. The valveholder plate, Fig. 3 (a), is capable of accepting either B7G or B9A holders in any one of four positions. Also, as the hole is positioned towards one end of the plate, the latter may be fitted to the runners in two ways.

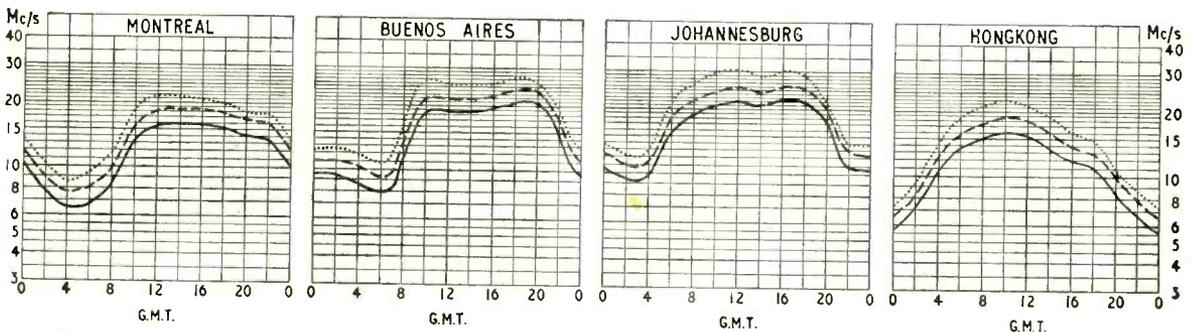
To save time and trouble in fitting earthing tags, a pair of saw-slots are made in either side of the plate, leaving a tag that may be bent up. One 4-BA clear hole is drilled in the plate to facilitate fitting a small tag-strip, or stand-off terminal, if required.

The potentiometer plate, Fig. 3 (b) needs little explanation beyond the fact that it is slotted for easy removal of potentiometers, rotary switches, etc. The distance between adjacent shaft centres is normally $1\frac{1}{2}$ in, but the slot permits the vertical staggering of components whose diameter somewhat exceeds this figure.

Input and output terminations may be made on small, single screw fixing stand-off terminals, but tag-strip would do equally well. In cases where screened input and/or output leads are necessary, suitable sockets could be mounted on the appropriate component plate.

The valveholder plates are made of brass to facilitate soldering, but aluminium alloy is satisfactory for the other parts, provided that earthing points on individual valve plates are bonded together. For work usually involving large components it would probably be convenient to scale-up the whole system, but the author has found that a chassis of the size illustrated is a fair compromise for the majority of experimental applications.

SHORT-WAVE CONDITIONS *Predictions for September*



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 September.

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

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

Aerial Circuit Magnification

Notes on Capacitive Bottom Coupling for Medium- and Long-wave Receivers

By S. KANNAN,* B.Sc., Assoc. Brit. I.R.E.

INPUT circuits with bottom capacitive coupling are commonly encountered in commercial broadcast receivers. A typical arrangement is that shown in Fig. 1, in which C represents the lumped capacitance (including any trimmer, gang or fixed capacitor, valve input capacitance and all strays); C_c is the coupling capacitor shunted by R whose value is chosen to be much greater than the reactance of C_c at the lowest radio frequency to which the receiver tunes and much smaller than the reactance of C_c at supply mains frequency so as to minimize any hum pick-up by the aerial; and L is the aerial coil. For medium and long waves, the equivalent circuit of Fig. 1 is given in

the two commonly encountered types of aerial tuned circuits:

(a) *Variable Capacitor Tuned Circuit*: as shown in Fig. 4, where C_s denotes the sum of all strays and valve input capacity, C_t = trimmer capacity, C_v = aerial tuning capacitance and $C_t + C_v + C_s = C$ of Fig. 1.

Due to C_v (usually one section of a ganged condenser), the value of C varies over the band, and hence, as shown in equation (3), the aerial gain also varies over the band. However, in order that the disturbance of the tuning by changes in aerial capacitance (C_a) be kept at a minimum (and in some cases in order also that the aerial circuit frequency coverage be not unduly restricted), C_c is usually much greater than C_a . In a typical medium-wave circuit, with $C_a = 200$ pF, $C_c = 4,700$ pF, $R = 10$ k Ω , $C_c + C_s = 70$ pF, $C_v = 13$ to 528 pF, the aerial gain at the

l.f. end of the band will be $= \frac{200.Q}{5498}$, while the gain at the h.f. end will be $= \frac{200.Q}{4983}$.

Hence, if the Q of the circuit remains fairly constant

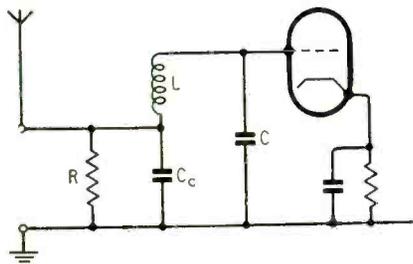


Fig. 1. Typical aerial input circuit with capacitive bottom coupling.

Fig. 2, where, for simplicity, R and the valve input resistance have been neglected, C_a represents the internal impedance of the aerial (mainly capacitive)

and $r = \frac{\omega L}{Q}$

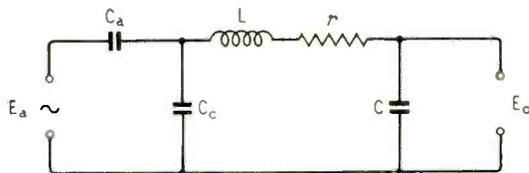


Fig. 2. Equivalent circuit of Fig. 1.

Fig. 2 is transformed, by Thévenin's theorem, into Fig. 3, where at any resonant frequency $f \left(= \frac{\omega}{2\pi} \right)$ of the aerial input circuit, the total circuit impedance = r.

$$\therefore E_o = E_a \cdot \frac{C_a}{C_a + C_c} \cdot \frac{1}{\omega C r} \quad \dots \quad (1)$$

Since the Q of the circuit

$$= \frac{\omega L}{r} = \frac{C + C_a + C_c}{\omega C r (C_a + C_c)}$$

equation (1) can be rewritten:

$$E_o = E_a \cdot \frac{Q C_a}{C + C_a + C_c} \quad \dots \quad (2)$$

$$\therefore \text{Aerial circuit gain}^\dagger = \frac{Q C_a}{C + C_a + C_c} \quad \dots \quad (3)$$

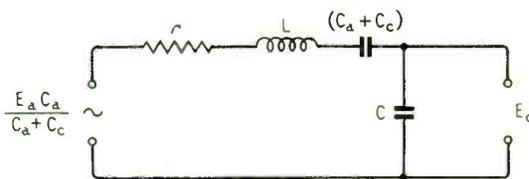


Fig. 3. Thévenin transformation of the equivalent circuit of Fig. 2.

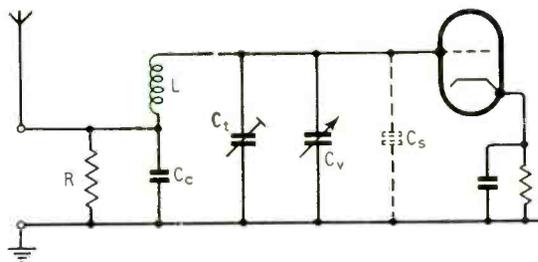


Fig. 4. Variable capacitance tuning.

*Development and Engineering Dep't., E. K. Cole Ltd.

†The terms "input circuit magnification", "aerial circuit gain" and "aerial step-up" are used synonymously to mean the ratio of E_o to E_a .

over the band, the gain at one end of the band will be $\frac{5498}{4983} = 1.1$ times that at the other end, the gains at

intermediate frequencies falling between these limits. Thus, with such a coupling, one desired feature of aerial circuit design is achieved, viz., fairly constant aerial gain over the band. Another desired feature, viz., a high enough aerial gain, will not be achieved with this method of aerial coupling unless the Q of the circuit is fairly high. Perhaps this explains why this method of coupling was not popular with designers in the days before ferrite-cored aerial coils, when the Q of air-cored and dust-cored aerial coils of normal dimensions rarely exceeded 50 and consequently more aerial gain could be obtained with other forms of aerial coupling. With the advent of ferrite cores, however, Q's of the order of 180 are easily held fairly constant over the band and, even allowing for a reduction of this Q by 50% due to valve input and other circuit damping, adequate gains are still obtainable.

Equation (3) also shows that, provided the circuit Q is constant over the band, the r.f. input sensitivity at aerial input must needs vary over the band by not more than the ratio indicated, viz.

$$\frac{(C_a + C_c + C_t + C_s + C_{v-max})}{(C_a + C_c + C_t + C_s + C_{v-min})}$$

Hence, if in a receiver where circuit Q is nearly constant over the band, the aerial sensitivity figures vary by an abnormal ratio (e.g., 100 μ V, to 10 μ V, over the band, which is not borne out by equation (3), the designer would do well to look elsewhere for the trouble, e.g., inconstant oscillator performance, wide tracking or ganging errors, etc.

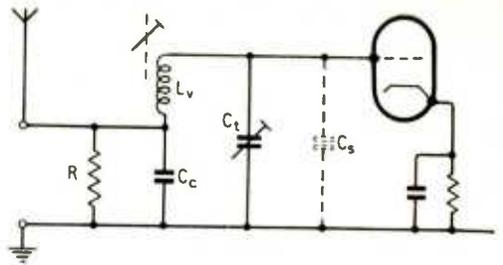


Fig. 5. Permeability-tuned aerial circuit.

(b) *Permeability-tuned Circuits*: Equation (3) also shows why this coupling system is especially suited for many applications of permeability-tuned aerial input circuits. One example is a car-radio design where an efficient coupling of the rather inefficient car-aerial was carried out by this method (see Fig. 5). With $C_a = 68$ pF, $C_c = 90$ pF, $C_t + C_s = C = 100$ pF, and the circuit Q varying between 20 and 40 over the band, the aerial step-up over the band was between 5.35 and 7.9. Thus with permeability-tuned circuits, and especially in applications (e.g., car-aerial installations) where the designer need not provide for much possible variation in C_a , a low value of C_c can be used to obtain good aerial gains even with low-Q aerial coils. It should be noted, however, that in mobile installations the equivalent series resistance of the aerial can, in some cases, become an important limiting factor in the determination of maximum obtainable aerial circuit gain.

COMMERCIAL LITERATURE

Colloidal Graphite Dispersions; a list of technical data, including solids content, density, flash point, diluent and typical applications, on 23 "dag" products arranged in convenient tabular form, from Acheson Colloids, 18, Pall Mall, London, S.W.1.

Silver Brazing Paste consisting of finely divided metal powder and flux in a liquid medium, which can be painted on the work, described in a leaflet "Easy-flo Paint" from Johnson, Matthey & Co., 73-83, Hatton Garden, London, E.C.1.

Books on Radio, television, electronics and other engineering subjects. A classified catalogue with descriptive notes from Cleaver-Hume Press, 31 Wright's Lane, Kensington, London, W.8.

Equipment Cases, racks, consoles, chassis, panels, etc. listed in an illustrated catalogue giving dimensions and enclosing a price list, from Alfred Imhof, 112-116 New Oxford Street, London, W.C.1.

Continuous Terminal Strip (to be cut up into pieces as required); cable cleating and strapping; sleeving; mouldings; grommets and other products described in an illustrated catalogue with tables of dimensions from Creators, Plansel Works, Sheerwater, Woking, Surrey.

Harmonic Distortion Meter Kit for an instrument covering 20 c/s-20 kc/s with an accuracy of ± 5 per cent of f.s. reading plus 0.1 per cent distortion. Specification of this "Heathkit" from Rocke International Corporation, 13 East 40th Street, New York 16, N.Y., U.S.A.

Tantalum Electrolytic Capacitors claimed to have greater reliability and longer shelf-life than conventional aluminium types. Technical bulletin giving capacitances, sizes, etc. from The Telegraph Condenser Co., North Acton, London, W.3.

Vibration Generators and power oscillators for driving them. Concise descriptions and specifications of a complete range of equipment on a leaflet from Goodmans Industries, Axiom Works, Wembley, Middlesex.

Switches and Signal Lamps. An illustrated catalogue containing ten new products and notable for its "blueprint" drawings of constructions and mechanisms (with dimensions). From Arcoelectric Switches, Central Avenue, West Molesey, Surrey.

High Stability Resistors (wire-wound) ranging from 0.1 Ω to 1M Ω with resistance tolerance of 0.1 per cent and temperature coefficient of only 0.002 per cent per degree C. Leaflet from Electrothermal Engineering, 270 Neville Road, London, N.7.

Small Electrolytic Capacitors by T.C.C. referred to in our June issue do not, of course, have a "paper dielectric construction" but the electrical advantages associated with such a construction, combined with the high capacitance values given by electrolytic operation. Apologies to the makers.

Oscilloscopes, oscillators, amplifiers, pulse generators and other test equipment. A short leaflet catalogue from the Solartron Electronic Group, Solartron Works, Thames Ditton, Surrey. Also a leaflet on a transfer function analyser, comprising 1.f. decade oscillator and phase sensitive voltmeter, for testing servo systems.

Amateur Transmitter Valves. A valve line-up chart, "Headliners for Hams," giving operating conditions for class C amplifier and oscillator, modulator and frequency-multiplier service and also s.s.b. valve data. From the Radio Corporation of America, Tube Division, Harrison, New Jersey, U.S.A.

"V.H.F. Broadcasting Starts"

An error occurred on page 252, of our June, 1955, issue, where it was said that a transmitter fault could produce merely a 3-dB drop in signal strength. The figure should be 6dB, since if one transmitter fails one half of the aerial is also inoperative and the aerial gain is halved.

Rugby Radio Extension

Control and Supervision from a Central Point

TWENTY-EIGHT modern 30-kW transmitters have been installed in a new building on a 700-acre extension of the long-range Post Office radio station at Rugby. Eventually the new building will be surrounded by about 100 aerials of one kind or another radiating telephony and telegraphy signals to all parts of the world on frequencies between 4 and 27.5 Mc/s. About 60 aerials, mostly rhombics, are at present in use; these are multi-wire types and being non-resonant work over a wide range of frequencies. Were resonant aerials employed far more than the 100 legislated for would be needed to maintain the service envisaged for the new extension.

The aerials are connected by open-wire transmission lines to switching units inside the building; these are twin coaxial systems providing complete interchange of connections between transmitters and aerials. There are two such switching units installed, each serving 14 transmitters and giving each transmitter the choice of any one of six different aerials by remote control. On the roof of the transmitting building the twin coaxial feeders are transformer-matched, by four open-wire lines, to the main twin-wire outdoor transmission line systems.

For telephony each transmitter accepts an input on about 3 Mc/s and, by mixing with an internal crystal-controlled oscillator, converts this to the required output frequency. Linear amplifiers are employed throughout with considerable negative feedback and suppression of harmonic and inter-modulation components.

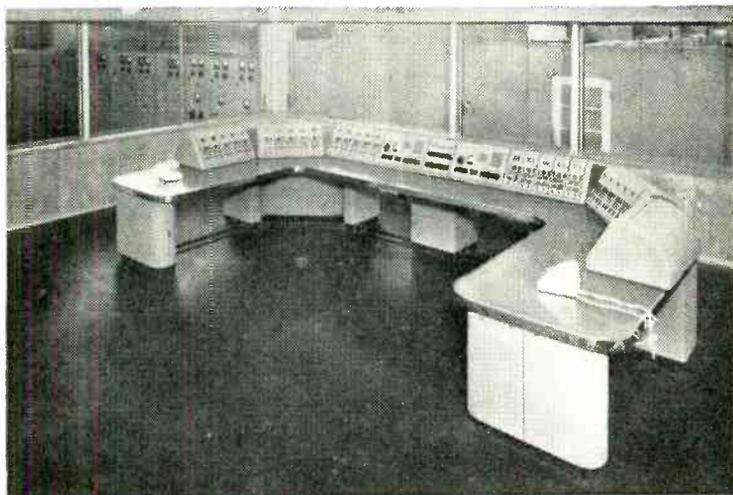
When supplied with two separate telephony (or audio) inputs between 100 and 6,000 c/s, the drive equipment provides two independent sideband outputs or, if required, a double sideband output. It is also capable of providing an output of four telephony speech channels 300 to 3,000 c/s wide for operating the main transmitter as a four-channel independent sideband system.

The frequency-shift system is generally favoured for telegraphy whenever suitable facilities exist at the receiving end. The output of this drive unit is on a fixed frequency between 4 and 27.5 Mc/s and can be normal single-channel FSK, single-channel FSK with frequency modulation, two-channel FSK or on-off keying.

Control of all the 28 transmitters is effected from a central operating position taking the form of a curved control desk as shown in the illustration. On it are assembled separate control panels for each transmitter with switches for on-off, monitor, local or distant operation of the transmitters and indicating lamps to give warning of a fault in any of the transmitters.

The transmitters, drive units, aerial switching system and much of the associated equipment were supplied by Marconi's Wireless Telegraph Company and installation was carried out in co-operation with the Post Office.

The heart of the new extension to the G.P.O.'s station at Rugby is shown here. From it the engineers in charge can start up or close down any one of 28 transmitters, monitor their operation and change frequency and aerials by remote control. The transmitting hall is visible in the background.



For Reliability in

SOUND

For more than a generation the name TRIX has been synonymous with quality—for TRIX Sound Equipment is produced to the highest standards of Sound engineering. Whether large or small, each unit is designed and built to give reliable and lasting service the world over.

STAND
NUMBER
26

WE SHALL BE AT THE
RADIO SHOW
EARLS COURT
AUG 24 - SEPT 3



A typical example of TRIX Rack Mounted Equipment which can be provided in multiples for any power output required.

Some notable TRIX installations:

UNITED NATIONS, NEW YORK.

ROLLS-ROYCE

SOUTH AFRICAN RAILWAYS CAPETOWN STATION.

MONTREAL GENERAL HOSPITAL.

LONDON TRANSPORT.

TRIX

Quality
Sound Equipment

THE TRIX ELECTRICAL CO. LTD.
MAPLE PLACE · TOTTENHAM COURT ROAD,
LONDON W.1.

Tel: MUS. 5817. Grams. Trixadio, Wesdo, London

RANDOM RADIATIONS

By "DIALLIST"

Penny Plain, Tuppence Coloured

A GOOD MANY readers living in the service area of the Alexandra Palace transmitter will probably take the opportunity of seeing something of the B.B.C.'s experimental transmissions of colour television in the autumn. The vast majority of them, I imagine, will have to content themselves with the penny plain version and will only be able to make guesses about the tuppence coloured pictures. But even that is well worth while: for they will be able to discover whether or not the system being tested is genuinely compatible; whether, in other words, the colour transmission gives an acceptable monochrome picture. That's going to be a very important point. We're not far from the time when there'll be 5,000,000 monochrome sets in use in this country and, whatever happens about colour, a good service for them has to be provided for years to come. There'd be an outcry if their owners thought that they were being sacrificed on the altar of colour television.

Making the Change

The number of black-and-white television sets in the homes of this country may well be doubled by the time a completely satisfactory colour system has been developed. And that, I believe, is one of the reasons why neither the B.B.C. nor the I.T.A. are likely to be in any particular hurry to develop it. It's highly improbable that it will be feasible to convert or adapt existing sets for colour; those who want the tuppenny version will have to buy new receivers, which seem likely to be a good deal more costly than those of to-day. Unless, in fact revolutionary new processes of transmission and reception are developed, the stage seems hardly to be set for a boom in colour television. It's much more probable that when good compatible transmissions are regularly on the air a gradual, rather than a spectacular, increase in the number of domestic colour receivers will take place. People will buy them when the time comes to replace their existing sets.

Festina Lente

Hasten slowly is a sound watchword in such matters as the develop-

ment of colour TV. It's no use, as our good friends on the other side of the Pond have found, going off at half-cock. And I don't think we're in danger of doing that. The P.M.G. won't sanction the adoption of any system until his advisers are completely satisfied that it's the goods; and I'm sure that the B.B.C. and the I.T.A. will be just as hard to please. The radio industry itself provides another staunch safeguard. It certainly wouldn't support the kind of colour television system that could be guaranteed to give passable pictures only if users were prepared to pay £300 for a receiver and to employ a whole-time resident serviceman! Please don't imagine that I want the development of colour TV to be delayed: I certainly don't. But there must be no ifs or buts about the system we launch.

Divis Starts Well

AS I write, there are splendid reports of the coverage disclosed by the initial transmissions from the new Belfast television station at Divis. Reception has been good over a larger area of Northern Ireland than was forecast by the B.B.C., and excellent pictures have been obtained much farther afield than that. In fact, they've left little to be desired

in much of the area round Dublin as well as in other parts of Southern Ireland. It's unlikely that Southern Ireland will be able, at all events in the near future, to finance a television service of its own. I don't think, though, that we need worry if some of its folk can pull in the Divis programmes free, gratis and for nothing so far as licence fees are concerned. To do so they'll have to buy receivers made in this country, and that's good business for us. Actually there are already quite a few enthusiasts in that part of the world who have been eager to spend money on rather chancy reception of Wenvoe and Holme Moss. Divis has also been well received in many parts of N.W. England and S.W. Scotland, in which it has hitherto not been possible to rely on getting good, steady pictures from stations on the mainland. Altogether a very satisfactory show, on which all concerned deserve warm congratulations.

A Spot of Bother

RATHER an interesting fault cropped up recently in my television receiver. It had been right up to the mark when previously used; but now, after the usual warming-up period, the brightness of the picture was a good deal below its normal level. As the sound was unaffected and the height and width of the picture were as they should be, it seemed that the h.t. line was beyond suspicion. The picture was clear and steady enough; just dim. Tests dis-



"WIRELESS WORLD" PUBLICATIONS

	Net Price	By Post
RADIO LABORATORY HANDBOOK. M. G. Scroggie, B.Sc., M.I.E.E. 6th Edition	25/-	26/3
STUDIO ENGINEERING FOR SOUND BROADCASTING. B.B.C. Engineering Training Manual by members of the B.B.C. Engineering Division. General Editor J. W. Godfrey.	25/-	25/6
SHORT-WAVE RADIO AND THE IONOSPHERE. T. W. Bennington, Engineering Division, B.B.C. Second Edition	10/6	10/10
INTRODUCTION TO VALVES. R. W. Hallows, M.A. (Cantab.), M.I.E.E., and H. K. Milward, B.Sc. (Lond.), A.M.I.E.E.	8/6	8/10
WIRELESS WORLD TELEVISION RECEIVER MODEL II: Complete constructional details with notes on modernizing the original design	3/6	3/9
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. A B.B.C. Engineering Training Manual. J. W. Godfrey and S. W. Amos, B.Sc. (Hons.), A.M.I.E.E.	30/-	30/8
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

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

closed a weak signal at the video amplifier, and, moving forward, the trouble was eventually found to be at the input to the second vision i.f. stage. The cause was, in fact, a defective i.f. transformer. When a new one had been obtained and connected up reception was again as good as ever. The reason why I describe this fault is that the symptoms were rather misleading. More often perhaps than not a poor signal from the video amplifier means an unsteady picture; with maybe line break-up and vertical rolling, the reason being that the sync pulses aren't good enough to take proper charge of the time bases.

Present Help in Time of Trouble

IT'S a bit surprising, I think, that dealers and service technicians don't make more general use of the oscilloscope. Many of them, of course, are fully cognisant of its virtues as an aid both to fault-finding and to correct alignment; but there are lots who never give it a thought. Simple oscilloscopes suitable for the jobs in question aren't all that expensive. It certainly takes a bit of practice and of common sense to use them effectively; but this instrument does so speed up the work, once its use has become familiar, that I'm sure it must quickly pay for itself in a busy repair shop. Myself, I wouldn't care to undertake the job of lining up the superhet stages of a high-quality sound or television receiver without being able to see what's going on by means of the oscilloscope screen. Perhaps the coming of v.h.f. sound broadcasting with frequency modulation will give the oscilloscope a boost, for it's the most reliable of all means of checking up f.m. receivers.

Lining 'em Up

THE South Wales Electricity Board is to spend a tidy bit of money during the next 18 months on getting rid of d.c. supplies and standardizing those that are already a.c. but with some odd voltage or frequency. I only hope that other Boards will take a leaf out of their book. It's a job that should be pressed forward, for the different forms of mains power supply now still often to be found in the same town—or even on different sides of the same street—are more than a nuisance to domestic and other users. If, for instance, you come to move house, you may well find that quite a number of your existing appliances won't be of any use in the new abode.

"THE CHOICE OF CRITICS"

The RADIO SHOW

EARLS COURT, AUG. 24 - SEPT. 3

* * * *

NEW BULGIN COMPONENTS ON SHOW

Once again, the vast range of Bulgin Radio and Electronic Components are displayed at the National Radio Show at Earls Court. Many new and improved designs are shown, a few of which are described below.



SEALED SIGNAL LAMP

This new fitting is intended for Services, etc., watertight equipment and is fully sealed, even the removal or breakage of the lens-cap will not permit ingress of moisture to the equipment. *List Nos. D.676+677/R.C.S.1000/Colour*

THE UNSEALED VERSION

A second model of matching appearance and lamp acceptance, splash-proof but not sealed, is also manufactured. Thermo-setting lenses on both models are available in Red, Green or White translucent plastic. *List Nos. D.678+679/R.C.S.1000/Colour*

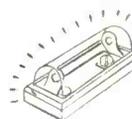


VALVE-TOP-BOSS CONNECTOR

Available in either OCTAL or STANDARD sizes. The shroud is manufactured in red thermo-setting plastic, contacting members are silver-plated. Fitted with double-ended tag inside, for junction to series resistor.

NEW SURFACE MOUNTING SIGNAL LAMP

A new surface mounting signal lamp fitting for 3 watt max. Festoon Bulbs, 6-50 V. with removable translucent coloured cover (red, green, white), and internal terminals and lamp clips. For rear or surface wiring and alternative mountings.



MAKE A POINT OF VISITING THE BULGIN STAND NO. 59

but if you are unable to do so, send for *NEW CATALOGUE* (Ref. 195/WW). *Price 1/- post free.*



BULGIN

A. F. BULGIN & CO. LTD.
BYE-PASS ROAD,
BARKING, ESSEX
 Telephone: R1Ppleway 5588 (5 lines)

UNBIASED

By FREE GRID

A New Menace

WE are, I hope, all trying hard nowadays to avoid causing interference to radio reception and to that end have fitted suppressors to all electrical apparatus under our control. I have long ago put my own house in order in this respect but Mrs. Free Grid arrived home recently from one of her infernal shopping expeditions with an entirely new piece of electrical apparatus which has so far defied all my efforts to suppress it. I am wondering, therefore, if any of you with specialized technical knowledge in the matter of suppression can let me have a word of advice.

The apparatus calls itself a magnetic broom and claims quite rightly that unlike ordinary brooms it does not raise a cloud of dust when you use it, as the polystyrene bristles become electrified by friction with the carpet or floor. All dust particles thus cling to the bristles. Its very virtues are its greatest drawback from the point of view of listeners and lookers as the friction between bristles and carpet, which brings into being the static charge, causes an inferno of crackles and snowstorms. I have tried earthing the bristles but this merely converts the sweeper into an ordinary broom. Is there any solution at all?—beyond the obvious one, of course.

Communal TV Aerials

ANYONE taking a train from any of the great London termini cannot help being struck by the large and ever-increasing number of TV aerials that adorn the chimney pots. As the train gets farther afield and passes through country towns the number of elements on each aerial steadily increases until the skyline of distant towns seems ornamented with a lot of elevated xylophones.

When taking such a journey the other day I could not help wondering whether some of the xylophone owners would not have laid out their money to better advantage if they

had invested in a really tall mast instead of in a family of directors. Here and there I did notice that somebody had been thinking on somewhat the same lines as myself and had put their ideas into practice; I'll warrant that such people get better reception than do their xylophonic neighbours.

However, a tall mast needs careful staying and if everybody erected one the general effect would be far from beautiful. At the same time, if TV aerials continue to grow at their present rate the skyline of a densely populated district will look even uglier than it does to-day.

I have been wondering, therefore, if it would not be possible for streets to co-operate as they did for fire-watching during the war and contribute to the erection of a really high and well-stayed mast to carry a communal aerial which would feed signals to subscribing houses by means of a coaxial cable.

An aerial pre-amplifier would, of course, be needed and possibly others at intervals along the distribution cable.

The mast could carry aerial arrays for B.B.C. and I.T.A. television and also for f.m. The advantage of such an arrangement would be increased signal strength, greater freedom from interference and greater beauty of skyline. Also the cost of maintaining the mast and aerial arrays would work out less per subscriber than the present cost of keeping individual aerials up to the mark.

I quite expect to be told that this is already done in some areas; in fact, the other day I noticed a TV mast towering above a building outside Wandsworth Town station which was such a fine piece of work that I suspect it to be a communal effort.

Hi-Fi-Li

A CORRESPONDENT has sent me a copy of the Toronto *Telegram* in which appears an advertisement for what is called Hi-Fi make-up. I can only suppose that the vendors of this cosmetic or the composers of their advertisement have no knowledge of feminine psychology.

Hi-Fi in radio, or anything else, virtually means "the same as the original" or at any rate a close approach to the original. Therefore the girl who uses this cosmetic may expect to look as Nature made her; a thought which

would send a shudder through even the most tempting torso. Surely, the whole object of using cosmetics is to make some improvement upon Nature's handiwork, or in other words to obtain a result which is as lo-fi as possible.



Improving upon Nature!

Have the people responsible for this advertisement never heard that—

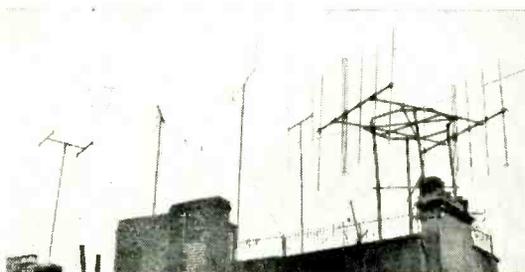
"A little touch of powder,
A little dab of paint,
Can make the female features
Look like what they ain't?"

As Others See Us

DURING May I took the opportunity of visiting the "Photo Fair" not so much because of an interest in photography as to see how another great industry went to work in putting itself over to its customers, and to find out if we radio people could pick up a few valuable ideas.

I took Mrs. Free Grid along as she and people like her with their "snaps" of repulsive-looking people on the beach or in the garden and of babies in their baths are the very backbone of the photographic industry. Their cameras are only in the crystal-set class and yet they use more films and paper and so bring more grist to the mills of the big photographic manufacturers than do the owners of the lordly Leica and such-like instruments.

To my astonishment this numerically great class of prosperity-bringers was almost totally ignored by the exhibition. It made me wonder if we are making a similar mistake at the annual radio show. Honestly I don't think we are, for at Earls Court is to be found the true democratic spirit with something for all the listening and looking public. Nobody is ignored, but all the same I should like to read a photographer's criticism of the Radio Show.



Could anything be uglier?

ALL-ROUND DEPENDABILITY

UNIVERSAL BRIDGE

VALVE CHARACTERISTIC METER

ELECTRONIC TESTMETER

ELECTRONIC TEST UNIT

WIDE RANGE SIGNAL GENERATOR

THE D.C. MINOR

HEAVY DUTY METER

UNIVERSAL MINOR

UNIVERSAL METER



Precision ELECTRICAL MEASURING INSTRUMENTS

WE SHALL BE AT THE
RADIO SHOW
EARLS COURT
AUG 24 - SEPT 3

Stand No.

116

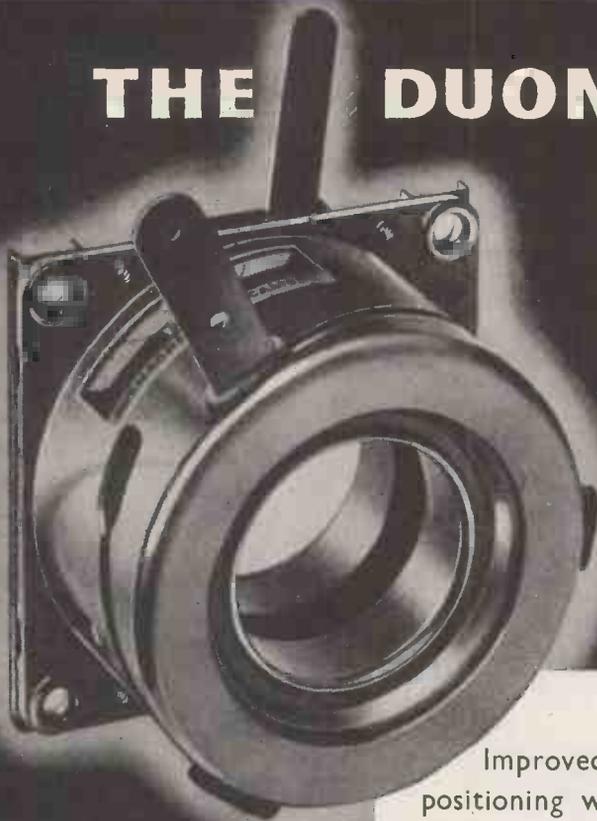
You can depend on "Avo". When choosing instruments, consult our complete catalogue, a copy of which may be had free on application

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE DOUGLAS STREET LONDON, S.W.1

Telephone: VICTORIA 3404-9



THE DUOMAGNETTE



THE LATEST ELAC FOCALISER

*Leading the
field in TV
components*



Improved beam focus and picture positioning with minimum effect on scan coils and ion trap assemblies.

- Fitted with latest type dual "Magnadur" sintered Oxide Magnets.
- Magnets DO NOT ROTATE during adjustment.
- Friction damping ensures smooth positive movement without backlash.
- Rapid and easy adjustment of focus and picture position.

*For wide angle tubes with 38 mm.
diameter necks.*

RETAIL PRICES IN U.K.

Type FD12/90 (Low flux)	22/6
Type FD13/90 (Medium flux)	23/-
Type FD14/90 (High flux)	25/-

ELECTRO ACOUSTIC INDUSTRIES LIMITED

Stamford Works, Broad Lane, Tottenham, N.15

Telephone : TOTenham 0505-7

E180F

wide-band low-noise

pentode



16 mA/V

$c_{in} = 8 \text{ pF}$ $c_{out} = 3 \text{ pF}$

PRINCIPAL CHARACTERISTICS

V_a 190V	g_m 16.5mA/V
V_{g2} 160V	r_a 35k Ω
V_{g1} -1V	μ_{g1-g2} 50
I_a 13mA	Heater 6.3V,0.3A
I_{g2} 3mA	Base B9A

Input damping = 6k Ω (at $f = 50 \text{ Mc/s}$ and with cathode connections strapped).

The unusually high slope/capacitance ratio of this new Mullard pentode has been achieved by using very fine grid wire, the latest type of frame grid and the smallest cathode-grid clearance yet employed in large scale production.

Gold plating of the base pins ensures that, when mounted in a suitable socket, the E180F makes one of the best base connections obtainable.

This new valve is eminently suitable for wide-band amplifier applications such as radar i.f. amplifiers, camera and transmission equipment for high definition television, and telephone line and transmission equipment.

For low-noise input stages the valve may be triode-connected and very favourably employed in pre-amplifiers in radar i.f. and camera equipment.

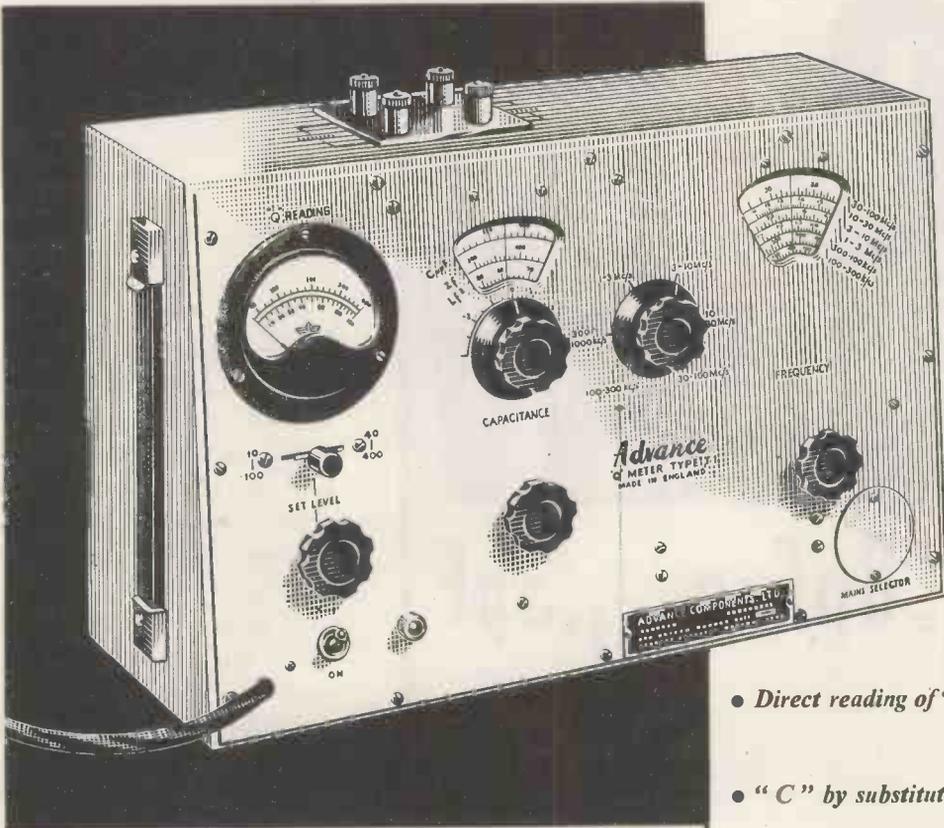
Your enquiries on the E180F will be welcomed at the address below.

Mullard



Mullard Limited, Communications & Industrial Valve Dept., Century House, Shaftesbury Avenue, London, W.C.2.

ANNOUNCING THE Advance 'Q' METER



The ADVANCE "Q" Meter is different! It is small, portable and has an excellent specification—a useful addition to any electronic laboratory and well suited for production testing. Furthermore, it is offered at a price to suit all applications. With the T1, RF measurements can be made of "Q" inductance, impedance, capacitance and power factor at frequencies between 100 kc/s. and 100 Mc/s.

Full details in leaflet W/31 which we will be pleased to forward on your request.

- Direct reading of "Q" Range 10-400
- "C" by substitution.
- Rapid calculation of "L" and "Z"
- No "Set-Zero" problems
- Small and portable

TYPE T1

£55
NETT PRICE
IN U.K.



**TAILORED
FOR THE
JOB**

It is by no means accidental that the Ferroglyph has achieved so high a reputation in every country to which exportation is possible, and at a price no greater than that of an ordinary home recorder.

One of the main contributory factors is that practically all component parts used in the Ferroglyph are made in our own works at South Shields, having been expressly designed for the function they are to perform.

Thus, by purposeful design, adequate control during manufacture, and strict inspection, standards have been established to which all Wearite/Ferroglyph components conform.

After assembly from such parts each Ferroglyph is subjected to a multiplicity of tests, culminating in a pen-recorder trace of its response and wow.

Only thus has the Ferroglyph set and maintained the standard by which all other recorders are judged.

Dealerships in several of the principal towns are still open and applications are invited.

Ferroglyph

BRIEF SPECIFICATION

Twin Track (to International standards)
Playing British and American pre-recorded tapes

Playing Time with 1,750 ft. Reel
45 minutes per track at 7½ i.p.s. (others speeds prorata)

Quick Rewind
in less than 60 seconds

Signal Level Meter
giving positive reading

MODEL 2A/N
3¾ and 7½ i.p.s.
76 gns.

Frequency Response
±3 db 50/10,000 c.p.s. at 7½ i.p.s.

"Wow" and Flutter
Less than 0.2% at 7½ i.p.s.

Signal to Noise Ratio
Better than 50 db, 200/12,000 c.p.s. Unweighted, including hum, 45 db.

Longterm Speed Stability
Less than .5% variation

Output Power
2½ watts into 15 ohms

MODEL 2A/NH
7½ and 15 i.p.s.
86 gns.



WRIGHT & WEAIRE LTD

131 SLOANE STREET · LONDON SW1 · Telephone: SLOane 2214/5 and 1510

BAND III CONVERTERS

order them **NOW!**

★ **ALBA**

For Models: T.301, 304, 312, 372, 392, 394, 472, TR.9872, T492, T.483, 493, TRG.0971, T.484, 304, TRG.1974.

5 gns. complete

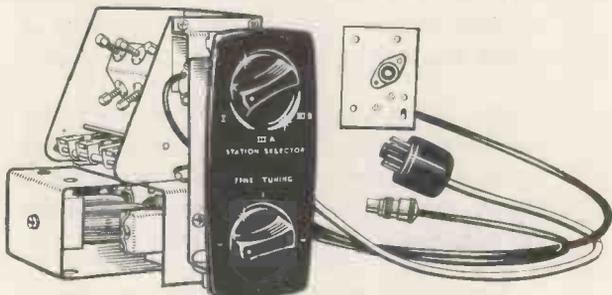
The Adaptor with Accessories

★ **EKCO**

Type TT.234 (for A.C. mains) for Models T.C.138—T.217.
Type TTD.258 (for D.C. mains).
These Converters are for the Superhet models only.

6 gns.

★ **FERGUSON** (illustrated below)



Type A. For Models: 992, 994, 996, 998, 9916.
Type B. For Models: 991, 993, 995, 997.
Type B.1. For Models: 983, 984, 988, 989, 990, 991, 992, 993, 994, 996, 997, 998.

5 gns.

★ **G.E.C.**

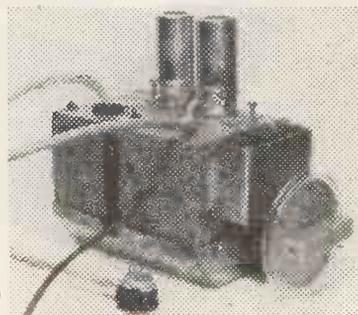
Type BT.199. For Models: BT.2147, BT.5144, BT.5145.
Type BT.204. For Models: BT.5147, BT.5246.
Type BT.200. For Models: BT.4541, BT.4542.
Type BT.205. For Models: BT.1449, BT.2448.
Type BT.206. For Models: BT.1251.
Type BT.203. For Models: BT.4541, BT.4542, BT.4543, BT.4544, BT.4643, BT.5543, BT.5642, BT.6542, BT.6641.

8 gns.
8 gns.
7 gns.
5 gns.
5 gns.
7 gns.

★ **H.M.V.**

6 gns.

Type K. For Models: 1824, 1826.
Type L. For Model: 1825.
Type M. For Model: 1827.
Type N. For Model: 1829.



★ **K.B.** (illustrated right)

Type A. For Model: KV.50.
Type B. For Models: HV.40F, JF.40F, KF.60, KF.60F.
Type C. For Models: HV.20, EV.30/40, FV.30/40, HV.40, HF.40/60, JF.40, FT.50, KF.50 HT.60.
Type D. For Model: KV.35.

6 gns.

★ **PYE**

Type 47. For Models: V.4, V.4C, V.7, V.7CD, V.7CDL.
*Type 124. For Models: F.V.I, F.V.I.C, FV.2C, FV.4C, V.54C.
* Delivery mid August

6½ gns.

★ **STELLA**

6 gns.

For Models
Type ST.601/00. ST.8317U.
Type ST.601/01. ST.8314U.
Type ST.601/02. ST.6414U/45
Type ST.601/04. ST.1481A.



★ **ULTRA**

Type TU.1. For Model 81 Series.

6 gns.

CONVERTERS WITH OWN POWER PACK



Aerialite TC.3 £9 10 0
Channel C.1 £9 9 0
(With 2-way switch)
Channel C.2 £10 10 0
(With 4-way switch)
Pam. Converter £9 9 0
(As illustrated left)

Our 1955 Replacement and Rewind Handbook is invaluable to every T.V. Engineer and Dealer. 1/- post free.

Make your own Converter for Band III!

Kit of 2 IFs, Coils and circuit diagram 15/- plus 1/- packing/post.

direct TV REPLACEMENTS

TERMS OF BUSINESS: Please add 3/- packing/post. C.W.O., C.O.D. or pro forma. State clearly model number and make of set.

134-136 LEWISHAM WAY, NEW CROSS, S.E.14.
Telephone: TIDeway 3696-2330. Telegrams: Flibak London, S.E.14.

Valves for Industry

R.F. Heating

The increasing use of R.F. Heating in industry has shown the need for units to provide outputs between 10 and 50 kW

To meet this demand, the English Electric Valve Company have developed two new valves for R.F. generators of 10 kW and upwards.

These new products are not modifications of valves used for communications, but are designed expressly for operation under the less favourable conditions imposed by factory use.

They are rugged and will withstand severe overloads; they are low in first cost and have a long service life. Both types are available in air-cooled or water-cooled versions and a suitable range of rectifying valves for use in conjunction with them is also available.



'ENGLISH ELECTRIC'

Type	Maximum Operating Frequency at Full Rating (Mc/s)	Cathode	Dimensions (maximum)		Filament		Maximum Anode Voltage kV (D.C.)	Maximum Anode Dissipation (Kilowatts)	Usable Emission (Amperes)	Amplification Factor	Mutual Conductance (mA/V)
			Length mm.	Diameter mm.	Volts	Amperes					
BR. 1102	50	Th.	483	241	8.2	230	12.0	20.0	45	42	20.0
BW. 1102	50	Th.	473	152	8.2	230	12.0	20.0	45	42	20.0
BR. 1103	100	Th.	356	203	6.0	120	8.5	10.0	16	25	8.3
BW. 1103	100	Th.	343	116	6.0	120	8.5	10.0	16	25	8.3

NOTE: CATHODE:—Th. denotes THORIATED TUNGSTEN.
BR. denotes AIR-COOLED.

BW. denotes WATER-COOLED.
Technical data sheets are available on request.

ENGLISH ELECTRIC VALVE CO. LTD.



Waterhouse Lane, Chelmsford
Telephone: Chelmsford 3491



Home Constructors

MAKE A SOUND JOB OF IT WITH . . .

HUNTS CAPACITORS

APPROVED CAPACITOR KITS FOR CONVERSION TO THE OSRAM "912 PLUS"

PASSIVE INPUT UNIT (NO VALVE)

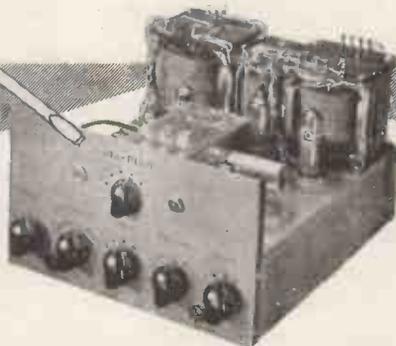
Ref.	Capacitance	Volts D.C. Wkg.	List No.	List Price s. d.
C 24	470pF ± 10%	350	L 433	1 4½
C 25	0.002μF	1500	A 77	1 6
C 26	0.005μF	1000	A 71	1 3
C 27	0.005μF	1000	A 71	1 3
C 28	0.01μF	600	A 60	1 0
C 29	220pF ± 10%	350	L 433	1 4½
C 30	100pF ± 10%	350	L 431	1 4½
C 31	100pF ± 10%	350	L 431	1 4½
C 32	33pF ± 10%	350	L 430	1 4½

Price for complete kit 11.10½d.

PRE-AMPLIFIER INPUT UNIT

Ref.	Capacitance	Volts D.C. Wkg.	List No.	List Price s. d.
C 33	0.1μF	350	B 406	2 3
C 34	25μF	12	JD 26T	2 3
C 35	0.05μF	350	B 405	2 3
C 36	330pF ± 10%	350	L 433	1 4½
C 37	150pF ± 10%	350	L 433	1 4½
C 38	68pF ± 10%	350	L 430	1 4½
C 39	33pF ± 10%	350	L 430	1 4½
C 40	1000pF ± 10%	350	L 433	1 9
C 41	8μF	450	JF 553TS	3 6

Price for complete kit 17.6d.



APPROVED CAPACITOR KIT FOR THE OSRAM 912 High Quality Amplifier

Ref.	Capacitance	Volts D.C. Wkg.	List No.	List Price s. d.
C 1	0.005μF	1000	B 402	2 0
C 2	25μF	25	JD 52T	2 6
C 3	0.1μF	350	B 406	2 3
C 4	0.05μF	500	B 405	2 3
C 5	8 + 16μF	450	JE 561	7 6
C 6	470pF ± 5%	350	L 433	1 6
C 7	1000pF ± 5%	350	L 435	1 9
C 8	2000pF ± 5%	350	L 435	2 4½
C 9	0.02μF	750	B 404	2 1½
C 10	22pF ± 5%	350	L 430	1 6
C 11	220pF ± 5%	350	L 433	1 6
C 12	470pF ± 5%	350	L 433	1 6
C 13	25μF	25	JD 52T	2 6
C 14	0.1μF	150	B 500	2 0
C 15	2μF	150	B 504	5 6
C 16	0.01μF	350	B 810	1 6
C 17	0.05μF	500	B 405	2 3
C 18	0.05μF	500	B 405	2 3
C 19	50μF	25	JD 53T	2 9
C 20	50μF	25	JD 53T	2 9
C 21	0.001μF	600	B 847	1 3
C 22	0.001μF	600	B 847	1 3
C 23	8 + 16μF	450	JE 561	7 6

2 Horizontal Mounting clips H 1

Special price for complete kit £2.15.0

A. H. HUNT (Capacitors) LTD.
WANDSWORTH, LONDON, S.W.18

Telephone: BATtersea 1083/7



And in Canada: **HUNT CAPACITORS (Canada) LTD. AJAX ONTARIO**

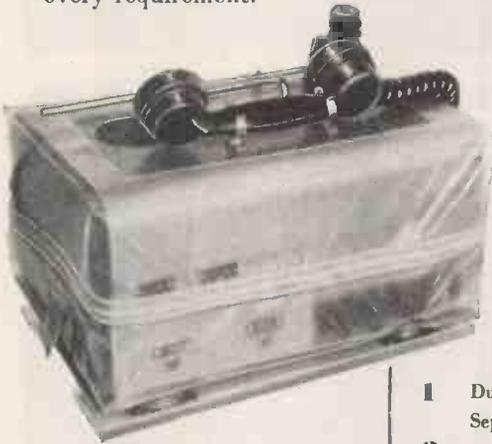
A NEW ADDITION TO THE RANGE OF

Hudson

RADIO-TELEPHONES

MODEL AM.102

This new HUDSON Radio-Telephone has been designed to embody the most up-to-date specifications and embrace a wide variation in methods of use, thus making it extremely suitable for every requirement.



A FEW OF THE MANY SPECIAL FEATURES OF THIS NEW MODEL

- 1 Dual vibrator system enabling operation from either 6 or 12 D.C. supply. Separate external power unit available for 220 A.C. mains operation.
- 2 Operation on up to 6 close spaced channels.
- 3 Suitable for 50 Kc channel spacing up to 175 Mc/s.
- 4 Built-in aerial for portable operation. Aerial socket available for normal vehicle or fixed station aerial.
- 5 Can be operated direct or via extension control unit up to 50 feet away.
- 6 Suitable for permanent boot-mounted vehicle installation or temporary emergency installation on passenger seat next to driver.
- 7 Fitted with protective plastic shock absorber strips to protect car upholstery when used for emergency installations.
- 8 Plastic cover for protection from weather and dirt when used in adverse locations.
- 9 Hermetically sealed changeover re'lay and 60 watt double contact vibrator for maximum reliability.

BRIEF TECHNICAL SPECIFICATION

TRANSMITTER OUTPUT

7 watts to 175 Mc/s amplitude modulated.

RECEIVER SENSITIVITY

1 microvolt gives 8 dB signal to noise ratio.

RECEIVER SELECTIVITY

60 dBs down. 50 Kc/s off tune.

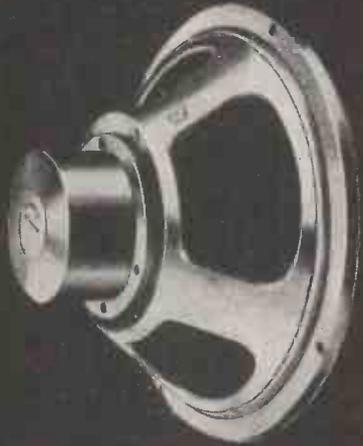
Literature on the full range of Hudson two-way communication systems, applicable to the various requirements of all countries, supplied on request.

HUDSON ELECTRONIC DEVICES LTD.

Sales Office and Factory

KNIGHT'S HILL SQUARE, WEST NORWOOD, LONDON, S.E.27

Telephone GIPsy Hill 2384



FOR SOUND REPRODUCTION

**NATIONAL RADIO SHOW
STAND NO. 17**

We are proud of the vast number of our loudspeakers incorporated in radio and television receivers used throughout the world. Their quality of reproduction and unfailing performance have been amply proved over many years in every climate and condition of service.

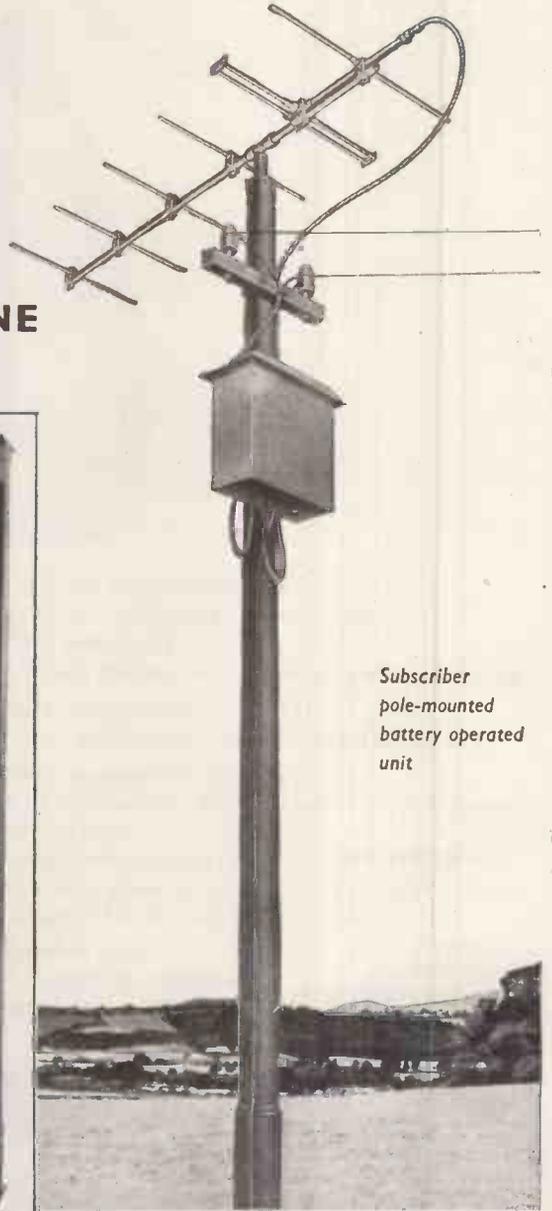
Rola Celestion Ltd.

FERRY WORKS, THAMES DITTON, SURREY
TELEPHONE: EMBerbrook 340216

The Invisible link with the Isolated Community

V.H.F.

RADIO TELEPHONE

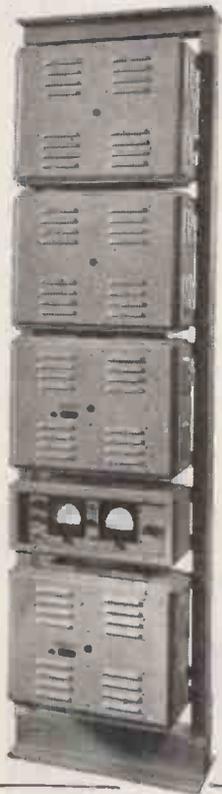


*Subscriber
pole-mounted
battery operated
unit*

- ★ No Change in Normal Telephone Operating Procedure
- ★ Mains or Battery Operation
- ★ Signalling Units for All Types of Circuit

The V.H.F. link provides the most practical means of direct communication between isolated communities in all areas where the nature of the terrain or distance involved preclude the use of open wires for junction or subscribers' lines. Dialling facilities can be employed, and the radio equipment can be interposed in a standard line circuit in any part of a telephone system without modification to switching equipment.

*Exchange
equipment bay*

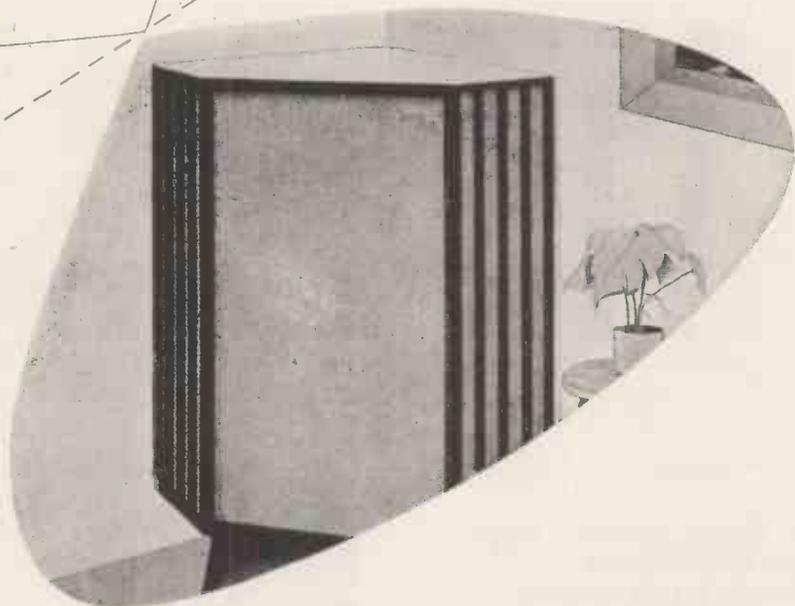


AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

Radio & Transmission Division, Strowger House, Arundel Street, London, W.C.2. 'Phone: TEMple Bar 9262. 'Grams: Strowgerex London.

AT14511-Bx107

What's in an Enclosure ?



For those to whom acoustics is a mystery, the mounting of such a fine high fidelity instrument as the Tannoy Dual Concentric Speaker is inevitably something of a hit-and-miss procedure. And it is difficult subsequently to subdue the nagging thought that perhaps a more knowledgeable approach might have produced even finer results.

It is for such people . . . people who cannot be happy with anything short of the best . . . that the GRF Enclosure has been produced.

Based on the larger and more costly 'Autograph' enclosure, it has an elaborate interior system of sound source expansion, incorporating all the advantages of horn loading for bass reproduction. Mid-range frequencies are covered by direct frontal radiation via an entirely new acoustic coupling device, and the high frequency end of the spectrum is amply catered for by the normal non-directional horn loaded source of the 15" Tannoy Dual Concentric unit.

. . . And if technicalities are of little more than passing interest, the point that really counts is that, obviously, Tannoy would never release an enclosure that did not extract the last possible degree of realism from their own Speaker unit.

DIMENSIONS

Max. front to rear 29"

Max. width 38"

Overall length 48"

Floor clearance, on
standard legs 6½"

Price in U.K. £95

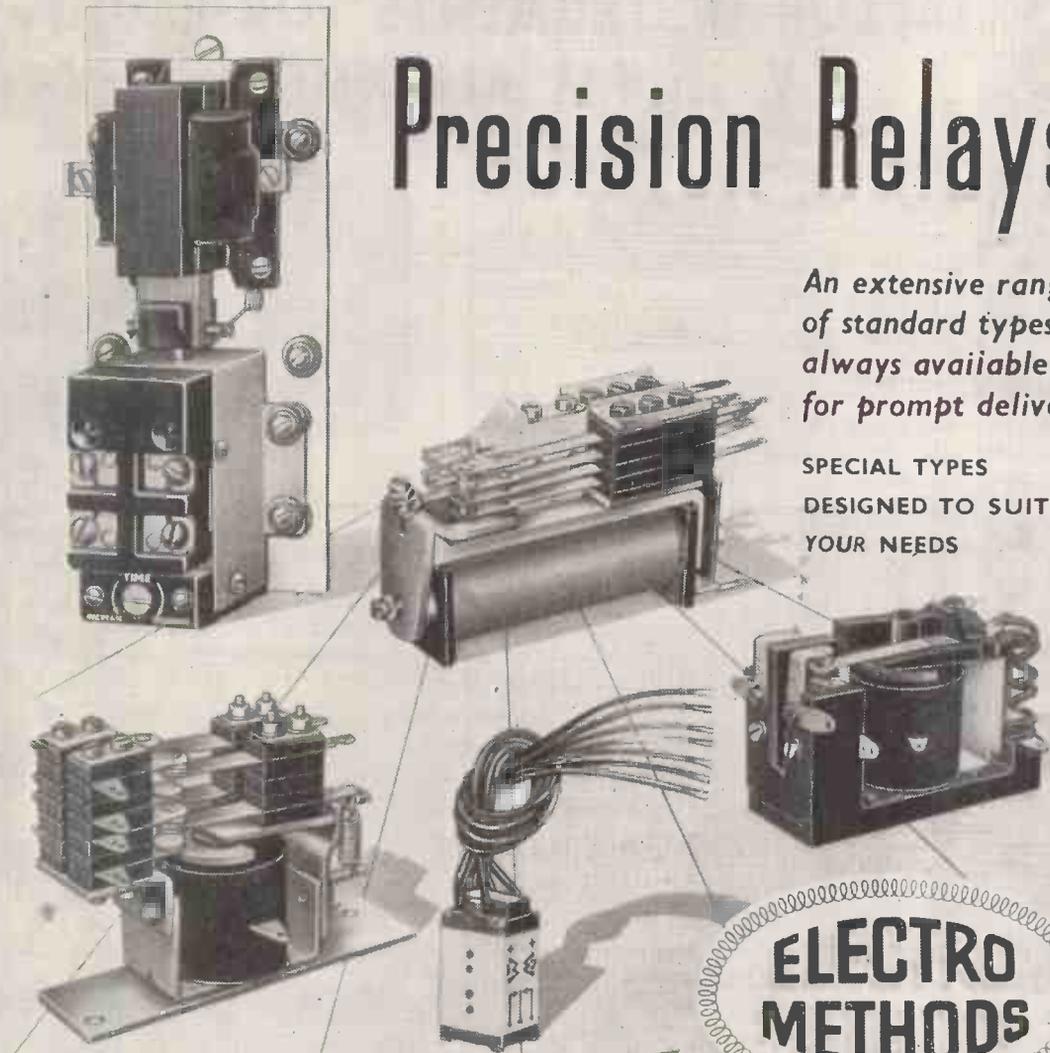


Practitioners in Sound

Precision Relays

*An extensive range
of standard types
always available
for prompt delivery*

**SPECIAL TYPES
DESIGNED TO SUIT
YOUR NEEDS**



**—THE WORLD-RENOWNED SPECIALIST DESIGNERS
AND MANUFACTURERS OF ALL TYPES OF RELAYS**



Now FREE to all!

THE E-M TECHNICAL ADVISORY SERVICE

Regardless of whether your relay problem is simple or complex, the fact remains that the only reliable solution is that which entirely eliminates risk.

We therefore respectfully invite you to avail yourself of the wide resources of technical knowledge and practical experience possessed by the specialist technicians of our Relay Division.

**Full technical data
and illustrated leaflets
promptly forwarded
on request!**

ELECTRO METHODS LTD. 12-36 CAXTON WAY, STEVENAGE, HERTS. Phone: STEVENAGE 780

3 TAYLOR INSTRUMENTS FOR RADIO T.V. AND F.M. ALIGNMENT

TAYLOR SWEEP OSCILLATOR MODEL 92A For T.V. and F.M. Receiver Alignment

Frequency-modulated oscillator designed for the rapid and accurate alignment of T.V. and F.M. receivers. Also suitable for checking band pass amplifiers.

Frequency range: 5-250 Mc/s.

Frequency deviation: Continuously variable to approx. 15 Mc/s.

Output: 40 microvolts to 2 millivolts continuously variable.

Freq. Mod.: Substantially linear to 6 Mc/s.

Sweep width: Less than 10% max. sweep.

Sweep: Sweep voltage continuously variable to a max. of 300 V.R.M.S.

CASH PRICE £30.0.0 **Prompt Delivery**
Available on advantageous Hire Purchase Terms



TAYLOR OSCILLOSCOPE MODEL 31A

An Oscilloscope of advanced design and reliable performance intended primarily to meet the requirements of T.V. and Radio Servicing and Alignment, but its versatile features make it ideally suitable for general laboratory work.

Tube: Flat faced C.R. tube 4in diameter.

Electro static deflection.

Hard Time Base: Covers frequencies from 10 c/s to 500 Kc/s, free running or triggered.

Amplifiers: Both horizontal and vertical with push pull output are provided. High gain amplifier band width 10 c/s to 6 Mc/s. Flyback Suppression Circuit fitted with tube modulator.

CASH PRICE £60 **Prompt Delivery**
Available on advantageous Hire Purchase Terms

TAYLOR SIGNAL GENERATOR MODEL 67A For Television up to 240 Mc/s

The Colpitt's oscillator circuit used gives good frequency stability and waveform over the wide frequency range.

Frequency range: 100 Kc/s-240 Mc/s in six bands. Covers Band III.

Total Scale Length: 48in.

Accuracy: $\pm 1\%$.

Modulation: 400 cycles, 30% depth.

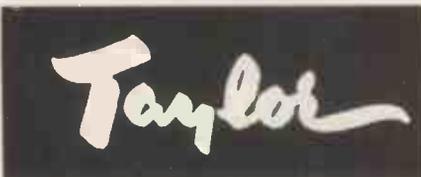
Output impedance: 75 ohms.

Direct A.F. output provided.

Attenuation: 100 dB continuously variable.

Automatic cut-out against mains overload.

CASH PRICE £22.0.0 **Prompt Delivery**
Available on advantageous Hire Purchase Terms



- Separate leaflets giving full technical details available. All Taylor Instruments available on Hire Purchase. Write for catalogue and details of Hire Purchase Terms.

ELECTRICAL INSTRUMENTS LTD.

MONTROSE AVENUE, SLOUGH, BUCKS. Telephone: Slough 21381 Cables: Taylins, Slough

Goodmans

take pleasure in announcing a new range of loudspeaker enclosures for their Axiom and Audiom range

The

Axiom Enclosures

- ★ *Under two thirds capacity of conventional Bass Reflex Enclosures.*
- ★ *System resonance when used with recommended speakers 20 c/s. This resonance is well damped.*
- ★ *Absence of all resonances above 20c/s.*
- ★ *More efficient at low frequencies than bass reflex enclosures.*
- ★ *Distortion due to excessive cone amplitude reduced to a minimum.*
- ★ *Good transient response due to controlled damping over L.F. range.*
- ★ *Resonant frequency of loudspeaker not critical. If cone resonance is higher than that recommended the bass extension will be reduced. Other advantages will still be maintained.*
- ★ *Economical and simple to construct.*

**These Cabinets are being Demonstrated
on Stand No. 20 National Radio Show**

Demonstrations daily at 12-1-2.30-4-5-6-7-8-9 p.m.



Write for tickets now to: GOODMANS INDUSTRIES LTD.

Axiom Works, Wembley, Middlesex. WEMbley 1200

**ANOTHER ACHIEVEMENT FROM THE MOST
MODERN LOUDSPEAKER LABORATORY IN EUROPE**

TELEQUIPMENT

SIGNAL GENERATORS

FOR T.V. PRODUCTION TESTING

The Telequipment Monoscope Picture Generator is the cheapest and most reliable means of producing a standard test pattern for T.V. receiver production testing and alignment.

Hitherto the price of this type of equipment has put it out of reach of all but the large Manufacturer.

By unique circuit design and simplification we have both greatly increased the reliability and brought the price to within the reach of the smaller manufacturer, Relay Companies and Trade Service Establishments.

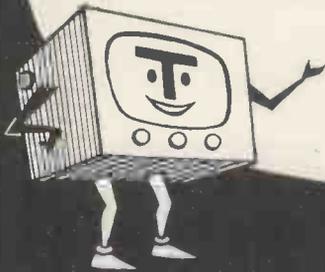
These equipments are in regular use by most of the leading T.V. set manufacturers and by Belling and Lee Limited for the G9AED experimental transmitter.

The illustration shows a complete installation for Factory T.V. testing. The equipment comprises the Monoscope unit, producing the standard test picture together with Vision and Sound transmitters each crystal controlled.

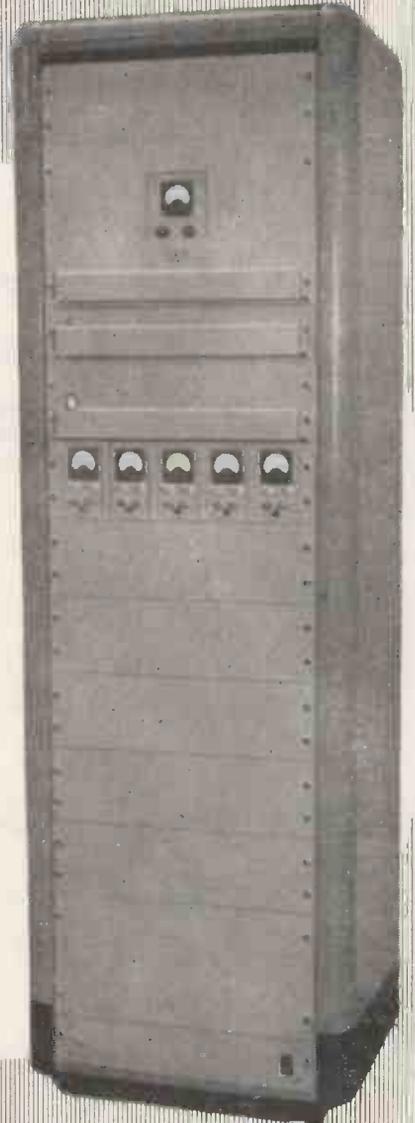
The Monoscope tube used is completely free from microphony, interference, and other effects usually associated with this type of apparatus.

The equipment is available for 405, 525 and 625 lines.

We shall be pleased to quote for variations of this equipment to meet individual requirements.



MONOSCOPE



TELEQUIPMENT LTD.

Specialists in all types of T.V. Test Equipment

313 · CHASE ROAD · SOUTHGATE · LONDON · N.14

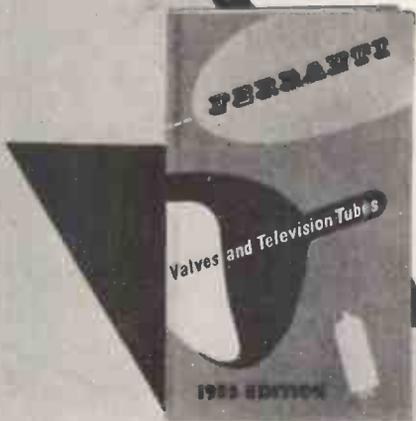
Telephone: Palmers Green 7111

Write for fullest details
or visit us on

STAND 105
RADIO SHOW
EARLS COURT



Valuable aids to the RADIO SERVICE ENGINEER

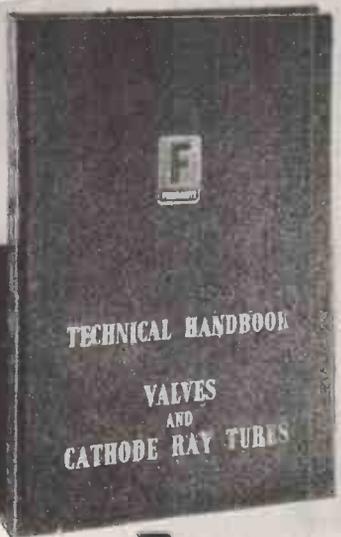


96 PAGE POCKET BOOKLET

A 96 page pocket-size booklet gives summarised data i.e. characteristics, operating conditions, base diagrams relating to Ferranti valves and cathode ray tubes. Included also is a comprehensive valve equivalents list. Free copy supplied on request.

TECHNICAL HANDBOOK

This Handbook contains the fullest information about all types of Ferranti valves and cathode ray tubes. Complete data such as physical details, base connections, ratings, operating conditions, etc. Price 7/6.



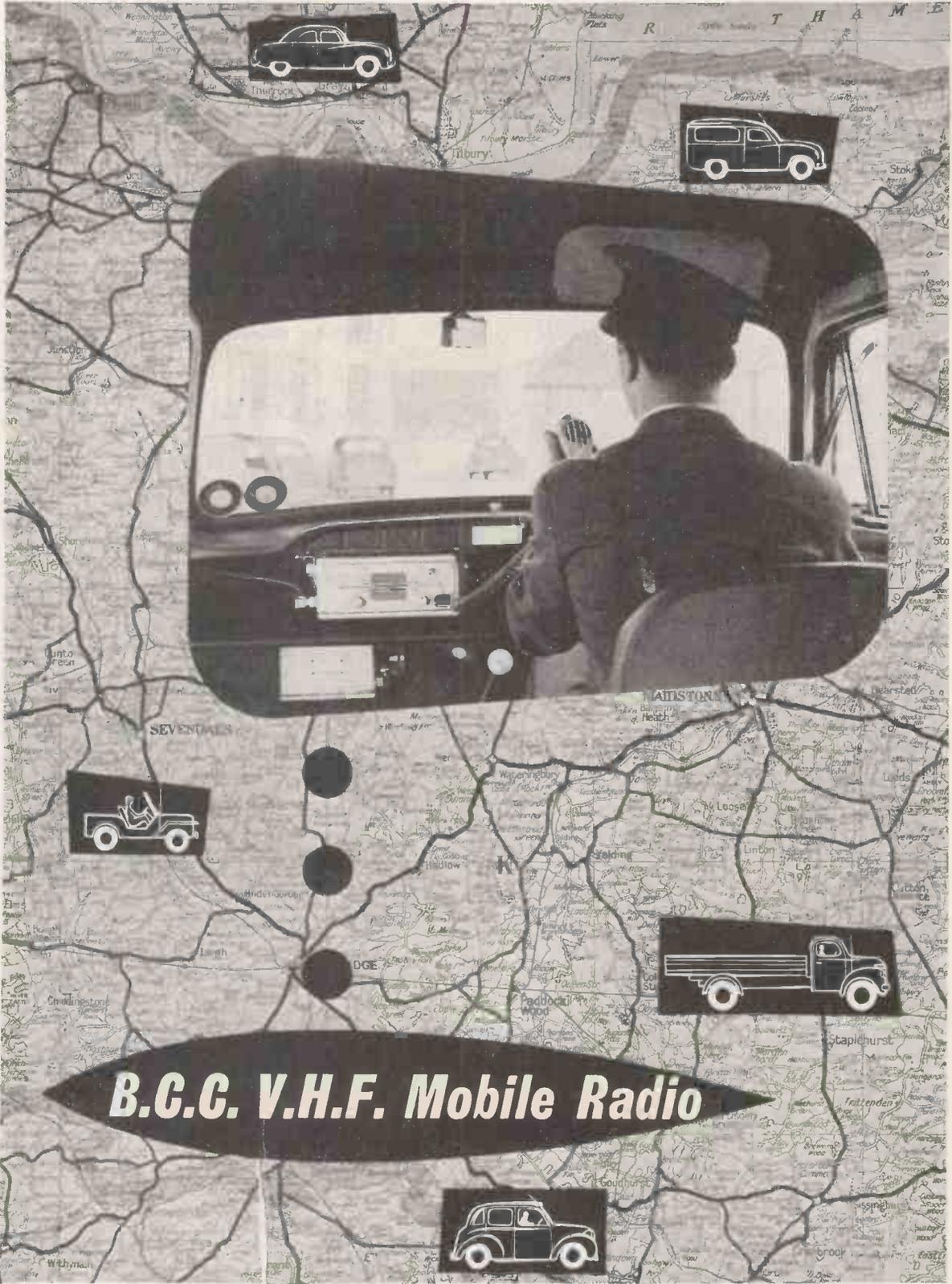
Send now for both publications to:—

FERRANTI LTD

GEM MILL · CHADDERTON · OLDHAM · LANCASHIRE

London Office: KERN HOUSE, 36 KINGSWAY, W.C.2.





B.C.C. V.H.F. Mobile Radio



BRITISH COMMUNICATIONS CORPORATION LIMITED

Second Way, Exhibition Grounds, Wembley, England

Telephone: WEMbley 1212

Telegram: BEECEEE

m-i-n-u-t-e-s into seconds...

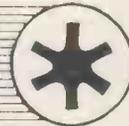
with the brilliant **NEW**
Superspeed
SOLDERING IRON

MANUFACTURED FOR ENTHOVEN SOLDERS LTD. BY SCOPE LABORATORIES, MELBOURNE, AUSTRALIA



STAR FEATURES

- ★ Heats up from cold in 6 seconds—by a light thumb pressure on the switch ring.
- ★ When not in use, current is automatically switched off—thus greatly reducing wear of copper bit. Electricity consumption is correspondingly reduced.
- ★ It is 10" long, weighs 3½ ozs., can be used on 2.5 to 6.3-volt supply. 4-volt transformer normally supplied.
- ★ More powerful than conventional 150-watt irons and equally suitable for light wiring work or heavy soldering on chassis.
- ★ Simple to operate, ideal for precision work. Requires minimum maintenance at negligible cost. Shows lowest operating cost over a period.
- ★ Can be used from a car battery.
- ★ It is by far the most efficient and economical soldering iron ever designed for test bench and maintenance work.



STAR APPLICATIONS

Designed on an entirely new principle, this light-weight, versatile iron is eminently suitable for soldering operations in the **RADIO, TELEVISION, ELECTRONIC** and **TELECOMMUNICATION** industries, particularly for all **SERVICE** work. For general purpose work the Superspeed Iron is the ideal stand-by soldering tool.

The **Superspeed** soldering iron is available **NOW**

Write for full particulars, including guarantee terms and free trial facilities, to the sole concessionaires in this country—

ENTHOVEN SOLDERS LIMITED
 (Industrial Equipment Division), 89 Upper Thames St.,
 London, E.C.4. Telephone: MANSion House 4533

SOLDERING INSTRUMENTS AND ALLIED EQUIPMENT

by



TYPES FOR

**FACTORY
BENCH
LINE
ASSEMBLY**

**AND
GENERAL
MAINTEN-
ANCE**

VOLT RANGES

6/7v to 230/250v

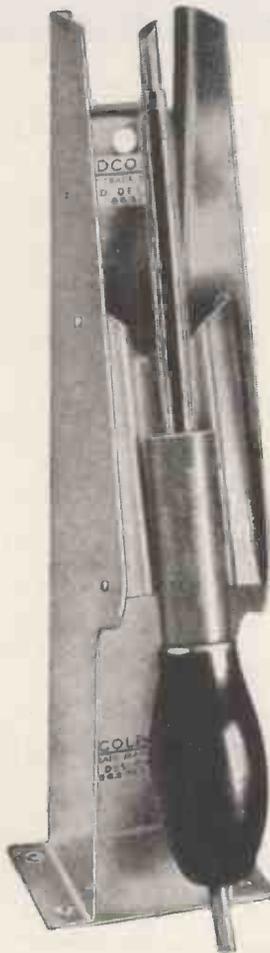
**PROTECTIVE
SHIELD
AS
ILLUSTRATED**

LIST NO. 68

*With no extra cost for
low voltages*

**$\frac{3}{16}$ " BIT
INSTRUMENT
AS
ILLUSTRATED**

LIST NO. 64



CATALOGUES & LISTS

HEAD OFFICE SALES AND SERVICE

ADCOLA PRODUCTS LTD.

GAUDEN RD., CLAPHAM HIGH ST., LONDON, S.W.4

Telephone: MACAULAY 4272

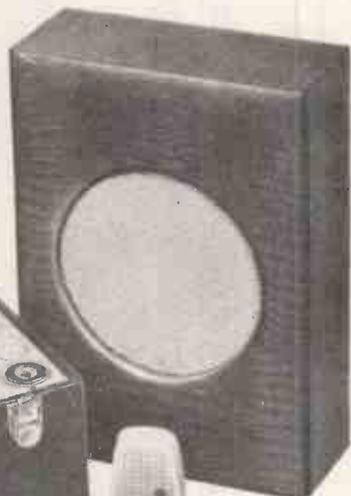
WE CAN DELIVER FROM STOCK

these popular Tape Recorders



HI-FI RECORDERS

These superb British made Dual Track recorders, rich in range and tonal qualities, incorporate an additional High Fidelity 10 in. GOODMAN'S Loudspeaker in the lid, which can be detached and used in any position desired for public meetings, concerts, dances, etc. They are powerful enough to meet any volume requirements, yet maintain crystal clear quality reproduction at all volume levels. IDEAL FOR PRE-RECORDED TAPES.



- ★ Two speeds—3½ in. and 7½ in. per sec.
- ★ Two hours recording.
- ★ Instantaneous braking.
- ★ Instantly ready to record or playback.
- ★ Built-in speaker is additional to 10 in. high flux speaker in detachable lid, giving greater versatility.
- ★ Easily removable chassis built on unique steel frame, ensuring ease of inspection.
- ★ Size overall 11½ in. x 16½ in. x 12 in. Weight 37 lb.
- ★ Magic eye level indicator.
- ★ Independent BASS and TREBLE controls.
- ★ For A.C. mains 200-250v.

EDITOR HI-FI

Fitted in elegant leathercloth suitcase with gilt fittings. Complete with High Fidelity desk microphone and 1200 ft. spool of tape.

49 gns.

EDITOR SUPER HI-FI (Illustrated above)

Fitted in padded simulated crocodile case with continental gilt fittings and locks, with elegantly styled super tape deck. Completely automatic simple interlocked control; MIXING and MONITORING facilities. Complete with microphone and tape.

60 gns.

Also available from stock . . .

EDITOR TWO-SPEED (Illustrated right)

Easy to carry—easy to look at! Two hours recording and two speeds—3½ in. and 7½ in. per sec. Fitted in leathercloth suitcase. Complete with microphone and 1200 ft. tape

45 gns.



EDITOR SUPER TWO-SPEED

De Luxe version of the Editor, with elegantly styled super tape deck and MIXING and MONITORING facilities. Complete with microphone and 1200 ft. tape

55 gns.

Our PERSONAL CREDIT PLAN

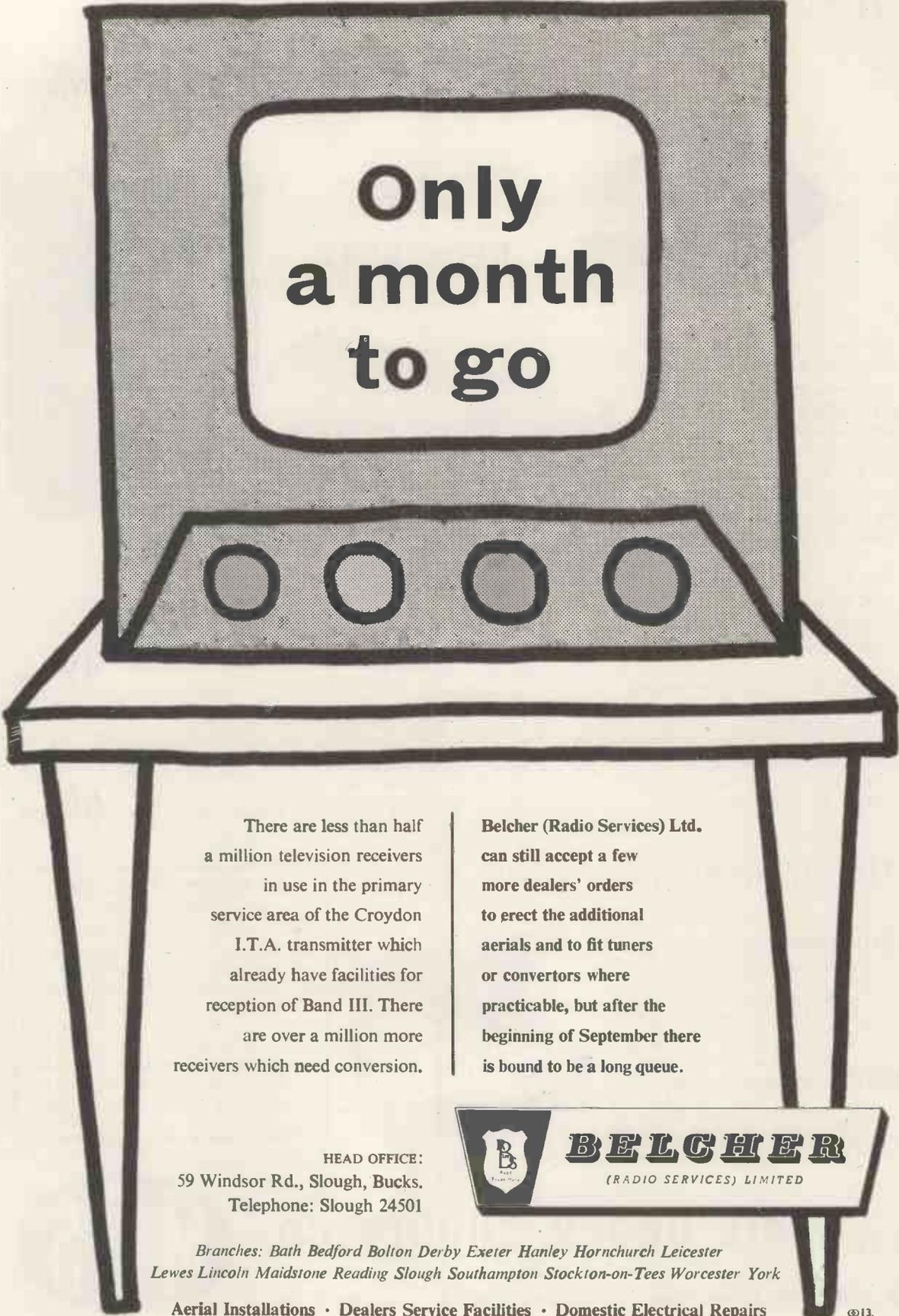
is used by all discerning and careful buyers—it provides easy repayment terms coupled with very low deposits and low service charges. We are authorised Distributors for most high grade Electronic Equipments, and if you will let us know your requirements we will quote details by return. Or send your deposit with your order, allowing sufficient for carriage and packing extra, in order to secure your needs. Please specify over what period, up to a maximum of 18 months, you wish to repay, and the necessary forms will be sent to you immediately.

E. & G. **MAIL ORDER SUPPLY CO.**

The Radio Centre

33, Tottenham Court Road · London · W.1 · Tel. MUS 6667





**Only
a month
to go**

There are less than half a million television receivers in use in the primary service area of the Croydon I.T.A. transmitter which already have facilities for reception of Band III. There are over a million more receivers which need conversion.

Belcher (Radio Services) Ltd. can still accept a few more dealers' orders to erect the additional aerials and to fit tuners or convertors where practicable, but after the beginning of September there is bound to be a long queue.

HEAD OFFICE:
59 Windsor Rd., Slough, Bucks.
Telephone: Slough 24501



BELCHER

(RADIO SERVICES) LIMITED

*Branches: Bath Bedford Bolton Derby Exeter Hanley Hornchurch Leicester
Lewes Lincoln Maidstone Reading Slough Southampton Stockton-on-Tees Worcester York*

Aerial Installations • Dealers Service Facilities • Domestic Electrical Repairs

NEW... from start to finish...



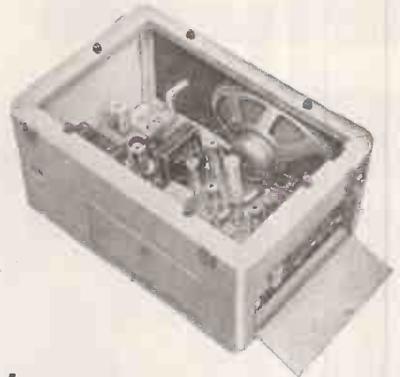
SP/2 TAPE RECORDER

- ★ **Frequency Response**
50 - 12,000 c.p.s. \pm 3db. at 7 $\frac{1}{2}$ i.p.s.
50 - 7,000 c.p.s. \pm 3db. at 3 $\frac{3}{4}$ i.p.s.
- ★ **Ten-inch Loudspeaker**
- ★ **Autostop**
- ★ **Two-stage Capstan**
- ★ **'Fingertip' Control**
- ★ **Three Motor Drive**
- ★ **10 watts p.p. output**
- ★ **Independent
Bass & Treble**
- ★ **Twin-track recording**
- ★ **High Fidelity Amplifier**
can be used independently of the recorder
for P.A., Radio or Record Reproduction.

85 gns.

H. P. FACILITIES
WITH PLEASURE

The NEW SIMON Model SP/2 Tape Recorder is designed and built to top standards. Years of specialist experience in the field of sound-recording engineering and techniques have been combined to produce an entirely new equipment which is faultless in performance and appearance. The SP/2 provides superb recording and reproduction facilities. Ask your dealer to show you the new SP/2 now...



The inside story...

Ask for a copy of the new booklet — "Affairs of Tape", free of course. Brings you up to date on Tape Recording — gives you the inside story of the SP/2.

Simon is Sound recording

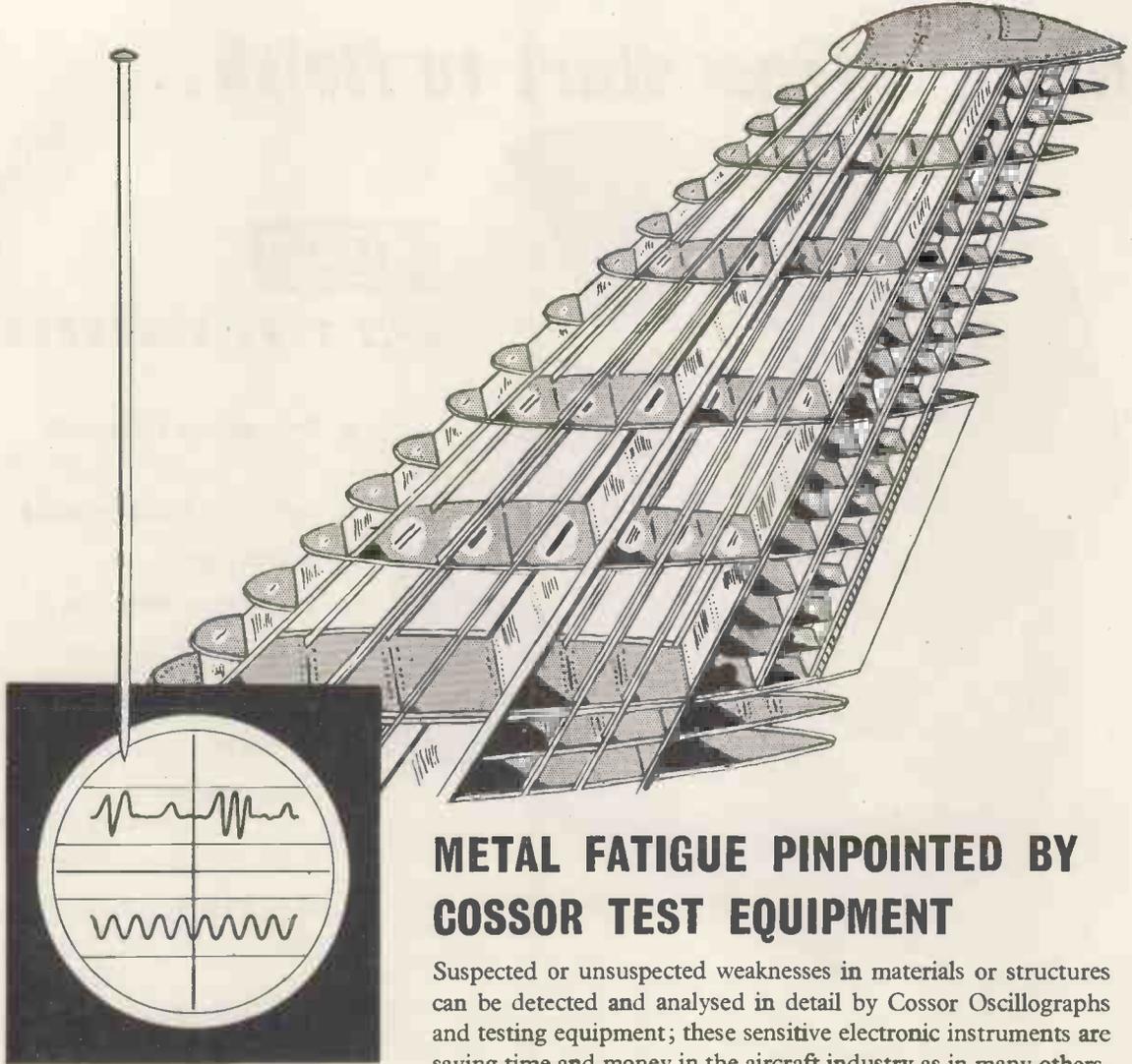
SIMON SOUND SERVICE LTD.
46-50 GEORGE STREET, LONDON, W.1. WELbeck 2371 (5 lines)

WE SHALL BE AT THE



EARLS COURT
Aug 24-Sept 3

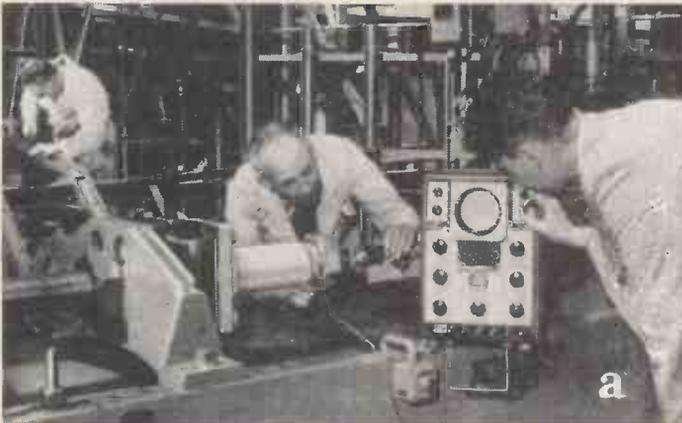
STAND 10



METAL FATIGUE PINPOINTED BY COSSOR TEST EQUIPMENT

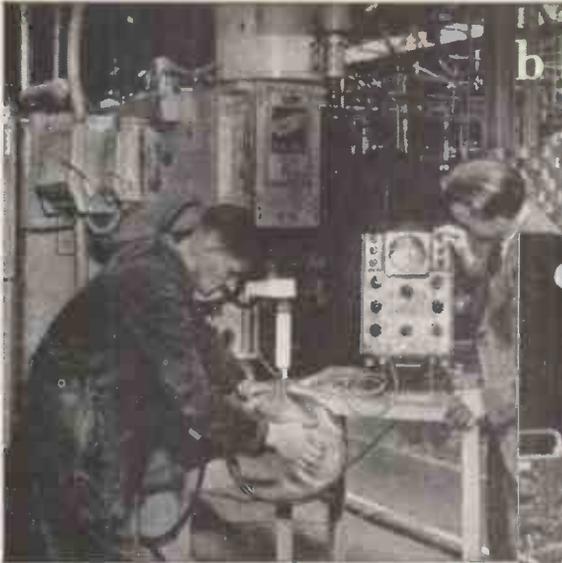
Suspected or unsuspected weaknesses in materials or structures can be detected and analysed in detail by Cossor Oscillographs and testing equipment; these sensitive electronic instruments are saving time and money in the aircraft industry as in many others.

A practical demonstration of an oscillograph in conjunction with a dynamic model of the Vickers Supermarine "Swift" can be seen on the Cossor Stand (No. 63) at the Farnborough Air Display.

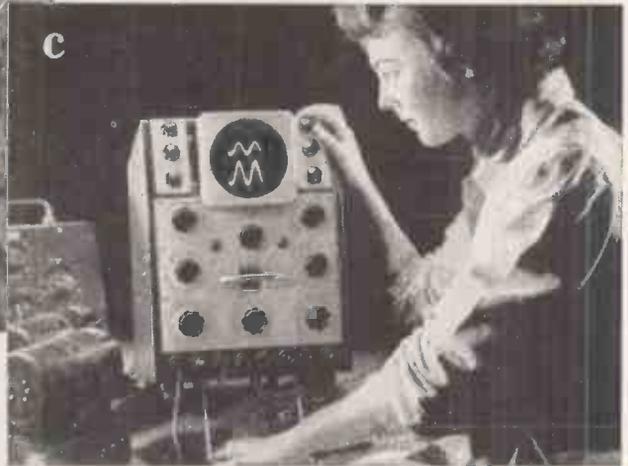


a Investigation of fatigue behaviour in aircraft structural components is carried out with this pulsator. Steady tensile loads of up to 20 tons per sq. in. may be applied to which can be added oscillatory stresses of up to 10 tons per sq. in. The Cossor Oscillograph displays the output of the exploring strain gauges. Photograph by courtesy of Saunders-Roe, Ltd.

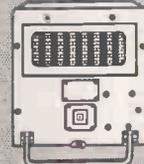
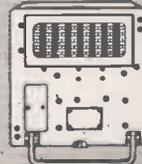
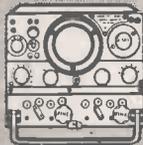
SEE THE COSSOR TEST EQUIPMENT IN OPERATION ON STAND No. 63
THE COSSOR GROUP OF COMPANIES • Highbury Grove • London • N.5
 A. C. COSSOR LTD • COSSOR RADAR LTD • COSSOR INSTRUMENTS LTD • STERLING CABLE CO. LTD
 BEST PRODUCTS LTD • COSSOR (CANADA) LTD • BEAM INSTRUMENTS CORPORATION (U.S.A.)



b The Cossor Model 1049 Double Beam Oscillograph is displaying the onload waveform of the welding current through a starter fairing of a Rolls-Royce "Avon" engine. Photograph by courtesy of Rolls-Royce Ltd.



c The Cossor Model 1049 Double Beam Oscillograph displays the output of the twin inverters under test at the works of Sir W. G. Armstrong-Whitworth Aircraft Ltd. Photograph by courtesy of Sir W. G. Armstrong-Whitworth Aircraft Ltd.



Transponder Surveillance Radar is a Secondary Radar system. This new Cossor development employs a ground interrogator pulse transmitter with an airborne transponder and gives greatly increased operational range.

The latest airborne equipment for reliable navigation is the Gee Mk. III produced by Cossor for use in the Gee system of hyperbolic navigation. It is used extensively by the R.A.F. and continental air forces and by Aer Lingus.

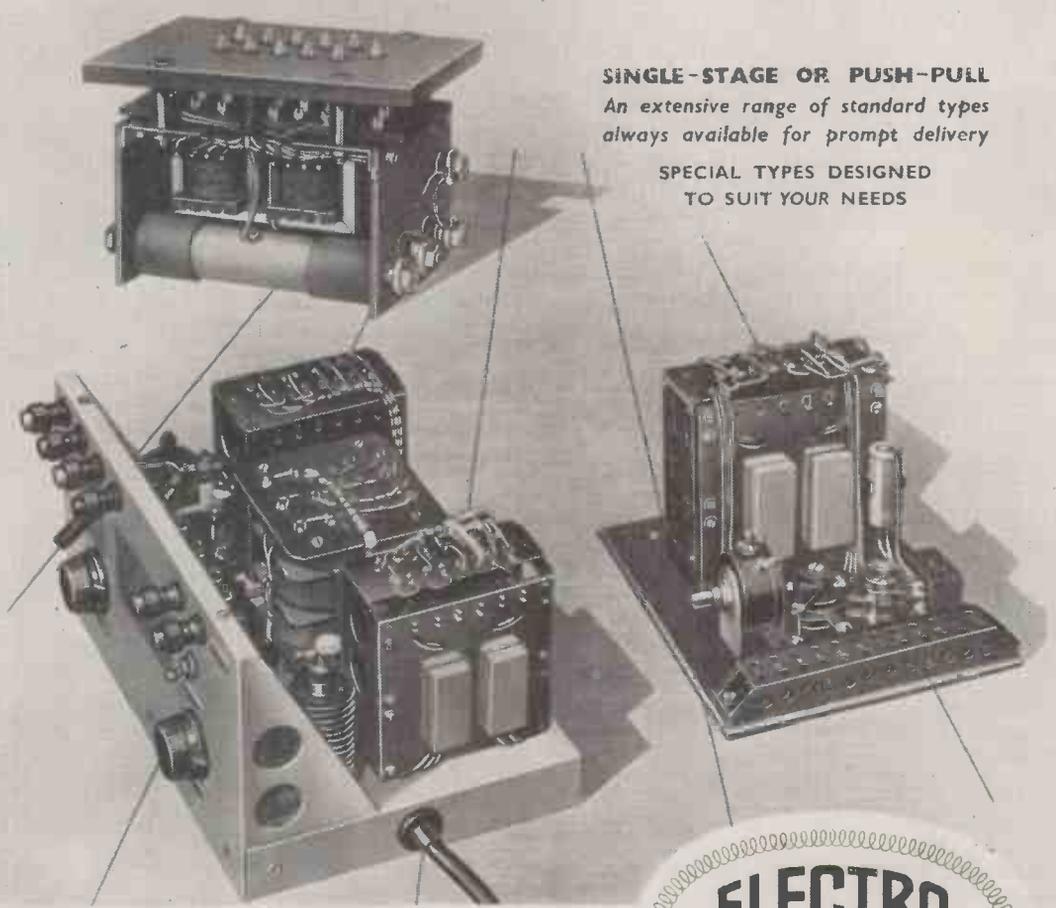
Now installed at London Airport, Zurich Airport and on Royal Dutch Air Force aerodromes, Cossor Airfield Surveillance Radar (ACR Mk. VI) gives permanent-echo cancellation, C.R.D.F. superimposition, 60 miles' range and video mapping. A full scale A.C.R. rotating Scanner, in conjunction with a Secondary Radar aerial, will be on show in the Equipment Park at the Air Display.



COSSOR

AT THE S.B.A.C. DISPLAY FARNBOROUGH
5th - 11th SEPTEMBER

HIGH-STABILITY Magnetic Amplifiers



SINGLE-STAGE OR PUSH-PULL

An extensive range of standard types
always available for prompt delivery

SPECIAL TYPES DESIGNED
TO SUIT YOUR NEEDS

THE WORLD-RENOWNED SPECIALIST DESIGNERS
AND MANUFACTURERS OF MAGNETIC AMPLIFIERS

**ELECTRO
METHODS**

LTD

OF STEVENAGE

Now FREE to all!

THE E-M TECHNICAL ADVISORY SERVICE

Regardless of whether your magnetic amplifier problem is simple or complex, the fact remains that the only reliable solution is that which entirely eliminates risk.

We therefore respectfully invite you to avail yourself of the wide resources of technical knowledge and practical experience possessed by the specialist technicians of our Magnetic Amplifier Division.

Full technical data
and illustrated leaflets
promptly forwarded
on request!

ELECTRO METHODS LTD. 12-36 CAXTON WAY, STEVENAGE, HERTS. Phone: STEVENAGE 780

Reflectograph

present the new R.R. (Record/Reproducer) Series 100 Magnetic Tape Recorder—an instrument of advanced circuit design and flexibility, with the following outstanding features:—



FULLY TRANSISTORIZED PLAYBACK AMPLIFIER

Two Frequency Ranges:—
60—12,000 cycles \pm 3dB.
D.C. Levels to 100 cycles (-3 dB)

Separate Record and Playback Amplifiers.

Full Monitoring facilities during Recording.

Continuously Variable Tape Speed from 3.75" to 8.50" per sec.

New type Carrying Case with hinged bottom, permitting immediate access to interior of instrument for the storage of accessories and for inspection of electrical and mechanical units.

IN THIS RECORDER no output stage is fitted; instead, a separate record and playback amplifier are provided delivering an equalized output of 300mV (Peak). During recording, the instrument operates from the mains supply in the conventional manner. On playback, however, all power supplies are switched off with the exception of the mains to the tape drive mechanism. The playback amplifier then operates from a small dry battery and so permits the full advantage of low noise and "hum" to be obtained from this unit during the playback function. The record level meter is switched to read "Transistor D.C. volts," "Record head bias volts," and "Record level," while, due to the unique design of the carrying case, all preset controls, mechanical and electrical units, are immediately accessible by unlocking and swinging down the hinged bottom.

The tape rewind is electrically interlocked with the record/playback switch to avoid accidental erasure during rewind, and coloured signal lamps indicate the record and playback functions.

In the home, when recording from an F.M. transmission, this instrument permits a playback quality virtually indistinguishable from the original signal, while in industry and research with the addition of the Model "T" sub-unit which plugs into the input and output sockets of the recorder, signals of D.C. levels and up to 100 cycles (-3 dB) may be recorded.

The new R.R. Series 100 may be seen, heard and demonstrated with other models in the Reflectograph range on Stand No. 208 at the National Radio Show, Earls Court.

RUDMAN DARLINGTON (ELECTRONICS) LTD

Wednesfield, Staffs. Tel: Wolverhampton 31704

good magnetic
characteristics

demand

PRECISE ELECTRICAL INSPECTION



Standard maintains its established leadership in the manufacture of high permeability magnetic alloys by constant vigilance in the control of each and every production process, one of which is illustrated here. Produced by a Company which has the unique advantage of being a large-scale user of its own magnetic materials, a long experience of the applications of these materials gives full appreciation of the properties essential for uniform electrical characteristics and stable performance.

It will pay you to investigate the capabilities of *Standard* magnetic alloys with relation to your specific requirements.

- PERMALLOY 'C' for highest initial permeability, useful for wide-band frequency transformers, current transformers, chokes, relays and magnetic shielding.
- PERMALLOY 'B' has lower initial permeability than Permalloy 'C' but higher values of flux density. Suitable where high permeability to alternating field is required superimposed upon a steady polarising field.
- PERMALLOY 'D' for very high resistivity without undue lowering of the maximum flux density. Variation of permeability with frequency is small. Ideal for H.F. applications.
- PERMALLOY 'F' for high flux density, very rectangular hysteresis loop, with a retentivity of at least 95% of its saturation value and low coercive force. Ideal for saturable reactors, magnetic amplifiers, digital computers, memory devices, etc.
- V-PERMENDUR for high permeability with a very high value of maximum flux density. Finds special application for use as high quality receiver diaphragms, also motor generators and servo-mechanisms in aircraft where weight and volume are important factors.

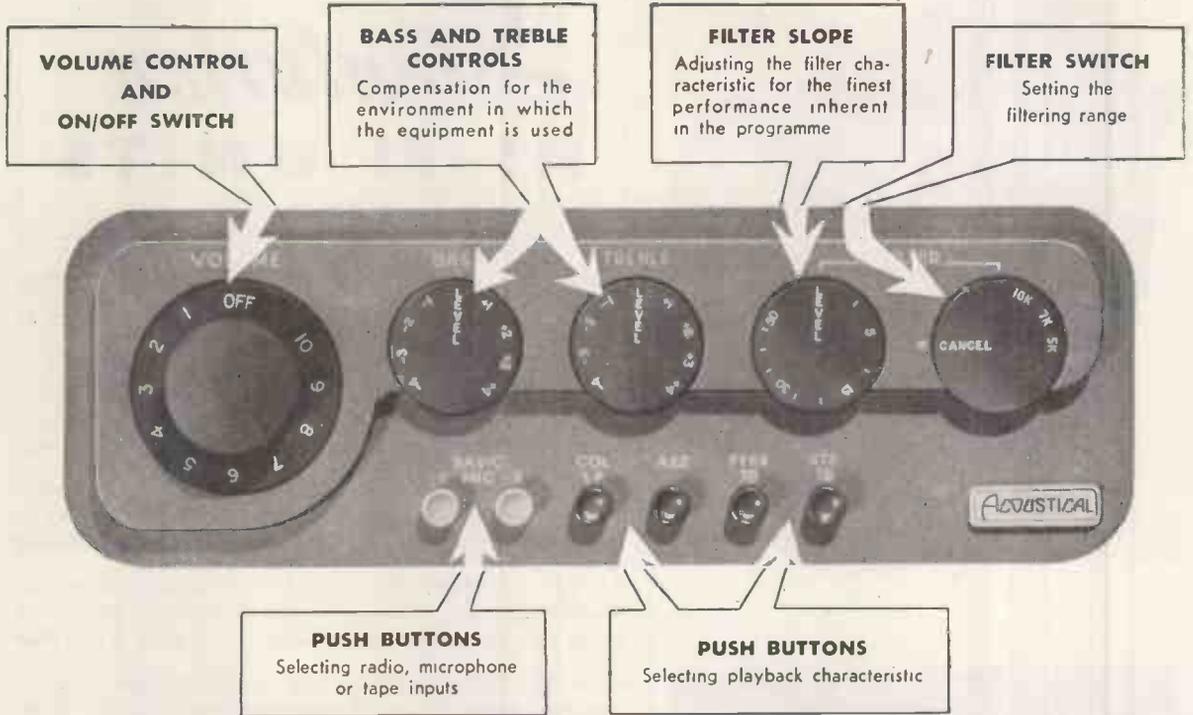


Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, W.C.2

TELEPHONE LINE DIVISION : North Woolwich, London, E.16

"Straightforward & Logical System of Control"



QUAD II CONTROL UNIT — SPECIFICATION

FREQUENCY RESPONSE :

Cancel position.

Radio & Tape inputs: 20-20,000 c/s within 0.3db.

Microphone input: 20-18,000 c/s within 1db.

Pickup Input (R.2): Within 0.5db of stated characteristics.

Other plugs, no significant change.

Bass and Treble controls: Within 1db of published curves.

Filter frequencies (ff): 5Kc/s, 7Kc/s 10Kc/s \pm 250 c/s.

Filter slope: Level to 50 db/Octave.

INPUT SENSITIVITIES (for 1.4 V.rms output):

Radio and Tape: Internal Impedance 100 K Ω : 100mV.

Microphone: " " 100 K Ω : 1.5mV.

Pickup: " " to suit pickup in use, adapted by plug-in unit.

DISTORTION (1.4 V output):

All controls 'level', Radio input or R.2 pickup input: 0.02% approx.

Least favourable arrangement of plugs and controls: less than 0.1%

POWER SUPPLY :

The unit takes its power from the main amplifier.

330 V 2 mA } Plus currents taken by tuner units which may be
6.3 V 1 A } connected to sockets provided.

Maximum power available from tuner sockets:
330 V 30 mA (each tuner)
6.3 V 2.5 A (total) The heater supply is C.T. to chassis.

VALVES :

1 x EF.86 (Z.729 or 6267), 1 x ECC.83 (12AX7) (ECC.81, B309 or 12AT7 with changed bias resistor).

BACKGROUND :

—70 db or where applicable, approximately 6 db above equivalent thermal noise of input impedance.

MECHANICAL :

Front panel: Die-cast, stove finished silvered fawn, machine engraved.

Knobs: Aluminium, stoved matt brown, machine engraved.

Chassis and Cover: Steel, rust-proof processed, stoved steel grey. The complete unit, electrically and mechanically is fully tropical and suitable for all climatic conditions.

DIMENSIONS :

10½" x 3½" x 6½".

WEIGHT :

7 lbs. nett. (3.15 Kg.).



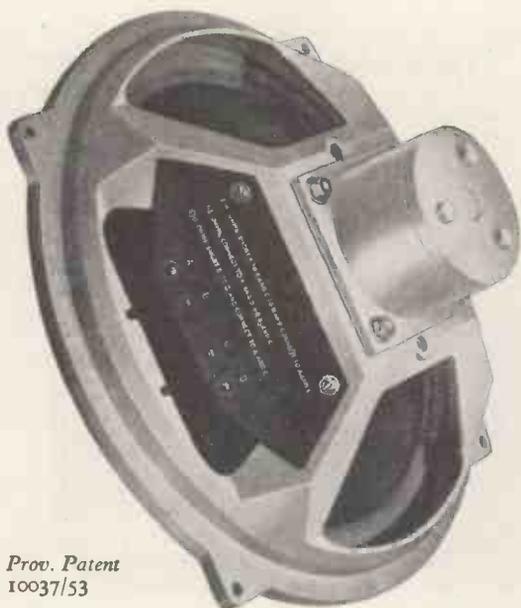
QUAD II

Send for illustrated brochure giving full details of the QUAD II Amplifier.

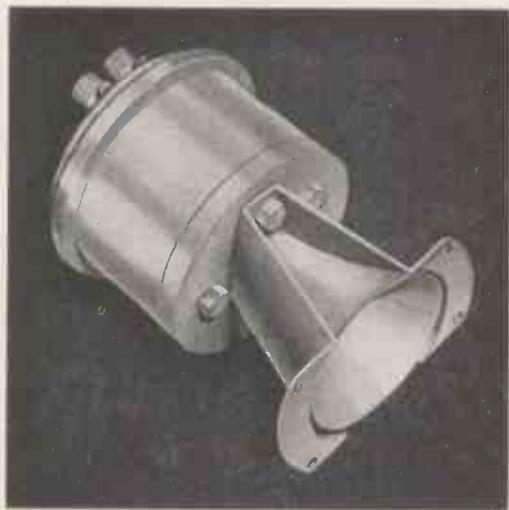
... for the closest approach to the original sound.

★ HIGH FIDELITY AT

acclaimed by leading experts



Prov. Patent
10037/53



Stentorian HI-FI UNITS

INCORPORATING THE PATENTED CAMBRIC CONE & UNIVERSAL IMPEDANCE SPEECH COIL AT 3, 7.5 AND 15 OHMS

H.F. 1012 10" Die-cast unit, incorporating 12,000 gauss magnet. Handling capacity, 10 watts. Frequency response, 30 c.p.s.—14,000 c.p.s. Bass resonance, 35 c.p.s. **£4. 17. 6 TAX PAID**

H.F. 812 Die-cast 8" unit, incorporating 12,000 gauss magnet. Handling capacity, 5 watts. Frequency response, 50 c.p.s.—12,000 c.p.s. Bass resonance, 65 c.p.s. **£4. 2. 9 TAX PAID**

H.F. 912 9" Die-cast unit, incorporating 12,000 gauss magnet. Handling capacity, 7 watts. Frequency response, 40 c.p.s.—13,000 c.p.s. Bass resonance, 45 c.p.s. **£4. 7. 3 TAX PAID**

H.F. 1214 (15 ohms only) 12" unit, Incorporating 14,000 gauss magnet. Handling capacity, 15 watts. Frequency response, 25 c.p.s.—14,000 c.p.s. Bass resonance, 39 c.p.s. Diecast chassis. **£9. 15. 6 TAX FREE**

Stentorian PRESSURE TYPE TWEETER UNITS

Provide outstanding quality of reproduction when used with Stentorian 10" or 12" Hi-fi units. Speech coil of aluminium wire, wound on aluminium former which is rigidly fixed to an aluminium diaphragm. Speech coil and diaphragm situated at the rear of magnet centre pole hollowed out to form the commencement of the Horn, in the centre of which is the phase equalizer.

T.10 Speech coil impedance: 15 or 30 ohms. Response: 2,000/14,000 c.p.s. Flux density: 14,000 gauss. Power handling capacity: 5 watts. Dispersion angle 90°. Dimensions: 4¼" long (exclusive of terminals). Distance between fixing holes: 2½" and 1½".

PRICE £4. 4. 0

T.12 Speech coil impedance: 15 ohms. Response: 3,000/17,000 c.p.s. Flux density: 16,000 gauss. Power handling capacity: 15 watts. Dispersion Angle 90°. Dimensions: 6⅞" long (exclusive of terminals). Distance between fixing holes: 4" and 2¼".

PRICE £12. 12. 0

A suitable cross-over network at 30/- is available.

WHITELEY ELECTRICAL RADIO CO. LTD

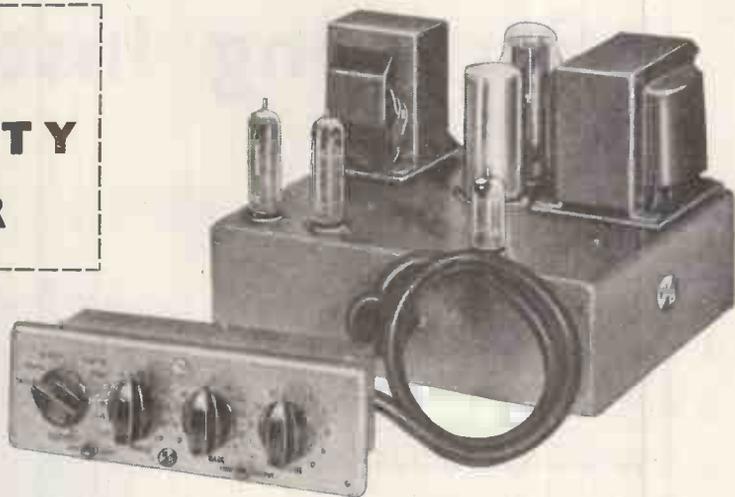


REALISTIC COST ★

THE WB12 HIGH FIDELITY AMPLIFIER

Thirty years' manufacturing experience of sound reproduction equipment is embodied in the development of this amplifier — the technical details will satisfy the most critical user. Employing the most recently developed valves, it has a low noise input circuit, feeding the double triode phase splitter, and a push-pull output stage, ultra-linear connected, using a specially designed Whiteley Output Transformer. 25 db negative feed back is applied over the main amplifier. Switched pick-up matching is incorporated in an extremely flexible, compact and easily mounted pre-amplifier tone control unit. Both units are attractively styled and finished in hammered gold.

This equipment, when used in conjunction with Stentorian Speakers, provides most outstanding reproduction.



Price £25 complete

MAIN AMPLIFIER

Power Output	12 watts
Distortion	400 c/s 0.2% 1,000 c/s 0.12%
Frequency Response	+ .15 db 20-20,000 c/s
Negative Feedback	25 db
Hum and Noise	—80 db relative to 10W
Output Tappings	3-4 ohms and 15 ohms

VALVES

GZ.32	2 X EL.84	2 X ECC.83
Power Supply for feeder available	6.3V, 1.5A, 50mA at 300V	

SPECIFICATION

CONTROL UNIT

Input Sensitivity for 10W	50mV
Hum and Noise relative to 10W	—72 db
Bass Control	Continuously variable from +11 db to —11 db at 30 c/s
Treble Control	Continuously variable from +10 db to —10 db at 10K c/s
Switched Input for Radio Feeder, Pickup and Tape	

NEW! An outstanding addition to the Whiteley range of High Fidelity equipment is the new F.M. Tuner, designed to take full advantage of the V.H.F. transmissions with their extended frequency range and absence of background and noise.

Attractively styled, it is tunable to cover present and proposed frequencies, and will operate efficiently with any good quality audio amplifier — particularly the W.B.12, which was designed with ample spare power for this purpose.

Maximum freedom from frequency drift has been ensured by the use of temperature-compensated circuits, while tuning is simple and positive, aided by the tuning indicator.

MANSFIELD · NOTTS

EASILY ASSEMBLED BASS REFLEX CONSOLE CABINET

This very attractive cabinet in highly polished walnut veneer is specially designed for use with Stentorian 10" or 12" units. Takes only a few minutes to assemble, the only tool required being a screwdriver. The sub-baffle has additional provision for Tweeter Unit if required. Size: 32 in. x 22 in. x 16 in. Supplied packed flat, complete with screws.

£10. 10. 0

CORNER CONSOLE CABINET for use with 8" HI-FI Cambric Cone Unit.

£5. 10. 0



★ See and hear them on Stand 25 at the Radio Show: alternatively, they may be heard at our London Office (109 Kingsway, W.C.2) any Saturday from 9 a.m. to noon.



A COMPLETE Television Servicing Instrument

Incorporating :—

- ★ WOBBLULATOR
- ★ PATTERN GENERATOR
- ★ A.M. SIGNAL GENERATOR
- ★ C.W. SIGNAL GENERATOR
- ★ L.F. OSCILLATOR
- ★ OSCILLOSCOPE
- ★ E.H.T. VOLTMETER
- ★ A.C. & D.C. VALVE VOLT-METER



THE **AIRMEC** **TELE VET TYPE 877** illustrated above, provides every facility needed for completely CHECKING, REPAIRING, OVERHAULING and ALIGNING Television Sets. It has the following :—

- CRYSTAL CALIBRATION
- CAN BE USED WITH BOTH A.C. & A.C./D.C. TYPE SETS
- COMPLETELY PORTABLE — WEIGHT 25 LBS.
- COVERS BANDS I & III

Come and use this instrument at our Stand No. 108 at the NATIONAL RADIO and TELEVISION EXHIBITION, August 24th to September 3rd

£66-10-0 Write now for full details to

LIST PRICE

AIRMEC

L I M I T E D

HIGH WYCOMBE

Telephone : High Wycombe 2060

— BUCKINGHAMSHIRE

Cables : Airmec, High Wycombe



THE
Concertone



for

Incomparable

★ *perfection* ★

and

★ *fidelity* ★

in

TAPE RECORDING



48 GNS.
COMPLETE

TRADE
ENQUIRIES
INVITED

MAGNETIC RECORDER

Meticulously recording every tonal facet with complete mastery, the "Concertone" tape recorder will give you the ultimate listening pleasure that comes from superb music faultlessly recorded and reproduced.

The "Concertone" will re-create, in the home, the true image of the original performance. Whether it be Solo Violin, or Oboe, or a Full Organ with its demanding power and range, the "Concertone" with its wide frequency response, and extended dynamic range, will satisfy the connoisseur of fine music.

Simple, absolutely reliable, rugged, compact, lightweight, and easily portable, the "Concertone" will, wherever there are sounds to be recorded, serve faithfully, earning, justly, unqualified praise for its faultless performance.

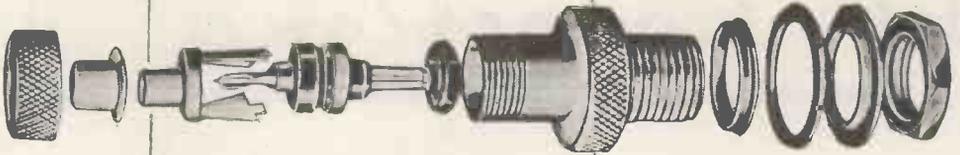
Manufactured by the company in its own precision machine shop, the tape mechanism employs three motors and a special design servomatic brake. The brake not only locks the spools securely during transit but, of greater importance, it is completely free from fade, being self-compensating for wear. Unique is the provision of a mechanical interlock which prevents faulty operation.

All Export enquiries to :—
BARNETT SHIPPING CO.
25 MONUMENT ST.,
LONDON, E.C.3

Entirely Manufactured by
FISHER ELECTRONICS COMPANY LTD.

**ASK YOUR DEALER FOR
A LEAFLET. IN CASE OF
DIFFICULTY WRITE
DIRECT (s.a.e. please).**

70 BREWER STREET · LONDON · W.1 TELEPHONE · GERRARD 3376



MINIATURE

CO-AXIAL SEALED PLUGS AND SOCKETS



732560

732557



732561

732558



732564

732563



732562

732559

**TYPE APPROVED—
COMPLYING WITH R.C.S. 322
PRESSURE SEALED AND
100% TESTED
USED WITH UNIRADIO 43 CABLE**

EXNING RD., NEWMARKET

A.I.D. & A.R.B. - APPROVED

**POWER CONTROLS
LIMITED**

PHONE: NEW 3181/2/3



SCALAMP FLUXMETER

Excellent design and the selection of the most suitable materials are combined to give this new FLUXMETER a truly outstanding performance. The drift rate with a search coil of 10 ohms or less is 0.1 per cent. A two speed "return-to-zero" control is fitted enabling measurements to be made with rapidity and ease. A spirit level and levelling feet facilitate setting-up and the automatic and manual coil clamps safeguard the suspension in transit. The illumination of the lamp bulb is effected either by an external 4-volt battery or by mains supply through the built-in transformer. Two search coils of mean diameter 1 cm and of area turns of 10 or 100 sq. cm are available.

Please write for our descriptive leaflet quoting Cat. No. W.W. 8834

OUR NEW ILLUSTRATED CATALOGUE IS AVAILABLE ON REQUEST

SCIENTIFIC  INSTRUMENTS

W. G. PYE & CO. LTD., GRANTA WORKS, CAMBRIDGE, ENGLAND

WG.55

7.5 to 250 Mc/s
ON FUNDAMENTALS
IN FIVE RANGES
SINE AND
SQUARE WAVE
MODULATION
R.F. OUTPUT
1 μ V to 100 mV

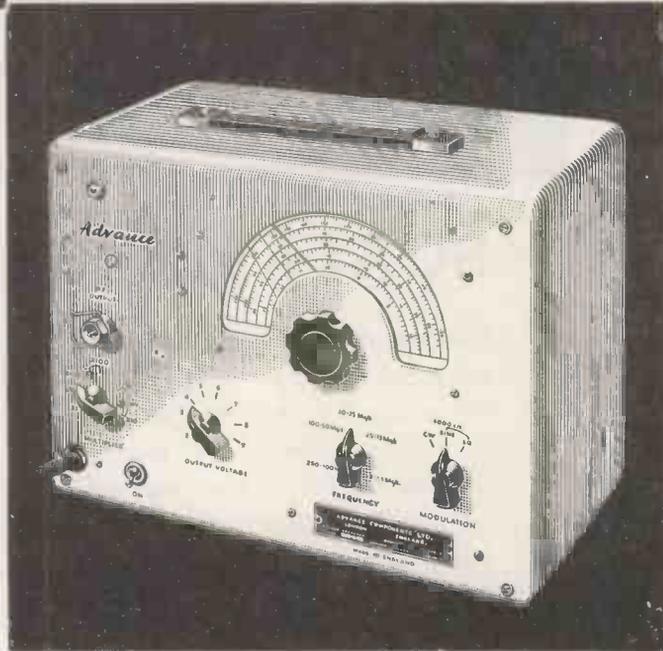
Advance

MODEL Q1
V.H.F. SIGNAL GENERATOR

£45

(List price in U.K.)

This "Advance" V.H.F. Signal Generator covers 7.5 to 250 Mc/s, a range that embraces Bands 1 and 2 and also the impending Very High Frequency Television Transmissions on Band 3. Moreover, this instrument is available at a price well within the reach of every service man. In the traditional "Advance" manner, this instrument is designed for simple operation and with a versatility that not only fulfils present needs, but anticipates the even more exacting requirements to deal with the television test problems of tomorrow.



Below are some outstanding features :-

- WIDE RANGE—7.5 to 250 Mc/s
- SINE AND SQUARE WAVE MODULATION
- RELIABLE ATTENUATION
- LOW LEAKAGE—less than 3 microvolts
- TRULY PORTABLE—weighs only 17 lbs.
- COMPETITIVE PRICE



The Q1 provides the ideal complement to the Model E2. These together give complete coverage from 100 kc/s to 250 Mc/s.

Full technical details available in Folder W23 on request.

'Araldite'

epoxy casting resins

epoxy

epoxies

'Araldite'

'Araldite'

epoxy resin adhesives

epoxy surface coating resins

'Araldite'

'Araldite'

- These versatile resins have a remarkable range of characteristics and uses.*
 They are used
- * for bonding metals and ceramics.
 - * for potting and sealing electrical components.
 - * for producing glass cloth laminates.
 - * for producing jigs, fixtures, patterns and tools.
 - * as fillers for sheet metal work.
 - * as protective coatings for metal surfaces.

ing resins

epoxy casting resins

'Araldite'

Araldite is a Registered Trade Mark

FULL DETAILS WILL BE SENT GLADLY ON REQUEST

Aero Research Limited

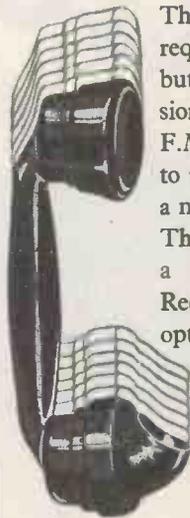
A Giba Company

Duxford Cambridge. Telephone : Sawston 187

AP 264-141A



**POINT-TO-POINT FM V.H.F.
RADIO TELEPHONE LINK**



There are many V.H.F. links which require one channel only in the first place but where, after a year or two, an expansion of traffic is anticipated. The Pye F.M. link system with a capacity for up to 7-channels is well suited to meet such a need.

The equipment illustrated comprises a complete radio terminal including Receiver, 10 watt Transmitter and an optional 50 watt Amplifier.



Abbreviated Specification

Frequency range 60–216 mc/s
Transmitter output Power 10 watts, or
 with Amplifier Unit—50 watts
Maximum Deviation 50 kc/s

Overall Transmitter-Receiver Performance

Frequency Response 300 c/s–6 kc/s ± 3 db
 6 kc/s–36 kc/s ± 1 db
Intermodulation Level At least -55 dbm
 for 2 tones applied each at 0 dbm
Receiver Bandwidth 6 db down ± 120 kc/s



Telecommunications

CAMBRIDGE ENGLAND



<p>Pye New Zealand Ltd. Auckland C.I., New Zealand</p> <p>Pye Radio & Television (Pty.) Ltd. Johannesburg South Africa</p>	<p>Pye Canada Ltd. Ajax, Canada</p> <p>Pye Limited Plaza de Necaxa 7 Mexico 5</p>	<p>Pye-Electronic Pty., Ltd. Melbourne, Australia</p> <p>Pye Limited Tucuman 829 Buenos Aires</p>	<p>Pye Ireland, Ltd. Dublin, Eire</p> <p>Pye Limited 5th Avenue Building 200, 5th Avenue, New York</p>
<p>PYE LIMITED . . . CAMBRIDGE . . . ENGLAND</p>			



NEW RCA SSB-1 TRANSCEIVER OPENS A NEW ERA IN LOW-COST HF COMMUNICATION

COMPACT NEW RCA SSB-1 is only 24 1/8" high, 22 3/8" wide, 16 1/2" deep. Ideal for simplex and duplex radio-telephone and radiotelegraph services.



FOR THE FIRST TIME in HF Telecommunications, RCA is making available the proved advantages of single-sideband communications . . . at a cost everyone can afford. This technique of communications has been used in intercontinental telephony since 1926, but never before has it been offered at such a low price.

Another advantage that will be welcomed by users of high frequency telephony and telegraphy is the extremely simple operation of RCA's new SSB-1. And of course, the SSB-1 offers you the practicality and dependability that have made RCA communications equipment world-famous. For full details, see your RCA distributor or write for free booklet today!

THE 60-WATT SSB-1 GIVES YOU THESE 6 BIG FEATURES:

1. **SPECTRUM CONSERVATION**—Uses less than 1/2 frequency bandwidth of conventional AM.
2. **HIGHER EFFECTIVENESS**—60-Watt SSB-1 is equal to 500-Watt conventional AM Transmitter.
3. **REDUCTION OF DISTORTION AND INTERFERENCE**—50% less interference than conventional AM.
4. **VERSATILITY**—Four channels, telegraphy and telephony.
5. **SIMPLICITY**—Does not require a technical operator.
6. **ECONOMY**—Low initial and operating costs.

FREE

Send for booklet giving full details of the new RCA SSB-1. Write:



TRADEMARK(S) & REGISTERED
MARCA(S) REGISTRADA(S)



**RCA INTERNATIONAL DIVISION
RADIO CORPORATION of AMERICA
30 ROCKEFELLER PLAZA, NEW YORK, N. Y., U. S. A.**

This
ALUMINIZED
Picture tube gives



60% brighter pictures
more contrast
extra tube life

AN Ediswan Mazda aluminized picture tube gives a picture 60% brighter and more contrasty than is possible with an ordinary tube.

In addition, Ediswan aluminizing protects the screen from ion burn and, with the new Ediswan ion trap tetrode gun to protect the cathode, tube life is increased.

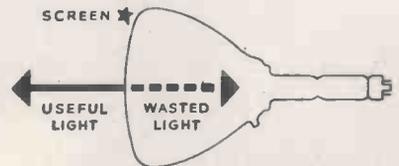
Ediswan production methods, which include the special in-line vacuumizing system, ensure a higher, more uniform standard of lasting efficiency. For complete satisfaction demonstrate and recommend Ediswan Mazda aluminized picture tubes.

EDISWAN
 M A Z D A

ALUMINIZED CATHODE RAY TUBES

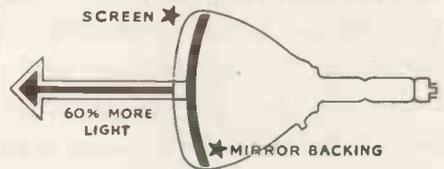
THE EDISON SWAN ELECTRIC COMPANY LIMITED,
 155 Charing Cross Road, London, W.C.2 and Branches.

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



WITHOUT ALUMINIZING

Without aluminizing, tubes waste half their light (see diagram above). To counteract this the brilliance must be increased and the tube life is shortened.



WITH EDISWAN ALUMINIZING

Ediswan aluminized tubes have a mirror backing to the screen. All the light is thus thrown forwards giving brighter, clearer pictures and extra life.

NATION WIDE SERVICE

6 fully equipped cathode ray tube service depots provide better, quicker tube testing should the need arise. Stocks of tubes are available in 26 Ediswan Offices. Only Ediswan give such complete backing to the Trade.

TAYLOR TUNNICLIFF

Makers of Porcelain Insulation

Low

Loss

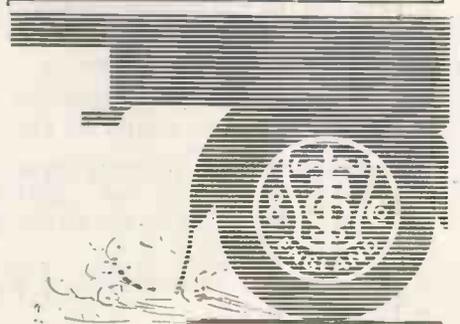


Ceramics

ANOTHER BATCH OF THE FINEST
QUALITY CERAMIC INSULATORS . . .

A SERVICE WHICH TT HAVE DEVELOPED
AFTER YEARS OF CONTINUOUS EXHAUSTIVE
RESEARCH.

THESE TT INSULATORS PLAY AN
IMPORTANT ROLE IN ELECTRONIC
DEVELOPMENT.



TAYLOR TUNNICLIFF (REFRACTORIES) LTD.

ALBION WORKS · LONGTON · STOKE-ON-TRENT

Telephone : Longton 33122

London Office: 125 HIGH HOLBORN, LONDON, W.C.1. Tel. Holborn 1951/2

ZEDES (SWISS)

The Ideal Soldering-Iron for the Telephone and Radio Industries



ZEDES Soldering-Irons have been manufactured for 25 years ; numerous factories use hundreds daily.

ZEDES (SWISS)

The most efficient Soldering-Iron for medium and heavy work
THE FOUR OUTSTANDING ADVANTAGES ARE

- 1** Minimum loss of heat. The heating-unit transmits the heat directly to the copper head, thus practically eliminating any loss of heat before contacting the soldering surface.
- 2** Full protection against oxidation. Owing to a special chemical treatment, the copper heads of ZEDES Soldering-Irons are fully protected against oxidation.
- 3** Easy interchangeability of copper heads. The broad or pointed shaped heads can easily be changed in a few seconds.
- 4** Complete security against overheating and over-voltage due to heating when not in use. ZEDES is the only Soldering-Iron which stands red-hot heat without causing damage.

As easily as the ZEDES is held in the hand, just so reliable is its work.

OBTAINABLE THROUGH REPUTABLE ELECTRICAL AND TOOL DEALERS OR DIRECT FROM SOLE U.K. CONCESSIONAIRES :

A. B. HOBBS & CO. (WW)

214 HATFIELD ROAD, ST. ALBANS, HERTS.

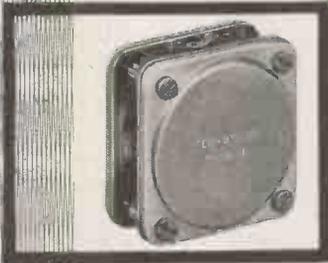
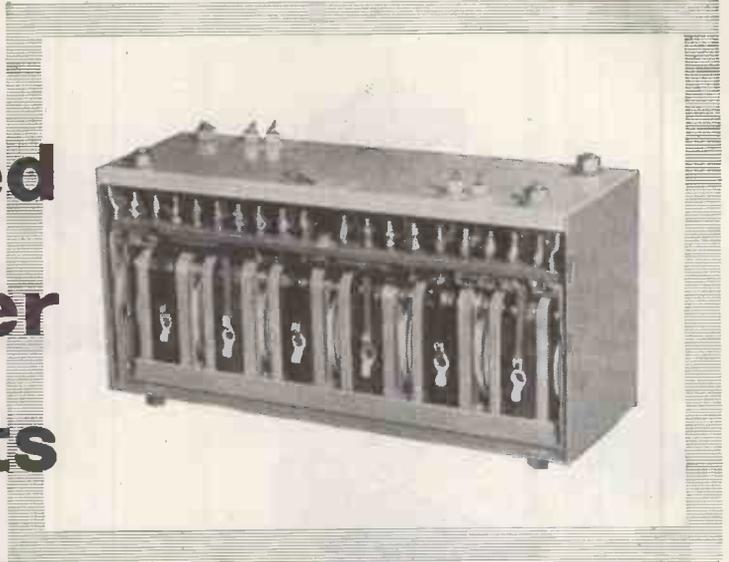
PHONE : ST. ALBANS 1730

GRAMS : "HOBBCO, ST. ALBANS"

TRADE ENQUIRIES INVITED

Send for Descriptive Leaflet

Improved filter units



with Ferroxcube pot cores

- 1 *High performance combined with small size and light weight.*
- 2 *Designed and built to customers' individual requirements.*
- 3 *Long term stability, even under conditions of temperature variation.*

High quality electrical filter units built around Ferroxcube cores can now be supplied to communications equipment designers' individual specifications. These filter units have significant advantages over comparable types designed without the use of Ferroxcube, particularly in the frequency range 300 c/s to 500 kc/s. For audio frequencies the use of Ferroxcube cores permits the winding of compact coils with very high inductances. This results in a considerable reduction in the size and cost of the associated condensers and hence of the filter unit as a whole. The high Q values obtained for a given volume, especially above 10 kc/s, enable sharp cut off characteristics and low pass-band losses to be achieved, while negligible stray flux facilitates the production of compact and mechanically robust filters. Electrical filter units are among a number of high quality components now being made available by Mullard. Full details of the complete series of components will be gladly supplied upon request.

Mullard

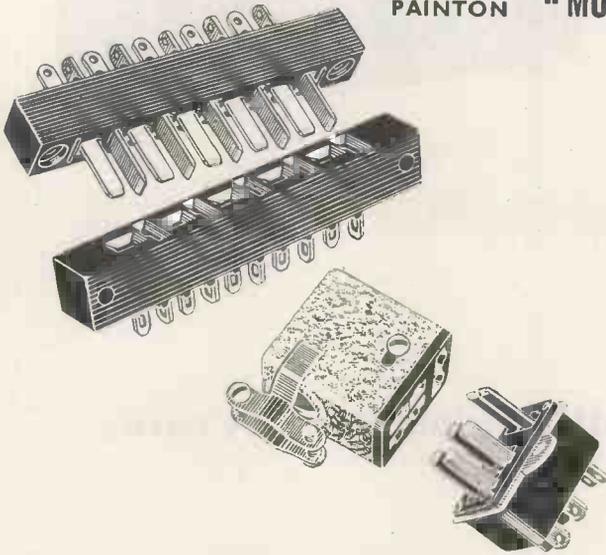


'Ticonal' permanent magnets
Magnadur ceramic magnets
Ferroxcube magnetic cores.



By Appointment to the Professional Engineer

PAINTON "MULTICON" PLUGS AND SOCKETS



COMMERCIAL RANGE

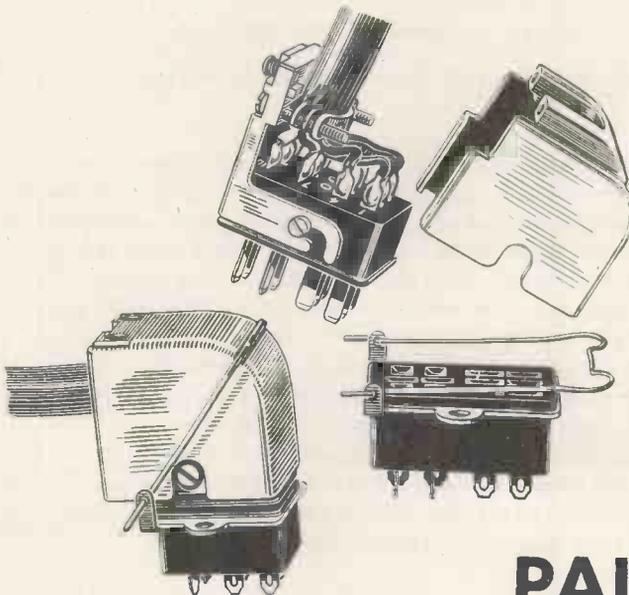
2 pole 4 pole 6 pole
8 pole 12 pole 18 pole
24 pole 33 pole
and 10-In-line unitor.

Voltage Rating: 500 volts.
D.C. or A.C. Peak.

Current Carrying Capacity :
5 amps. D.C. or A.C. (R.M.S.)
per contact.

Average Contact Resistance :
Less than 0.005 ohm.

Single-piece moulding ensures
satisfactory operation under
severe tropical and
climatic conditions.



SERVICES RANGE

6 pole 12 pole
18 pole 24 pole

Voltage Rating, Current
Carrying Capacity and Average
Contact Resistance are the same
as for the Commercial Range.

Two-piece die-cast cover
enables soldered joints and
cable-clamping arrangements
to be inspected easily.

Single-piece moulding ensures
tropical and climatic
performance in accordance
with RCS.321 standards.

PAINTON

Northampton England

Whatever the recorder
Choose—



— A NEW
LOW COST HIGH QUALITY

MAGNETIC RECORDING PAPER BASED TAPE

- MANUFACTURED BY ONE OF THE COUNTRY'S LEADING POWDER METALLURGICAL LABORATORIES
- MIRROR SMOOTH FINISH DESIGNED TO REDUCE FRICTION AND WEAR ON HEADS
- EMBODYING QUALITIES FOUND IN THE MORE EXPENSIVE TAPES
- 7" DIA. IMPROVED UNIVERSAL SPOOL CONTAINING 1,200 FEET
- LET THIS NEW TAPE "SPEAK FOR ITSELF"

RETAIL PRICE **£1** WITH FULL TRADE DISCOUNT

Enquiries to:—

SALFORD ELECTRICAL INSTRUMENTS LTD.

PEEL WORKS • SILK STREET • SALFORD 3 • LANC'S

LONDON OFFICE : MAGNET HOUSE • KINGSWAY • WC2 • Tel. Temple Bar 4669

A Subsidiary of THE GENERAL ELECTRIC COMPANY LTD. OF ENGLAND

STAND 47 AT THE
EARLS COURT RADIO
SHOW



Garrard
THE FINEST RECORD PLAYING
EQUIPMENT IN THE WORLD

A U D I O P E R F E C T I O N

20 Mc/s FREQUENCY MONITOR

The Automatic Frequency Monitor (20 Mc/s) is but one of a series of high grade monitors now in course of manufacture for the accurate measurement of frequency.

Employing hard valve techniques throughout, it will measure any frequency in the range 10 c/s to 20 Mc/s to an accuracy within ± 1 part in 10^6 .

The result, in decimal notation, is presented on eight panel mounted meters each scaled from 0 to 9 and the unknown frequency is automatically remeasured every few seconds.

This new equipment presents a considerable advance in frequency measuring techniques and apart from normal laboratory applications, is ideally suited for incorporation in production testing routines.

Full technical information on this and other frequency measuring equipment is available on request.



CINEMA TELEVISION LTD

A COMPANY WITHIN THE J. ARTHUR RANK ORGANISATION

WORSLEY BRIDGE ROAD · LONDON · S.E.26
HITHER GREEN 4600

SALES AND SERVICING AGENTS:

Hawnt & Co. Ltd., 59 Moor St. Birmingham, 4

Atkins, Robertson & Whiteford Ltd., 100 Torrisdale Street. Glasgow, S. 2

F. C. Robinson & Partners Ltd., 122 Seymour Grove, Old Trafford, Manchester, 16



The *PRACTICAL Hi Fi* AMPLIFIER

Close examination of the needs of the enthusiast and the engineer over a period of many years, has resulted in this superb PYE High Fidelity Amplifier—a brilliant combination of advanced technical design and complete practicability.

Four feet of linking cable are supplied for easy mounting in a wide variety of HI-FI layouts.

- ★ 12 watts undistorted output
- ★ Frequency response substantially flat from 2 to 160,000 cycles
- ★ Infinite damping factor
- ★ Ease of mounting
- ★ Handles records, tape, radio and microphone



DIMENSIONS:

PF 91

13 $\frac{1}{2}$ " x 10" x 7". 34.5 x 25.4 x 17.7 cms.

PF 91A

10 $\frac{3}{4}$ " x 3 $\frac{7}{8}$ " x 4". 25.6 x 9.2 x 10.2 cms.

5 Master controls give extreme flexibility

SELECTOR

Six positions—tape, radio, microphone and correction for all types of records.

BASS

10 indicated stages (5 cut, 5 boost), over 27 db. range. No distortion.

TREBLE

10 indicated stages (5 cut, 5 boost), over 27 db. range. No distortion.

FILTER

Cuts treble at 4,000, 7,000, and 12,000 cycles. This non-distorting device enables surface noise, high frequency interference, heterodyne whistle, etc., to be reduced.

VOLUME

Continuous volume control and on/off switch.

Pye Corporation of America,
270, Park Avenue,
New York.

Pye (New Zealand) Ltd.,
Auckland C.I.,
New Zealand.

Pye-Canada Ltd.,
Ajax,
Canada.

Pye Electronic Pty. Ltd.,
Melbourne,
Australia.

Pye (Ireland) Ltd.,
Dublin,
Eire.

Pye Limited,
Mexico
City.

Pye Radio & Television
(Pty.) Ltd.,
Johannesburg,
South Africa.

Pye Limited,
Tucuman 829,
Buenos Aires.

PYE LIMITED • CAMBRIDGE • ENGLAND

NO EXTERNAL CHANNELLING EQUIPMENT !

Standard
six channel

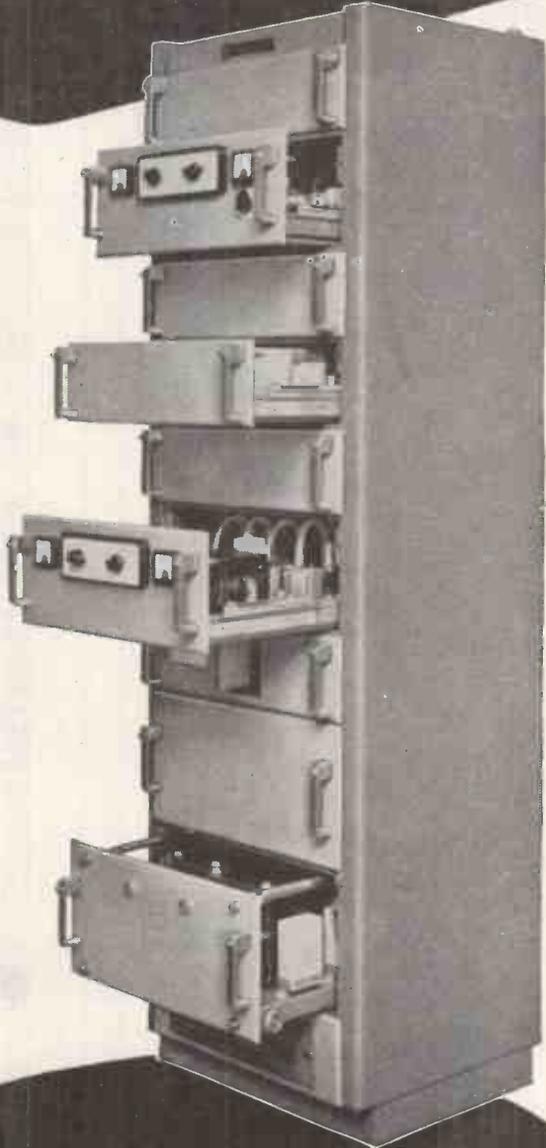
V H F
ery igh requency

radio link

type

FP 11

Six Telephone or Teleprinter Channels,
plus Independent Order Wire Circuit.
Full Supervisory and Control Facilities.
Alternative Radio Frequency Band.



**available for
early delivery**

complete in one cabinet

Write for leaflet No. 198/45.



Standard Telephones and Cables Limited

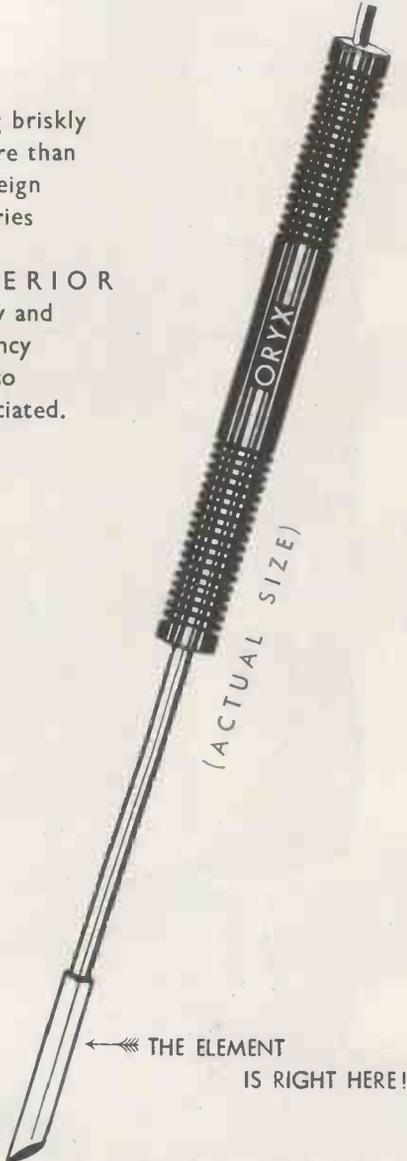
Registered Office: Connaught House, Aldwych, London, W.C.2

RADIO DIVISION Oakleigh Road • New Southgate • London • N.11

ORYX

MINIATURE
SOLDERING INSTRUMENTS

Selling briskly
in more than
16 foreign
countries
where
SUPERIOR
quality and
efficiency
are also
appreciated.



5 MODELS : BIT SIZES FROM $\frac{1}{16}$ " to $\frac{3}{16}$ "
VOLTAGES : 6, 12, 24 or 50. **PRICE 25/-**

SOLE DISTRIBUTORS:

ANTEX

3, TOWER HILL, LONDON, E.C.3 Tel. ROYAL 4439

WHY ENGINEERS SPECIFY EGEN potentiometers —

Egen Potentiometers are based on long experience of requirements of television and electronic equipment manufacturers. In design, dependability, accuracy and freedom from wear they are *outstanding*, but, above all, they are completely **NOISELESS**.



DUAL POTENTIOMETERS with concentric operating spindles. The new Egen Dual Potentiometers incorporate all these outstanding design features — multiple contact rotors, smooth easy movement, thorough screening between sections, plus a convenient soldering tag for earthing screened connections.

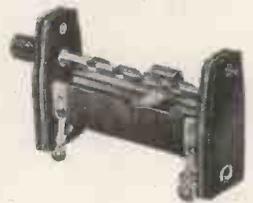
Switch and Potentiometer soldering tags are of high-grade brass heavily silver plated for easy soldering; they are positively located and withstand soldering heat and bending without loss of rigidity. Control spindles can be supplied to suit customers' requirements.

PRE-SET POTENTIOMETERS. Completely enclosed in high-grade phenolic mouldings. Solder tags heavily silver plated for quick soldering. Fully insulated spindles with integral control knobs. Tapped for 2-hole 6 B.A. fixing on $\frac{3}{8}$ " centres. Type 126, wire-wound. Type 127, carbon.

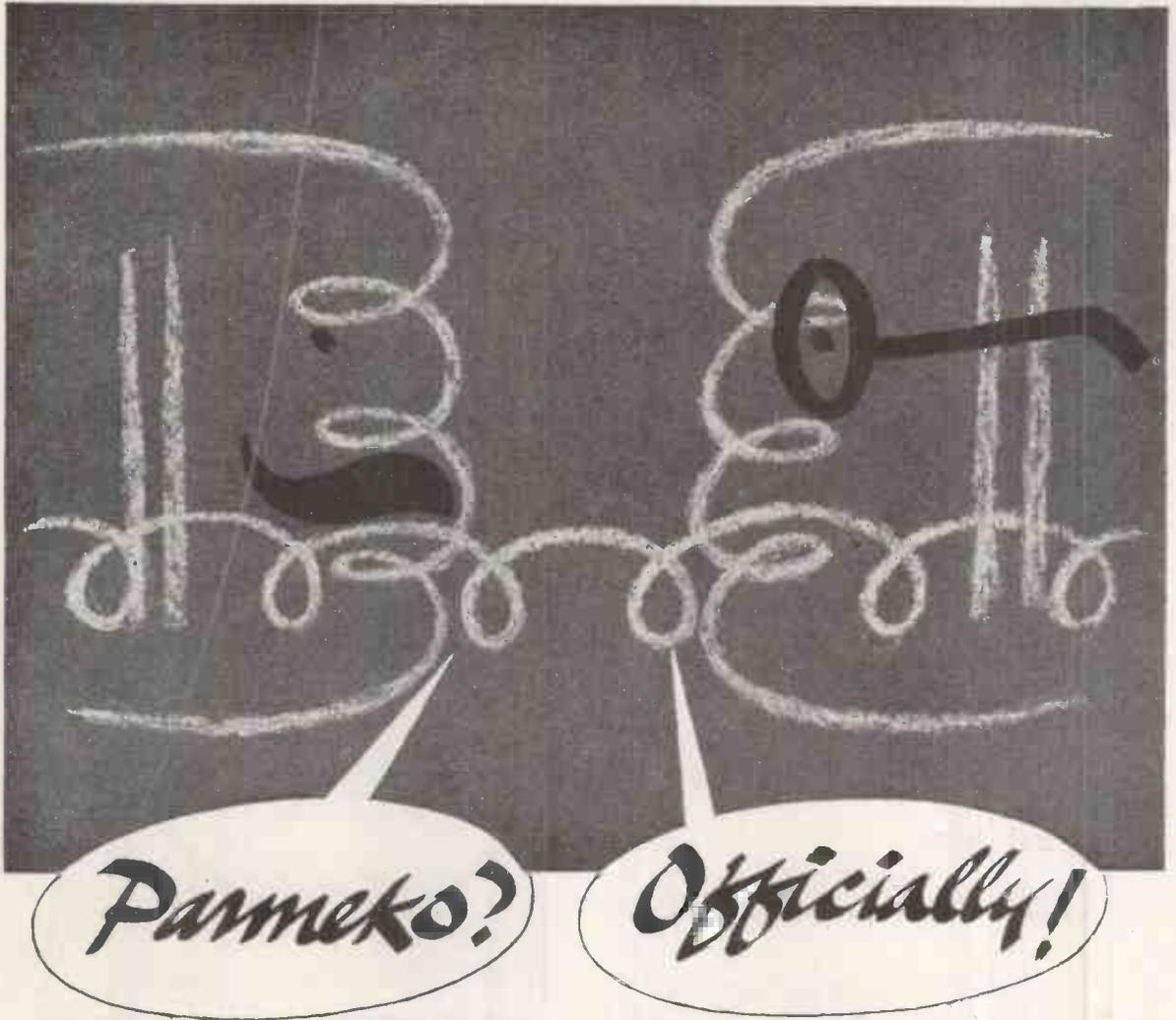


STANDARD CARBON POTENTIOMETERS. Made by an entirely new method ensuring a highly stable resistance element, which is also very durable. Silent and smooth in operation, these controls offer both mechanical and electrical reliability. Soldering tags are heavily silver plated to resist oxidation, and the mains switch has an efficient quick make-and-break action.

PRE-SET RESISTOR. This has a wire-wound resistance element, traversed by a nickel-silver slider. Adjustment is effected by a worm drive spindle fitted with a knurled and slotted knob. This component is smooth and noiseless in action and is designed to meet the many and varied requirements of the Electronic Industry. Egen pre-set resistors can be supplied in multi-bank assemblies to suit individual requirements. There are also twin-track models, and types with an electrically divided slider, giving adjustment on two resistors with one operation.



EGEN ELECTRIC LTD. Charfleet Industrial Estate, Canvey Island, Essex • Phone: Canvey Island 691/2



I say, George.

Sir!

By jove! You do sound official.

I am—after our last appearance there have been requests for the official description of a transductor.

And you're going to give it.

Exactly. A transductor is a device consisting of one or more ferro-magnetic cores with windings, by means of which an A.C. voltage or current can be varied by an independent voltage or current, utilizing saturation phenomena in the magnetic circuit.

By jove! That sounds impressive, George.

Almost as impressive as the performance of Parmeko transductors—the popularity of which is displayed in other types of 'Saturation phenomena'—bulging order books.

PARMEKO of **LEICESTER**

MAKERS OF TRANSFORMERS FOR THE ELECTRONIC AND ELECTRICAL INDUSTRY



an open
Invitation
to all manufacturers

of

Photo Flash Equipment

Deaf Aids

**Private Telephone
Installations**

Amplifiers

D.C. Power Units

Spot Welding Equipment

Test Gear

Magnetisation Equipment

You are invited to regard the **TECHNICIANS** at DALY as a part of your own technical staff. Non-standard components are invariably a source of worry, therefore the Electrical Industry find the DALY "made-to-measure" service for individual requirements specially helpful and a great time-saver.

For **URGENT** problems a telephone request will bring us post haste to your factory for consultation without obligation—and you will find our readiness to help both valuable and economic.

DALY ELECTROLYTICS for ELECTRONICS and COMMUNICATIONS . . . MOTOR START . . . RADIO and T.V. . . . are in great demand throughout the world; send for appropriate pamphlet.

DALY

ELECTROLYTIC CAPACITORS

CONDENSER SPECIALISTS FOR OVER 20 YEARS

DALY (CONDENSERS) LTD., WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5

Phone: EALing 3127-8-9. Cables: DALYCON, LONDON

Announcing— **TELECLIP** UNDER-CHIN HEADPHONES



OUNCES LIGHTER—GIVING MORE COMFORT AND CONVENIENCE AND BETTER SOUND

A new development in headphones which will save many a headache and hair-do. Weighing less than 2 ounces, TELECLIP suspends from the ears *under the chin*, leaving ample clearance for speaking. The earphones, cushioned with foam nylon plugs, have a high sensitivity and wide frequency range. TELECLIP is hygienically finished in aluminium grey plastic, is inconspicuous in use and can be worn for hours without fatigue.

SOME OF ITS USES

By telephone operators, receptionists and dictaphone typists. . . . In hospitals, churches, lecture rooms, beauty parlours and hairdressing salons. . . . for military communications. . . . by radio operators and constructors.

Send for leaflet fully describing TELECLIP and its many applications, also for quotations and terms.

ARDENTE

ELECTRO-ACOUSTIC ENGINEERS

ARDENTE ACOUSTIC LABORATORIES LIMITED
SPRINGFIELD WORKS, HORN LANE, ACTON, LONDON W.3
TELEPHONES: ACORN 4161-1282

RELAYS

AMERICAN RELAYS FOR OFFSHORE CONTRACTS

We are already tooled to manufacture many types of these relays, and through our association with the Guardian Electric Manufacturing Company of Chicago, we have access to full information on other types.

ENQUIRIES ARE INVITED.

TELEPHONE: NEWMARKET 3181-2-3

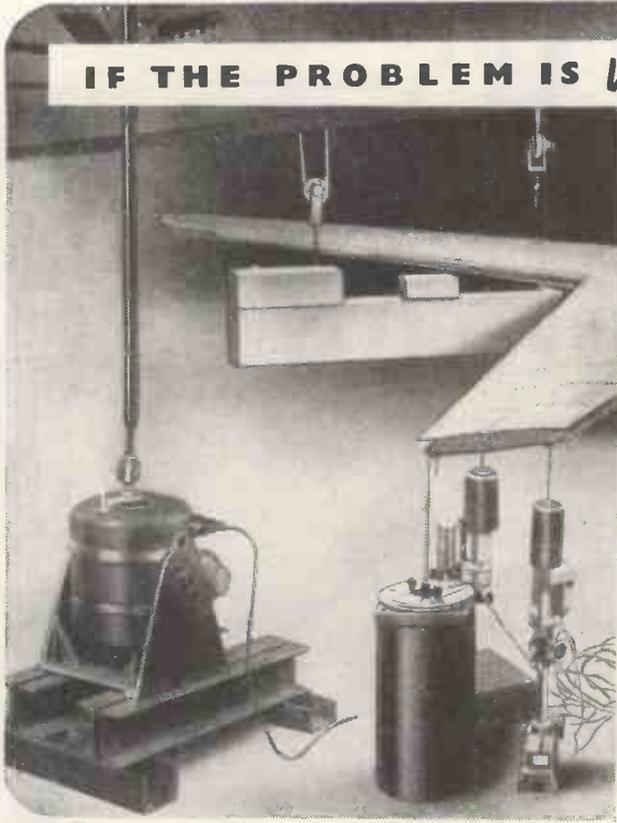
TELEGRAMS: MAGNETIC, NEWMARKET



MAGNETIC DEVICES LTD
EXNING ROAD, NEWMARKET

MD.7.

IF THE PROBLEM IS *VIBRATION INVESTIGATION*



— the solution may be in

Goodmans

VIBRATION GENERATORS

Today the significance of vibration—its cause and effect—is more pronounced by reason of ever faster speeds of aircraft, automobiles and many mechanisms in Industry. The higher frequencies encountered bring new problems, not the least important of which is the nature of metal fatigue. Goodmans Vibration Generators have given yeoman service in this sphere of investigation. These equipments are daily being applied to fatigue testing, electronic component testing, valve microphony testing, torsional and flexure testing in metals and plastics, etc.

If vibration presents a problem to your products—consult Goodmans. Write for technical data to "Vibration Dept. W."

GOODMANS INDUSTRIES LIMITED

AXIOM WORKS - WEMBLEY - MIDDX.

Telephone: Wembley 1200 (8 lines)

Ronette

*Coronation
"53"*

Hand Microphone

This hand microphone has allround sensitivity, fine frequency response (30-13000 c/s) as well as a good "grip". It is threaded either for international 5/8 -27 stands or for British 1/2 -26 stands, to your order. Coronation 53 microphones are supplied with a screened cable of 6 1/2 ft length. Highly polished black Polopas moulding.

Sole distributors for Gt. Britain:

TRIANON ELECTRIC Ltd. LONDON NW10

95, Cobbold Rd., Willesden

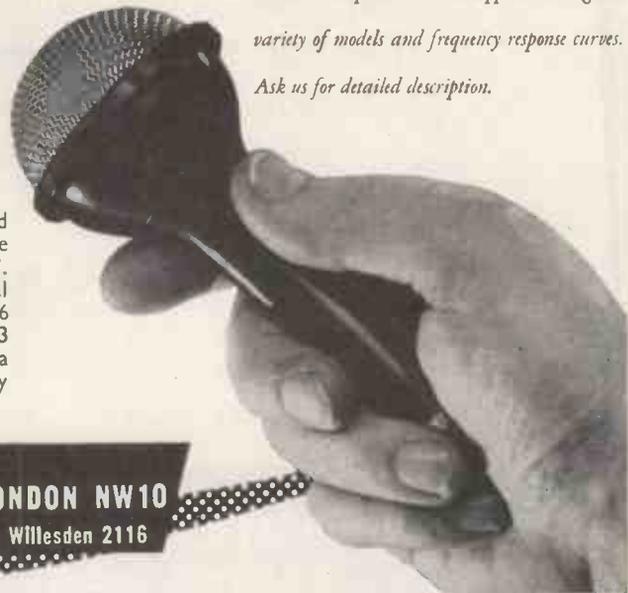
Telephone Willesden 2116



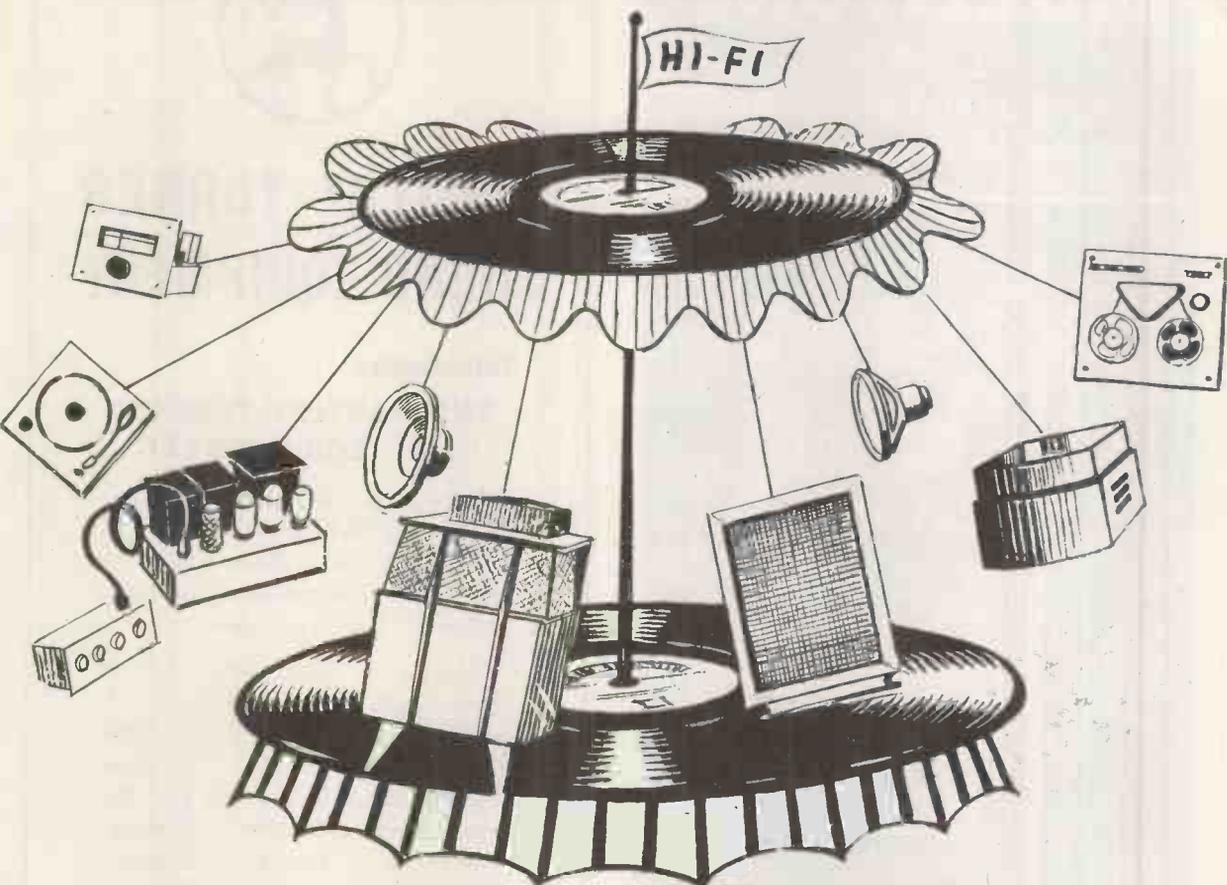
FAMOUS MICROPHONES

Ronette microphones can be supplied in a great variety of models and frequency response curves.

Ask us for detailed description.



Come to the Permanent Audio Fair



After all, people *do* come to Classic. If you haven't, you might wonder why they bother. There are lots of gramophone and radio dealers—good ones—yet people still come to Classic.

The reason is, of course, that we've got something unusual.

We specialise in Hi-Fi and Tape Recording equipment. And that means that we stock all the newest and the best pieces of equipment, and we know exactly what performance they can give, and *why*.

More than that—we can give comparative demonstrations to help the customer appreciate the difference. A manufacturer will naturally recommend his own product, but we give our customers unbiased advice on the best equipment for the results they require. You could travel a long way, visit many manufacturers, and even then miss some of the best equipment. We've got it here, under one roof—an Audio Fair that stays up to date and is open all the year round.

We can send equipment anywhere in the world,
That's why people come to Classic.

For friendly advice, and friendly H.P. terms and

for fair play all the time

CLASSIC

ELECTRICAL CO. LTD.

THE "HI-FI" SPECIALISTS.

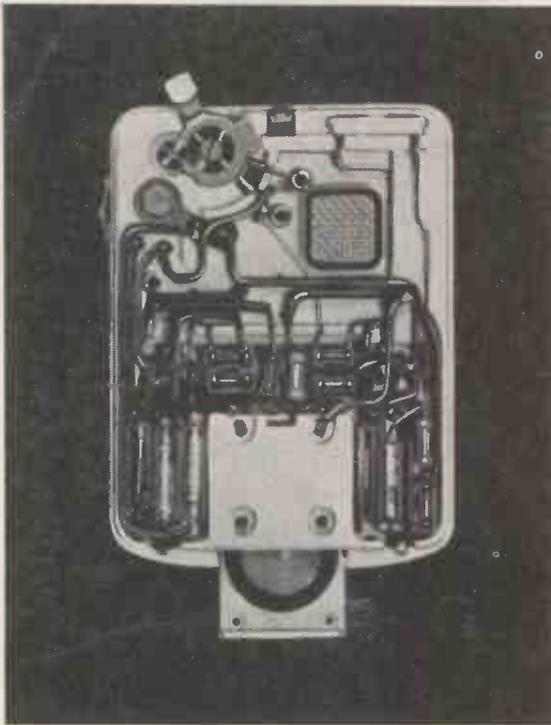
352 - 364 LOWER ADDISCOMBE ROAD, CROYDON, SURREY.

Telephone : ADDiscombe 6061

MULTITONE

SPECIALIZE

in equipment for the DEAF
and for PHYSIOTHERAPY



Actual Size of the A.V.C. Instrument (Covers removed).

AUTOMATIC VOLUME COMPRESSION

now available in the sub-miniature 4-stage

Transistor "MINUET" Hearing Aid

Multitone were the first to introduce A.V.C. in Hearing Aids in 1936. It has proved essential for:—

1. Cases of deafness with recruitment (Non-linear deafness).
2. The Quality-Conscious deaf who are unable to tolerate overload distortion.

With the Minuet, two degrees of compression can be selected by the user. In addition the instrument is adjusted during fitting to take variations in individual optimum volume requirements.

Weights only 1½ ounces complete with battery

Inquiries should be addressed to

MULTITONE ELECTRIC CO. LTD.

223-227 St. John Street, London, E.C.1.

PIONEERS IN SOUND AMPLIFICATION



HARTLEY-TURNER SOUND EQUIPMENT

Introducing

THE HARTLEY-TURNER "315" LOUDSPEAKER

Here is the latest product from H. A. HARTLEY COMPANY LIMITED. After many months of tests we are now proud to announce our new "315" Loudspeaker.

This is a 12in. diameter unit with a frequency range from 20 c/s to 15 Kc/s obtained from a special coil and cone assembly. The voice coil impedance is 4 ohms and the power handling capacity is 15 watts. The frequency response is substantially flat over the range 30 c/s—18 Kc/s.

The speaker employs a die cast frame and is manufactured to the same exacting specifications that have made Hartley-Turner products renowned throughout the world.

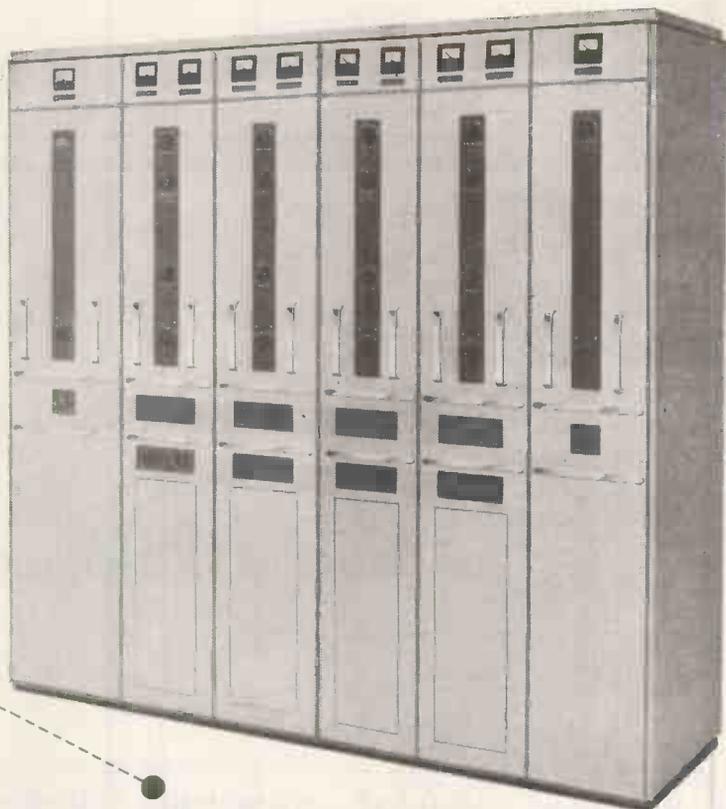
Modern methods of production enable us to offer this new speaker at

10 GUINEAS

Full details sent free on request to:

H. A. HARTLEY CO. LTD.
152, HAMMERSMITH ROAD,
HAMMERSMITH, LONDON, W.6.

Telephone: RIVerside 7387



2-3 kW Channelised Transmitter

The GFT.560/2 is a 2-3 kW channelised transmitter with a frequency range of 1.5-30 Mc/s. It consists of three basic cabinets—r.f. unit, modulator unit, and power supply unit—combinations of which can be used to provide multi-frequency working as well as a number of different types of emission. The wave change facilities of the transmitter are both rapid and reliable—a valuable asset when the operating frequency is changed many times each day. The GFT.560/2 is fully tropicalised, and its unit construction facilitates future expansion of the initial installation, should the need arise.

For use in conjunction with the GFT.560/2 there are ancillary units that enable the transmitter to be remotely controlled over a two wire telephone circuit: operational adjustments are dialled to the transmitter.

The versatility and reliability of this new Mullard transmitter make it particularly suitable for h.f. en-route, ground-to-air services and point-to-point communication networks. A team of Mullard communication engineers is available to advise on the use of the GFT.560/2 in such applications.

ABRIDGED DATA *Frequency Range 1.5—30 Mc/s Frequency Stability To Atlantic City 1947 standards Power Output 3kW. c.w., 2kW m.c.w. or r/t Types of Emission c.w., m.c.w., telephony, frequency shift A,1, A2, A3, F1 Output Impedance 600 ohms balanced twin feeder Power Supply 400V, 50-60 c/s, 3-phase.*

Mullard



SPECIALISED ELECTRONIC EQUIPMENT



For all Stock Transformers and Chokes

see GARDNERS RADIO catalogue



GARDNERS RADIO LTD., SOMERFORD, CHRISTCHURCH, Hants. Tel.: 1024

MAXI-Q IS THE REGISTERED TRADE MARK OF AN OLD ESTABLISHED HOUSE AND IS YOUR GUARANTEE OF LATEST DEVELOPMENT AND QUALITY.

IF you purchased our Scanning Equipment and Coils for the "Magna-View," "Supervisor," "Universal," etc., you will be pleased to know that they are still suitable and offer wonderful results with the new "Brimar" 21 inch C21HM Tube. We have seen and proved this undreamed of luxury that will turn your old receiver into a wide screen cinema.

F.M.—This advertisement isn't large enough to print the testimonials and congratulations we have received about this equipment which was the first available to the public and which is still selling faster than we can make.

SHORTLY will be available a home constructors' kit for commercial television converter, complete with power supply and cabinet at around £6 or lower.

WE do not believe in offering you a free or cheap Catalogue by covering the cost in higher priced or inferior components, we therefore request 1/- in stamps, which saves you postal order poundage and covers return postage, but please don't forget that if you live near a first-class reputable component retailer he will be a stockist of "MAXI-Q" products.

DENCO (CLACTON) LTD. 357/9 Old Road, Clacton-on-Sea, Essex
STOP PRESS:

"OSRAM 912 PLUS AMPLIFIER" Gold finished front panel with brown control markings, 7/6.
Completely punched aluminium chassis, 14/6. Pre-Amplifier chassis, 6/-.

"MULLARD FIVE-TEN AMPLIFIER" Chassis and Bronze finished Front Panel, 21/-.



Laboratory Instruments

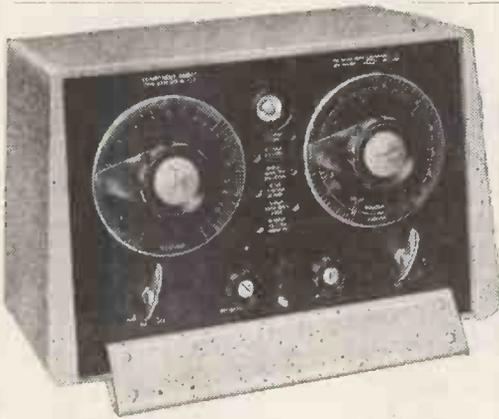
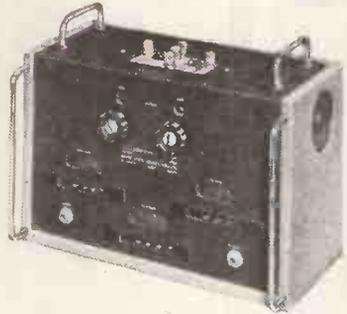
V.H.F. Impedance Bridge Type B.801

For balanced and unbalanced measurement from 1-100 Mc/s.

Susceptance: Equivalent to ± 230 pF. Conductance: 0-100 mmho.

Accuracy: $\pm 2\%$, ± 0.5 pF. Accuracy: $\pm 2\%$, ± 0.1 mmho.

This is one of a range of bridges for use with external source and detector for the measurement of aerials, cables, feeders, and a variety of components and materials between 15 kc/s and 250 Mc/s. Bridge sources and detectors are available for use between 1-100 Mc/s and 50-250 Mc/s.



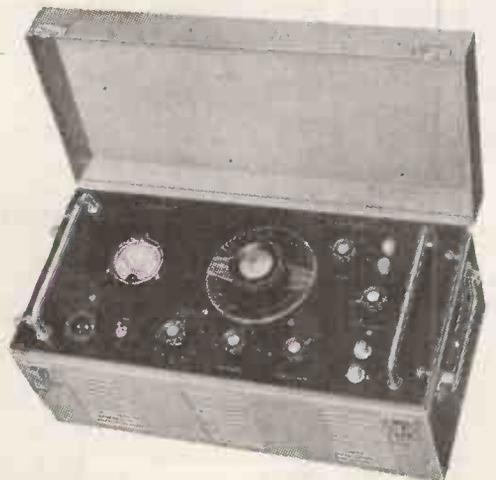
Component Bridge Type B.121

A moderately priced 50 c/s instrument with a very wide range, capable of 3-terminal and a variety of in situ measurements.

R: 3Ω to 1000 m Ω , C: 1 pF to 1000 mF, L: 100 mH to 10,000 H.

Portable Wave Analyser Type A.321

To measure the relative levels of the components of a complex waveform over a range of 75 db between 50 c/s and 20 kc/s. Input impedance 100K Ω unbalanced or $>25K\Omega$ balanced. In transportable case as shown, or for standard 19" mounting.



FOR DETAILS OF THE RANGE WHICH INCLUDES

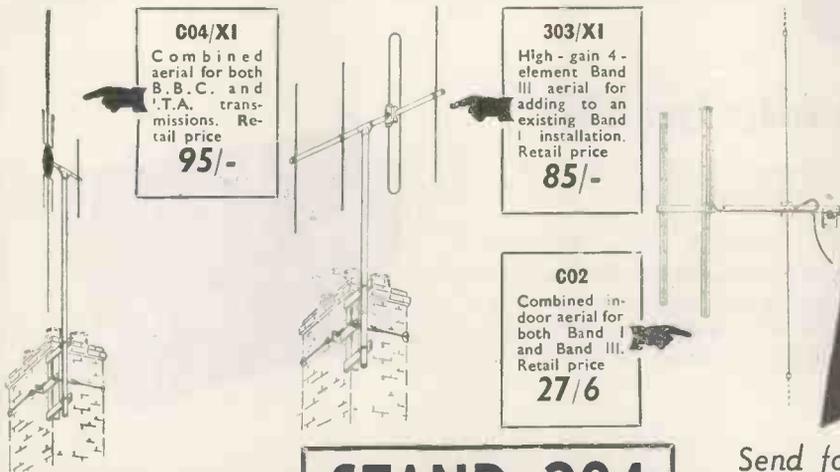
*AF HF and VHF Bridges Signal Sources Component Test Gear
Microwave Apparatus Special Purpose Equipment*

WRITE OR TELEPHONE

THE WAYNE KERR LABORATORIES LTD · NEW MALDEN · SURREY MALDEN 2202

Commercial T/V

STARTS ON SEPT. 22ND



G04/XI
Combined aerial for both B.B.C. and T.A. transmissions. Retail price **95/-**

303/XI
High-gain 4-element Band III aerial for adding to an existing Band I installation. Retail price **85/-**

G02
Combined indoor aerial for both Band I and Band III. Retail price **27/6**

NOW
is the time to prepare for the new programmes

WE SHALL BE AT THE
RADIO SHOW
EARLS COURT
Aug 24-Sept 3

STAND 204

Send for illustrated brochure covering our comprehensive range.

Labgear (Cambridge) Limited

WILLOW PLACE, CAMBRIDGE, ENG.

Telephone : 2494. Telegrams : "Labgear, Cambridge."

THE NEW ARMSTRONG F.M.56 F.M. TUNER



85-95 Mc/s; High Impedance Output. Magic Eye Tuning Indicator, £21.

AND THE ARMSTRONG F.C.48.

8 Valves, incl. 2 double triodes. 8 watts output. Provision for using F.M. adaptor. Separate Bass and Treble controls. 2 shorts, medium and long wavebands **£23 18 0**
Or £8 dep. and 2/9/2 monthly.

ALSO AVAILABLE FROM STOCK.

F.M. UNITS. By Lowther, Chapman and Sound Sales.

ANOTHER NEW RELEASE.

Chapman Combined F.M. and A.M. Tuner Unit, £32/10/-.

TRANSISTORS,

Mullard		
O.C.51	Point type	30/-
O.C.70	Junction Types	40/-
O.C.71		
S.T.C.		
3X300N	do.	40/-
3X302N	do.	50/-



LEAK DYNAMIC PICK-UP with diamond stylus.
Arm with L.P. or 78 head **£11 9 6**
Extra head **£7 15 3**
Mumetal cased trans. **£1 15 0**

ALL SPECIFIED COMPONENTS FOR:
Osram 912, Mullard 10 watt and Williamson Amplifiers and Amos & Johnson F.M. Unit.

LATEST GRAMOPHONE UNITS

Collaro 3/554—3 sp. with Studio Pick-up	£8 18 4
Collaro P.C.54—3 sp. Auto, with Studio Pick-up	£13 4 2
Garrard 301—Transcription Unit—3 speed	£25 3 6
Garrard TA—3 speed Gram. Unit T/O Head	£10 16 0
Garrard R.C.80M 3 sp. Auto, with Xtal T/O Pick-up	£17 9 6
Collaro 2010 Transcription Motor and Turntable complete with 3 speed Gear and Switch mounted on Rectangular Plate with Studio 'P' High Fidelity Pick-up	£18 4 9

"Q-MAX" CHASSIS CUTTERS
STILL the easiest and quickest way of cutting holes in SHEET METAL.

each	
or 2"	11/6
1 1/2" or 1 1/4"	12/6
or 1 1/2"	14/9
1 1/2"	16/6
1 1/2"	18/6
2 1/2"	30/-
2 1/2"	35/-
1" square	23/-

Keys, small, 10d.; medium, 1/3; large, 1/9.



Patent No. 619178

"Q-MAX" MODEL G.D.O.I.A. GRIP 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 eight ranges. PRICE: 12 Gns. Complete. (Or 4 Gns. Dep. and 12 monthly payments of 15/5.)



HIRE PURCHASE FACILITIES AVAILABLE

BERRY'S

(SHORT WAVE) LTD.

25, HIGH HOLBORN, LONDON, W.C.1

Tel.: HOLborn 6231

Our 1955 Enlarged and Fully Illustrated Catalogue of "Hi-Fi" and Amateur Equipment is now available, 6d. post free.

PRECISION *High Fidelity* 4 SPEED TRANSCRIPTION UNIT

WITH VARIABLE SPEED ADJUSTMENT



Engineered by Swiss
Master craftsmen for
the discerning
listener.

MAIN FEATURES

- Speed continuously variable from above 78 r.p.m. to below 16 r.p.m. Pre-set adjustable "click-in" positions for 78, 45, 33½ and 16 r.p.m.
These features are invaluable for:
Playing old celebrity discs requiring speeds above 78 r.p.m.
Tuning record pitch to a musical instrument.
Correcting for mains frequency variations.
- Accurately balanced heavy precision made turntable eliminates Wow and Flutter.
- Unique VERTICAL EDGE-DRIVE PULLEY principle eliminates Rumble.
- Less than 1% change in speed for up to 13% change in Line Voltage.
- Large resilient 4-pole constant velocity motor.
- External adjustment provided for precision diecast arm with plug-in shell. Fitted as standard with the superb Goldring Variable Reluctance Cartridge No. 500
(Diamond Styli are available on request)

Type GL50-4 Four speed. Price **£15/15/0**
110-250 volts, 50 cycles. P.T. £5/2/7

Type GL50-3 Three Speed. Price **£15/15/0**
100-250 volts, 40-60 cycles. P.T. £5/2/7

Sole Concessionaires for Great Britain and the British Commonwealth.

GOLDRING Manufacturing Company (Great Britain) LTD.

49-51a, DE BEAUVOIR ROAD, LONDON, N.1.

CLIssold 3434-5-6

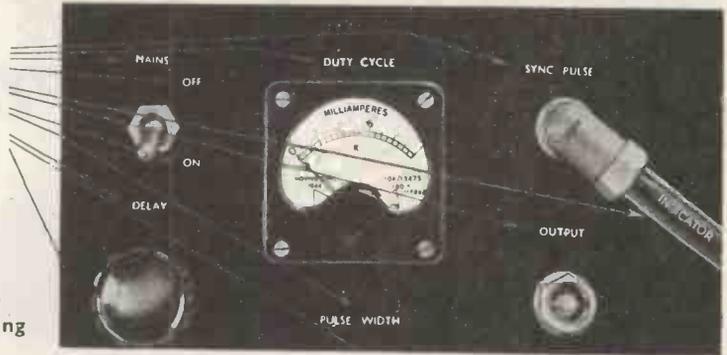
Transfer labels for marking electronic equipment

"DECALS"

- ★ Good appearance
- ★ Easily applied
- ★ No background
- ★ Long lasting

Decals are available in the following sets.

Standard Mk. II, 4/9, 3d. post.
Approx. 750 titles, covering all aspects of Electronics.
Amateur Mk. II, 3/6, 3d. post.
Approx. 300 titles, covering radio reception, transmission, recording, TV, etc.



Dials and Scales, 1/3, 3d. post.
12 Dial scales for small pointer knobs.
Letters and numbers ref. 24, 1/6, 3d. post.
Selection of spare letters and numerals 5/16in.

All above in Black or White, please state which is required.

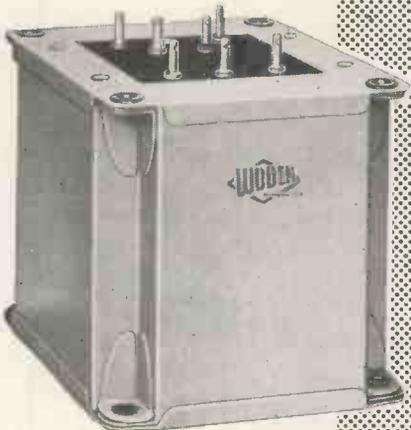
NEW PVC DECALS

Transfer labels for marking P.V.C. cables Direct (no sleeves).



Unaffected by Moisture, hydraulic fluids, petrol, acids, etc. Easily applied. Good appearance, hard wearing, economical. Supplied to manufacturers only, details and samples on request. Deliveries 14 days to any part of the world.

THE MURRAY-HILL CO., Link Hill, Nr. Hawkhurst, Kent. Phone: Sandhurst 276



Better Quality TRANSFORMERS for exacting duties

Low first cost

Robust construction

Excellent workmanship

Rigidly tested

Absolute reliability

A Woden Transformer will fulfil the most exacting specification, combining high precision and utmost reliability in service.

Both research and production are centred on the manufacture of first-class equipment at the lowest possible cost consistent with quality materials and workmanship.

WODEN TRANSFORMER CO. LTD

BILSTON • STAFFS Tel: BILSTON 41959

SPECTONE



MULLARD 5-10 AMPLIFIER

This remarkable development will meet the most exacting high fidelity requirements at an extremely low price. Meticulous inspection at each stage ensures that the Spectone Mullard 5-10 Amplifier fully meets Mullards specification.

TWO INPUTS One for radio tuner, microphone, etc., and one for pickup. The pickup input has two switch positions for equalisation—L.P. and Standard. Plug-in equalisers are available to suit various pickups.

CONTROLS Besides the input and equalisation selection switch, volume, treble and bass controls are provided. The treble control is continuously variable from +10db to -10db and the bass +11db to -5db.

MAXIMUM OUTPUT
15 watts

POWER OUTLET for pre-amplifier
300 volts at 12 milli-amps. 6.3 volts at 2 amps.

HUM & NOISE
-73db referred to 10 watts.

OUTPUT IMPEDANCE
15 ohms

FREQUENCY RESPONSE
± 0.5db 10 c/s to 20,000 c/s.

TOTAL HARMONIC DISTORTION at 10 watts.

Less than 0.4% at 40 c/s.
Less than 0.2% at 400 c/s.
Less than 0.3% at 2,000 c/s.

OPERATING VOLTAGE
200/250 volts A.C. 110/115 volt model available to special order.

OUTPUT RESISTANCE
at 1,000 c/s is 0.9 ohm.

DAMPING FACTOR
approximately 17.

WE SHALL BE AT THE



STAND 206

PRICE

£18 - 18 - 0

Pick-up Equaliser Plug 12/6

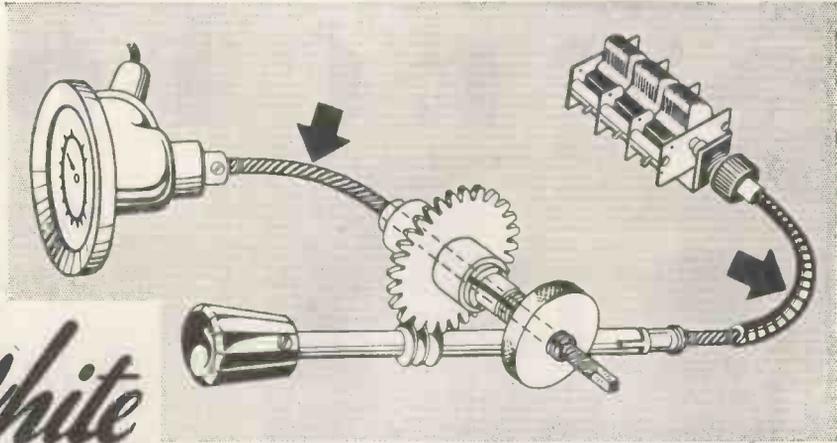


Manufacturers of the SPECTONE

Magnetic Tape Reproducers for playing Tape Records to the C.C.I.R. characteristic with the highest fidelity. The modern method of hearing good music faithfully reproduced.

Leaflets on request.

SPECTO LTD. Vale Rd Windsor



S.S. White

FLEXIBLE SHAFTING

for REMOTE CONTROL of ELECTRONIC EQUIPMENT

- RADIO TUNING
- INSTRUMENT CONTROL
- COMPONENT COUPLING

Flexible Shafts give freedom in design because they can be run between any two parts and eliminate alignment problems.

The S. S. White Company produce Remote Control Shafts to meet any requirement.

THE *S.S. White* CO. OF GREAT BRITAIN LTD.
INDUSTRIAL DIVISION

Britannia Works, 25-31 St. Pancras Way, London, N.W.1
Telephone: EUSton 5393

R.C.I

30%
PRICE REDUCTION

HIGH CLASS
INSTRUMENT CABINETS



A unique range of extremely robust cabinets, designed by instrument engineers to give first-class appearance for a very modest outlay. Cast aluminium frames ensure that equipment is held rigidly and afford a maximum of protection against damage in transit. Any quantity supplied, carriage free in the United Kingdom.

As a result of increased production, we are now able to offer our superior instrument cabinets at greatly reduced prices (approximately 30%) with further substantial reductions for quantities of 25 or more. We shall be pleased to quote on receipt of particulars of your requirements or to send you a leaflet giving dimensions and details of this range of outstanding cabinets.

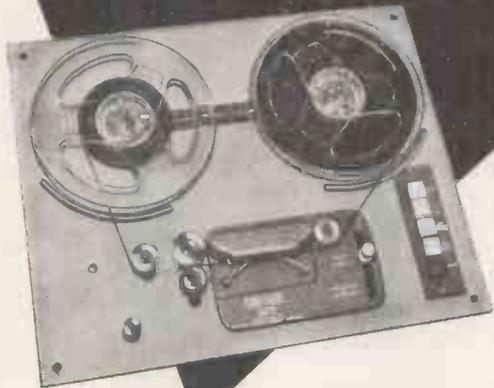
BOULTON PAUL ELECTRONICS

Boulton Paul Aircraft Limited, Wolverhampton

Telephone: Fordhouses 3191 (Ext. 99)

TRUVOX

TAPE RECORDER COMPONENTS
AND ACCESSORIES

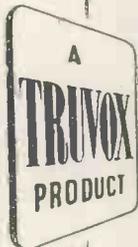


TAPE DECKS MARK IIIU SERIES

Technically identical with the world-famous Deck supplied, in bulk, to Recorder Manufacturers. With B.S.S. sense of tracking, it is fully approved for playback of pre-recorded tapes. List Price remains at 22 gns.

Details of complete recorders incorporating the TRUVOX Tape Deck are available on request.

The full range of Truvox Tape Recorder Components and Accessories is listed below—send for fully descriptive leaflets.



TAPE DECKS · AMPLIFIER · RADIO JACKS · FOOT CONTROL · TELEPHONE ADAPTOR · MONOSET & STETHOSET HEADPHONES · CORNER DIFFUSION SPEAKER

TRUVOX LIMITED

Sales Office: 15, LYON ROAD, HARROW, MIDD.

Tel.: Harrow 9282

Tech. & Service Depts.: 328, THE BROADWAY, STATION ROAD, HARROW, MIDD. Tel.: Harrow 4455

★ IMPORTANT NEWS ★

For the Latest News on . . .

T.V. Aerials (Band 1 & 111)

Convertors

Downleads

Aerial Accessories

Radio & F.M. Aerials

Come & see **STAND 33**
AT THE
NATIONAL RADIO & T.V. EXHIBITION

AERIALITE LTD.

CASTLE WORKS, STALYBRIDGE
CHESHIRE

Depots at London, Bristol, Birmingham,
Manchester, Newcastle, Glasgow. G123JY.

Armstrong HIGH FIDELITY

Specialists in High Quality Reproduction for over 20 years

... or just HI-FI

It has been stated by experts that assuming they meet certain specifications, any amplifier would sound much like any other amplifier. Now by and large we agree with this statement—although we know that hundreds of people who have heard the A10 stoutly maintain that it sounds much better than X or Y Amplifier. We would however remark in passing that very few amplifiers at any price have all the specifications of the Armstrong A10 and we would like to draw your attention to some of its features.

- Ultra-linear output stage handles peak power outputs with the least possible distortion.
- Harmonic distortion below 0.1% at 8 watts.
- High degree of negative feedback for outstanding transient performance, clean bass, and smooth treble.
- 6 position filter for optimum performance.
- We also manufacture AM and FM Tuner Units attractively finished in Florentine Bronze to match the A10 Control Unit.

(See page 72).



and the price? The Control Unit is £9.15.0 and the Amplifier £19.15.0

Where you can hear the A.10

- Webbs Radio, 14 Soho St., London, W.1.
- Imhofs, 112 New Oxford St., W.1.
- B.K. Partners, 229 Regent St., W.1.

- Classic Electrical, 352 Lower Addiscombe Rd., Croydon.
- Muscraft, 20 High St., Southall.
- Lancaster High Fidelity, 29 Lancaster Terrace, Manchester.
- Holleys, Southall, Middlesex.

or at

our Holloway Showrooms which are open on weekdays from 9 a.m. to 6 p.m. (Sats. until 5 p.m.). Special "Hi Fi" demonstration nights Thurs. at 7 p.m. If you are unable to visit us please write for booklet W.8.

ARMSTRONG WIRELESS & TELEVISION CO. LTD., WALTERS RD., LONDON, N.7 Telephone: NORTH 3213/4



A NEW range of flat subminiature directly heated valves for use in radio-frequency equipment

TYPE	DESCRIPTION	U.S. EQUIVALENT	FILAMENT		Anode Volts	Screen Volts	Grid Volts	Anode Ma	Screen Ma	Mutual Conductance	Power Output
			Volts	Ma							
X FR1*	R.F. Amplifier	1AD4*	1.25	100	45	45	0	3.0	0.9	2 mA/V	
X FR2*	R.F. Amplifier	5678*	1.25	50	67.5	67.5	0	1.8	0.5	1.1 mA/V	
X FR3	H.F. Triode	5676	1.25	120	135		-5	4.0		1.65 mA/V	
X FY14	Output Pentode	5672	1.25	50	67.5	67.5	-6.5	3.1	0.95	0.65 mA/V	50 mW†

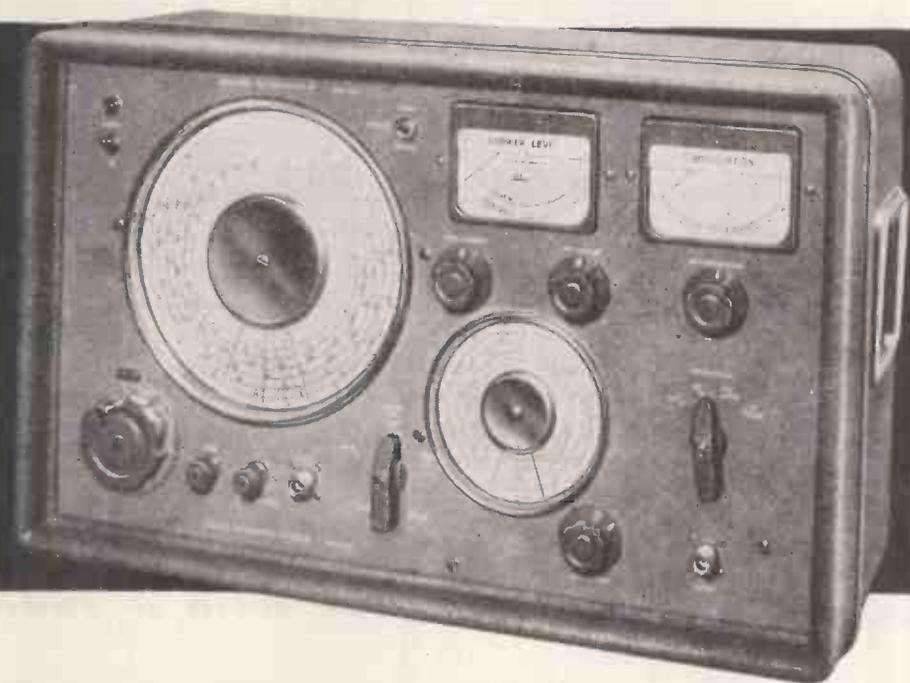
* Fully screened with metallized coating. † With input signal 4.55 V. A.C. and anode load 20 kΩ.



**STONEFIELD WAY, VICTORIA ROAD,
SOUTH RUISLIP, MIDDLESEX**

**Telephone:
Ruislip
3366**

THE NEW MARCONI SIGNAL GENERATOR TYPE TF 801B



FREQUENCY RANGE 10 to 500 Mc/s

NORMAL OUTPUT : 0.1 μ V to 0.5 volt, c.w. or modulated to 30% ,available under all conditions; 90% modulation at most carrier frequencies.

HIGH OUTPUT : up to 2 volts c.w., or 1 volt modulated, at most carrier frequencies. Sine a.m.: 1000-c/s internal or 30 c/s to 20 kc/s external. For external pulse modulation, r.f. band width extends to 3 Mc/s. Output impedance: 50 ohms. A.C. mains operated.

MARCONI INSTRUMENTS

SIGNAL GENERATORS · BRIDGES · VALVE VOLTMETERS · Q METERS · WAVEMETERS
FREQUENCY STANDARDS · WAVE ANALYSERS · BEAT FREQUENCY OSCILLATORS

MARCONI INSTRUMENTS LTD
30 Albion St., Kingston-upon-Hull

ST. ALBANS
Phone : Hull Central 16144

HERTS

TELEPHONE : ST. ALBANS 6160/9
19 The Parade, Leamington Spa Phone : 1408

Managing Agents in Export :

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED · MARCONI HOUSE · STRAND · LONDON · W.C.2

TC 68

CITY SALE & EXCHANGE LTD

The High Fidelity Specialists

WE OFFER FROM STOCK :

AMPLIFIERS

Leak T.L.10 with point I pre-amplifier	£28 7 0
Or with Vari-slope Mark 2	£34 13 0
Acoustical Quad II with control unit	£42 0 0
Lowther T.P.10 with master control unit Mark I	£60 0 0

SECONDHAND

Rogers Baby amplifier with jnr. pre-amplifier	£18 0 0
Charles amplifier and control unit 2 KT 66 output valves	£9 9 0
Decca Decola amplifier and control unit. Perfect order	£17 0 0
Decca P.A.6 in portable case	£13 13 0
Decca P.A.3 in portable case	£10 10 0

LOUDSPEAKERS TUNERS

Tannoy 12 inch dual concentric in corner cabinet	£48 6 0
Wharfedale treble speaker assembly	£73 10 0
Lowther TP I corner reproducer	£96 0 0
G.E.C. Octagonal Cabinet Speaker	£14 0 0
Salex 12in. corner baffle, handsomely veneered, priced at	£8 15 0
Suggested speaker units for above:	
Goodmans 150 Mark 2	£11 0 0
Tannoy direct radiator	£10 15 6
Wharfedale Super CS/AL	£12 0 0
R.D. Uniflex 12in. reflex cabinet	£17 10 0
R.D. Corner, Horn	£18 17 6
Pye Cantata Hi Fi	£18 17 6
	£36 15 0

Chapman F.M.81 magic eye	£21 0 0
Chapman S5/FM combined AM/FM	£32 10 0
Chapman S.6 AM Tuner, 6 stages	£30 0 0
Sound Sales A to Z FM unit	£20 18 2
Jason FM Tuner	£15 17 0
Dynatron pre-tuned FM Tuner with automatic frequency control	£23 7 0

SECONDHAND

Tannoy 15in. base unit	£9 0 0
Wharfedale Super 8 CS/AL unit	£4 10 0
W.B. HF10-12 15ohms	£2 19 6
R.A. 10in. Hi Flux	£3 10 0
Lowther Hegoman in perfect order	£78 15 0
Wharfedale 2 speaker system, mahogany case	£37 10 0

SECONDHAND

Leak U.S. Tuner, in perfect order	£17 0 0
Chapman S.5, with R.F. stage, as new	£12 12 0
Acoustical 4 station pre-set TRF	£11 0 0
Bell Sound FM Tuner	£4 0 0
Decca P.A.6 Variable Selectivity magic eye, handsome case	£14 0 0
Charles TRF/Superhet	£9 9 0

PART EXCHANGE

is our speciality, write, phone or call for estimated allowance.

FREE VAN DELIVERY

within 20 miles of our shop.

SIMPLE EASY PAYMENTS

arranged on goods over £10.

93-94, FLEET STREET, LONDON, E.C.4

Phone: *FLEet St.* 9391/2

- Allouis — Ankara
- B.B.C. — Bound Brook
- Delhi — Dacca
- Feldberg — Fortaleza
- Karachi — Kuldiga
- Lusaka — Lagos
- Moscow — Madrid
- Oslo — Osaka
- Sydney — Stalingrad
- Teheran — Tokio
- Vatican City — Valencia

for everyone with a radio set

GUIDE TO BROADCASTING STATIONS, 1955/56

All European long- and medium-wave broadcasting stations and over 1,600 short-wave transmitters in 125 countries are listed both geographically and in order of frequency and wavelength in this enlarged edition. The information, checked against measurements made at the B.B.C. receiving station at Tatsfield, has been corrected to mid-July. Frequencies of over 300 v.h.f. broadcasting stations in Europe, operating details of European television stations and a time-conversion table are also included.

NOW ON SALE GET YOUR COPY TO-DAY 2/6 net By Post 2/8

Published for "Wireless World"

Obtainable from booksellers or direct from:-

Illiffe & Sons Ltd · Dorset House · Stamford Street · London · S.E.1.

Over 2500 stations listed in all parts of the world

BICC

Cellular Polythene

T/V DOWNLOADS



A new range of television downloads is described in this booklet. They have been developed by BICC using Cellular Polythene as the dielectric to provide minimum attenuation, and resistance to moisture ingress.

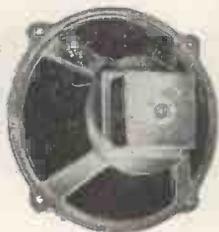
Write to-day for your copy of this Publication (No. 357)



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

Another LETTER FROM AMERICA!

3101 Leeds Road,
Columbus 21, Ohio, U.S.A.
June 4, 1955



GOOD BASS from W15/CS

Price of speaker £17.10.0
tax free. Total flux 180,000
lines. Coil impedance
12/15 ohms. Peak input
15 watts. Chassis
diameter 14½ ins.

The W15/CS with heavy cone and long
speech coil is designed for smooth re-
sponse between 25 and 2,000 c/s. It is
the ideal bass speaker for 2 or 3 speaker
systems.

Wharfedale

WIRELESS WORKS LTD.

Idle, Bradford, Yorkshire

Telephone : Idle 1235/6.

Last week I had occasion to demonstrate high-fidelity equipment in a room 45ft. long, 32ft. wide and 13ft. high; we brought along my sand-filled wall-corner cabinet with a W15/CS in it and an Altec-Lansing tweeter crossing over at 800 c/s. The crisp low bass of the Wharfedale unit put to shame all but the largest theatre horn speaker systems; even the theatre systems did not go as low. I had always suspected that the Wharfedale could hold its own against more elaborate systems in large rooms but this is the first time I have had a chance to put it to the test.

The high-fidelity dealer who sponsored the demonstration was rather unhappy as he is unable to obtain Wharfedale equipment.

The demonstration also struck a blow against the ubiquitous corner "horns" and caused many people to reappraise the values of SOLID bass-reflex cabinets. The only trouble I had was that the sand-filled is too solid, weighing about 250 lb. with bottom and back; it is quite a chore to carry it up and down stairs even with a stair climbing hand truck.

Ross F. Firestone

THE PROBLEM IS

DUST

the solution is



THE ANTI-STATIC RECORD CLEANER

The problem of overcoming the electrostatic charge in gramophone records (which attracts dust from all directions spoiling reproduction and damaging the surface) actually accentuated by most record cleaners, has been worrying manufacturers and gramophiles for years.

POINT STUDIOS (Acoustics Division) have developed "DE-STAT" solution, the completely new answer to record protection which can only be used in conjunction with our record cleaning system.

One application of "DE-STAT" not only removes the surface dust, but also imparts a mono-molecular film making the record completely anti-static.

The "DE-STAT" record cleaning kit comprises, cleaning, pad (as illustrated), plastic charging bottle of 'DE-STAT', and applicator complete in a recessed stand. With full instructions at 13/6 inclusive.

Trade terms on application to:—

POINT STUDIOS (ACOUSTICS DIVISION)

122, WARDOUR STREET · LONDON · W.1 · Telephone: GER 1612

If you have difficulty in obtaining the "DE-STAT" from your dealer, cut out this coupon NOW.

POINT STUDIOS (ACOUSTICS DIVISION)
122, WARDOUR ST., LONDON, W.1

Please send me without obligation details of the "DE-STAT" record cleaner (I enclose S.A.E.).

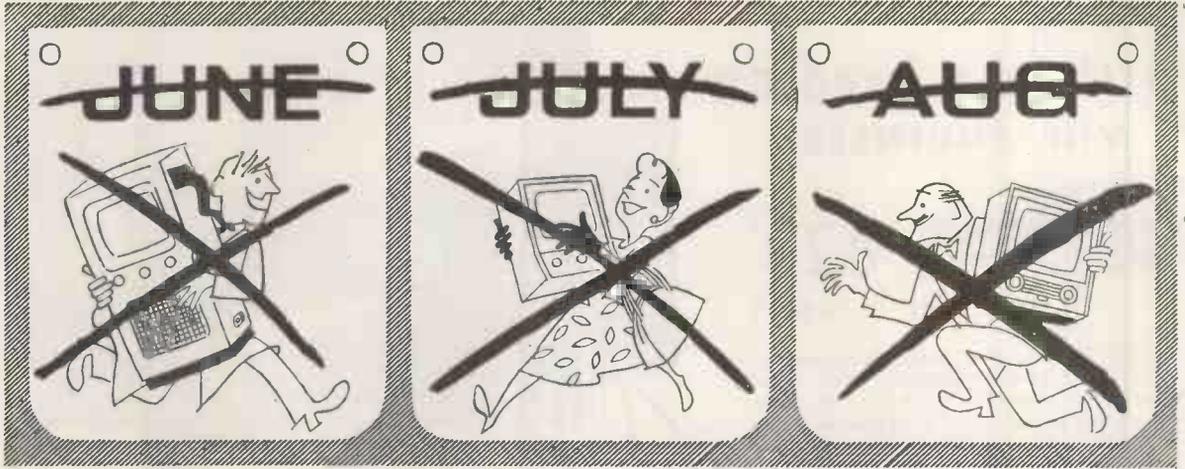
Please send me DE-STAT
CLEANER(S) at 13/6 each.

I enclose P.O./CHEQUE for £ s. d.

NAME.....

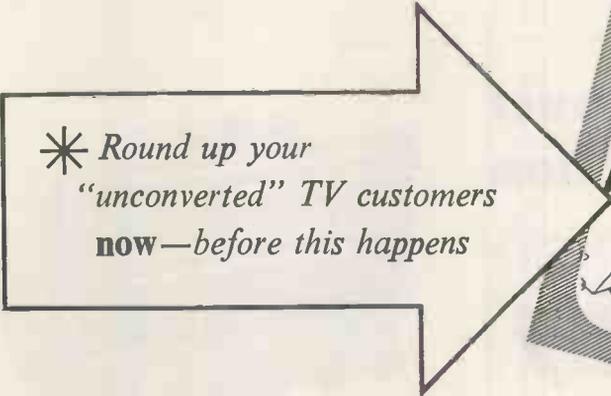
ADDRESS.....

W.1

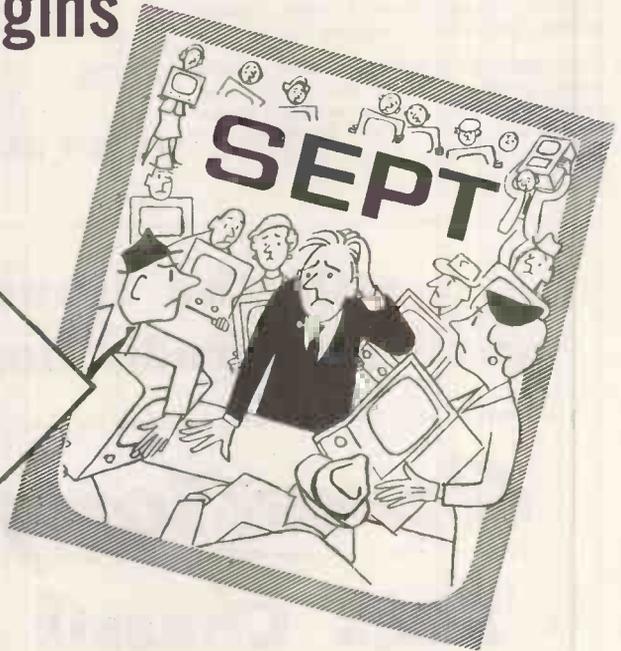


TIME IS RUNNING SHORT!

Independent TV begins
on September 22



* Round up your
"unconverted" TV customers
now—before this happens



Despite the success of our advertising campaign, there are *still* many viewers who have done nothing about conversion of their sets and aerials. Some of *your* customers are going to wake up on September 22nd and expect you to get their sets ready to receive the new programme that same evening—unless you round them up now! So let's make a special final effort to keep things on the move.

DEFERRED PAYMENT

The news that deferred payments can be arranged for conversion work should help you a lot. Many people who, for financial reasons, were putting off having their sets and aerials converted, will now be able to see you at once.

Then, with most of your conversion work behind you, you'll be able to sit back on September 22nd and enjoy the new programmes *yourself!*

DESIGNED AND BUILT BY

Britain's Leading VHF ENGINEERS

The NEW

EDDYSTONE '820'

V.H.F UNIT

WEBB'S are proud to present this efficient unit built with **PRECISION ENGINEERING SKILL** to give highest possible quality from the B.B.C. FM stations, combined with the convenience of reception on medium and long waves. The EDDYSTONE "820" is self-powered to work from A.C. mains, a feature which makes it particularly easy to install with any amplifier.

THE TECHNICIAN WILL NOTE—with approval

ON VHF/FM All three input circuits tuned by unique 3-gang condenser, a design detail contributing to high sensitivity, whereby the "820" will often give satisfactory operation well outside the normal service area. Uses Foster Seeley discriminator for absolute minimum distortion. "Straight-through" Gram. position simplifies incorporation with amplifier.

ON MED. AND LONG WAVES Uses normal mixer-IF-detector circuit giving useful gain and Selectivity. Switch position "MW1" pre-sets any station between 960-1550 kc/s; position "MW2" 610-960 kc/s; and long waves 150-250 kc/s.



ONE FIVE-WAY MASTER CONTROL SWITCH SELECTS:—

- Tuneable V.H.F.
- Medium Wave 1.
- Medium Wave 2.
- Long Wave.
- Gramophone.

- Tunes 87.5 to 100 mc/s. Includes entire existing and projected B.B.C. V.H.F. range.
- Precision slow motion drive with handsome dial and panel
- High sensitivity, suitable for both near and "Fringe" reception
- No external power problems, self-powered for A.C. mains
- Medium and long-wave positions can be pre-set to desired regional or continental stations
- Super-het circuit on medium and long-waves
- Best possible quality on VHF

THE EDDYSTONE "820" IS AVAILABLE FROM STOCK AT WEBB'S RADIO

PRICE £38

Also available on Webb's "6 months No Interest Credit Plan"—deposit £7/12/- and 6 payments of £5/1/4 by Bankers order. OR on extended terms—deposit £7/12/- and 12 payments of £2/15/9 or 18 of £1/18/11. Please ask Webb's for forms.

WEBB'S RADIO 14 SOHO ST., LONDON, W.1. Phone: GERrard 2089

... still the finest quality reproduction

Modernise and Improve your Radiogram with the

Armstrong

Specialists in High Quality Reproduction for over 20 years

FC48 Chassis



A worthy successor to a long line of tried and proven Armstrong radio chassis which we have been making continuously for over 20 years.

The FC48 has been specially designed to take the fullest possible advantage of modern high-fidelity recordings and the wide-range FM transmissions.

Special attention has been paid to the design of the audio stages and every worthwhile refinement has been incorporated. The Push Pull Tetraode output stage will give more than 8 watts output with a frequency range from 20-20,000 C.P.S. and due to the Negative Feed Back employed, distortion is negligible and Transient Response exceptionally good—a

specification better than many high-fidelity amplifiers.

An easily accessible socket at the rear enables an FM Tuner to be simply plugged in. The Armstrong FM56 Tuner can be supplied separately as and when required. Price £21 (see page 66).

The chassis is exceptionally easy to fit and requires no special skill; four fixing holes are provided and all connections are clearly marked on the back of the chassis.

- Frequency Response 20-20,000 cps.
- Provision for FM Tuner
- 4 Wavebands • 8 valves
- Independent Bass and Treble, lift and cut controls
- Magic Eye Tuning
- 4 colour illuminated dial (horizontal or vertical)
- Fly wheel drive

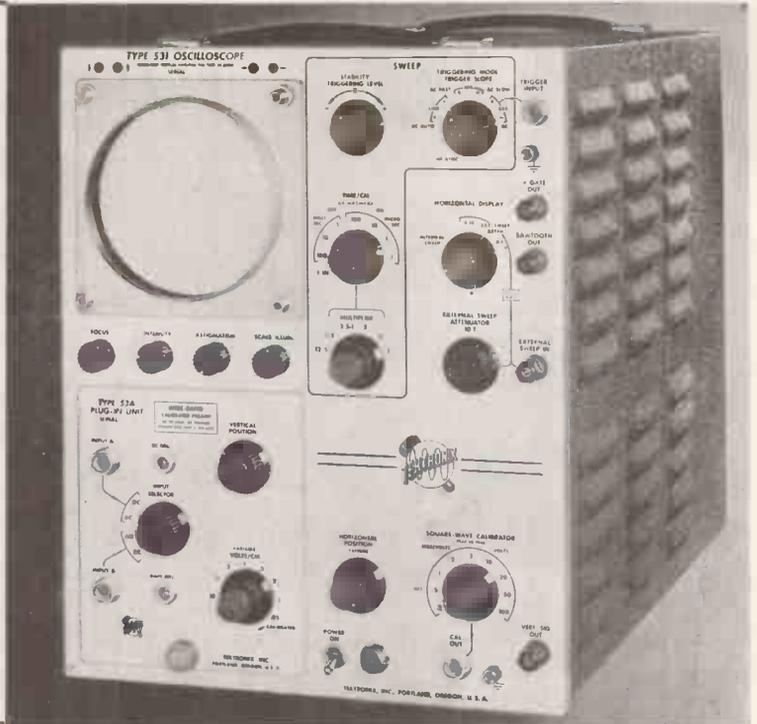
PRICE £23.18.0 (inc. tax)

GUARANTEE: All our models are sold under full and unconditional money-back guarantee of satisfaction. **HIRE PURCHASE** facilities are available. **TRIAL IN YOUR OWN HOME.** Your money will be returned if for any reason you are not satisfied after 7 days trial.

We shall be glad to give a full demonstration of this and other models in our range at our Warlters Road showrooms (open 9-6 p.m. weekdays and Saturdays). If you are unable to visit us please write for descriptive literature WS.

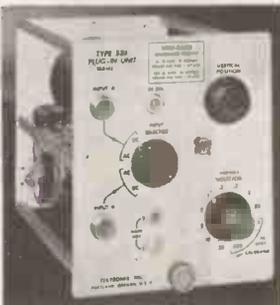
ARMSTRONG WIRELESS & TELEVISION CO. LTD., WARLTERS RD., HOLLOWAY, N.7 Telephone: NORTH 3213/4

5 BIG REASONS why you should own this oscilloscope



The Tektronix Type 531 Oscilloscope is far ahead in performance characteristics, and is capable of a much wider range of applications than the ordinary general-purpose laboratory oscilloscope.

- 1 **TYPE 531 EXCELS in vertical-amplifier characteristics** — with the Type 53B Plug-In Preamplifier it offers accurately calibrated sensitivity to 0.05 v/cm from dc to 10 mc, 0.035- μ sec risetime ... to 0.005 v/cm from 5 cycles to 9 mc, 0.04- μ sec risetime.
- 2 **TYPE 531 EXCELS in sweep characteristics** — Miller-runup circuitry generates linear sweeps in the extremely wide range of 0.02 μ sec/cm to 12 sec/cm (600,000,000-to-1 ratio), with 24 accurately calibrated sweeps from 0.1 μ sec/cm to 5 sec/cm. 5x magnifier is accurate on all ranges.
- 3 **TYPE 531 EXCELS in triggering facilities** — offering amplitude-level selection, automatic triggering, and 30-mc sync in addition to all standard triggering modes.
- 4 **TYPE 531 EXCELS in writing characteristics** — new Tektronix precision metallized crt with 10-kv accelerating potential provides high brightness, improved focus, and excellent linearity. (Recorded writing rate exceeds 175 cm/ μ sec).
- 5 **TYPE 531 EXCELS in versatility** — Quick change plug-in preamplifiers and inherent oscilloscope capabilities combine to convert the Type 531 to applications normally requiring separate highly-specialized instruments. Available plug-in units provide for dual-trace ... low-level differential ... wide-band differential ... and micro-sensitive applications in addition to wide-band high-gain applications. Current development work promises greatly extended capabilities through new designs in plug-in units.



Type 531 Oscilloscope
\$995, £ 384

Type 53B Plug-In Unit
\$125, £ 49

plus duty if applicable
f.o.b. Portland (Beaverton),
Oregon, U.S.A.

Write for 16-page booklet.

Represented in Great Britain by
LIVINGSTON LABORATORIES LTD.
Retcar Street, London N. 19
Archway 6251



Tektronix, Inc.
P. O. BOX 831D, PORTLAND 7, OREGON
Cypress 2-2611 • Cable: TEKTRONIX

LANE

TWO-SPEED UNIT

MK VI

£18.10.0

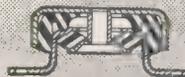
Less Attractive Discount
to Quantity Buyers

- ★ Three high-grade motors.
- ★ Single knob control, electrically and mechanically interlocked.
- ★ Drop-in tape loading.
- ★ Automatic brakes.
- ★ 2 speed 7½ in./sec. 3½ in./sec.
- ★ Speed change at turn of a key.
- ★ Twin track.
- ★ British Standard Specification.

Write for full details to

VERDIK SALES LTD. 8, RUPERT COURT, WARDOUR STREET,
LONDON, W.1. GERrard 8266

Protection against damage from IMPACT and VIBRATION



TYPE GBC 1000



TYPE GBC 2000

"BARRYMOUNT" cup-type isolators are designed primarily to absorb high-impact shocks with concurrent isolation of frequencies above 40 c.p.s. and general sound isolation. Utilisation of rubber in compression with substantially equal stiffness in all directions provides a smooth load-deflection curve.

Load ratings indicated for Mobile Applications (including shipboard installations) are such as to ensure a vertical natural frequency between 25 and 35 c.p.s. The design and assembly of the metal parts are such that they are self-captivating for maximum security.

Samples are available immediately ex stock

There are also air-damped types available for the protection of airborne equipment. "Barrymount" isolators are made in England under licence from Barry Controls Incorporated of U.S.A.

BARRY B MOUNT

DESIGNED FOR:-

- ★ MOBILE electronic and electrical equipment.
- ★ MILITARY and GUIDED MISSILE instrumentation.
- ★ SHIPBORNE sensitive equipment.
- ★ PROVIDING the optimum combination of impact isolation, vibration isolation, noise reduction, stability for the mounted unit.

CEMENTATION (MUFFELITE) LTD., 39 VICTORIA STREET, LONDON, S.W.1

GOODSELL



Williamson Amplifiers (below)

Type illustrated is the GW12 fitted with large 'C' core output transformer.

Price GW18 £33 : 15 : 0

with 'C' core £38 : 5 : 0

GW12 £27 : 10 : 0

with 'C' core £32 : 0 : 0

Please write for latest list.



Type PFA Pre-amplifiers (above)

The latest PFA unit is built especially for use with our range of Williamson Amplifiers. Separate bass and treble control in equaliser section. Low noise—high gain. 5 mv. input. 6 valves. Price £20.

★ FM receivers from £13 : 17 : 6 plus tax. Tape pre-amplifier with PFA and for use with Wearite 'B' deck £45.

GOODSELL LTD.

40 Gardner Street · Brighton 1 · Sussex
Tel. : Brighton 26735

LINE OUTPUT TRANSFORMER

TYPE L.O. 352

"L.O. 352" IS THE TYPE NUMBER OF AN ENTIRELY NEW ALLEN LINE OUTPUT AUTO-TRANSFORMER NOW AVAILABLE.

Note the following "Star" features:

- ★ E.H.T.: 14 to 18 KV.
- ★ E.H.T. Regulation: Better than 5 M.Ω
- ★ Audible Whistle: Negligible.
- ★ Application: Self-running, Square-wave or Sawtooth driven.
- ★ Associated Valves: PL81, PY81.
- ★ Associated Yoke: Allen Type DC605/C.
- ★ H.T. Rail: 190 volts for 14KV.
- ★ Core Material: Mullard Ferroxcube (earthed).
- ★ Scanning Angle: 72 degrees.
- ★ Suitable C.R.T.s: Any "wide-angle" tube, from 14 to 21in.

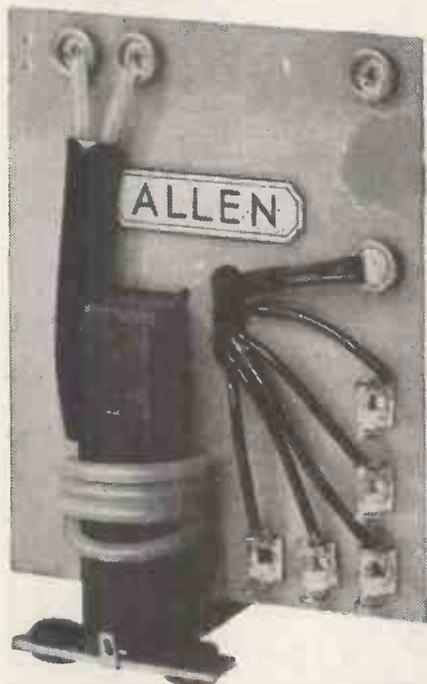
Manufacturers are invited to write for further details and prices. Home-Constructors: Please send S.A.E. for recommended circuit diagram and details.

COILS FOR WIRELESS WORLD F.M. TUNER

FMC 102	Aerial Coil	7/- each
FMC 103	R.F. Inter-valve Coil	5/- each
FMC 104	Oscillator Coil.....	7/- each
FMC 101	I.F. Transformer	7/6 each
FMC 151	Ratio Detector Transformers	25/- each
	(Crystal Diodes built-in)	

(Specialists in high-grade television components)

ALLEN COMPONENTS LTD. 197, LOWER RICHMOND ROAD, RICHMOND, SURREY



RD JUNIOR — "Designed exclusively for home High Fidelity systems"

CORNER HORN AND AMPLIFIER/CONTROL UNIT



Designed to form the nucleus of all but the most ambitious home high fidelity installations, the general performance of the RD JUNIOR is in keeping with the standard which has come to be expected of the modern high fidelity amplifier. It is, however, the many unique and novel features which have been incorporated in the design which distinguish it from its contemporaries and place it in a class apart, unrivalled by any other equipment approaching it in price. Outstanding amongst these features is the inclusion of an INDEPENDENT LOW PASS FILTER, virtually essential when dealing with worn records or bad radio transmissions, but normally only associated with the highest priced equipment. Exclusive features include "Impedance Plug", loudspeaker matching and the provision of four alternative Panel and Control Knob colours. Anticipating the use of an FM Unit a second radio input is provided, whilst the availability of ample spare power avoids the added expense of an additional power pack. An unusually high standard of materials and workmanship combine to provide absolute reliability, a factor reflected in the unconditional TWO-YEAR GUARANTEE covering both units.

PRICE £26 COMPLETE

Primarily designed to house the exceptional Goodmans Axiom 102 speaker, the Junior Corner Horn combines excellent bass response with virtually perfect treble diffusion to provide a standard of performance far superior to that suggested by its modest price. Compact in size it is the ideal reproducer for domestic use and the perfect companion for the RD JUNIOR amplifier.

BASIC PRICE, less speaker and side panels, £18/17/6 (carriage extra). Louvred side panels £3 per pair. Goodmans AXIOM 102 £9/18/1 incl. Illustrated literature post free on request.

12-page Illustrated Booklet post free on request.

Available from Specialist Dealers in London and the Provinces or, if in any difficulty, please apply direct. Agents in the majority of overseas countries.

Trade and Export enquiries invited.

ROGERS DEVELOPMENTS Co.

"Rodevco House," 116, Blackheath Rd., S.E.10. TIDeway 1723

MODERN ELECTRICS LTD.

164 Charing Cross Road, London, W.C.2.

Tel: TEMple Bar 7587.

Covent Gdn. 1703

Cables: Modcharex, London.

Prompt attention to post orders.

Export enquiries welcomed.

Immediate delivery from stock.

TAPE RECORDERS

GRUNDIG TK12 ...	70 gns.
GRUNDIG TK5 ...	45 gns.
GRUNDIG TK819 ...	95 gns.
GRUNDIG TK820/3D ...	98 gns.
FERROGRAPH 2A/N ...	76 gns.
VORTEXION 2A ...	80 gns.
VORTEXION 2B ...	£99

The following Recording Tapes are available from stock.
1,750ft. 1,200ft. 600ft.

FERROGRAPH	£3/3/-
FERROGRAPH	45/- 26/9
GRUNDIG BASF	40/- 25/-
SCOTCH BOY	35/- 21/-
EMI 77	48/-
EMI 88	35/- 21/-
AGFA	37/6 22/6
GAEVERT	35/- 21/-
PURETONE	20/-
FERROVOICE	32/6
SOUNDMIRROR	30/-

Empty Spools for all the above
3in. up to 8½in.

RECORD REPRODUCING EQUIPMENT

COLLARO TRANSCRIPTION	
Model 2010 PX	£18 11 11
RC54	£13 4 2
SS4 Unit	£8 18 4
GARRARD UNITS	
RC80M AC	£17 9 6
RC80M AC/DC	£26 3 5
301 Transcrip	£25 3 6
Type TA/AC	£10 16 0
Type TA/B with Decca heads	£14 0 11
CONNOISSEUR Variable 3 speed	£27 2 6

SPEAKERS

W.B. STENTORIAN	
HF.610	£2 10 6
HF.810	£3 0 6
HF.912	£3 9 6
HF.1012 tapped coil, 3, 7.5 or 15 ohms.	£3 17 6
GOODMANS	
Axiom 150 Mk. II	£10 5 6
Axiom 102	£9 18 2
Axiom 101	£6 12 1
Axiom 22	£14 14 0
WHARFEDALE	
W15CS	£17 10 0
Super 12 CS/AL	£17 10 0
W12CS	£9 15 0
Golden 10 CSB	£8 6 7
Super 5 and 8 CS/AL	£6 13 3
Bronze 10in.	£4 12 9
Bronze 8in.	£3 4 0
W.B. Crossover Unit	£1 10 0
W.B. Tweeter Unit	£4 4 0

TEST EQUIPMENT

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 MK III	£75 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)	£28 0 0
E.2 (Sig/Gen)	£32 10 0
P.1	£22 5 0
COSSOR	
Oscilloscope 1035	£120 0 0
Oscilloscope 1052	£104 0 0
Volt: Calibrator 1433	£18 5 0
TAYLOR	
All new Taylor Test Gear in stock.	

PICK-UPS

ACOS HGP20	£3 8 8
DECCA X.M.S. Magnetic	£6 9 5
CONNOISSEUR	
Super L/weight	£9 9 11
Spare Heads	£3 7 10
COLLARO STUDIO	
Type O or P	£3 14 8

LEAK PICK UP

2 Heads with Diamond Stylus	£20 19 9
FERRANTI	
With L.P.	£25 10 2

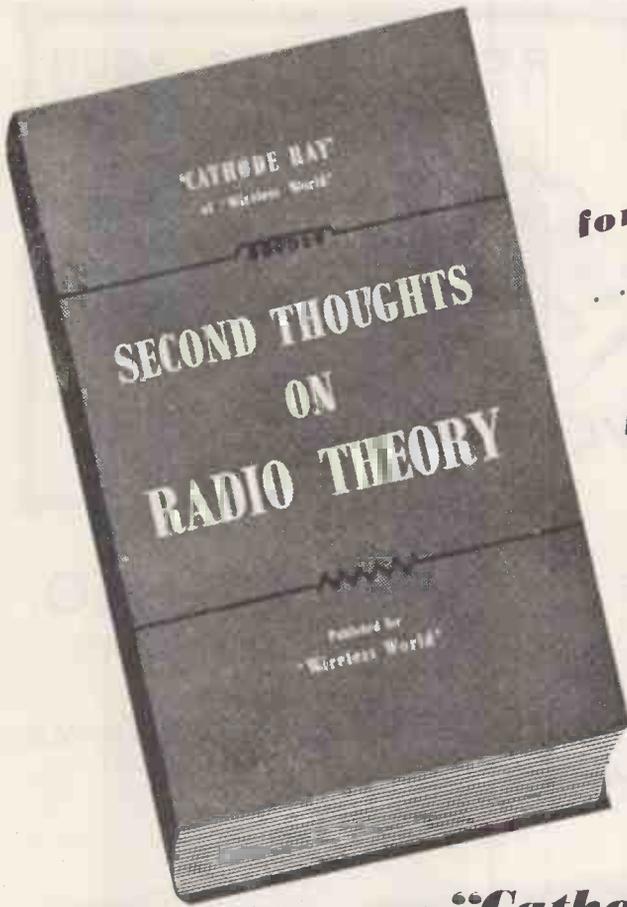
MICROPHONES

ACOS	
Mic 22 (Crystal)	£2 2 0
Mic inserts for above	£1 0 0
Mic 33-1	£2 10 0
Mic 35-1 (Crystal)	£1 5 0
LUSTRAPHONE	
M/C High Imp.	£5 15 6
LPV59 Dynamic	£8 18 6
RESLO	
URA Ribbon	£7 5 0
RVA Ribbon	£9 0 0
VMC (low imp.)	£6 0 0
FILM INDUSTRIES	
Ribbon	£8 15 0
MICROPHONE STANDS	
Floor, 3 extensions	£3 12 6
Table Stand	£1 5 0

LEAK AMPLIFIERS

TL10 complete	£28 7 0
Point 1, TL12	£28 7 0
Point 2, TL25	£34 7 0
QUAD, Mk. II	£42 0 0
MULLARD	£18 18 0
E.A.R., 4 watt	£9 9 0
TRIX, 4 watt	£16 10 0

ALL GARRARD, CONNOISSEUR, DECCA and COLLARO HEADS, SAPPHIRE and DIAMOND STYL for the above HEADS NOW AVAILABLE



for the student
... a helpful textbook

for the engineer
... a useful refresher
course

for all enthusiasts
... an invaluable
source of reference

CONTENTS INCLUDE:

- Basic Ideas
- Harmonics
- Modulation
- Resonance Curves
- The Coupling Capacitor
- The Cathode Follower
- Negative Feedback and Hum
- Attenuators
- Smoothing Circuits
- Super-Regenerative Receivers
- Cavity Resonators
- The Differential Calculus
- The Valve "Equivalent Generator"
- Thévenin's Theorem
- Reactance Sketches
- Tolerances and Errors
- Answers to Problems

"Cathode Ray" explains . . .

For over twenty years, "Cathode Ray" has been making radio theory—even its mathematics—intelligible and interesting in the pages of "Wireless World." More than forty of his most useful articles are now republished in this invaluable book, throwing new light on basic electrical ideas, circuit elements and calculations. Such things are too often glossed over by the student—and this book shows there is more to them than may be suspected!

Order your copy NOW!

Size 8½in. x 5½in. 412 pp.

25s. NET
BY POST 25s. 8d.

SECOND THOUGHTS ON RADIO THEORY

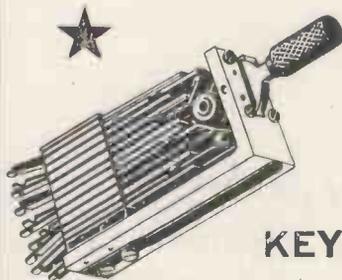
Published for "Wireless World"

R-E-L-A-Y-S

3000 TYPES

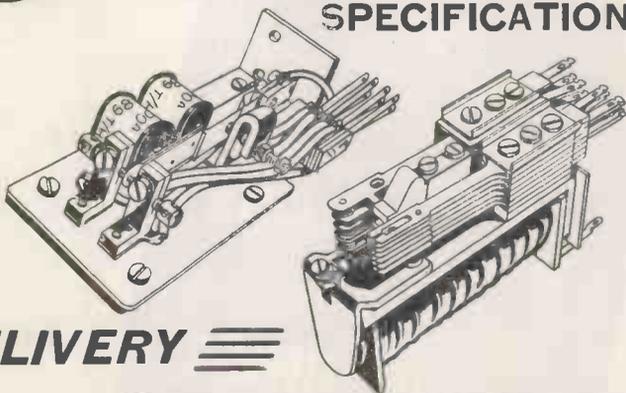
Standard or special COILS and CONTACTS up to 80,000Ω and up to 8 c/o's. 600 and HIGH-SPEED TYPES also Supplied.

≡ PROMPT DELIVERY ≡



LARGE
STOCKS
OF
KEYSWITCHES

P.O. TYPES TO YOUR SPECIFICATION



The
KEYSWITCH CO.

ALL POST OFFICE EQUIPMENT

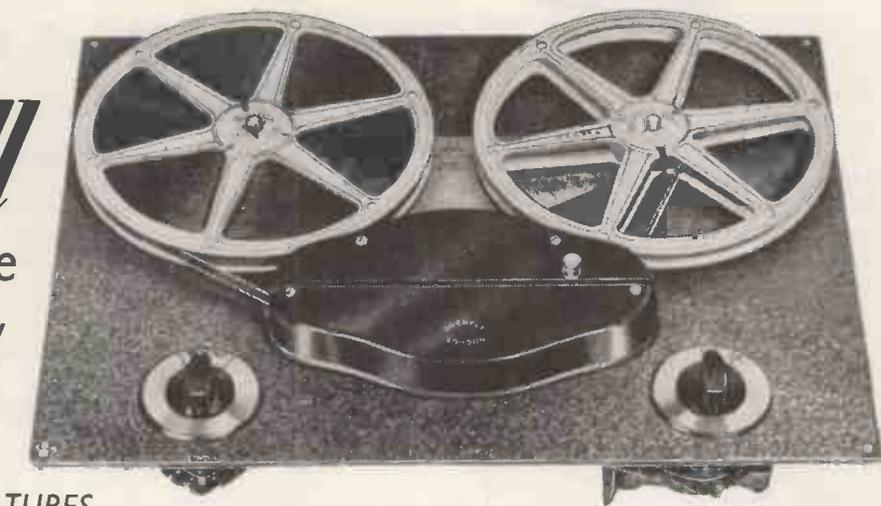
Enquiries to Sales Manager,
126, KENSAL ROAD, LONDON, W.10
Telephone LAD 0666 and 4640

Brenell

-best value
in quality
Tape Decks

WITH
ALL THE FEATURES

—at a price
anyone can afford
18 GNS

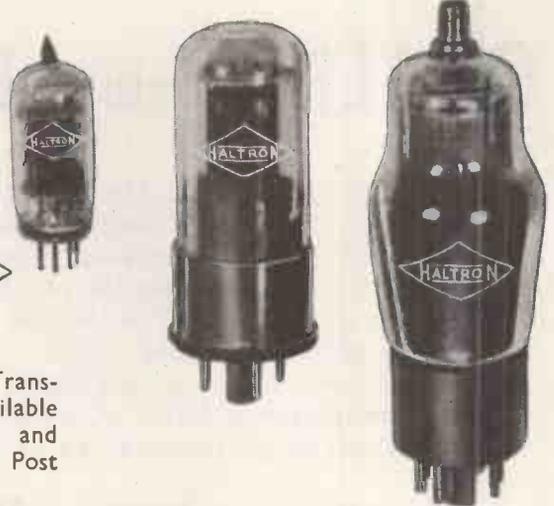


- Heavy Duralumin Baseplate 15" x 11½"
- Three independent motors
- Three speeds: 3¾, 7½ and 15 i.p.s.
- Twin-track recording, 7" reels (1,200 ft.)
- Foolproof "drop in" tape loading
- Simple two-knob control
- Positive mechanical braking
- Interlocked switching
- Visual playing time Indication
- Fast forward or reverse in 45 seconds
- Plays all makes of pre-recorded Tapes
- Azimuth adjustment to Record/Playback Head

From your
Wireless Dealer
or in case of difficulty write
to sole manufacturers:

BRENELL RECORDING AMPLIFIER ALSO AVAILABLE 16½ GNS
BRENELL ENGINEERING CO. LTD., 2 NORTHINGTON, ST., LONDON, W.C.1.

STRICTLY EXPORT ONLY



Leading Exporters of all types of Radio Receiving and Transmitting Tubes. Over 1,200 types in large quantities, available ex-stock. Contractors to British Commonwealth and Foreign Governments for Army, Navy and Air Forces, Post Offices, Civil Air Lines, etc. Ask for Export List.

SOME OF THE TYPES CARRIED IN STOCK

1AC6	3C23	6B5	6N7GT	7H7	16A5	77	808	402A	CMG28	LK82	EL91
1A3	3C24	6B6G	6P7G	7N7	17Z3	78	809	4021A	CMV6	DL83	EY51
1A5GT	3C45	6B7	6Q7G	7Q7	18	80	810	4033A	CMV28	DL66	EZ40
1A7G	3CP1	6B8	6Q7GT	7R7	18A95	80/S	811	404A	CV3	DL82	FG17
1A7GT	3DE/129	6B8G	6R7	7S7	19E2	81	813	404B	CV6	DL92	FG27A
1B68	3DP1	6B8GT	6R7G	7W7	19X3	82	814	4060A	CV24	DL93	FG67
1B27	3FF7	6BA6	6R7GT	7Y4	19Y3	83	815	4205E	CV43	DL94	FX215
1C5G	3LF4	6BE8	6S7	7Z4	21A6	83V	816	4212E	CV52	DRM1B	GG50
1C5GT	3Q4	6BG6G	6SA7	8D2	23D	84	828	4280A	CV67	DRM2B	GDT4B
1D5	3Q5G	6BE6	6SA7GT	8D5	24G	85J	828	4313C	CV68	DRM3B	GEX100
1D6	3Q5GT	6B19	6SC5	8D2	25A6G	86Y	829A	4323D	CV64	E448	GEX34
1S4/GT	3S4	6B17	6SG7GT	9D5	25A8GT	100TH	929B	4378	CV67	E1148	GEX35
1E7G	3V4	6BS7	6SD7GT	9HP7	25L6	117L7GT	830B	4690	CV72	E1155	GEX44/1
1E7GT	4C27	6BW6	6SF5	10	25L8GT	117N7GT	832	5763	CV75	E1190	GEX45/1
1F5G	4C29	6BW7	6SF7	10Y	25SN7GT	117Z6GT	838A	7193	CV83	E1191	GEX54
1G4GT	4D1	6BX6	6SG7	10D1	25Y6	210HL	833/833A	7475	CV85	E1192	GEX54/3
1G5G	4G3	6C4	6SH7	11D3	25Z4G	210SP	8011	CV88	E1221	E1248	GEX54/4
1G6/GT	4T3A	6C5	6SH7GT	11D5	25Z5	210SPT	837	8012A	CV92	E1248	GEX54/5
1H5G	4TFB	6C5G	6S7	12A6	25Z6G	210VPT	838	8013A	CV100	E1254	GEX55/1
1H5GT	5A21	6C5GT	6SJ7GT	12A6GT	25Z6GT	212E	841	8016	CV101	E1265	GEX56/1
1H6G	5A/102D	6C8	6SJ7Y	12A8GT	27	213P	843	8019	CV118	E1266	GEX68
1L4	5B4G	6C21	6SK7	12AH7GT	28D7	215GG	850	8020	CV119	E1271	GEX69
1L4A	5B/502A	6CD6G	6SK7GT	12AH8	30	217C	860	9001	CV125	E1325	GL450
1LC8	5BP1	6C8E	6SL7GT	12AT6	32	220B	861	9002	CV172	E1320	GL451
1LD5	5CP1	6D8	6SN7GT	12AT7	33	220P	863	9003	CV174	E1323	GU20
1LH4	5CP7	6D7	6SQ7	12AU6	33A/100A	220TC	864	9004	CV179	E1359	GUR2
1LN5	5C/450A	6E5	6SQ7GT	12AU7	35A5	220TH	865	9006	CV192	E1368	GUR21
1NSG	5D21	6E6	6SS7	12AX7	35L6GT	231D	866A	AC4/PEN	CV135	E1379	GV50
1NSGT	5FP7	6E7	6ST7	12BA6	35T	250TH	866R	AC4P	CV987	E1468	H30
1P5GT	5GP1	6F5G	6TTG	12BE6	35TG	262A/B	869B	ACT6	CV980	E1468	H63
1Q5GT	5JP4	6F5GT	6U5G	12BH7	35W4	279A	872A	ACT17	CV988	E1474	HD14
1R4	5L35	6F6	6U5/6G5	12C8	35Z3	282A	874	APP4B	CV1451	E1481	HF30
1R5	5L91	6F6G	6U7G	12C8GT	304TH, TL	875A	875A	APP4C	CV1563	E1484	HL2
1S4	5R4GY	6F6GT	6V6	12DP7	35Z5GT	307A	876	APP4G	CV1588	E1488	HL23
1S5	5T4	6F7	6V6G	12E6	36	310A	878A	AR12	CV1598	EA50	HL4
1T4	5U4G	6F7E	6V6GT	12F5GT	37	310B	884	AR13	CV6008	EB34	HL23
1U5	5V4G	6F8G	6W2	12J7GT	38	311A	905A	AR300A	CV31	EB91	HL41
1V	5X4G	6F8GT	6W7G	12K7GT	39/44	313C	923	AR4101	CV32	EB93	HP210
2A3	5Y3G	6G6G	6X4	12K8	40	323A	931A	AR3P	D1	EB33	FR210
2A4G	5Y3GT	6G6G	6X5	12K8GT	41	327A	954	AR4P	D15	EB34	KW6
2A5	5Y4G	6H6	6X5G	12Q7GT	41MP	328A/4328A	955	ARP13	D41	EC54	KR3
2A6	5Z3	6H6G	6X6GT	12SA7	41MPT	337A	956	AR38	D42	EC68	KR8/3
2A7	5Z4	6H8GT	6Y6G	12SA7GT	41MTL	354V	957	AR36	D43	EC68	KR2
2B7	5Z4G	6I5	6Y7G	12SC7	41MXP	357A	958A	AT4	DB3	EC68	KT2
2C8	5Z4GT	6I5G	6Z5	12SG7	41STH	368A	959	AT5	DB7	EC61	K78
2C8A	6A2	6I5GT	7A2	12SH7	42	380A	991	AT40	DA30	ECH22	KT24
2C34	6A6	6I6	7A4	12S7	42SPT	388A	1299A	AT4P	DA60	ECH35	KT30
2C40	6A7	6I7	7A5	12S7GT	43	394A	1816	AT870	DA90	ECH42	KT31
2C43	6A8G	6I7G	7A6	12SA7	45	450TL	1819	AU5	DA100	ECL80	KT32
2D21	6A8GT	6J7GT	7A7	12SK7GT	45SPE	703A	1822	AU7	DA31	EP22	KT33C
2E22	6A87	6J8G	7B6	12SL7GT	46	705A	1824	AZ1	DDR25	EF36	KT44
2J21A	6A88	6K6G	7B7	12SN7GT	50C5	707A/B	1625	AZ31	DEF7	EF37	KT61
2J34	6A07	6K6GT	7B7E	12SQ7	50CD6G	708A	1628	AZ41	DET9	EF37A	KT76
2J38	6AF6G	6K7	7B7P	12SQ7GT	50L8GT	709A	1629	B21	DET12	EF39	KT71
2J39	6AG5	6K7G	7C4	12SR7	50Y8GT	713A	1635	B30	DET16	EF41	KT761
2J48	6AG7	6K7GT	7C5	12T5G	53A	714Y	1642	BL43	DET19	EF50	KTW62
2J54	6A17	6K8	7C6	12X3	53KU	717A	1648	BT45	DET19	EF54	KTW63
2J54B	6AK5	6K8G	7C7	12Y4	54	723A/B	1815	C5B	DET25	EF80	KTZ41
2X2/878	6AK6	6K9GT	7D5	14B8	57	724A	1851	C10	DFP1	EF91	KTZ63
2X2A	6AL5	6L5G	7D7	14E7	58	725A	1960	C9A	DF92	EF92	KTZ73
3A4	6AM5	6L6	7D8	14E7	59	736A	2050	CA525	DL45	EF93	L2
3A71	6AM6	6L6G	7D9	14E7G	61P	800	2051	CA725	JE78	EF94	L30
3B7/1291	6AQ5	6L6GA	7E5	14E7	71A	801	2151	CK1005	DB77	EF95	L63
3B24	6AT6	6L7	7E6	14E7	72	801A	3951	CL33	DH31	EL22	L77
3B28	6AU6	6L7G	7E7	15D2	73	803	4003A	CM68	D4101	EL32	L610
3B/151A	6AV6	6N7	7E7	15E	75	805	4019A	CM622	DE107	EL33	LD210
3BP1	6B4G	6N7G	7G7	15R	76	807	4019B	CM625	DK31	EL41	LD410

HALL ELECTRIC LTD

HALTRON HOUSE, 49-55 LISSON GROVE, LONDON N.W.1.

Tel.: Ambassador 1041 (5 lines) Cables: Halletric, London

HALTRON

HALTRON

QUALITY PLUS ECONOMY

Is that possible? YES! The answer is to be found in the now complete range of "BAKERS Quality Speakers" comprising some 14 models covering the requirements of both the "Quality" enthusiast and the more general purpose Public Address. Further information on the above, including constructional details of suitable enclosures, will be gladly forwarded on request.



THE 12" 15W. DE LUXE
MK. I & MK. II

ALL EXPORT enquiries to:—

JOHN LIONNET & COMPANY,
62-63, Queen Street, London, E.C.4.

PROMPT QUOTATIONS WILL BE SUBMITTED ON REQUEST

BAKERS
'Selhurst'
RADIO

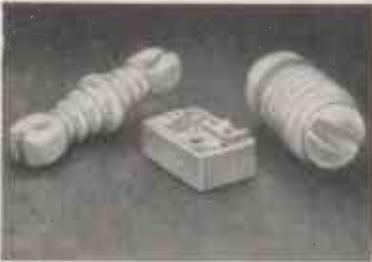
Please write for full details to:

24 DINGWALL ROAD, CROYDON, SURREY.

Croydon 2271/2

Bullers CERAMICS FOR INDUSTRY

High quality material and dimensional precision are attributes of Bullers die-pressed products. Prompt delivery at competitive prices.



We specialise in the manufacture of—**PORCELAIN**
for general insulation
REFRATORIES
for high-temperature insulation

FREQUELEX
for high-frequency insulation
PERMALEX & TEMPLEX
for capacitors



BULLERS LIMITED

MILTON · STOKE-ON-TRENT · STAFFS

Phone: Stoke-on-Trent 21381 (5 lines) · Telegrams & Cables: Bullers, Stoke-on-Trent

Ironworks: TIPTON, STAFFS

London Office: 6 LAURENCE POUNTNEY HILL, E.C.4

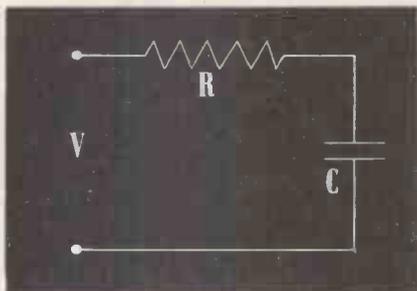
Phone: Tipton 1691

Phone: MANsion House 9971



Integration

In the hour glass, and the egg timer, the falling of a grain of sand marks the unit of time, and this is summated to measure longer periods. A contemporary analogy is a succession of electrical pulses integrated by a capacitor as used, for example, in fundamental particle counters and analogue computers. The **Suflex Polystyrene Capacitor** ensures the high insulation resistance and low dielectric absorption essential for accuracy, and is specified for these and many similar applications by even the most hard-boiled engineers.



Suflex Polystyrene Capacitors

- High insulation resistance
- Low dielectric absorption
- Good capacitance stability

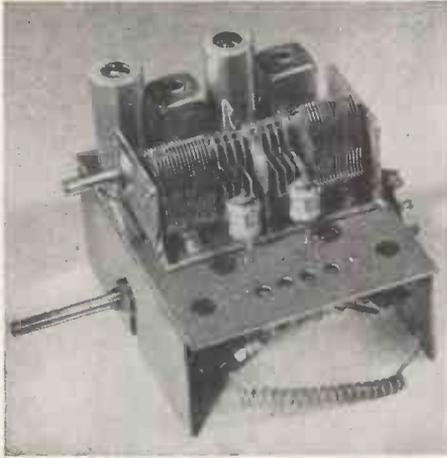
A quality component which may be economically used in commercial equipment



35 BAKER STREET, LONDON W1
 Telephone: WELbeck 0791 Cables: Suflex London

WEYRAD

COMPONENTS FOR FREQUENCY MODULATION



COMBINED AM/FM COIL PACK. TYPE B.60.

Provides AM reception on Long and Medium waves and FM in the 84-96 Mc/s. band.

Completely assembled with 4-position switch, valve holders, screens and all associated components. Designed for use with valves types 8AM6 (R.F. amplifier on FM only) and 8BE6 Frequency Changer (AM and FM).

Dimensions: Width 5½ in. Length 4½ in. (plus switch spindle). Overall depth 4½ in.

The tuning condenser is a twin gang, 2-section type and can also be supplied with the Coil Pack.

PRICE: Coil Pack 71/9. Plus 23/4 P.T. Tuning Condenser 22/-.

I.F. TRANSFORMERS AND RATIO DETECTOR.

Type P.21/1 470 kc/s and 10.7 Mc/s I.F. Transformers.

Type P.21/2 470 Kc/s. I.F. and Ratio Detector.

Iron-cored assemblies mounted in aluminium cans, core adjustment at opposite sides of can. Size 1½ in. square, 3½ in. high. Recommended valves are—6BE6, 6BA6 and EABC80.

PRICE P.21/1, 12/6 each. P.21/2, 14/2 each.

TELEPHONE :—
WEYMOUTH
701.

WEYMOUTH RADIO MFG., CO., LTD.
CRESCENT STREET, WEYMOUTH, DORSET

TELEGRAMS :—
WEYRAD.
WEYMOUTH.

M. R. SUPPLIES Ltd.

For the right goods at the right price. Full and fair descriptions. Immediate delivery carefully packed. Prices nett.

HIGH DUTY MAINS TRANSFORMERS (5½ kvA.). Very fine offer of £40 units ex. Philips. Brand new, ex. cancelled order. Primary tapped 200/250 v., 50 c. 1 phase. Secondary providing taps up to 180 volts 30 amps (or 360 volts 15 amps). Taps:—4, 8, 12, 16, 20, 42, 63, 90, 120, 140 and 180 volts (two identical secondary windings). Dimensions:—13in. high by 10in. width by 19in. length, weight approx. 1 cwt. Double wound, tropical specification. We have 25 only at £12/10/- each nett. ex. this address. Suitable for use with high-current rectifiers, mains isolation, and general laboratory use. We prefer that these be picked up from here but can quote or despatch. Suitable rectifiers for above, if required, are in stock.

L.V. HIGH CURRENT TRANSFORMERS (ex. above cancelled order). Brand new. Prim.—200/250 v. 50 c. 1 ph. Sec.—Two identical windings of 1 volt 40 amps. Windings in parallel produce 1 volt 80 amps. A few at 28/8 (despatch 2/6).

SYNCHRONOUS TIME SWITCHES. 200/250 v. 50 c. Can be set to switch on and off at any desired time of the day. Load capacity 4 amps A.C. (250 v.). In wall mount metal housing with glass window. Secondhand, perfect, 58/6 (des. 2/6). The finest bargain in first-grade Time Switches.

ROTARY TRANSFORMERS (Perm. magnet field—for stepping up or down). Three commutators, 6 and 12 volt to 250 v. D.C., 65 mA., or will deliver 6 or 12 volts from 200/250 v. D.C. mains for model railways, or 200/250 v. D.C. from car battery for electric razors. Very handy units, in new condition, 12/6 (des. 2/-).

STUD SWITCHES, with 20 stud taps, make before break, 5in. sq. by 2in. deep, with laminated switch arm, brand new, boxed, 9/6 (des. 1/-).

MAINS MOTORS. Best capacitor/induction type, for 250/250 v. 50 c. 1 ph. (capacitor fitted to motor) 1,425 r.p.m. reversible. One-quarter H.P. 24/18/6 (des. 5/-). Also One-half H.P., same type, ball bearings, 27/5/- (des. 7/6). These are brand new.

F.H.P. GEARED MOTORS—we are the largest stockists in London and we invite interested firms to send for our net list GM/365 giving full details of many models from stock. Final speeds from 1 r.p.m. to 160 r.p.m., final torques from 3 lbs./ins. to 75 lbs./ins. Prices from 25/17/6. Dimensional drawings available.

SMALL GEAR BOXES. Double worm gear, 300/1 reduction. In die-cast housing 2½ x 2½ x 2in. Final shaft ½in. dia. by 1½in. proj. Ball bearings, transmission up to 1/10th H.P., 45/- (des. 1/6).

PUSH-BUTTON SWITCHES. Two-button, push-on, push-off. Diamond H, capacity, 5 amps (250 v.), 2/6 (des. 6d).

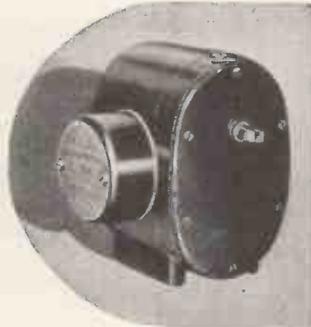
Details on request—Philips Variable Transformers, Stuart Electric Pumps, B.P.L. Measuring Instruments, Thermostats, Extractor Fans.

SYNCHRONOUS ELECTRIC CLOCK MOVEMENTS. Owing to certain delays caused by the great demand for this popular offer we have not again advertised these until we have substantial stocks immediately available. We promise delivery by return. For 200/250 volts 50 cycles, with spindles for hours, minutes and seconds hands, in plastic dust cover 3½in. dia. 2in. deep, with flex ready for use, 27/6 (des. 1/-). Set of 3 hands, in good style, for 6/7in. dial, 2/-.

VERY MINIATURE L.V. MOTORS for Models, 6/12 v. operation 0.25 amp. Well made with P.M. field, reversible, only 1¼ x 1¼ x ½in. with shaft proj. ½in., 8/6 (post paid).

M. R. SUPPLIES, Ltd., 68 New Oxford St., London, W.C.1
Telephone: MUSeum 2958

Fractional H.P. MOTOR UNITS



The DRAYTON R.Q. is a miniature capacitor induction type motor with a current consumption at 230 volts, 50 cycles of 0.09 amps pf. 0.9.

RQG GEARLESS

Running at 2,700 r.p.m. continuously or intermittently in either direction or continuously reversed.

RQR GEARED

For continuous or intermittent running or reversing at speeds from 27 mins. per rev. to 600 revs. per min., with or without self-switching up to 2 1/3 r.p.m.

RQH GEARED

For high final shaft speeds for continuous or intermittent running, forward or reverse.

Send for List No. N. 302-1.

for actuating valves, dampers, rheostats, geneva movements, rocking baths, flashing signs, illuminated models, soldering and welding fixtures, rotating tables, automatic light strip feed, lubricating and other small pumps, small machines, animated displays, vibrators, developing baths, agitators, fans, aspirators, etc.

-The DRAYTON 'R.Q.'

The Drayton Regulator & Instrument Co. Ltd., West Drayton, Middlesex

RQ14

"ADDEX" UNITS

ANTIFERRENCE now offer a complete range of "Addex" attachments to convert existing Band 1 Television aerials for dual Band reception. These units are simply and quickly fitted and obviate the necessity for separate cable connections. The six models available are illustrated below and literature dealing with them all is obtainable through your usual Antiferrence wholesaler, who can also supply you with leaflets covering the entire range of individual Band 3 models for separate installation, and the comprehensive ranges of Band 1 and Band 2 (FM) aerials.

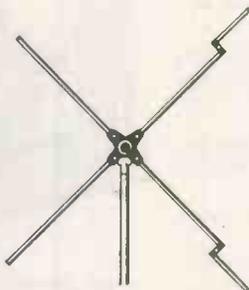
*bring Band I
Aerials up-to-date*

"ADDEX" Type 'X' List Price 15/-



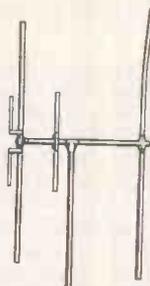
The "Addex" Type 'X' for fitment to a Band 1 aerial and suitable for Channels 1 and 2. This kit comprises 4 "grip-on" rod units for attachment to aerials of 3/8 in. or 1/2 in. dia. rod elements.

"ADDEX" Type 'BX' List Price 7/6.



2 units only (for Channel 4)

"ADDEX" Type 'H' List Price 15/-



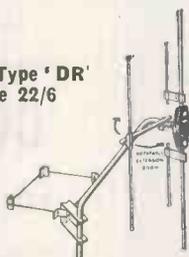
Comprising two "grip-on" rod units and one "reflector" unit with universal boom fitting. Suitable for all "H" aerials with 3/8 in. or 1/2 in. dia. rods.

"ADDEX" Type 'D' List Price 7/6



For use on single dipole aerials and comprising two "grip-on" units. Suitable for all dipoles with 3/8 in. or 1/2 in. dia. rods.

"ADDEX" Type 'DR' List Price 22/6



For attachment to single Dipole or 'H' aerial for Band 3 reception over greater distances.

"ADDEX" Type 'D/RD' List Price 32/6



For attachment to single Dipole or 'H' aerial for Band 3 reception over greater distances.

★ Visit us at the RADIO SHOW at Earls Court on STAND 64.

ANTIFERRENCE LIMITED

Sales Division:
Bicester Road, Aylesbury,
Bucks.
Telephone: Aylesbury 1467/8/9

PREMIER RADIO CO.

B. H. MORRIS & CO. (RADIO) LTD. EST. 40 YRS.

(Dept. W.W.) 207 EDGWARE RD., LONDON, W.2. Tel.: AMBassador 4033 & PADdington 3271

THE NEW PREMIER TELEVISOR 13 CHANNEL DESIGN

SUITABLE FOR USE WITH ANY POPULAR WIDE ANGLE TUBE

BAND 3 (COMMERCIAL)
For the Home Constructor

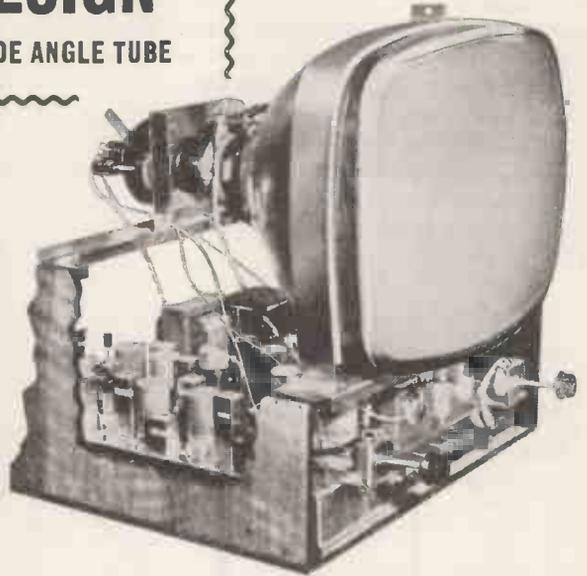
DESIGN 1. Includes a Multi-Channel Tuner (Channels 1-13) continuously variable 40 — 100 Mc/s and 170-225 Mc/s. The Tuner is supplied wired and tested and is complete with valves, all connecting leads and fixing brackets.

THIS DESIGN MAY BE BUILT FOR £34/9/7 (plus cost of C.R.T.).

DESIGN 2. Channels 1-5, tunable from 40-68 Mc/s. THIS DESIGN MAY BE BUILT FOR £30 (plus cost of C.R.T.).

- ★ Constructors who have built Design 2 (5 Channels) may convert their receivers to Design 1 for £6, this price includes Multi-Channel Tuner, New Vision Input Coil and full instructions.
- ★ All coils supplied for these two Superhet Receivers are PRE-TUNED ASSURING ACCURATE ALIGNMENT and EXCELLENT BANDWIDTH.
- ★ Duomag permanent magnet focusing with simple picture centring adjustment.
- ★ Exceptionally good picture "hold" and interlace. Noise suppression on both Sound and Vision.

THE COMPLETE TELEVISOR IS SAFE TO HANDLE, BEING COMPLETELY ISOLATED FROM THE MAINS BY A DOUBLE WOUND MAINS TRANSFORMER. ALL PRESET CONTROLS CAN BE ADJUSTED FROM THE FRONT, MAKING SETTING UP VERY SIMPLE.



The Televisor may be constructed in 5 easy stages: (1) Vision, (2) Time Base, (3) Sound, (4) Power Pack, (5) Final Assembly. Each stage is fully covered in the Instruction Book, which includes layout, circuit diagrams and point-to-point wiring instructions.

The Instruction Book also includes full details for converting existing Premier Magnetic Televisors for use with modern wide angle tubes. All components are individually priced.

Instruction book 3/6, Post Free. Includes details of both designs.



CONSOLE CABINETS

For 14", 16" and 17" Televisors

A handsome Walnut Cabinet that will be a fitting housing for a first-class Televisor.

Folding doors are fitted to cover the Cathode Ray Tube when not in use. A flap is provided which gives access to the preset controls on the front edge of the Chassis. A baffle board suitable for a 10in. Loudspeaker and all the necessary Tube and Chassis bearers are included. The overall dimensions of the Cabinets are the same: Height 38½in. Width 19in. Depth Top 19in. Depth Bottom 21in.

TUBE ESCUTCHEONS

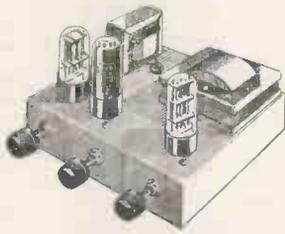
17in. White Moulded.....	21/- (pkg. & post 1/6)
17in. Bronze Moulded, complete with Protective Glass.....	48/- (pkg. & post 2/6)
14in. Black Moulded.....	7/6 (pkg. & post 1/-)
Dark Screen Filter suitable for 14in. Tube.....	21/- (pkg. & post 1/6)
Dark Screen Filter suitable for 16in. and 17in. Tubes.....	25/- (pkg. & post 1/6)
Polystyrene Mask for E.E.T.901.....	45/4 (pkg. & post 2/6)
Rubber Ring (anti-Corona) for E.E.T.901.....	6/8
Polystyrene Shroud for E.E.T.901.....	6/8

PRICE **£13-10-0** PLUS 21/- PKG. & CAR. H.P. TERMS: DEPOSIT £3.10.0 & 11 MONTHLY PAYMENTS OF £1.0.0

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.

PREMIER RADIO COMPANY

4-WATT AMPLIFIER



MAY BE BUILT FOR **£4.10.0** Plus 2/6 Pkg. & Carr.

Valve line-up 6SL7, 6V8 and 6X5, FOR A.C. MAINS 200/250 VOLTS. Output Transformer suitable for either 3 ohm or 15 ohm Speakers. Negative feed-back is applied from the secondary of the output Transformer over the whole Amplifier to the input stage giving an excellent frequency response. Due to the high gain and wide range tone controls any type of pick-up may be used. Overall size 9 7/8 x 5 1/2 in. Price of Amplifier complete, tested and ready for use, £5/5/-, plus 3/6 pkg. and carr. Steel case finished black crackle with engraved panel. 21/- extra.

INSTRUCTION BOOK, 1/- (Post Free) which includes Assembly and wiring diagram, also a detailed Stock List of priced components.

QUALITY ENTHUSIASTS

Electrostatic H.F. Speaker type LSH75 Gain of 20 db over the range of 7-18 kcs., inherent capacity 800 pf., maximum polarising voltage 300 D.C., operative A.C. voltage 60, suitable for outputs of up to 5 watts, size 2 1/2 in. x 2 1/2 in. x 1 1/2 in., price 12/6. Type LS100, details as above, inherent capacity 1100 pf., suitable for outputs of up to 20 watts, size 5 in. x 3 in. x 1 1/2 in., price 21/-.

Will add sparkle to the top response of any equipment.

RECTIFIERS

Type	E.M.T. Pencil Type S.T.C.	1 mA.	4/7
.. K3/25	650 v.	1 mA.	6/-
.. K3/40	3.2 kV.	1 mA.	8/2
.. K3/45	3.6 kV.	1 mA.	8/8
.. K3/60	4 kV.	1 mA.	8/8
.. K8/100	8 kV.	3 mA.	14/8
.. N3/160	12 kV.	1 mA.	21/6
.. K3/180	14.4 kV.	1 mA.	24/6

Type	H.T.	S.T.C.	60 mA.	4/-
.. RM1	125 v.	120 mA.	4/6	
.. RM2	125 v.	125 mA.	5/6	
.. RM3	125 v.	250 mA.	18/-	
.. RM4	250 v.			

L.T. Type Full Wave			
12 v. 1 amp.			8/-
12 v. 2 amp.			10/9
12 v. 4 amp.			19/6

A RANGE OF BAND 3' AND F.M. AERIALS IS NOW AVAILABLE

Teletron Ferrite Rod Aerials. Medium Wave 8/9. Medium/Long Wave 12/9.

Illustrated list available giving full details of Bureau type Cabinets.

ALUMINIUM CHASSIS 18 s.w.g.

Substantially made from Bright Aluminium with four sides:

7 x 5 1/2 x 2 1/2 in. ... 4/-	10 x 9 x 3 in. 7/-
7 x 3 1/2 x 2 1/2 in. ... 3/9	12 x 10 x 3 in. ... 7/9
9 1/2 x 4 x 2 1/2 in. ... 4/3	14 x 10 x 3 in. ... 7/11
10 x 8 x 2 1/2 in. ... 5/6	16 x 10 x 3 in. ... 8/3
12 x 9 x 2 1/2 in. ... 7/-	16 x 8 x 2 1/2 in. ... 8/-
14 x 9 x 2 1/2 in. ... 7/6	

ALUMINIUM PANELS 18 s.w.g.

7 x 5 1/2 in. 1/3	7 x 4 in. 1/-
9 1/2 x 6 in. 1/8	9 1/2 x 4 in. 1/5
10 x 9 in. 2/2	10 x 7 in. 1/11
12 x 9 in. 2/8	12 x 7 in. 2/5
14 x 9 in. 3/2	14 x 7 in. 2/11
16 x 9 in. 3/8	16 x 7 in. 3/5
20 x 9 in. 4/8	20 x 7 in. 4/5
22 x 9 in. 5/2	22 x 7 in. 4/11

CABINETS—PORTABLE

Model PC/1

Brown Rexine covered 15/11
Overall dimensions 15 in. x 13 1/2 in. x 6 in.
Clearance under lid when closed 2 1/2 in.



Model PC/2

Grey Lizard Rexine covered 45/-
Overall dimensions 15 in. x 13 in. x 6 in.
Clearance under lid when closed 3 in.

Model PC/3

Rexine type covering in various colors, 69/6.
Overall dimensions 16 1/2 in. x 14 1/2 in. x 10 1/2 in.
Clearance under lid when closed 6 1/2 in.
All the above Cabinets are supplied with Panel Carrying Handle and Clips.

Packing and Postage 2/6.

FREQUENCY MODULATION

V.H.F. Tuning Unit type UT340 permeability tuned, coverage 86-103 mcs. stage gain Aerial to output of 1st I.F. (contained in Unit) approximately 350. Maximum frequency drift 0-70 degrees centigrade 30 kcs. Radiation less than 26 microvolts per metre price 59/5, (including tax). Valve UCC85.

I.F. type U.F.376 inter-stage, 10.7 mcs., C-110. Coupling factor unity, price 7/-.

Ratio Filter type URF377 Q1-75, Q2-105, price 10/6
Overall bandwidth of the above Units 200 kcs.

Complete Handbook containing full details of construction and point-to-point wiring diagrams including also details of F.M. Aerials 2/6 post free.

★QUALITY CRYSTAL PICK-UP ROTHERMEL TYPE U48 26'-. Plus 1/6 Pkg. and Carr.

★
SPECIAL OFFER
LIMITED PERIOD

“PREMIER PORTABLE”

TAPE RECORDER

USING THE NEW LANE 2-SPEED TAPE UNIT MARK 6

COMPLETE **£36** CASH

Packing & Carriage 1 gn.

(Including Reel of Scotch Boy Tape and Microphone)

H.P. Terms: Deposit £10/8/- and 12 monthly payments of £2/16/-.

SPECIFICATION

- ★ TWO SPEEDS 7 1/2 in. AND 3 1/2 in. PER SECOND.
- ★ THREE SPECIALLY DESIGNED RECORDING MOTORS.
- ★ 1,200FT. TAPE REELS PROVIDING PLAYING TIMES OF 1 HR. AND 2 HRS.
- ★ DROP-IN TAPE LOADING.
- ★ EASY FORWARD OR REWINDING WITHOUT REMOVING TAPE.
- ★ ONE KNOB DECK OPERATION.
- ★ 7-VALVE HIGH QUALITY AMPLIFIER.
- ★ INDEPENDENT TREBLE AND BASS CONTROLS.
- ★ MAGIC EYE RECORD LEVEL INDICATOR.
- ★ AMPLIFIER MAY BE USED FOR RECORD REPRODUCTION OF HIGH QUALITY.
- ★ COMPARTMENT FOR HOUSING MICROPHONE.
- ★ SPECIALLY DESIGNED MICROPHONE BY A LEADING MANUFACTURER.



SEPARATE UNITS CAN BE SUPPLIED AS LISTED BELOW:—

Amplifier (built, wired and tested with Speaker). £14/15/-, plus postage and carriage 7/6.

Hire Purchase Terms, Deposit £3/15/- and 11 monthly payments of £1/2/-.

New Lane 2-speed Tape Unit Mark 6. £18/10/- plus packing and carriage 7/6.

Hire Purchase terms, Deposit £4/11/9 and 12 monthly payments of £1/5/6.

Portable Cabinet (rexine covered). £4/19/6, plus postage and carriage 5/-.

Microphone, £2/15/-, plus postage and carriage 1/-.

Reel Scotch Boy Tape MC2-111 (1,200ft.), £1/15/-, plus packing and carriage 1/-.

Instruction Booklet. 2/6. Post free.

PREMIER RADIO COMPANY

WILLIAMSON AMPLIFIER KIT 15 gns.

H.P. Terms:
Deposit £3.18.9 & 12 monthly payments of £1.1.8
This Kit is absolutely complete and all components are guaranteed exactly to author's specification.

WILLIAMSON OUTPUT TRANSFORMER

Author's Specification 3.6 ohms secondary £4.10.0

MAINS TRANSFORMER SP425A

(Completely Shrouded)
This Transformer has an extra 6.3 v. 3 A. and is capable of supplying an additional 50 mA. for Pre-amp or Feeder unit £2.12.6

WILLIAMSON CHOKES

12H 150 mA. Fully shrouded 19/6
30H 20 mA. Fully shrouded 11/9

PRE-AMPLIFIER AND TONE CONTROL UNIT



Suitable for use with the "Williamson" or any other Quality Amplifier. Two switched inputs with pre-set volume controls. Tone controls, bass boost and cut treble boost and cut. Output volume control, fitted into Steel box 10 1/2 in. x 3 1/2 in. x 3 1/2 in., silver hammer finished complete with black Perspex panel engraved in silver. Power requirements LT 6.3 volts, 9 amp. HT 250 volts 5 mA. Kindly state HT voltage available, if over 250 volts, to enable the correct dropping resistor to be fitted in the Pre-amplifier. Completely wired, tested and supplied with Valves for £5/5/-, postage and packing 2/6.

PREMIER MAINS TRANSFORMERS

All primaries are tapped for 200-230-250 v. mains 40-100 cycles. All primaries are screened.
SP175B, 175-0-175, 50 mA., 4 v. @ 1 a., 4 v. @ 2-3 a. 15/-
SP350A, 350-0-350, 100 mA., 5 v. @ 2-3 a., 6.3 v. @ 2-3 a. 21/-
SP351A, 350-0-350, 150 mA., 4 v. @ 2-3 a., 4 v. @ 3-6 a., 4 v. @ 1-2 a., 4 v. @ 1-2 a. 30/-
SP352, 350-0-350, 150 mA., 5 v. @ 2-3 a., 6.3 v. @ 2-3 a., 6.3 v. @ 2-3 a. 30/-
SP425A, 425-0-425, 300 mA., 6.3 v. @ 2-3 a., 6.3 v. @ 3-5 a., 5 v. @ 2-5 a. 52/6
250-0-250, 80 mA., 6.3 v. @ 4 a., 5 v. @ 2 a. 19/6
350-0-350, 80 mA., 6.3 v. @ 4 a., 5 v. @ 2 a. 19/6
200-230-250 output 3 v.-30 v. @ 2 a. 17/6

E.H.T., primary 230 v., secondary 1.75 Kv., 2 1/4 v. tapped 2 v. 37/6
E.H.T. TRANSFORMER, primary 210 v., 230 v., 250 v., secondary 4 Kv. and 2 v. £3/7/6
E.H.T. TRANSFORMER, primary 210 v., 230 v., 250 v., secondary 5 Kv. and 2 v. £3/12/6

Build these NEW PREMIER DESIGNS

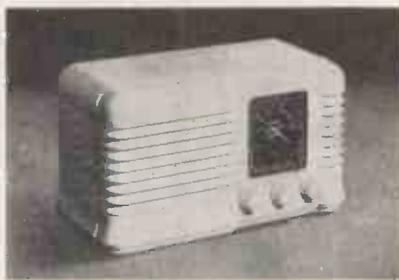
3-BAND SUPERHET RECEIVER



MAY BE BUILT FOR **£7.19.6** Plus 2/6 Pkg. & Carr.

Latest type Superhet Circuit using 4 valves and metal rectifiers for operation on 200/250 volts A.C. mains. Waveband coverage — short 16-50 metres, medium 180-550 metres, and long 900-2,000 metres. Valve line-up 6K8 freq. changer, 6K7, 1F, 6Q7, Detector AVC and first AF, 6V6 output. The attractive cabinet to house the Receiver size 12in. long, 6 1/2 in. high, 5 1/2 in. deep can be supplied in either WALNUT or IVORY BAKELITE or WOOD. Instruction Book 1/- post free, which includes assembly and wiring diagrams, also a detailed stock list of priced components.

TRF RECEIVER



MAY BE BUILT FOR **£5.15.0** Plus 2/6 Pkg. & Carr.

The circuit is the latest type TRF using 3 valves and Metal Rectifiers for operation on 200/250 A.C. mains. Waveband coverage is 180-550 metres on medium wave and 800-2,000 metres on long wave. The dial is illuminated and the Valve line-up is 6K7 H.F. Pentode, 6I7 Detector and 6V6—Output. The attractive Cabinets to house the Receiver size 12in. long, 6 1/2 in. high, 5 1/2 in. deep, can be supplied in either WALNUT or IVORY BAKELITE or WOOD. INSTRUCTION BOOK 1/- (post free) which includes Assembly and wiring diagrams, also a detailed Stock List of priced component.

ALL-DRY BATTERY PORTABLE RADIO RECEIVER



MAY BE BUILT FOR **£7.8.0** Plus 2/6 Pkg. & Carr.

4 miniature Valves in a Superhet Circuit covering medium and long waves. Rexine covered Cabinets 11 1/2 in. x 10 in. x 5 1/2 in. in two contrasting colours. Wine with Grey Panel, or Blue with Grey Panel, please state choice when ordering. THE SET MAY BE USED EVERYWHERE—home, office, car or holidays. INSTRUCTION BOOK 1/6 (Post Free) which includes Assembly and wiring diagrams, also a detailed Stock List of priced components.

DECCA MODEL 33A

RECORD PLAYER ADAPTABLE FOR STAND. OR L.P.

Includes crystal pick-up with sapphire stylus and a light-weight plastic spring balanced arm. Heavy gauge pressed steel case with brown enamel finish in good quality for operation on A.C. mains 200/250 v. 50 c.p.s. Supplied complete with single head (either standard or long playing.) £24/19/6. Extra Head can be supplied. Plus Pkg. and Carr. 5/-.

DECCA MODEL 37A. Appearance as above (Model 33A) lever speed change 33 1/3 r.p.m. and standard, crystal turnover Head. £8/19/6. Plus packing and carr. 5/-.

LOUDSPEAKERS

ELAC ELIPTICAL 7" x 4" 21/10
ELAC SPESSEY 12" 37/6
ELAC—2 1/2 in. dia. Moving Coil, 15 ohm imp. 15/-
ELAC—8 in. dia. Moving Coil 3 ohms imp. 19/6
PLESSEY—8 in. dia., Mains Energised, 3 ohms imp. (600 ohms field) with Pentode Transformer 12/6
PLESSEY—8 in. dia., Mains Energised, 3 ohms imp. (600 ohms field) 10/6
PLESSEY—10 in. dia. Moving Coil, 3 ohms imp. 23/6
GOODMANS—12 in. dia., Moving Coil, 15 ohms. Plus 5/- packing and carriage £8/12/6
VITAVOX—K12/20 12 in. dia., Moving Coil 15 ohms. imp. £11/11/- Plus 5/- packing and carriage.

3-SPEED AUTOMATIC RECORD CHANGER

Made by World-famous manufacturer. The Unit designed to play 12in., 10in. and 7in. Records intermixed 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. For use on 100/125-200/250 volts 50 cycles. A.C. mains. LIMITED QUANTITY ONLY. Plus packing and carriage 5/-. BRAND NEW, guaranteed and in manufacturers' original carton. LIST PRICE £16/10/-



£9.19.6

BARGAIN OFFER

DARK SCREEN FILTER IN TRIPLEX GLASS 18" x 14" SUITABLE FOR ALL TUBES UP TO 17" 10/-. PLUS PACKING & POSTAGE 1/6d. LATEST TYPE RUBBER ESCUTCHEON SUITABLE FOR 17" RECTANGULAR TUBES AT A SPECIAL PRICE OF 10/-. PLUS PACKING & POST 1/6d.

LATEST TYPE 3-SPEED SINGLE PLAYER



By famous manufacturer with crystal turnover head, for use on 100-250 v. 50 cycle A.C. mains. £7/19/6. Plus pkg. & carr. 5/-.

ACCUMULATORS

2 volt 10 amp. (by famous maker) 4/11
2 volt 16 amp. 5/11

METERS

Full Scale Deflection	External Dimensions in.	Movement	
3.5 A.	2 1/2 x 2 1/2	B.F. Thermo.	7/6
20 A.	2 1/2 round	M/C	8/6
40 A.	2 1/2 round	M/C	8/6
100 mA.	2 1/2 round	M/C	10/6
30 A.	2 1/2 x 2 1/2	M/C	8/6
50 mA.	2 1/2 x 2 1/2	M/C	7/6
20 V.	2 1/2 x 2 1/2	M/C	6/6
1 mA.	2 1/2 round	M/C	22/6

CRYSTAL MICROPHONE INSERTS

Ideal for tape recording and amplifier. No. Matching transformer required, 8/6 post free



SPECIAL OFFER

Acos Microphone type 22-2 complete with Stand 39/6

MAINS NOISE ELIMINATOR KIT

Two specially designed chokes with three smoothing condensers with circuit diagrams. Cuts out all mains-noise. Can be assembled inside existing receiver, 4/11. plus 6d. pkg. and carr.

Germanium Crystal Diodes. G.E.C. wire ended, 2/6. 24/- doz.

PREMIER RADIO COMPANY

1155 RECEIVER UNIT

GRADE 2
Slightly soiled complete with 10 valves.
Frequency range 18.5 Mc/s. - 75 Kc/s. in 5 wave-bands. £9/19/6.
Plus 10/6 packing and carriage.
Hire Purchase Terms: £2/9/6 deposit and 10 monthly payments of 17/-.



POWER SUPPLY UNIT WITH OUTPUT STAGE FOR ABOVE



Jones plugs for connecting the Power Pack to the Receiver are included. The 6V6 output stage complete with Output Transformer and 6in. speaker is built into the unit. Price £5/5/- plus 5/- packing and carriage. The two above units together on Hire Purchase Terms £3/15/6 deposit and 12 monthly payments of £1/1/0 plus 15/6 pkg. and carriage.

PUSH-PULL OUTPUT TRANSFORMERS. 2x 6V6 into 2/3 ohms, 5/6, post free.

T.1154. BRAND NEW COMPLETE WITH VALVES, £2/19/6, post and carriage 7/6.

METER RECTIFIERS. Miniature type with leads 1-5 mA., 6/9 post paid.

SLIDER RESISTANCE. Geared adjustments, 7.5 ohms, 4 a., 12/6, postage and carriage 1/6.

HEAVY DUTY L.T. TRANSFORMER. Primary tapped 180-230 volts, 50 cycles. Secondaries 4.2 v. 10 a. 4.2 v. 10 a., 25/-, postage and carriage 2/6.

ROTARY RESISTANCE. Wire-wound heavy duty 14 k. ohms, 7/6, postage and carriage 1/-.

MINIATURE TUNING CONDENSERS

2-gang .0005 mfd. with trimmers 6/9

PREMIER VARIABLE IMPEDANCE "MATCHMAKER" M.O.15 OUTPUT TRANSFORMERS

Designed to meet the demand for an efficient variable ratio Output Transformer 11 ratios from 13 : 1 to 80 : 1, all centre tapped and can be used to match any output valves either single or push-pull Class 'A', 'AB1', 'AB2' or 'B' to any low impedance speech coil or combination thereof. Primary Inductance 50 henries 15 watts audio 100 mA. Price 45/-.

SEND 2½d. STAMP FOR OUR 1955 CATALOGUE

SELECTION OF H.P. ITEMS

GRUNDIG TK.819. Cash price £99/15/-. Deposit £24/4/-. 12 monthly payments £6/18/6. Postage and packing 21/-.

GRUNDIG TK9. Cash price £68/5/-. Deposit £17/5/-. 12 monthly payments £4/13/6. Postage and packing 15/-.

LEAK TL10 AMPLIFIER AND PREAMPLIFIER. Cash price £28/7/-. Deposit £7/1/6. 12 monthly payments £1/19/-. Post and packing 7/6.

LEAK DYNAMIC PICKUP WITH DIAMOND STYL (A) Cash price £11/9/6. Deposit £2/16/-. 9 monthly payments £1/1/6 (B) with Extra head. Cash price £19/5/3. Deposit £4/16/3. 12 monthly payments £1/6/6. Mu Metal Transformer £1/15/-. Post and packing 8/-.

TRUVOX TYPE C AMPLIFIER. Cash price £16/16/-. Deposit £4/2/6. 12 monthly payments £1/3/3. Post and packing 7/6.

TRUVOX MK. III DECK. Cash price £23/2/-. Deposit £5/16/-. 12 monthly payments £1/11/9. Post and packing 7/6.

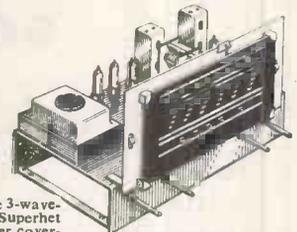
ELPICO TUNER UNIT MODEL RF/720. Cash price £15/15/-. Deposit £3/18/9. 12 monthly payments £1/1/8. Post and packing 5/-.

GARRARD CHANGER TYPE RC80. A.C./D.C. with turnover head. Cash price £26/2/5. Deposit £6/15/5. 12 monthly payments of £1/15/6, plus packing and carriage 7/6.

COLLARD TRANSCRIPTION UNIT TYPE 20/10. Cash price £18/11/11. H.P. Terms: Deposit £4/12/-. 12 monthly payments of £1/6/-. Packing and carriage 7/6.

GRUNDIG TK12. Cash price £73/10/-. H.P. Terms: Deposit £18/6/-. 12 monthly payments at £5/1/2. Packing and carriage 21/-.

RADIOGRAM CHASSIS



5 Valve 3-wave-band Superhet Receiver covering short, medium and long waves. Using the latest miniature all glass valves, overall chassis size 13 1/2 in. x 7 in. high x 6 in. deep, dial aperture 10 in. x 4 1/2 in. BRAND NEW. READY FOR USE AND GUARANTEED. **£10-5-0**
Postage and packing 10/-.
Or on Hire Purchase terms, deposit £2/5/- and 9 monthly payments of £1.

CABINET available for above Chassis in figured walnut lined with white sycamore, size 3ft. wide, 2ft. 8in. high, 1ft. 5in. deep. £15/15/-. Or on Hire Purchase Terms, deposit £3/18/9 and 12 monthly payments of £1/1/8.
Packing and Carriage extra.

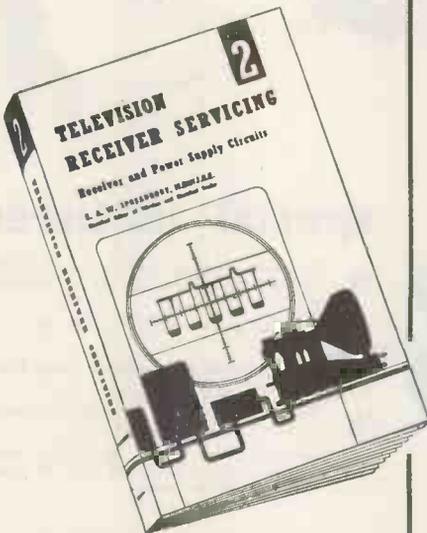
PORTABLE TAPE RECORDER CABINETS

All Rexine covered

Tape Deck	Amplifier	Type	Price
Lanc Mk. VI	Premier	Mk. VI	£4/19/6
Truvox Mk. III	E.A.P.	T.D.1	£4/4/-
Truvox Mk. III	Premier	T.D.2	£4/4/-
Truvox Mk. III	Truvox C	T.D.3	£4/4/-

Plus Postage and Packing 5/-.

We carry a comprehensive stock of components by all leading Manufacturers.



Completes a standard work for Television Engineers

Television Receiver Servicing: Volume 2

Receiver and Power Supply Circuits

By E. W. A. Spreadbury M.BRIT.I.R.E. Volume 2 of this unique work follows on logically where Volume 1 left off. It covers the video circuits, vision tuning and detector circuits and includes methods of multi-channel tuning, the sound channel and power-supply circuits. There is also a chapter on television aerials and another on the technique of circuit alignment.
With Volume 1 this book provides the experienced service engineer a complete picture of the problems likely to be encountered in television service work.

NOW ON SALE — GET YOUR COPY TO-DAY

Published for "Wireless & Electrical Trader"

From booksellers or direct from Dorset House, Stamford Street, London, S.E.1.

Universal praise for Volume 1.

"... worth double its cost. This book is highly recommended."—*The Practical Radio Engineer.*

"... a very valuable book, excellently written, illustrated and produced."—*Journal of the British Institution of Radio Engineers.*

"The Book succeeds where others have failed."—*Marconi Review.*

The answer to **set designers' headache**

Who ever heard of a set designer with no headaches? We haven't. But we do know of many with considerably fewer headaches since they discovered the Monarch Automatic Record Changer.

Many manufacturers have, in fact, found the Monarch to be so completely reliable they have eliminated their own tests!

Any designer with more than his fair share of headaches would do well to examine the Monarch carefully. His critical appraisal will reveal a changer with many virtues, no vices—and no headaches.

The Monarch is now fitted as standard equipment by the majority of the world's leading set makers.



special features

- ★ Exclusive 'Magidisk' automatically selects 7 in., 10 in. and 12 in. records, intermixed.
- ★ Plays up to 10 records at 33½, 45 or 78 r.p.m.
- ★ High compliance crystal cartridge fitted with dual sapphire styli.
- ★ 'Rotocam' centralized control is simple, foolproof and trouble-free.
- ★ Independently tested Monarchs have completed equivalent of over 90 years' faultless performance.

MONARCH

world's finest autochanger



BIRMINGHAM SOUND REPRODUCERS LTD · OLD HILL · ENGLAND

Wireless World

RADIO, ELECTRONICS, TELEVISION

Managing Editor :

HUGH S. POCOCK, M.I.E.E.

Editor :

H. F. SMITH

SEPTEMBER 1955

In This Issue

Editorial Comment	405
Rocket Sounding in the Upper Air. <i>By Sir Edward Appleton</i>	406
Differentiating Speech and Music	407
World of Wireless	408
National Radio Show	412
Guide to the Stands	414
Letters to the Editor	427
Neon F.M. Tuning Indicator. <i>By John D. Collinson</i>	428
Toronto Audio Show. <i>By P. G. A. H. Voigt</i>	430
Language Translation by Electronics. <i>By J. P. Cleave and B. Zacharov</i>	433
Etched Foil Printed Circuits. <i>By H. G. Manfield</i>	436
American Oscilloscope Technique. <i>By A. J. Reynolds</i>	441
Transistor Equivalent Circuits—3. <i>By W. T. Cocking</i>	444
Books Received	448
Design of Tchebycheff Filters. <i>By G. H. Burchill</i>	449
Simplified G.C.A.	451
Vertical Pattern of V.H.F. Aerials. <i>By E. G. Hamer</i>	452
Fourier—Fact or Fiction? <i>By "Cathode Ray"</i>	455
Ultrasonic Fish Detection	458
Standard Chassis. <i>By T. K. Cowell</i>	459
Short-wave Conditions	460
Aerial Circuit Magnification. <i>By S. Kannan</i>	461
Rugby Radio Extension	463
Random Radiations. <i>By "Diallist"</i>	464
Unbiased. <i>By "Free Grid"</i>	466

VOLUME 61 NO. 9

PRICE: TWO SHILLINGS

FORTY-FIFTH YEAR
OF PUBLICATION



VALVES, TUBES & CIRCUITS

33. MW53-80: A 90° TELEVISION PICTURE TUBE

REASONS FOR 90° SCANNING

The screen size of direct-viewing picture tubes has grown rapidly since the television service was re-started after the war. The 9-inch circular tube of 1946 has been supplanted by progressively larger tubes, the latest of which has a rectangular face with a 21-inch diagonal. If these larger tubes had been merely expanded versions of the 9-inch tube, the problem of cabinet depth, which was present even in 1946, would have been very much aggravated. Tube lengths, however, have been kept within reasonable limits by the introduction of greater scanning angles. If, for a given screen size, the scanning angle of the electron beam is increased, it follows that the gun and the deflection coils will be moved in towards the screen, and the overall length of the tube will be reduced. The effectiveness of this solution to the problem is shown by the fact that a 21-inch tube with the same scanning angle as a 9-inch tube would be half as long again as it actually is. The new Mullard 21-inch, 90° tube type MW53-80, which is shown in the photograph, is, in fact, about three inches shorter than a 70° tube of the same screen size.



CIRCUIT AND TUBE PROBLEMS

Wide angle scanning eases cabinet design, but it brings problems of its own. The most serious is the disproportionate increase in the deflection coil power requirements. If the scanning angle is changed from 70° to 90°, the power which must be supplied by the line timebase output transformer is increased by 50 per cent. A second complication is that the beam at maximum deflection is liable to be intercepted by the envelope of the tube, producing corner cutting

of the picture. Thirdly, in tubes with approximately flat faces, the deflected beam strikes the screen at increasingly acute angles, and the spot may be markedly defocused at the edges of the screen.

These difficulties have been countered by improving the efficiency of the scanning system and its associated circuits, so that the increase in power drain is not out of proportion to the gain in useful picture size. A practical line scanning circuit, in which the efficiency is improved by the use of the full h.t. line potential in conjunction with tuning of the leakage inductance of the output transformer, will be described in a further advertisement in this series.

Deflection defocusing and corner cutting are overcome by careful tube and deflection unit design. In particular, the scanning coils and the front of the yoke are shaped to fit the cone of the picture tube—giving optimum sensitivity.

A NEW PICTURE TUBE

The Mullard MW53-80 is an indirectly heated direct-viewing tube with a 90° deflection angle and a rectangular screen with a 21-inch diagonal. The metal-backed grey glass screen, with white fluorescence, has a useful area of 378mm by 482mm. The tube incorporates an ion trap, and the electron gun is designed to give uniform focus over the whole screen. Magnetic focusing and double magnetic deflection are used. The capacitance formed by the external conductive coating and the final anode may be used to provide smoothing for the e.h.t. supply. The 6.3V, 300mA heater is suitable for parallel or series connection. The overall length of the tube is 507 ± 10 mm.

Operating data for the MW53-80 will be included in the reprint of this advertisement.

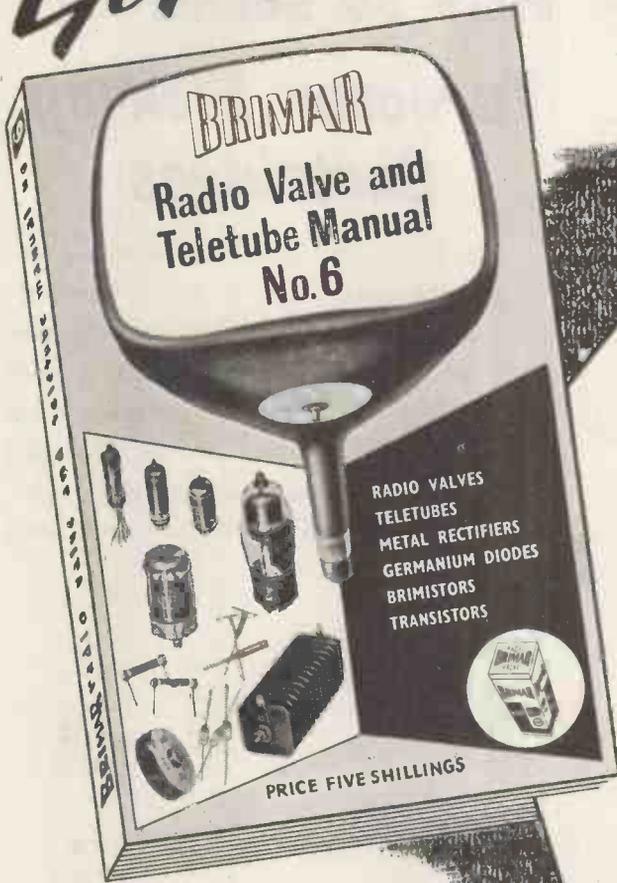
Reprints of all the advertisements in the "Valves, Tubes, and Circuits" series, with additional notes, are available without charge from the address given below.



MULLARD LTD · TECHNICAL SERVICE DEPT., CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON W.C.2

Get your new

BRIMAR MANUAL



The
LATEST EDITION
has

272 Pages
of **VALVE and**
TELETUBE DATA
CIRCUITRY
& SPECIAL
COMPONENTS

still only 5/-

SUMMARY OF CONTENTS

- Valve ratings and base connection symbols.
- Classified list of nearly 300 valves, teletubes and selenium rectifiers.
- Germanium diode section including ratings in various circuits.
- Brimistors section.

- Radio engineering formulae and NEW circuits.
- Brimarize section. Valves and teletubes.
- Up-to-date substitution list of American types.
- Equivalents and C.V. numbers.
- Details of Trustworthy types.
- Valuable information on Transistors.

Send 5/- for your copy, to :

Standard Telephones and Cables Limited

Publicity Dept.: **FOOTSCRAY · SIDCUP · KENT**

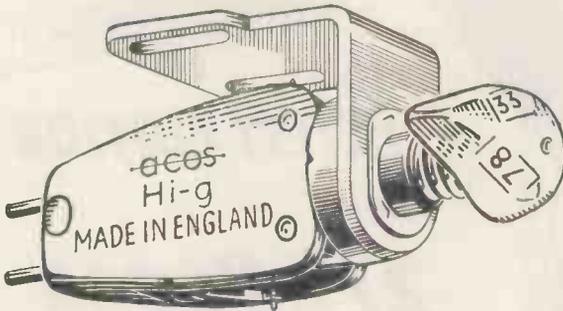
FOOTscray 3333

NEW- QUITE EXCEPTIONAL IN DEFINITION AND QUALITY OF REPRODUCTION

The ~~ACOS~~ HGP 59 Series

High Definition

Turnover Pick-up Cartridges



This new ACOS "High Definition" Series represents a most important advance in "turnover" pick-up cartridge design. There are two versions — the HGP 59-1 with a normal output which will give superb wide-range reproduction in the highest grade radiogram, and the HGP 59-3 which will load a single valve amplifier in a portable player. Both have all the features listed on the left.

Salient Features

Extremely smooth response with no peaks to colour or mar reproduction.

*

New type stylus mounting reduces all Pick-up distortion to an absolute minimum.

*

Extremely light stylus pressure.

*

Very compliant stylus—superb transient response, low record and sapphire wear.

*

Sapphire styli replaced very simply without any tools whatsoever.

*

Positive turnover mechanism with a neutral position.

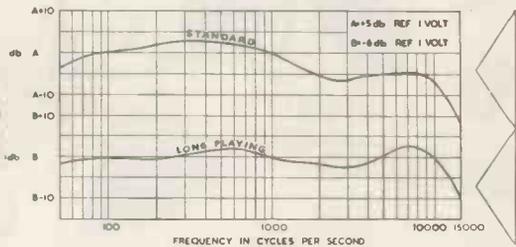
*

Precision sapphires made by the finest precious stone lapidaries. Individually inspected under 500x magnification.

*

Each unit very carefully checked for sensitivity and response and finally subjected to a critical listening test before being despatched from the factory.

HGP 59-1

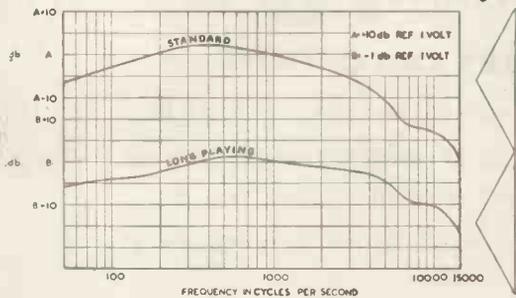


1.4 VOLTS

.4 VOLTS

Amazing Outputs!

HGP 59-3



3 VOLTS

1 VOLT



... always well ahead

THE RADIO SHOW
EARLS COURT

STAND No. 201

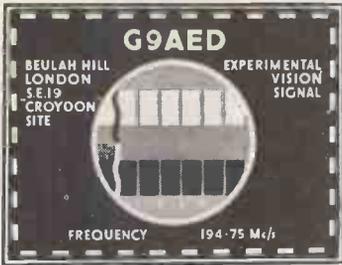
ACOS devices are protected by patents, patent applications and registered designs in Great Britain and abroad.

COSMOCORD LIMITED · ENFIELD · MIDDX · TEL: ENFIELD 4022

"BELLING-LEE" NOTES

G9AED CROYDON

Within a week of publication of this issue of the "Wireless World," the "Belling-Lee" band III experimental transmitter at Croydon will have closed down. We would like to thank all those readers who have assisted us by sending in reception reports. We have also been very pleased to receive letters of appreciation from so many dealers and others in the Trade. So far as we are concerned, we are grateful to those members of our staff who have carried out the duties of station operators. Up to the time of writing the station has kept to schedule with only a one minute breakdown from the starting date of April 1st. The only other times the station has been "off the air" during scheduled hours has been due to co-operation with I.T.A. engineers testing on dummy load etc. G9AED Croydon now closing down.



NOW CLOSING DOWN!

SEAMED v. EXTRUDED TUBES for TELEVISION and V.H.F. AERIAL ELEMENTS

Some people are rather inclined to look upon the use of all forms of seamed tube as a means to achieve cheapness, but it is significant that one prominent maker of television aerials is changing over from extruded to seamed tube as quickly as possible, and perusal of the findings of the research project into this question removes all doubt as to reasons why.

In the manufacture of extruded tube, the alloy in a "semi-plastic" condition is forced through a die, and the resulting grain structure is short. Any flaw in the element may result in fracture, and such a flaw may appear anywhere along its length.

In the manufacture of a close seamed rolled tube, a strip is cut along the grain from a sheet of the correct alloy; this strip is rolled to form a tube. The grain is along the length of the tube which is work hardened during the process.

The tables showing tensile tests show the seamed tubes to be superior under all headings; tons per sq. inch, 0.1% proof stress, ultimate tensile stress, elongation and Young's modulus.

Deflection tests also favour the seamed tube.

The table showing Fatigue tests show the most astonishing figures. Here the elements in their normal housings were subjected to vibration tests. Both types of element being tested horizontally and vertically until fatigue cracks appeared. The advantage of the seamed tube over the extruded tube is in the region of 4:1.

Authorities are satisfied that in general it is not high wind that causes aerial elements to snap, but fatigue.

These tests were carried out on elements manufactured from standard alloy specifications commonly used in good practice.

Drawn tube B.S.1471 HT.10WP. and

Seamed tube B.S.1470 HS.10.

It is important to note that manganese is generally omitted from billets used for extrusion, as it slows down the rate, but the presence of this metal in significant quantities in the sheet from which the seamed tubes are rolled, has the effect of retarding corrosion.

There is insufficient capacity in the country to supply the requirements of the one manufacturer using this method of construction.

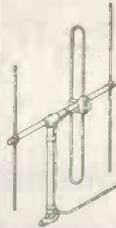
Finally, no claims are made for the use of seamed tube under conditions of torsional stress, as in crossarms, booms or masts. This would definitely be a wrong application.

From careful consideration of the facts it would appear that there is quite a lot in favour of rolled seamed elements correctly manufactured.

Belling & Lee Ltd.,
Great Cambridge Road,
Enfield,
Middlesex.

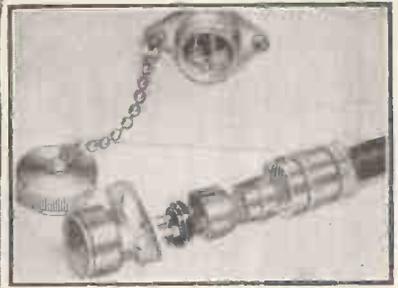
NDB/EFW
15.7.55.

A NEW HIGH-GAIN 3-ELEMENT



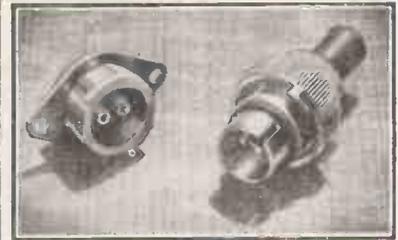
This further addition to the "Belling-Lee" band III range was designed specifically as an inexpensive high gain aerial to cover channel 9 only. Available with various mounting arrangements and listed under L925.

Advertisement of
BELLING & LEE LTD.
Great Cambridge Rd., Enfield, Middx.
Written 24th July, 1955



A range of lightweight
plugs & sockets

"SCREENECTOR"
for instrumentation, etc.



These non-reversible, screened connectors accommodate cables up to 0.24 in. overall diameter and are available for 1

to 3 ways. Points to note:—A spring-loaded locking ring is now incorporated giving vibration-proof locking; resilient skirt maintains screen contact even if locking ring is left undone; contacts assembled on moisture resistant, nylon-filled, phenolic moulded insulant; rubber cable support to minimise wear at clamping point; housing designed so that the moulded inserts can be interposed, i.e. fixed or free plug, etc.; flange permits use on panels of any thickness.

New type plugs (L.788, L.789 or L.790 range) will mate with old type sockets (L.722, L.625 or L.715 range) locking as formerly, and old type plugs will mate with new type sockets but will not lock in as the ring is not spring-loaded. Apart from this both ranges are interchangeable mechanically and electrically.

Contact Resistance:—less than 2 milliohms per pole.

Working Voltage: 150 v. d.c. or a.c. peak.

Insulation Resistance:—60,000 megohms at 500 v. d.c. between contacts and from contacts to housing.

BELLING & LEE LTD
GREAT CAMBRIDGE ROAD, ENFIELD, MIDD., ENGLAND

Marconi VHF Multi-Channel Equipment

TYPE HM 181

Multi-channel radio links are not only recognised economic alternatives to line and cable routes wherever the latter are costly because of intensive urban development or the wild nature of the terrain; they are frequently preferable in their own right. The type HM 181 equipment has been designed for comparatively simple schemes using two terminals working point-to-point or with a limited number of repeaters. It operates in the frequency range 150-200 M/cs, employs frequency modulation and gives high performance with low distortion.

It provides the following facilities:—

- 8, 16 or 24 channels
- Repeaters with easy channel dropping facilities
- Unattended operation
- Engineers' order wire
- Ease of access for maintenance

Over 80 countries now have Marconi equipped telegraph and communication systems. Many of these are still giving trouble free service after more than twenty years in operation



Lifeline of communication

MARCONI

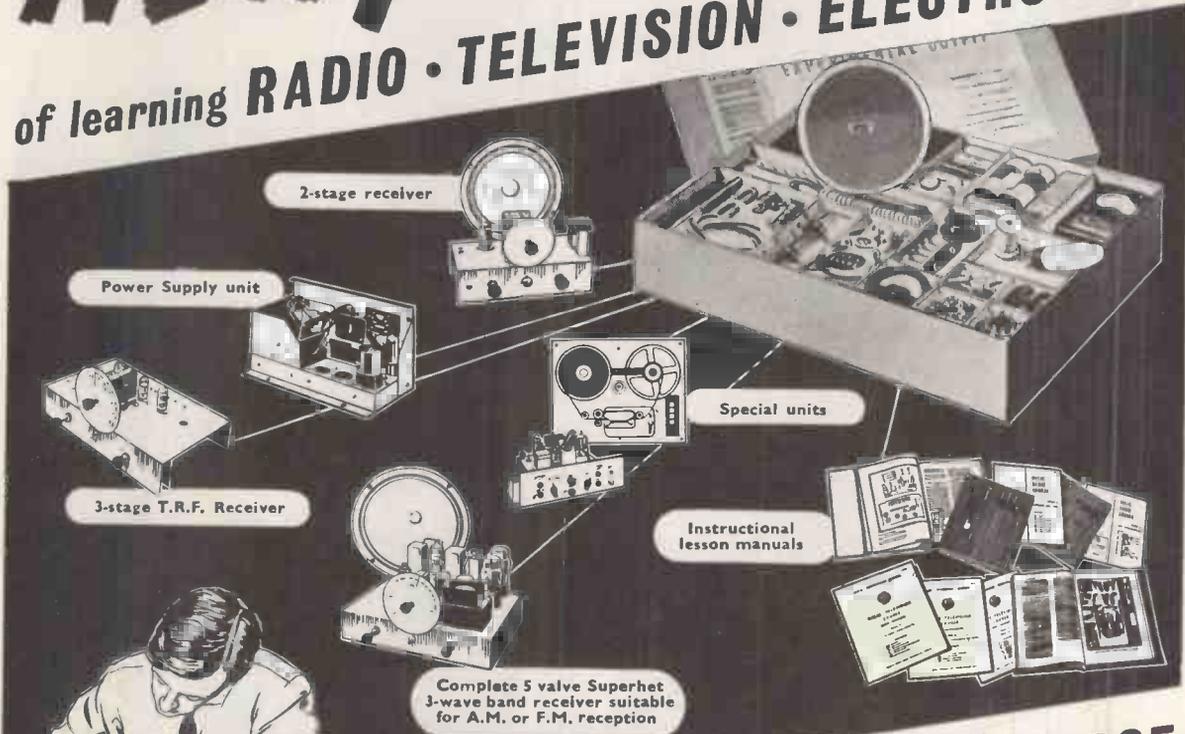
COMPLETE COMMUNICATION SYSTEMS

Surveyed, planned, installed, maintained

MARCONI'S WIRELESS TELEGRAPH CO., LTD., CHELMSFORD, ESSEX

Partners in progress with The 'ENGLISH ELECTRIC' Company Ltd.

NEW! THE PRACTICAL WAY of learning RADIO • TELEVISION • ELECTRONICS

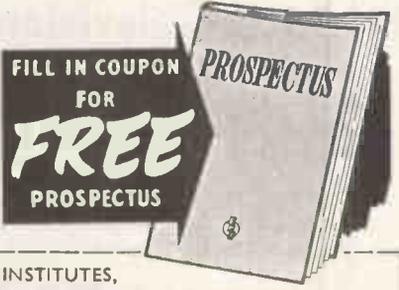


COMPLETE EXPERIMENTAL COURSE in RADIO ENGINEERING and SERVICING

An entirely new series of courses designed to teach Radio, Television and Electronics more quickly and thoroughly than any other method. Specially prepared sets of radio parts are supplied and with these we teach you, in your own home, the working of fundamental electronic circuits and bring you easily to the point when you can construct and service radio receivers, etc.

Whether you are a student for an examination; starting a new hobby; intent upon a career in industry; or running your own business — these Practical Courses are ideal and may be yours at very moderate cost.

With these outfits, which you receive upon enrolment and which remain your property, you are instructed how to build basic Electronic Circuits (Amplifiers, Oscillators, Power Units, etc.) leading to designing, testing and servicing of complete Radio and Television Receivers.



NEW TELEVISION COURSE including a complete set of equipment dealing with the design, construction and servicing of a high quality television receiver.

Courses (with equipment) also available in many other engineering subjects.

COURSES FROM 15/- PER MONTH

EMI INSTITUTES

An educational organisation serving the E.M.I. Group of Companies which include "HIS MASTER'S VOICE," MARCONIPHONE, COLUMBIA, ETC.

To E.M.I. INSTITUTES,
Dept. 127X, Grove Park Road, London, W.4.
Please send me your FREE book on Practical Courses.

Subject(s) of interest _____

NAME _____

ADDRESS _____



Why Ediswan Clix P.T.F.E. Valveholders are widely used in B.B.C. Television equipment

Large quantities of Ediswan Clix P.T.F.E. Valveholders are used in B.B.C. Television equipment. Only the combination of the finest insulation—P.T.F.E., the most efficient contact material—Beryllium copper—and Ediswan Clix design and manufacture can match the requirements of efficiency and reliability in this and all other

stringent valveholder applications. Ediswan Clix P.T.F.E. Valveholders are fully type approved for Services Grade 1, Class 1 conditions. Full details of these valveholders and other components in the Ediswan range are given in catalogue CR.1681. Manufacturers and Development Groups may have a copy on request.

EDISWAN

CLIX

RADIO, TELEVISION & ELECTRONIC COMPONENTS

THE EDISON SWAN ELECTRIC COMPANY LIMITED, *Member of the A.E.I. Group of Companies*
155 Charing Cross Road, London, W.C.2 and Branches. Telephone: Gerrard 8660. Telegrams: Ediswan, Westcent, London

MARCONI-SIEMENS

Five Band Split Privacy Radio Telephone Equipment



This equipment, which may be switched in or out of use at the radio terminal, provides a very high degree of privacy for speech on a radio-telephone circuit by:-

- (1) splitting the speech band of 250-3000 c/s into five sub-bands of 550 c/s and recombining them in different relative positions,
- (2) inverting the frequency range of any one or more of the sub-bands, and
- (3) rearranging the combination of the sub-bands simultaneously at both ends of the radio-circuit in accordance with a pre-arranged sequence at controlled intervals between 4 and 20 seconds.

The resulting speech band, which modulates the transmitter, is unintelligible and the frequent regrouping of the sub-bands, with or without inversion precludes any simple method of interception. A reversal of the process at the distant terminal restores the original speech. The processes involved are reversible, thus common channel equipment can be used for both transmission and reception. Amplifiers in the privacy path compensate for the losses in band splitting and recombining. The simultaneous switching system, operates by means of relays under the control of a synchronous motor driven by a high precision crystal oscillator, this does away with the need for a transmitter pilot tone.



THE LINK BETWEEN RADIO AND LINE COMMUNICATIONS



Full technical details of this and other Marconi-Siemens equipment, which provides completely integrated radio and line telegraph and telephone systems may be obtained from either

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, CHELMSFORD, ESSEX
OR SIEMENS BROTHERS AND COMPANY LIMITED, WOOLWICH, LONDON, S.E.18



**POST THE COUPON TODAY
FOR OUR BROCHURE ON THE
LATEST METHODS OF HOME
TRAINING FOR OVER
150 CAREERS AND HOBBIES**

THE ADVANTAGES OF E.M.I. TRAINING

- ★ The teaching methods are planned to meet modern industrial requirements.
- ★ We offer training in all subjects which provide lucrative jobs or interesting hobbies.
- ★ The student is taken carefully and thoroughly through his chosen subject.
- ★ A tutor is personally allotted by name to ensure private and individual tuition.
- ★ Free advice covering all aspects of training is given to students before and after enrolment with us.

NEW

**LEARN THE PRACTICAL WAY
— COURSES WITH EQUIPMENT**

With many courses we supply actual equipment thus combining theory and practice in the correct educational sequence. The equipment, specially prepared and designed, remains your property. Courses include: Radio, Television, Electronics, Draughtsmanship, Carpentry, Photography and Commercial Art, Amateur S.W. Radio, Electricity, Languages, Mechanics, etc.



Equipment supplied upon enrolment and remains your property.

PRIVATE AND INDIVIDUAL TUITION IN YOUR OWN HOME

Accountancy	Customs & Excise Officer	M.C.A. Licences	Secretaryship
Advertising	Draughtsmanship	Mechanical Engineering	Shorthand & Typing
Aeronautical Engineering	Economics	Motor Engineering	Sound Recording
Automobile Engineering	Electrical Engineering	Photography	Structural Engineering
Banking	Electronics	P.M.G. Licences	Telecommunications
Book-keeping	Fashion Drawing	Police Production	Television
Building	Heating & Ventilating Engineering	Public Speaking	Time & Motion Study
Business Management	Industrial Administration	Radar	Tracing
Carpentry	Journalism	Radio & Television Servicing	Welding
Chemistry	Languages	Refrigeration	Writing
Civil Service	Marine Engineering	Retail Shop Management	Workshop Practice Works
Civil Engineering	Mathematics	Salesmanship	and many others.
Commercial Subjects		Sanitation	
Commercial Art & Drawing			

Also courses for University Degrees, General Certificate of Education, B.Sc. Eng., A.M.I. Mech.E., L.I.O.B., A.C.C.A., A.C.I.S., A.M. Brit. I.R.E., A.M.I.I.A., City & Guilds Examinations, R.S.A. Certificates, etc.

Courses from 15/- per month

**EMI
INSTITUTES**

**THE ONLY POSTAL COLLEGE WHICH
IS PART OF A WORLD-WIDE
INDUSTRIAL ORGANISATION**

POST THIS COUPON TODAY

Please send without obligation your FREE book.
E.M.I. INSTITUTES Dept. 127k,
Grove Park Road, London, W.4.

NAME _____

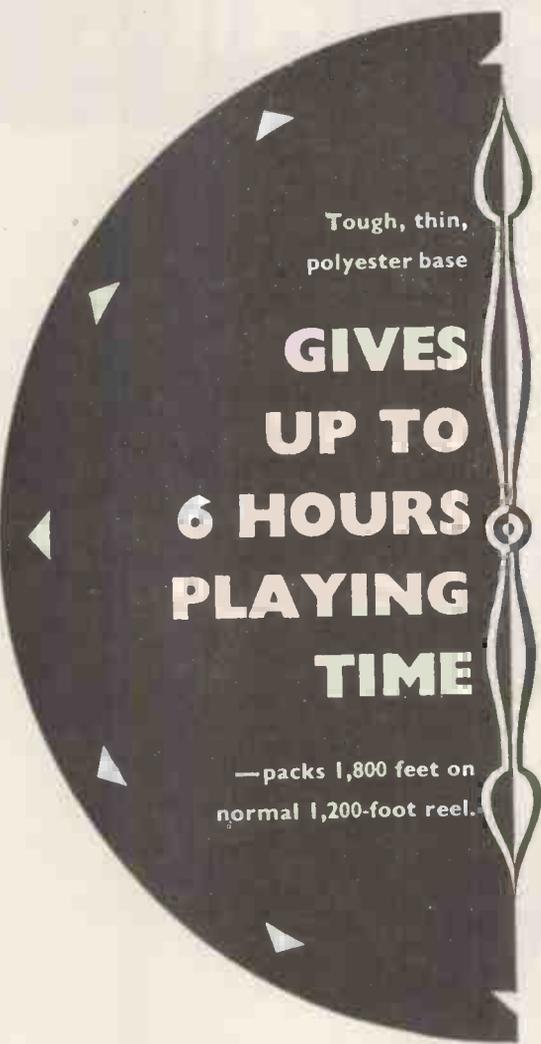
ADDRESS _____

SUBJECT(S) OF INTEREST _____
(We shall not worry you with personal visits)

new world-beating 'SCOTCH BOY'

Regd. Trade Mark

extra-play magnetic recording tape 190m



Tough, thin,
polyester base

**GIVES
UP TO
6 HOURS
PLAYING
TIME**

—packs 1,800 feet on
normal 1,200-foot reel.

THE FINEST BASE-FILM EVER MADE

The astonishing new polyester base-film for 'Scotch Boy 190M,' is so much stronger than other tape bases that it can be made 33 1/3% thinner—and still be stronger. This means you get 50% more length—and 50% EXTRA PLAYING TIME—on the same-sized reel.

Polyester film is a naturally limp and flexible material, and is little affected by temperature and humidity changes. 'Scotch Boy 190M' tape conforms snugly to recorder heads, is easy to handle, winds trimly, and tracks smoothly. It has an indefinite life in storage, and is an ideal tape for archive purposes.

NEW THIN COATING

The new and potent oxide coating of 'Scotch Boy 190M' tape gives clear, crisp reproduction of every frequency in the audible range. High-frequency response shows a specially notable improvement. Output variations from reel to reel and within each reel are remarkably small and, as with all Scotch Boy tapes, background noise is negligible.

THE WORLD'S FINEST TAPE

'Scotch Boy 190M' has been developed and produced in Britain by the 3M Company. Its appearance in Britain is its first appearance in the world. This is a landmark in the development of tape recording.

'SCOTCH BOY' 190m

MAGNETIC RECORDING TAPE

with polyester base



ANOTHER PRODUCT

MINNESOTA MINING & MANUFACTURING CO. LTD.
LONDON, BIRMINGHAM, MANCHESTER AND GLASGOW.



a New

**STABILISED POWER SUPPLY UNIT
FOR PHOTO-MULTIPLIERS**

Ediswan now have available a new stabilised power supply unit which has been specially designed to feed Photo-Multipliers. It is particularly suitable as a supply unit for Ediswan Mazda Photo-Multipliers type 27.M1, 27.M2 and 27.M3.

BRIEF SPECIFICATION TYPE R1184

INPUT	OUTPUT	STABILITY	OUTPUT RESISTANCE	RIPPLE
200-250 v., 40-100 c.p.s.	High stability low ripple D.C. supply variable between 300 and 1,100 volts. Max. current 2 mA. Pos. or neg. may be earthed.	A 10% change in mains input voltage results in a change of less than 0.1% between 1,100 volts and 600 volts output.	Approximately 1,500 ohms.	Less than 0.01% R.M.S.

MOUNTING The Unit is suitable for standard rack mounting or for bench use. Bench Stands are available.



PRICE — £48

Further information is available on request

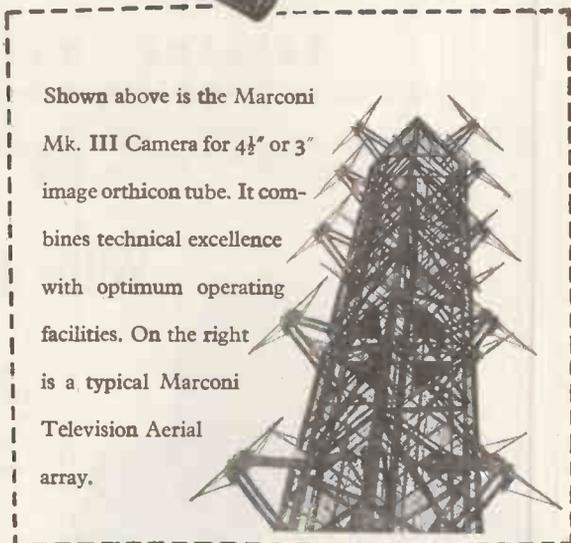
EDISWAN

RADIO DIVISION · THE EDISON SWAN ELECTRIC COMPANY LIMITED
155 Charing Cross Road, London, W.C.2. Telephone: Gerrard 8660. Telegrams: Ediswan, Westcent, London
Member of the A.E.I. Group of Companies



**Marconi Complete
TELEVISION
SYSTEMS
from Camera
to Aerial**

Both for studio and outside broadcasting of television programmes Marconi equipment is required at every stage of production and transmission. Cameras, Picture and Waveform Monitors, Vision Mixers, Telecine Equipment where film sequences are included, Microwave Links, Transmitters and Aerial must all be matched as components of a completely integrated system with a designed performance. The long experience and advanced technical knowledge of the Company's Broadcasting Division are at the disposal of all who are responsible for television, throughout the world.



Shown above is the Marconi Mk. III Camera for 4½" or 3" image orthicon tube. It combines technical excellence with optimum operating facilities. On the right is a typical Marconi Television Aerial array.

Marconi Television Equipment is installed in every one of the B.B.C.'s Television stations and has been supplied to countries in North and South America, Europe and Asia. Compatible colour television was first demonstrated in Britain by Marconi's.



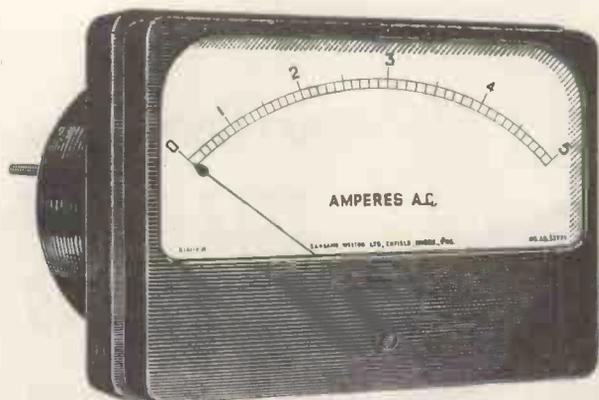
Lifeline of communication

MARCONI

Complete Broadcasting and Television Systems

MARCONI'S WIRELESS TELEGRAPH CO. LTD., CHELMSFORD, ESSEX

Partners in progress with the 'ENGLISH ELECTRIC' Company Limited



THE WESTON RANGE OF RECTANGULAR INSTRUMENTS

Supplied as D.C. moving coil, A.C. rectifier and H.F. thermocouple types; also A.C./D.C. moving iron types. Four sizes are available with scale lengths of 2.5in., 3.2in., 4.2in. and 6.25in.

Front of panel or back of panel mounting may be adopted as desired, and if the former method is used there is complete interchangeability with existing round models. The 3.2in. and 4.2in. scale instruments are available with either illuminated or non-illuminated dials; the 2.5in. and 6.25in. scale instruments being available only with non-illuminated dials.

WESTON ELECTRICAL INSTRUMENTS INCLUDE:—
 LABORATORY STANDARDS · PRECISION GRADE INSTRUMENTS · INDUSTRIAL GRADE INSTRUMENTS
 PORTABLE, ROUND, RECTANGULAR AND EDGEWISE SWITCHBOARD AND PANEL MODELS · PORTABLE TEST SETS · RELAYS · AIRCRAFT INSTRUMENTS

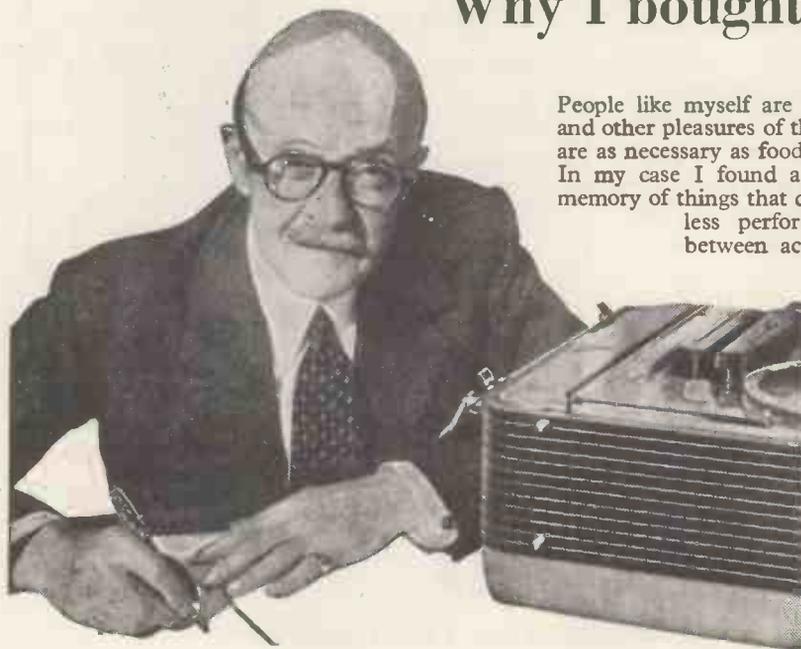
WESTON Measuring Instruments

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (6 lines) Grams: Sanwest, Enfield

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151.
 Branches: London, CHAncery 4971 · Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867 · Leeds, Leeds 30867 · Liverpool, Central 0230 · Wolverhampton, Wolverhampton 21912
 Nottingham, Nottingham 42403 · Bristol, Bristol 21781 · Southampton, Soton 23328 · Brighton, Brighton 28497

Why I bought a **GRUNDIG**



People like myself are inveterate listeners. For us, music and other pleasures of the mind—drama, discussion, verse—are as necessary as food.

In my case I found a need to “capture and keep” the memory of things that delighted my ear—to record the peerless performance or the subtle interchange between accomplished speakers.

For this, my Grundig Tape Recorder is perfect. It has a wide range, high fidelity reproduction and simple controls with looks that match its performance.



The Grundig TK 12 70gns. plus microphone from 6½gns. Attractive H.P. terms available.

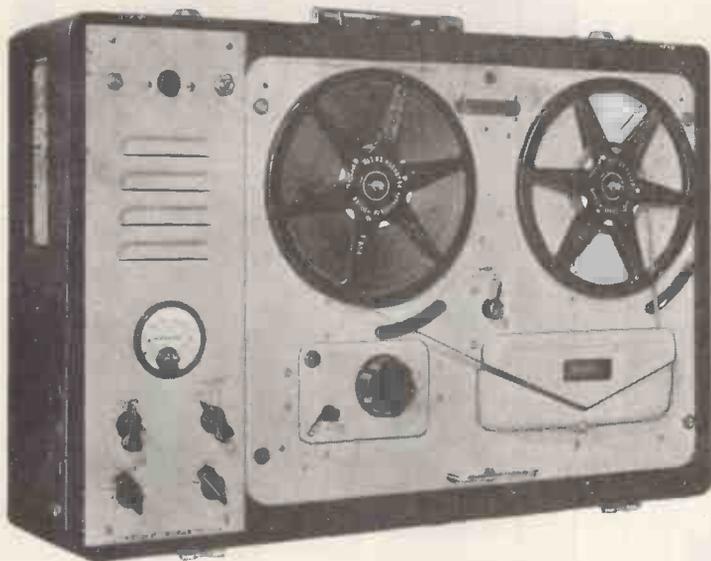
GRUNDIG THE FINEST TAPE RECORDERS IN THE WORLD

See your nearest Grundig dealer or write to us for full details.

GRUNDIG (GT. BRITAIN) LTD. (Dept. W) 39/41 NEW OXFORD STREET, W.C.1.
 (Electronics Division, Gas Purification & Chemical Co. Ltd.)

G/TK 105

VORTEXION TAPE RECORDER



The amplifier, speaker and case, with detachable lid, measures 8½in. x 22½in. x 15½in. and weighs 30 lb.

PRICE, complete with WEARITE TAPE DECK £84 0 0

- ★ The play back amplifier may be used as a microphone or gramophone amplifier separately or whilst recording is being made.
- ★ The unit may be left running on record or play back, even with 1,750ft. reels, with the lid closed.

★ The total hum and noise at 7½ inches per second 50-12,000 c.p.s. unweighted is better than 50 db.

★ The meter fitted for reading signal level will also read bias voltage to enable a level response to be obtained under all circumstances. A control is provided for bias adjustment to compensate low mains or ageing valves.

★ A lower bias lifts the treble response and increases distortion. A high bias attenuates the treble and reduces distortion. The normal setting is inscribed for each instrument.

★ The distortion of the recording amplifier under recording conditions is too low to be accurately measured and is negligible.

★ 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. This is equivalent to 20ft. from a ribbon microphone and the cable may be extended 440 yds. without appreciable loss.

★ 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.

POWER SUPPLY UNIT to work from 12 volt Battery with an output of 230 v., 120 watts, 50 cycles within 1%. Suppressed for use with Tape Recorder. **PRICE £18 0 0.**
We supply and recommend the Jason F.M. Feeder Unit. **PRICE £15 17 0,** including Purchase Tax.

3-WAY MIXER AND PEAK PROGRAMME METER

FOR RECORDING AND LARGE SOUND INSTALLATIONS, ETC.

One milliwatt output on 600 ohm line (.775V) for an input of 30 micro-volts on 7.5-30 ohm balanced input.

Output balanced or unbalanced by internal switch. The meter reading is obtained by a valve voltmeter with 1 second time constant, which reads programme level, and responds to transient peaks.

Calibration in 2 db steps, to plus 12 db and minus 20 db referred to zero level. Special low field internal power pack supplies 8 valves including stabilising and selenium rectifier, consumption 23 watts.



Manufactured by

VORTEXION LIMITED, 257-263, The Broadway, Wimbledon, London, S.W.19

Telephones: LIBerty 2814 and 6242-3

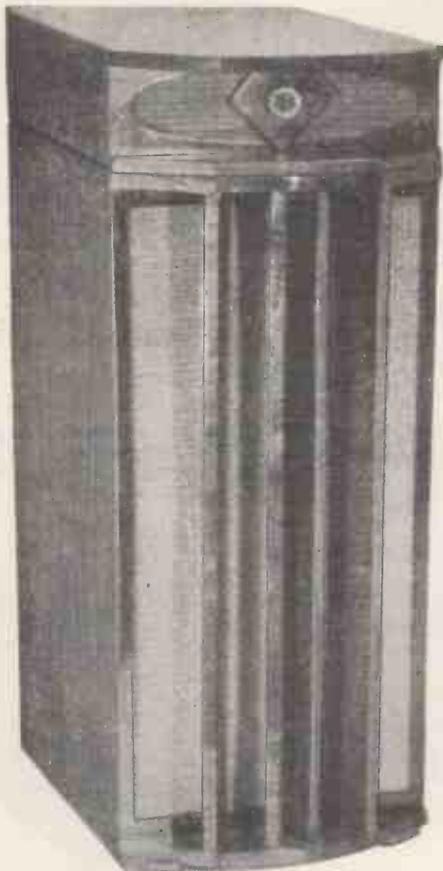
Telegrams: "Vortexion, Wimble, London."

"Extratop"



£12-10s.

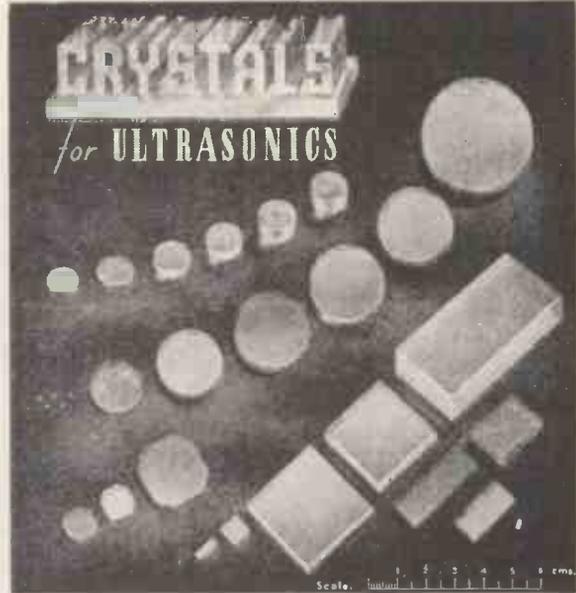
Add to the wide response already obtainable from the famous Phase Inverter Speaker by merely adding the new "Extratop" Dynamic Pressure Tweeter Unit complete with Crossover. Impedance 15 ohms. Suitable for use in conjunction with any 15 ohm speaker but even better with the Phase Inverter Speaker. Tweeter £12 10s; Phase Inverter Speaker £14 10s.



£14-10s.

SOUND SALES LIMITED

"Manufacturers of all A-Z Products ('A-Z' Regd. Trade Mark)"
 Works and Acoustic Laboratories :-
WEST STREET, FARNHAM, SURREY, ENGLAND
 Tel. Farnham 6461 (3 lines) "Grams : Sounsense Farnham"



Quartz Crystals of any shape and size cut and ground precisely to specification and coated, if required, with Gold, Silver, Aluminium or Rhodium, etc.

BROOKES CRYSTALS LTD

Suppliers to Ministry of Supply, Home Office, B.B.C., etc.
181/3 TRAFALGAR ROAD, GREENWICH, LONDON, S.E.10
 Phone: Greenwich 1828
 Grams: Xtals, Green, London. Cables: Xtals, London.



S.G. Brown
SINGLE HEADSET
 with
BOOM MICROPHONE
 for :-

TELEPHONE OPERATORS
 CONFERENCE INTERPRETERS
 BROADCASTING TECHNICIANS

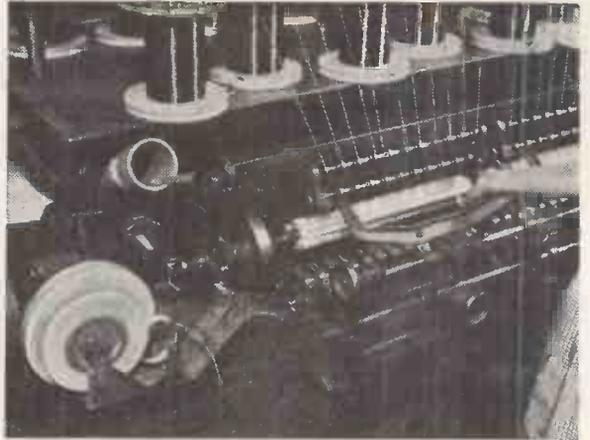
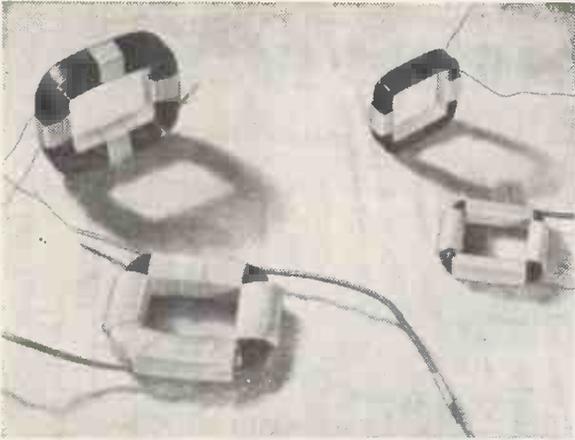
Designed with fully adjustable single earpiece and microphone. Leaves both hands free. Enables operators to listen and speak, independently.

S. G. Brown provide Head-phones and associated equipment for all known purposes. Brochure 'W' sent on request.

Telephone:
 Watford
 7241

S.G. Brown, Ltd.

SHAKESPEARE STREET, WATFORD, HERTS.



'SCOTCH BOY'

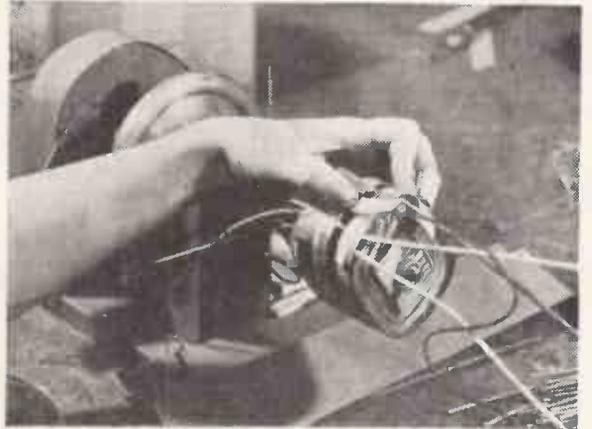
Electrical Tapes

NOW
with *Thermosetting Adhesive*

In the field of component assembly, 'Scotch Boy' electrical tapes have long been unrivalled for strength, ease of application, and excellent dielectric properties.

Now a new range of 'Scotch Boy' electrical tapes, with thermosetting adhesive, has been introduced. These remarkable new paper, glass cloth, and acetate cloth tapes have the same ability to stick at a touch, but the adhesive cures firm when components are subjected to the normal drying cycles.

The cured adhesive has greatly increased solvent resistance, and soft spots are eliminated. The new tapes are, therefore, ideal for use with solventless varnishes and casting resins.



HERE ARE TYPICAL APPLICATIONS :

- CENTRE RIGHT *No. 27 Glass Cloth Tape holds the leads and insulates the lead wire splice of a lighting transformer*
- TOP RIGHT *No. 38 Paper Tape is used to anchor, start, and finish wires*
- TOP LEFT *No. 38 Paper Tape binds and insulates motor field coils*
- BOTTOM RIGHT *No. 28 Acetate Cloth Tape anchors leads in secondary windings, and No. 38 Paper Tape holds fibre lead pads of a transformer*

FOR SPEED AND ECONOMY IN COIL ASSEMBLY

'SCOTCH BOY'

(Regd. Trade Mark)

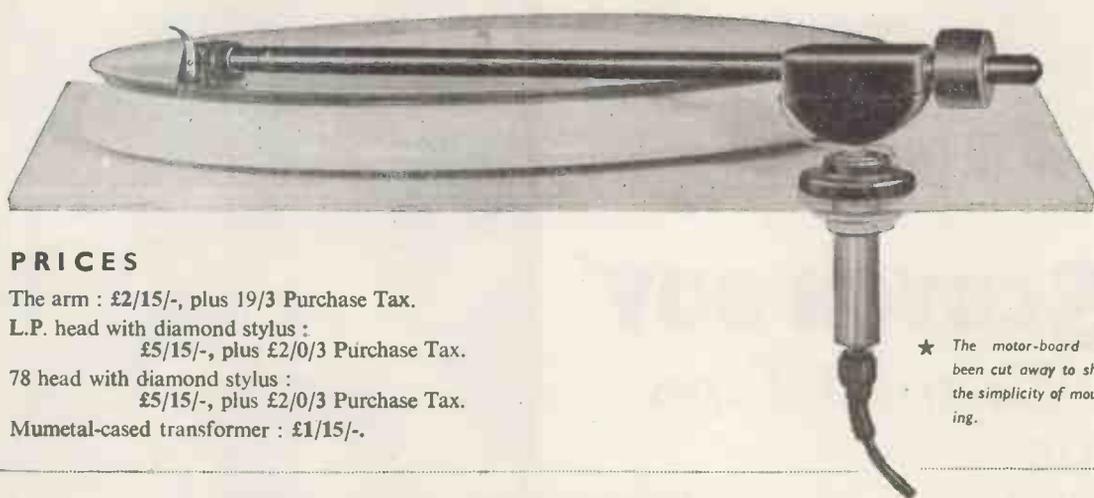
Electrical Tapes

ANOTHER  PRODUCT

THE

LEAK**DYNAMIC PICKUP**

This new pickup results from five years continuous development of our first moving coil design. Reports from users during the first few months of its sales have justified our earlier belief that the pickup might earn recognition as the best in the world.



★ The motor-board has been cut away to show the simplicity of mounting.

PRICES

The arm : £2/15/-, plus 19/3 Purchase Tax.

L.P. head with diamond stylus :
£5/15/-, plus £2/0/3 Purchase Tax.

78 head with diamond stylus :
£5/15/-, plus £2/0/3 Purchase Tax.

Mumetal-cased transformer : £1/15/-.

SPECIFICATION**★ THE ARM**

This is of advanced design having very low inertia. Friction is kept to a minimum by using a single pivot bearing. The arm is counter-weighted and has provision for plug-in interchangeable heads. An arm-rest is provided.

★ GENERATING SYSTEM

Dynamic (moving-coil). Coil impedance approximately 6 ohms, 1,000 c/s. No magnetic material is embodied in the moving parts, and the pickup is free from the inherent distortion of moving iron (magnetic variable reluctance) types. These distortions are also inherent in those dynamic pickups in which the moving coil is wound on a magnetic core.

★ STYLUS

Material : Diamond, guaranteed unconditionally not to chip or break.
Stylus sizes : L.P. 0.001 in. radius + nothing -0.0001 in.
78, 0.0025 in. radius ± 0.0001 in.

★ PLAYING WEIGHTS

Between 2 and 3 grammes for L.P.
Between 5 and 6 grammes for 78.
Automatically adjusted by the weight of the head.

★ RECORD AND STYLUS WEAR

These are lower than on any pickup of which we have cognisance. Diamond has a playing life of approx. 100 times longer than sapphire, and because it will take a higher polish than any other material it therefore causes less record wear.

★ OUTPUT

The shielded step-up transformer delivers an output of 8 mV for each cm/sec. r.m.s. recorded velocity. This means that an amplifier with a sensitivity of 40 mV at 1,000 c/s will be easily loaded by the pickup from commercial records.

★ FREQUENCY RESPONSE

Total variation ± 1 db 20,000 c/s to 40 c/s with the LP head, including transformer (recorded velocity 1.2 cms/sec. r.m.s. above turnover).
Low frequency resonance :
20 c/s ± 5 c/s with our very lightweight arm.
High frequency resonance :
0.001 in. radius on Vynil, 21,000 c/s ± 2,000 c/s.
0.0025 in. radius on shellac, above 27,000 c/s.
The frequency response does not change with temperature.

★ SIGNAL-TO-HUM-RATIO

It is not possible to specify this important ratio without stipulating the strength of the interfering fields. These fields will, of course, vary according to the installation. However, for the purpose of comparison measurements have been taken under working conditions, i.e. with various pickups mounted normally within inches of the electric turntable motor and within two feet of a power transformer in an amplifier. The results show that the Leak Dynamic Pickup has a lower hum content than any variable reluctance (moving-iron, magnetic) pickup and a very much lower hum content than a single turn moving coil (i.e. "ribbon") pickup. This confirms what would be expected from theoretical considerations.

★ DIMENSIONS

From the centre of the fixing stem to the front of the pickup head, 9½ in.
From the centre of the fixing stem to the rear of the arm, 2 in. The height of the pickup is adjustable and it can be used with any turntable.

★ MOUNTING

A template of original Leak design is supplied, enabling the pickup to be accurately located on the turntable mounting board. There is a single fixing hole and the stem contains a miniature socket which accepts the plug leading to the transformer (see illustration).

★ TRANSFORMER

The transformer has a step-up ratio of 1.80 and is heavily shielded in mu-metal. The primary lead is terminated in a plug and a shielded secondary lead is supplied.

★ Write for illustrated leaflet 'W'.

ELECTROSTATIC LOUDSPEAKERS

Reprints of "The Gramophone" article (May, 1955), by H. J. Leak, summarising his work and findings on Electrostatic and Dynamic Loudspeakers, are available on request, free of charge

Sole distributors for H. J. LEAK & CO. LTD.

AUDIO TRANSDUCERS LTD., PICCADILLY HOUSE, 33-37 REGENT STREET, LONDON, S.W.1

Telephone: REGent 5659

Telegrams: HIFI, PHONE, LONDON

Cables: HIFI. LONDON

The first 21 years . . .

On Monday, September 14th, 1934, Mr. H. J. Leak left his employment as a sound-film engineer and founded our company. The beginning was modest. The aim of the founder was to earn a living in the way which appeared to hold the best promise of a happy life; by making sound-reproducing equipment better, if possible, than anyone else. To-day, twenty-one years later, the objective is exactly the same and is approached with the same enthusiasm, but the circumstances have vastly altered. The company is known throughout the world, and owns a fine post-war factory and office buildings, designed for the most efficient production of audio products, with ample spare land for periodic expansion. The company's steady growth has been achieved without any surrender of independence, for the final direction and control, both engineering and commercial, remains with the founder, who is assisted and advised by an efficient and enthusiastic nucleus of executives each having fourteen or more years of service.

During the first eleven years of the company's life the main products were audio amplifiers of many types, the company remaining somewhat anonymous because these amplifiers, though they were of Leak design, were supplied to large organisations for sale under their own names, or to government departments. Wider recognition came in 1945 when, as the result of war-time research in our laboratories, we were able to offer audio amplifiers with a distortion content as low as 0.1%. A survey of engineering literature will confirm that we were the first manufacturers in the world to design and market amplifiers with such a small distortion content, and the magnitude of this advance can be gauged when it is remembered that the then accepted standard for laboratory amplifiers was 2% distortion. Our figure of 0.1% was received with incredulity, but it was subsequently confirmed by the National Physical Laboratory, and this criterion is still an accepted world-wide standard.

With this clear lead on low-distortion amplifiers we were able to build up an export market much greater than the domestic one, and the increased volume of manufacture resulted in lower prices which, in turn, brought real high-fidelity amplifiers within the reach of the music lover at home. We also further popularized high-fidelity by lecturing throughout the country and giving demonstrations of comparisons between live and recorded voices and music.

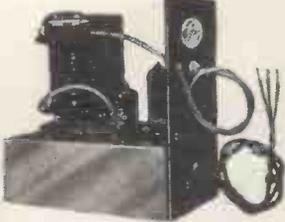
During all these years we have carried out constant research and development on transducers, and our first moving-coil pickup (1948) was widely greeted as a distinct advance over the available magnetic and crystal types. This pickup is still in use all over the world in many recording studios for dubbing and play-back work. Our latest "Dynamic" pickup is a development of the earlier model and has found a ready market throughout the world among those who demand the highest quality of record reproduction.

Until very recently all our work on loudspeakers had not enabled us to offer products markedly superior and cheaper than those obtainable elsewhere, and we therefore refrained from entering this market. However, final designs are in the process of tooling, and within the next few months we shall market loudspeaker transducers giving very obvious improvements in listening quality. These loudspeaker motors will initially comprise a 15" moving-coil bass reproducer employing novel constructions and materials, resulting in an enhanced steady state and transient performance as compared with conventional loudspeakers. There will also be a balanced-push-pull electrostatic loudspeaker having astonishingly low harmonic and transient distortions. In combination these motors give an advance in listening quality comparable with the advance made by the advent of the Rice-Kellogg moving-coil loudspeaker in 1925, and with the advance made by our introduction of low-distortion amplifiers ten years ago.

Within a month or so details of the Leak "Trough-Line" FM tuner will be announced. Most of the conventional bases of present-day FM tuners have been abandoned for solutions resting on firmer engineering grounds, and many features of the tuner may well become standard practices of the future, just as happened with the original "Point One" amplifier.

Our grateful thanks are due to very many people. To our suppliers for giving us the high-quality materials and finishes on which we insist; to our agents and dealers overseas and at home for their service to our customers and ourselves; and to our customers for their support and recommendation—the basis on which the company has grown. Finally, a special word of thanks to fellow engineers for the knowledge which they spread by the written and spoken word.

It has been an exciting and happy twenty-one years. The founder, who is in his forties, is the oldest executive, so we are still a *young* company in outlook, with the enthusiasm of youth tempered by the experience of survival and achievement. We therefore look forward exuberantly to the future and we hope that you will share with us the pleasures resulting from the undoubted advances yet to come in the art and science of sound reproduction.



T.V. E.H.T. GENERATOR

Gives 6 to 9 k.v. output—draws its power supplies (6.3 volt, 8 amp, 250 volts 59 mA.) from the set. 69/6 plus 2/6 post.

1in. MICROMETER



Exceptional purchase enables us to offer a 1in. precision micrometer at the very low price of 10/-. A micrometer is an essential part of an engineer's equipment. You will have found the need for one on many occasions in the past for measuring wire gauge, etc. Price 10/-. post free. Note.—We now have a waiting list for this: orders in rotation.

INSTANT HEAT CONVECTOR

The heater with the lowest possible thermal capacity, 4ft. long made from heavy gauge sheet steel (galvanised), 1 kW., suitable A.C. or D.C. Price only 50/- with thermostat, £3/15/-. Note.—The thermostat mounts separately and will control up to three heaters.

CLEVELAND CAR BATTERY CHARGER



Gives 1 1/2 amp. charge—uses everlasting metal rectifier and robust double wound mains transformer in metal carrying case with leads and croc. clips. Price, 6 volt, 39/6; 6 and 12 volts, 39/6, post 2/6.

TRANSFORMER PRIMARIES

These are transformers with wound primaries tapped 200, 220 and 240 but with no secondaries. There is ample window space, however, for the hand winding of secondary to suit your own requirements. Size required depends upon amps. taken out and the voltage: e.g. if 10 amps. at 10 volts is required then a 100-watt primary is needed. 50 amps. at 5 volts requires 250 watt, etc., etc. Transformers are complete with clamps and feet.

Watts	Price	Post & Pkg.
80	7/6	1/6
100	10/-	2/-
120	12/6	2/6
250	19/6	2/6
500	25/-	4/6
1,000	40/-	6/6
2,000	60/-	8/6

CHANCE OF A LIFETIME



Corner Console. A massive cabinet but being corner fitted is not out of place even in a modern small living-room. Overall dimensions of this cabinet are 47in. wide x 31in. (deep to corner) x 50in. high. Made to house "15" Television. Radio Unit, Amplifier, Tape Deck, etc. Originally £18—our price £10, plus 30/- carriage.

—ADDITA—BAND III CONVERTOR—



Our convertor has given very satisfactory results from the experimental Beulah Hill station, and we have had many satisfying reports regarding its performance.

It is a very neat-looking unit and fits to the side or the back of the television. It is designed to convert any T.V. superhet or T.R.F. and no internal modifications of any kind are required. Simply plug in the aeriols, connect to the mains, and you have Band I or Band III at the flick of a switch. Standard models are set for London working but the unit is completely tunable for any combination of stations.

Build it Yourself

You can save at least £2 on the above if you build the convertor yourself. Price of all components including stove enameled case and even transfers for the front, is £3/10/-, plus 2/6 post, or £4/10/- if mains components also required. Data is included free with the parts or available separately price 2/6.

BAND 3 AERIAL KIT

An interesting aerial, "The Folded V," was described in the July number of a T.V. magazine. We tried this and found it to be most efficient, both for interference reducing and increasing reception strength. It is simple to make. We, therefore, offer this aerial as a constructor's kit. The kit comprises alloy elements and connectors, neat plastic centre piece with polythene insulators and saddle for mounting on existing mast or in loft, window frame, drain pipe, etc., etc. 8/6. Construction data free with parts or available separately, price 1/-.



W.W. (May 1954 Band III Kit)

One of the most successful circuits for Band III conversion was published in the "Wireless World," May 1954. The results we have received in our Harborne laboratory have been more than satisfactory and we consequently offer a complete kit of parts including the specified EF80 valves, wound coils, drilled chassis in fact, everything including a copy of the circuit diagram. Price only 42/6, post 2/6 extra. Mains components if required 25/- extra.



AERIALS

BAND III Aerials—These aerials have quick fitting alloy elements and polythene low-loss insulators.

BAND III DOWN-LEAD. 8fd. per yard, or super low loss 1/4 per yard.

Ready Built for Band III—59/6
We have a very limited quantity of a ready built convertors intended for Band I to Band III conversion at aerial frequency. This is a two-valve circuit and it's frequency can be set anywhere within the 186-196 mc/s Band. It will convert to any frequency between 40-48 mc/s. Input arranged for standard coaxial feeders.

- 3 element array with swan neck mast with "U" bolt clamp for fitting to existing masts from 1/2in. to 2 1/2in. dia. 41/6
- 3 element array with cranked mast and wall mounting bracket 42/6
- 3 element array with cranked mast and chimney lashing equipment 65/-
- 5 element array with swan-neck mast and "U" bolt clamp for fitting existing mast from 1/2in. to 2 1/2in. dia. 52/6
- 5 element array with cranked mast and wall mounting bracket 53/6
- 5 element array with cranked mast and chimney lashing equipment 67/-
- 8 element array with swan neck mast and "U" bolt clamp for fitting to 1/2in. to 2 1/2in. dia. mast 69/-
- 8 element array with cranked mast and chimney lashing equipment 83/6
- 10 element array with cranked mast and chimney lashing equipment 134/-
- 10 element array with 1 1/2in. mast cap, 10ft. mast and heavy duty single chimney lashing equipment 94/6
- 10 element array with 1 1/2in. mast cap, 12ft. mast and heavy duty double chimney lashing equipment 145/-
- 10 element array with 2 1/2in. mast cap, 12ft. mast and heavy duty double chimney lashing equipment 178/6

—WHAT IS IT?—

It is the indicator that you would make to check that the "Elpreq Band III Signal Generator" is working properly. When the loop is brought up to the output circuit the lamp lights brightly.



THE "ELPREQ" Band III SIGNAL GENERATOR is most useful. It:—
 1. Will provide the signal for tuning to any Band III station.
 2. Can be used as a grid-dip meter for checking the frequency of Band III T.V. aeriols, Coils, etc.
 3. Can be made to give a pattern on T.V. Receiver screen.
 4. Can be accurately calibrated with included equipment.
 All the parts including valves, tuning condenser and metal chassis are available as a Kit at 25/- post free. Construction data free with Kit or available separately price 2/6.

DEMONSTRATIONS OF BAND III EQUIPMENT AT ALL BRANCHES

CABINETS FOR ALL

We confidently believe we carry the best stock of cabinets in London. The one illustrated is the Bureau, a really beautiful cabinet elegantly veneered in walnut and finely polished. The control board is revealed when the front is dropped. Both radio board and motor board are left uncut to suit your own equipment. Price 18 guineas, carriage 12/6. We have many other types in stock. Pay us a visit or send for Cabinet List.



THE CLEVELAND ORGANTONE

Five valve 3 waveband superhet covering Long, Medium and Short waves — built to attain highest performance of sensitivity, fidelity and output—Osram miniature valves—low loss iron coils—permeability tuned I.F.S.—full A.V.C.—variable negative feedback—gram, position on wave change switch—4 watts output—particularly fine tone especially on gram. Chassis size: 7 x 7 x 7 approx. scale size 4 1/2 x 4 1/2 approx. Tested in difficult areas where exceptional results have been obtained. Price £11/10/-, or £3/16/- deposit. Carr., etc., 7/6.

THE CLEVELAND "TREMENDO"
The Cleveland Organtone was good, but this one is really superb. It has a 7-valve circuit with 6-watt output, fitted with independent bass and treble controls. It is really an efficient B.F. circuit coupled to a high fidelity amplifier. The chassis size is the same as the Organtone, namely 12 x 7 x 7 with the 1 1/2 x 4 1/2 multi-coloured scale, and it is built to the same exacting specification as the Organtone. Price £15/10/-, carriage and packing 7/6. Terms £2/5/- deposit.

AUTO-CHANGER BARGAIN
3-SPEED BY MOST FAMOUS MAKER
Plays all records 7in., 10in. and 12in. Records may be mixed. 7in., 10in. and 12in. Uses famous Acos, Hi-G turnover Sapphire c'dge. Brand new, in maker's carton Free 12 months' guarantee Normal price £16/10/-.



Huge purchase enables us to offer these at £9/17/6 or £4 deposit and seven monthly payments of £1 each. Non-callers please add 7/6 for carriage and insurance.



CHASSIS ASSEMBLY
Three-colour 3-waveband scale covering standard, Long, Medium, and Short waveband, scale pan, chassis, punched for standard 6-valve superhet, pulley driving head, springs, etc., to suit. Scale size 1 1/4 x 3 1/4in. Chassis size 15 x 5in. x 2 deep. Price 15/- plus 1/6 post. Note.—This is the one that fits our 37/8 table cabinet.



MULLARD AMPLIFIER "510"
A High Quality Amplifier designed by Mullard engineers. Robust high fidelity with a power output exceeding 10 watts and a harmonic distortion less than 4% at 10 watts. Its frequency response is extremely wide and level being almost flat from 10 to 20,000 C.P.S.—three controls are provided and the whole unit is very suitable for use with the Collaro Studio and most other good pick-ups. The price of the unit completely made up and ready to work is £12/10/- plus 10/- carriage and insurance. Alternatively, if you wish to make up the unit yourself we shall be glad to supply the components separately. Send for the Mullard amplifier shopping list.

Old customers please note our post order and inquiry department is now being run from Eastbourne and we can promise a much better service than of late.

THE CLEVELAND F.M. TUNER



This tuner is based upon the very successful circuit in the booklet published by Data Publications, sometimes known as "Jason" circuit. We have made up models at all branches and will be glad to demonstrate.

Four valves and two crystals are used. Two crystals are used in the ratio detector to avoid heater-cathode hum so often encountered with valve ratio detectors. Stability is extremely good and tuning most simple. The tuner draws its power supply from the set or amplifier, its valve heaters are not connected to earth

With only a simple indoor aerial made by parting the ends of ordinary flexible cable this tuner works very well at Eastbourne (over 60 miles from London) and we await reports from even greater distances. Cost of all parts including valves, prepared metal chassis, wound coils and stove enamelled scale, slow motion drive, pointer, tuning knob, in fact everything needed to make the complete unit, is £6/12/6. Data is included free with the parts or is available separately, price 2/-.

THIS MONTH'S SNIP

THREE-SPEED GRAM MOTOR
200-240 A.C. mains-operated, complete with turntable—plays 33, 45 and 78 r.p.m. records. Post and insurance 3/6.
59/6

COMMUNICATIONS RECEIVER R1155
This set, as most will know, is considered to be one of the finest communications receivers available today. The frequency range is 15 kc/s to 18 Mc/s. It is complete with 10 valves and is fitted in a black metal case. Made for the R.A.F., so obviously a robust receiver which will give years of service. Slightly used but completely overhauled and guaranteed in perfect working order. PRICES; Grade 2 £7/19/6. Grade 1 £9/19/6. Or will be sent against deposit of 30%. If you cannot call to collect please include an additional 15% to cover cost of transit and case carriage. This partly returnable to you if and when you return the transit case.

MAINS POWER PACK FOR R1155
With Pentode output stage. Plug into socket on receiver so no internal modifications are required. Price £5/10/- complete with speaker ready to work, carriage 3/6. Or in cabinet £8/15/-. Carriage 5/-.

ENTIRELY NEW CIRCUIT
Redesigned and developed and built by the Cleveland Company—very good reports received.

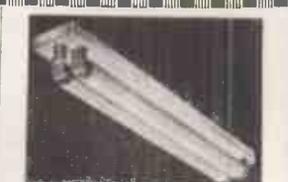
THE "WINDSOR 5"
This is a 5-valve A.C. superhet covering the usual long, medium and short wavebands. It has a particularly fine clear dial with an extra long pointer travel. The latest type local valves are used and the chassis is complete and ready to operate. Chassis size 15 x 6 x 6in. Price £9/19/6 complete with 8in. speaker. Carriage and insurance 10/-. H.P. terms if required.

TABLE RADIO CABINET
Due to a special purchase, we are able to offer this very fine cabinet, size approx. 16 1/2 x 14 x 6 1/2in. Walnut veneered and satin finished, 37/6, carriage and packing 3/6. Note—This cabinet is the correct one for the Windsor chassis above with 6 1/2in. speaker.

OCTAGONAL SPEAKER CABINET
Conforming exactly to the designer's specification—for G.E.C. metal cone speaker; also suitable any good 8in. speaker. Price £12/10/- or 37/8 deposit, carriage and insurance 7/6 extra. G.E.C. metal cone (extra octave) speaker £3/15/-.

SPEAKERS
The latest W.B. cambrie cone speaker units all in die-cast frames with universal impedance speech coils 3 ohms, 7.5 ohms, and 15 ohms.
Model H.F. 812 8in. £3 5 6
Model H.F. 812 9in. £3 9 6
Model H.F. 1012 10in. £3 17 6
Also in die-cast frames but with 3 ohm, or 15 ohms, speech coils.
Model H.F. 510 5in. £1 19 6
Model H.F. 610 6in. £2 12 6
Model H.P. 1214 12in. £9 15 6
We also carry a range of G.E.C. Wharfedale and Goodmans Hi-Fi speakers.

PICKUPS
ACOS HI-G HEADS for use with Garrard or Collaro plug-in units in brown or ivory, 42/- each.
THE B.J. ARM, new type to give correct tracking over the whole recording. Extra lightweight, suitable for Decca, Garrard and Chancery heads. £2/19/6.
ACOS GP20 HI-G with the new HI-G plug-in heads, all designed to obtain the nearest to perfect reproduction—pressure only 8 grammes. Complete with either head. £3/7/6. Extra head £2/2/-.
THE NEW LEAK TL-10 AMPLIFIER WITH "POINT-ONE" PRE-AMP. In the amplifier world the name Leak probably stands highest. It is symbolic of precision sound engineering. The TL-10 has an output of 10 watts and with its pre-amplifier will operate from any good pick-up. A continuously variable input attenuator in the pre-amp. permits the use of crystal, moving iron or moving coil pick-up. Provision is made for tape recording and play-back as an exclusive feature. Easy accessible jacks being provided on the front panel for speedy hook-up. The complete amplifier with pre-amp. £28/7/- Or TL-10 amplifier only 17 gns. Or "Point-One" amp., only 10 gns.



THE TWIN 20
This is a complete fluorescent lighting fitting. It has built-in ballast and starter, stove enamelled white and ready to work. It is an ideal unit for the kitchen over the work-bench, and in similar locations. It uses two 20-watt lamps. Price, complete less tubes, 22/6, or with two tubes, 39/6. Post and insurance 2/6. Extra 20-watt tubes 7/6 each.

22/6 FLUORESCENT LIGHTING
40 WATT
Complete kit comprises 40-watt control unit, starter lamp, lamp holders, clips and wiring diagrams. Price, less tubes, 22/6, plus 1/6 post. With tube, 30/-, plus 3/6 carr.



AMAZING MINI-RADIO
Uses high-efficiency coils—covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, £3/19/6, plus 2/- post. Constructional data free with the parts, or available separately 1/6.

A.C./D.C. MULTI-METER KIT
The Multi-Meter illustrated measures A.C./D.C. volts and D.C. m/amps. and ohms. It has a sensitivity of 200 ohms per volt and is equally suitable for the keen experimenter, service engineer or student. All the essential parts including 2in. moving coil meter, selected resistors, wire for shunts, 8-point range selector calibrated scale, stick-on range indicator and full instructions for making are available as a kit, price 19/6 plus 9d. post and packing.

VALVE HOLDER PLUGS
Each is fitted with a rubber shroud. For 57G button base and type 2 for B9A. Price 2/- each discounts for quantities.

BEETHOVEN CHASSIS
Chassis size approx. 9 1/2 x 7 1/2 x 8 1/2. First class components. A.C. mains operation. Three-wave (medium and two short). Complete with five valves, ready to work. Special cash-with-order price this month, £5/19/6, carriage and insurance 7/6. Brand new and unused.

ELECTRONIC PRECISION EQUIPMENT LTD.

249-Kilburn High Road, Kilburn
Phone: MA1 4921
Half-day Thursday

42-46 Windmill Hill, Ruislip, Middlesex
Phone: RUISLIP 5780
Half-day Wednesday

152-153 Fleet St., E.C.4
Phone: FLEET 2833
Half-day Saturday

29 Stroud Green Road, Finsbury Park, N.4
Phone: ARCHWAY 1049
Half-day Thursday

Post orders should be marked "Dept. 2" and addressed to E.P.E. LTD., 123, TERMINUS ROAD, EASTBOURNE. All enquiries to Eastbourne address and please enclose S.A.E., terms are cash with order.

MAINLY FOR THE INDUSTRIAL USER

UNITS FOR CONTROLLED AUTOMATIC ROTATION



contain selsyn transmitter/receivers and it is these that provide the impulses which cause the aerial to rotate backwards or forwards. The equipment intended for 117 volt A.C. mains but will operate from our mains if connected through step down transformer of 1 K.W. rating.

Prices 1-221-A £25 plus carriage. TR24A £35 plus carriage. Special discount of £5 for cash with order or C.O.D. if both units purchased together.

HIGH POWER TRANSFORMERS



For R.F. Heaters, transmitters, etc., etc. These are open wound type for maximum cooling and have the normal 200-250 primary fully screened.

Type 5F8. 1,000 v. at 1 amp., e.g., 5 K.V.A. Price £15, carriage and packing 7/6.

Type 5F7A. 2,200 v. at 1 amp., e.g., 2 K.V.A. Price £15, carriage and packing 7/6.

Type 5M1. 1000-1000 v. at 1.5 amps., e.g., 1 1/2 K.V.A. Price £12/10/-, carriage and packing 7/6.

Type 5M2. 1000-0-1000 v. at 500 mA. and 4 v. at 4 a. Price £7/10/-, carriage and packing 4/8.

Type 5M3. 375-0-375 v. at 250 mA. and 4 v. at 4 a. Price 3/7/6, carriage and packing 3/6.

Type 5J1. 500-0-500 v. at 500 mA., 6.3 v. at 6 a., 45/-, carriage and packing 3/7

POWER FILAMENT TRANSFORMERS

Type 5M4. 4 v. at 4 a. 2-0-2 v. at 10 a. Price 13/6, carriage and packing 3/8

Type 5M5. 3.15-0-3.15 at 10 a., 4-0-4 at 10 a., 4-0-4 at 2 a. 4 at 4 a. 2.5-0-2.5 at 3 a. Price 27/6, plus carriage and packing 3/8.

Type 5M6. 34 v. at 2 a. tapped 32 v., 30 v. and 28 v., for relays, etc., 22/6, plus 3/6 carriage and packing.

Type 5J2. This has four 4 v., 10 amp. centre tapped secondaries 35/- Plus 3/6 packing and post.

POWER CHOKES. Open wound type and feet with clamps.

Type 5M7 30 Henry at 500 mA., 35/-

Type 5M8 20 Henry at 500 mA., 32/6

Type 5M9 15 Henry at 500 mA., 27/6

Type 5M10 10 Henry at 500 mA., 22/6

Type 5M11 25 Henry at 250 mA., 18/6

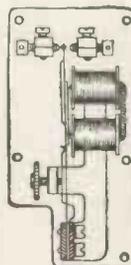
Type 5M12 8 Henry at 10 amps., 18/6

Type 5M13 200 Henry at 5 mA., 15/-

PORCELAIN STAND-OFF INSULATORS



threaded each end. Price 1/6



RELAYS

Extra light weight, extra sensitive for high speed or radio control work, weight only 1 1/2 oz., closes on 2 mA., solid platinum change-over contacts, adjustable pressure. Price 12/6.

TELEPHONE JACK PLUGS



As illustrated 7d. each. Sockets to suit, 10d. each.

AUTOMATIC MOTOR STARTER



For remote control of D.C. motor between 1 and 3 kw., adjustment for 100v. or 230v. Unused and in first-class condition, complete with metal and wired glass cover. Price £10. carriage 5/-.

POTTED MAINS TRANSFORMERS

These are of really superior construction fitted in cast metal cases and compound filled. Terminals come to abouite base-board. All are upright mounting and have 220/230 normal 50 cycle mains input and fully screened primary.

Type 5F1. 265-0-265 at 500 mA.: 6.3 v. at 7 amp., 4.4 v. at 2.5 amp.; Price 35/- plus 3/6 carriage.

Type 5F2. 365-0-365 at 150 mA.: 4 v. at 2.5 a.; 6.9 v. at 4.2 a. Price 32/6, carriage and packing 3/6.

Type 5F3. 1540 v. 2 v. at 2 a.; 4 v. at 1 a.; This is an Ideal transformer for televisions and scopes using V.C.R. 97, etc. Price 25/-, carriage 2/6.

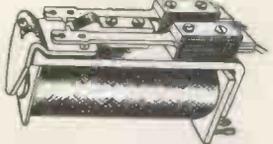
POTTED CHOKES

These chokes are in similar type cases and therefore match the above transformers.

Type 5F4. 5 H. at 300 mA. Price 10/-, carriage and packing 2/6.

Type 5F5. 10 H. at 150 mA. Price 12/6. Post and packing 2/6.

RELAYS P.O. 3000 TYPE



Ref. 5A1. 2,000 ohm, slow close coil plat. contacts, one break, two make. Price 12/6 each.

Ref. 5A2. 10,000 ohm. standard coil plat. contacts change over make before break, two make, 1 break. Price 15/-.

Ref. 5A3. 200 ohms. standard coil plat. contacts, two make. Price 7/6 each.

Ref. 5A4. 10 ohm. standard coil, one pair plat. contacts, also mounted but not operated by the relay, are thermal change-over contacts, make before break. Price 8/6 each.

WELD TYPE WIRE JOINTER

This jointer melts the wires and causes the metal of each to run together, thus making a strong and permanent weld. It obviously is not intended to replace the soldering iron but nevertheless is ideal for making joints that have, for instance, to withstand heat, vibration, chemical action, etc.

In many cases also this method is faster than soldering and there can be a considerable saving of current. Price 9/6. Or complete with enclosed mains transformer, 29/6.



AUTO TRANSFORMERS

For working American equipment of our main etc., etc. Input tapped 200-240 v. Output 115 v. In addition to those listed below we have special this month 150/200 watt totally enclosed in metal box with input and output leads. Price 47/6, plus 2/- post and packing.

Totally enclosed and screened.	Price	Carr.
50 watt	£12/6	1/6
100 watt	£17/6	1/6
150 watt	£22/-	2/6
250 watt	£24/10/-	2/6
500 watt	£25/10/-	2/6

Unscreened	Price	Carr.
1 KVA (1,000 w.)	£28/10/-	5/-
1.5 KVA (1,500 w.)	£27/17/6	5/-
2 KVA (2,000 w.)	£10/17/8	7/6
3 KVA (3,000 w.)	£12/7/6	10/-
5 KVA (5,000 w.)	£19/5/-	12/6

VARIABLE RESISTORS Heavy Duty Type.

Ohms	Amps.	Price
• 5	30-40	35/-
• 1	20-25	35/-
1.2	10-15	15/-
3	7-10	15/-
11	3-5	22/-
• 50	2 1/4-4	45/-
• 100	2-3	45/-

*These are screw adjust types

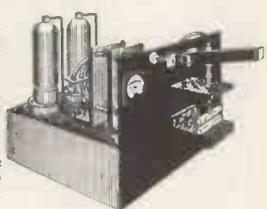
R.F. HEATERS CONSTRUCTOR'S KIT

THE ELPREQ R.F. HEATER

The Elpreq R.F. Heater has been planned to fill the need in industry for a reasonably priced unit to be used in the works or for development.

The heater is supplied in kit form, mainly to keep the cost low but also as it is thought that many users will wish to assemble the units within special casings to be close to the production line.

As it is not possible to have one frequency which is equally efficient for both dielectric and inductive heating a frequency efficient for dielectric work has been chosen. It being felt that this fills the greater need



THE POWER PACK

The Power Pack used is the "Elpreq Variable 500" which is fully described in another section, this gives ten variations of power to a maximum of 500 mA. at 1,000 V.—continuous rating.

THE R.F. UNIT

Two carbon anode, high power triodes working into a push-pull circuit act as R.F. generators. The R.F. output to the "work" is taken from the tank coil.

Two meters are provided. The one in the main H.T. line shows the total millamps being drawn by the R.F. unit. The other in the R.F. output stage indicates the R.F. current into that circuit.

The output frequency is approximately 15 megacycles but this will vary with the work and can be deliberately changed by tuning or by altering the size of the tank coil. Connection to the work is through two substantial bipolar terminals brought out to the front panel.

Size is approximately 16 1/2 in. x 13 in. x 14 in. and weight is approximately 25 lb. Price of all components including metal chassis to make power pack and R.F. units is £40 Or wired up ready to work £55.

All prices are ex our Eastbourne works and terms are cash with order

RACKS AND RACKING EQUIPMENT

ALL EX-MINISTRY EQUIPMENT

STANDARD RACK

6ft. high and 19in. wide, heavy steel construction. Holes drilled and tapped at the standardized spacings. Price 24/15/- plus carriage.

ENCLOSED RACK

As above but rectangular and with sheet metal enclosed sides (vented), fitted handle and closing bars. Price 27/15/- or 28/15/- depending on condition, plus carriage.

MOUNTING PLATES

to fit above racks. Heavy 1/2 in. steel plates (drilled at standard intervals and 19in. centres) with chassis mounting brackets.

Ref. 5A5—19x14 front plate with chassis brackets, 17/6.

Ref. 5A6—19x12 front plate with chassis brackets, 16/6.

Ref. 5A7—19x10 1/2 front plate with chassis brackets but drilled for meters and other items, 8/6.

SAFETY SWITCH

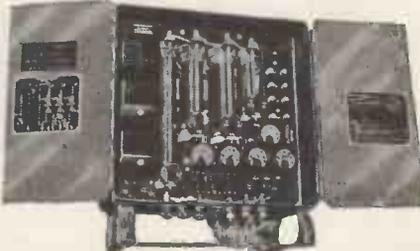
When fitted this switch will cut off the mains as rack door is opened. 5/6.



CHARGING SWITCHBOARD

Feed this Switchboard through a Mains Transformer and Rectifier giving 24 volt D.C. up to 50 amps, and you have an excellent multi-circuit charger for simultaneously charging several batteries at different currents. This is an ex-Government switchboard rated at 550 watts 18 volts fitted into steel cases with doors. It contains three reverse current relays, one voltmeter, one main ammeter, two secondary ammeters and three variable resistors for controlling circuits. These are brand new, in original cases Price £4/10/-, carriage 10/-.

We can supply a 12 volt, 50 amp. Mains Transformer at 24/5/- plus 5/- carriage.





EX-ROYAL NAVY SOUND POWERED TELEPHONE

These require no batteries, and will go for long periods without attention. Complete with generator and sounder which gives a high pitched note, easily heard above any other noise. Also fitted with an indicator lamp which in quiet situations can be used instead of the sounder, or where several telephones are used together will indicate which one is being called. Size 7 1/2 in. x 9 in. x 7 1/2 in., wall mounting, designed for ships' use but equally suitable for home, office, warehouse, factory, garage, etc. Price £5/6 each, plus 4/6 carriage.

BLOCK CONDENSERS



All unused. .5 mfd. at 2,500 v., 3/6; 4 mfd. at 750 v., 3/6; 8 mfd. at 500 v., 5/-; 4 mfd. at 500 v., 2/6; 4 mfd. at 1,500 v., 6/6.

SENSITIVE ALTIMETER

These contain aneroid barometer movement and useful gears. Price 7/6 each. Post 1/-.



Note.—Also a few in good working order, available at 22/6.

SCRAMBLER—TELEPHONE EQUIPMENT

As used by Ministries and Forces for holding secret conversations. Works in conjunction with normal telephone equipment. Items available, all new and unused, are: Frequency Changer, Type 6AC, Ref. No. YB02700, price £5. Standard G.P.O. desk type instrument with scrambler switch, complete with lead and junction box, price £2/10/-.

GREATLY REDUCED. CATHODE RAY TUBES

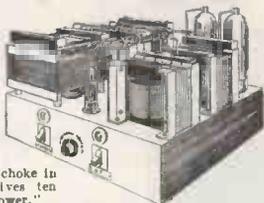
VCR97. Brand new and unused, "cut-off type," ideal for scope, etc. Price 12/6. Carriage and insurance 5/- extra.
VCR517. 6 1/2 in. guaranteed full picture, 29/6, plus 5/- carriage and insurance.
VCR139A. 2 1/2 in. 32/6, plus 2/6 carriage, etc.
VCR138. 3 1/2 in. electrostatic short persistence, suitable for T.V. and ideal for "scope work, 37/6 plus 3/6 carriage, etc.
VCR112. 5 in. electrostatic, persistence not known, 15/- each, plus 5/- carriage, etc.
CV998. 6 in. electrostatic, persistence not known, 15/- each, plus 5/- carriage, etc.
CV1140, CV1500, CV1548. All 12 in. magnetic, long persistence, £4/10/-, plus 10/- carriage.

10-CORE CABLE

10 flexible copper conductors well insulated suitable for mains work. Covered Overall with hard rubber, 1/8 per yard.

HEAVY DUTY POWER PACKS

500 WATT 1,000 v. (VARIABLE)
The conventional circuitry is employed throughout and all components are amply proportioned to permit substantial overloading. A master switch controls the whole unit and whenever this is on current is supplied to the rectifier filament, thus keeping them always in the emissive state. The H.T. transformer is supplied from the primary of the filament transformer, connection being via an on/off switch and a tapped choke. The on/off switch controls the H.T. and the tapped choke in conjunction with its selector switch gives ten variations from "low power" to "high power." Two directly heated rectifiers give a full wave output which is smoothed by a 10 Henry choke and 4 mfd. condenser. A bleeder resistor connected across the output serves as a dummy load and also discharges the smoothing condenser which otherwise would be a source of danger to users. The continuous rating of the power pack is 1,000 volts at 500 milliamp (500 watts). But the proportions of the various components are such that 100 per cent. overloading can be allowed for pulse work or other intermittent operations. The size of the power pack is approximately 16 1/2 in. x 13 in. x 13 in. and its weight is approximately 87 lb. Price: Kit of parts £27/10/-, or made up ready £37/10/-.



500 WATT 2,000 v. (VARIABLE)
The maximum continuous rating of this is 250 milliamps at 2,000 volts. Rectification is half wave. Specification otherwise as for the variable 500/1,000 v.

1,000 WATT 2,000 v. (VARIABLE)
The continuous power rating of this is 500 milliamps at 2,000 volts. But the tapped choke and selector switch enables this to be reduced in ten steps. Weight approximately 120 lb., size 16 1/2 in. x 13 in. Price £37/10/- in kit form, or made up ready to use £47/10/-.

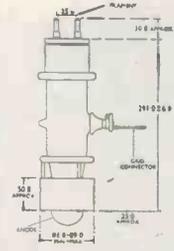
1,000 WATT 1,000 v. (VARIABLE)
The maximum continuous rating of this is 1 amp. at 1,000 volts. Rectification is full wave, output is variable. Weight approximately 120 lb., size 16 1/2 in. x 13 in. Price £37/10/- in kit form, or £47/10/- made up ready to work.

FIXED MODELS

Any of the models mentioned above can be supplied without the tapped choke and selector switch. The prices are as follows:—
Fixed 500/1,000 v. £22/10/- in kit form, or £30 made up.
Fixed 250/2,000 v. £22/10/- in kit form, or £30 made up.
Fixed 500/2,000 v. £22/10/- in kit form, or £40 made up.
Fixed 1,000/1,000 v. £22/10/- in kit form, or £40 made up.
All prices quoted are ex Works.

CEILING FAN

This model, made by Revo, incorporates a series-wound totally enclosed ball-bearing motor of robust construction and noiseless operation. The fan has a blade diameter of 36 in. and is supplied with 20 in. suspension tube and ceiling canopy. All finished white cellulose enamel. The voltage working is 230-250 v. D.C. Revo catalogue number D12288. Price £10/10/-.

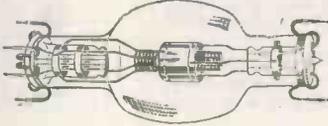


SPECIAL PURPOSE VALVES

Triode Type CV 1098—this is a high-power air-cooled triode. Specification of which is as follows: Filament voltage 8.2 v., filament current 35 amp., anode dissipation 750 watts. Maximum anode voltage 23 kV.
This valve is very suitable for R.F. heating at high frequencies and two of these in push-pull under Class C conditions would have an output of approximately 2 kilowatts. Brand new, still in original shockproof packing, price £15 each.

TETRODE TYPE VT31

This is a high-powered air-cooled tetrode. Specification of which is as follows:—Heater voltage 11.25, heater current 8 amp., maximum anode voltage 8 kV., anode dissipation 250 watts, size approximately 14 1/2 in. long and 6 1/2 in. across the bulb. Limited quantity only at £4 each, still in original packing.



WATCH THESE COLUMNS FOR DETAILS OF VARIOUS OTHER INDUSTRIAL TYPE VALVES. ALTERNATIVELY SEND US YOUR ENQUIRIES.

HIGH CYCLE MOTOR ALTERNATOR

TYPE 1. Has a motor 230 v., 50 cycle single phase 2,800 r.p.m., coupled to a generator output 250 v., 1,728 cycles at .24 amps. Good condition. with wiring diagram, £3/10/- plus 7/6 carriage.
TYPE 2. Has a motor 230 v., 50 cycle single phase, coupled to an alternator output 250 v. 625 cycles .24 amps. Price £3/10/-, plus 7/6 carriage.

SPECIAL EQUIPMENT SALES

IMPORTANT NOTE
Owing to the bulkiness of many of the items listed on these two pages it may not be possible to keep stocks at branches, therefore please telephone confirmation that the item is actually at the branch before journeying specially to see it.
SPECIAL SALES DEPT., E.P.E. LTD., 123, TERMINUS ROAD, EASTBOURNE. Phone: Eastbourne 5055

NEW 5 AMP. THERMOSTAT (MINIATURE)



2 1/2" x 1 1/2" x 1 1/2" high.
Useful for the control of appliances such as convectors, gusepots vulcanisers, hot plates, etc. This thermostat is adjustable to operate over the temperature range 50-550 deg. F., fitted with heavy (5 amp. A.C.) silver contacts size 1 1/2 in. long x 1/4 in. wide, price 8/6, post 6d.; 1 amp. type 3/6. 2 amp type 5/6.



METERS

2 1/2 in. Flush mounting	10/6
0-30 mA. moving coil	10/8
0-500 mA. moving coil	10/8
5-0-5 mA. moving coil	17/6
0-1 amp. moving coil	17/6
2 in. Flush mounting	
0-2 amp. R.F. thermo.	7/6
0-3 amp. R.F. thermo.	7/6
0-5 amp. R.F. thermo.	7/6
0-5 mA. moving coil	8/6
0-3 mA. moving coil	8/6
0-20 amp. moving coil	10/8
0-40 amp. moving coil	12/6
Hot Wire Amp. Meters	
0-9 amp. 2 1/2 in. flush	12/6
0-10 amp. 5 in. surface	25/-

PYREX AERIAL INSULATORS

Ideal for aerial connections through cabin walls or through panels. Consists of glass dome with threaded rod and terminal ends and metal fixing flange. Price 2/- each



PLUG AND SOCKET



This brass eased plug and socket is extremely robust and ideal for P.A. or outside work. Ideal also for taking power to units as it insulates the ends of the wires. Contacts are quite suitable for carrying up to 10 amps. so this can be used for lighting or power. Price 2/6 per pair



JUMBO VALVE BASE

Ceramic 4-pin for transmitting valves. 805, etc. Price 3/6 each.

FLEXIBLE COUPLINGS



These are sometimes known as bellows couplings because they will extend as well as bend. They are ideal for joining shafts which are out of alignment and for slung tuning controls where the core has to come in and out. Price 1/9 each.



30 AMP ROTARY SWITCH

Single pole ON/OFF, a very robust switch, made by one of our most famous firms. Will give life-time of service. Price complete with pointer knob, 4/9.

GRUBB PARSONS A.C. STABILISER

NEW & IMPROVED MODEL



Stability

PERFORMANCE DATA

± 0.05% for input voltage changes of at least ± 10% at all loads and for normal frequency variations.

Regulation

Within ± 0.1% for changes from no load to full load.

Waveform

Total introduced harmonic content within 3% (Mainly 3rd and 5th) under average conditions.

Reactive Loads

Above performance maintained for loads of P.F. from 0.8 to unity, lagging or leading. (Nominal) 210, 220, 230, 240 and 250, switch selected.

Input Volts

- ★ Even greater constancy of output voltage than with earlier model.
- ★ Increased output—up to 1 amp.
- ★ Safety device incorporated to avoid any dangerous rise in output voltage in event of failure of any part of the unit.
- ★ Optional provision of voltmeter and ammeter to measure input and output voltages and output current.
- ★ Stabiliser can be adapted at small cost to stabilise the radiation emission from light sources such as filament lamps and Nernst filaments.

**SIR HOWARD GRUBB, PARSONS & COMPANY
WALKER GATE, NEWCASTLE UPON TYNE 6**
PROPRIETORS: C. A. PARSONS & COMPANY LIMITED

- T/V TECHNOLOGY
- RADIO ENGINEERING
- ELECTRONICS
- RADIO SERVICING

There's a big future in T/V and Radio Act now! Increase your knowledge. Back up experience with a sound theoretical background. I.C.S. offer courses of instruction in—

T/V TECHNOLOGY ● ADVANCED SHORT-WAVE RADIO ● RADIO ENGINEERING ● RADIO SERVICE ENGINEERING ● RADAR ● BASIC ELECTRONICS ● FREQUENCY MODULATION.

I.C.S. will also coach you for the following examinations:— B.I.R.E.; P.M.G. Certificate for Wireless Operators; Radio Servicing Certificate (R.T.E.B.); C. & G. Telecommunications, etc., etc.

DON'T DELAY—SEND COUPON TODAY for free descriptive booklet, stating which subject or examination interests you. Fees include all books needed. Examination students coached until successful.

Reduced terms for H.M. Forces.
Dept. 223D, I.C.S., 71 Kingsway, W.C.2.

INTERNATIONAL CORRESPONDENCE SCHOOLS.
Dept. 223D, International Buildings, Kingsway, London, W.C.2.

Please send Booklet on subject

Name..... Age

Address.....



STL

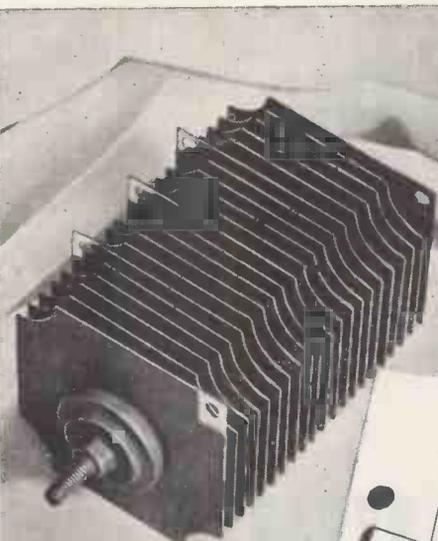
*Hermetically
sealed
transformers
for
tropical
conditions*

STL TRANSFORMERS

incorporate sound design and are manufactured to the highest standards called for in the electronic and communication fields. Consult us for your next transformer requirements.

STEWART TRANSFORMERS Ltd.

75 KILBURN LANE, LONDON, W.10 · LADbroke 2296/7



See us on Stand 101 at the RADIO SHOW, or write, stating requirements, direct to:

W. W. 9, WESTINGHOUSE BRAKE & SIGNAL CO. LTD.,
82 York Way, King's Cross, London, N.1. TERminus 6432

WESTALITE RECTIFIERS TYPE 4

Per series element. Maximum peak reverse: 24-3 volts.
Ratings in various circuits with sinusoidal input.

Circuit	Load	MAX. O.C.		NOMINAL MEAN OUTPUT
		R.M.S. INPUT	INPUT	
Half-wave	Condenser	10 volts	10 volts	10 volts
Voltage-doubler	Resistive	10 volts	12 volts	20 volts
Phase bridge	Condenser	17.1 volts	12 volts	12 volts
"	Resistive	15 volts	12 volts	12 volts
"	Battery: AC	18.0 volts	15.2 volts	12 volts
"	res. ballast	17.1 volts	12 volts	12 volts

Next Smaller, see D.S. 405 Data Sheet 404
Next Larger, see D.S. 403 1st Edition

Inter Service Type Approval Certificate 479/4 (588/1) covering full approval for 35°C. Category H.2 has been granted for type T4A rectifiers.

MOUNTING DETAILS

4A, B, C spindles horizontal, but not more than two horizontal layers.
4D may have spindle vertical.

PARALLEL PATHS

Economic limit 1 path of 4B, C, D but 1 or 2 paths of 4A. Space limitations may apply.

WESTALITE RECTIFIERS TYPE 14

Per series element. Maximum peak reverse: 42 volts.
Ratings in various circuits with sinusoidal input.

Circuit	Load	MAX. O.C.		NOMINAL MEAN OUTPUT
		R.M.S. INPUT	INPUT	
Half-wave	Condenser	15 volts	15 volts	15 volts
Voltage-doubler	Resistive	15 volts	20 volts	22.5 volts
Phase bridge	Condenser	29.5 volts	20 volts	20 volts
"	res. ballast	29.5 volts	30 volts	24 volts
"	Battery: AC	36 volts	29.5 volts	24 volts
"	res. ballast	36 volts	29.5 volts	22 volts
"	Battery: DC	36 volts	29.5 volts	28 volts
"	res. ballast	36 volts	29.5 volts	34 volts
"	Battery, choke	36 volts	29.5 volts	28 volts
"	res. ballast	36 volts	29.5 volts	28 volts
"	Battery, choke	36 volts	29.5 volts	28 volts
"	res. ballast	36 volts	29.5 volts	28 volts
DC Stopper	Resistive	25 volts	25 volts	25 volts

Next Smaller, see D.S. 415 Data Sheet 414
Next Larger, see D.S. 413 1st Edition

Inter Service Type Approval Certificate 479.4 (588.1) covering full approval for 35°C. Category H.2 has been granted for type T14A rectifiers.

MOUNTING DETAILS

14A, B, C spindles horizontal, but not more than two horizontal layers.
14D may have spindle vertical.

PARALLEL PATHS

Economic limit 1 path of 14D, C or B but 1 or 2 parallel paths of 14A. Space limitations may necessitate using more parallel paths. There is no restriction.

Type	CURRENT RATINGS:		Per parallel path (milliamperes mean)	
	average	maximum	Non-preferred type 14D	Preferred type 14A
Half-wave: Voltage-doubler	25	35	25	35
Single-phase bridge: resistive load	35	45	35	45
Single-phase bridge: battery choke	25	35	25	35
Single-phase bridge: battery choke	25	20	15	15
Single-phase bridge: condenser	110	85	45	45
Single-phase bridge: battery resistive	50	35	25	20
Three-phase bridge, resistive or battery load	88	68	36	36
DC Stopper	160	120	65	65

DIMENSIONS and WEIGHTS. (Approximate)
Cat. No. appears on the positive end, except when both ends are negative.



Overall size .. Maximum number of elements ..	Type 14D		Type 14C		Type 14B		Type 14A	
	90	14D (20 mm) Dia.	90 (Inc. dummies)	14C (28 mm) Dia.	90 (Inc. dummies)	14B (45 mm) Sq.	90 (Inc. dummies)	14A (57 mm) Sq.
In the following formulae N = Total number of discs used, i.e., elements + dummies.	1 1/2" (38 mm) Dia.		1 1/2" (38 mm) Dia.		1 1/2" (38 mm) Dia.		1 1/2" (38 mm) Dia.	
Length (ins.) (mm)	25.3 + 0.072N	25.3 + 0.072N	25.3 + 0.076N					
Weight (ozs.) (gms.)	0.33 + 0.146N	0.33 + 0.146N	0.84 + 0.163N	0.84 + 0.163N	0.8 + 0.163N	0.8 + 0.163N	0.8 + 0.163N	0.8 + 0.163N
Flash Test	9.2 + 4N	9.2 + 4N	26 + 4.55N					
Forward Reverse	2,000 volts AC R.M.S. to spindle.	2,000 volts AC R.M.S. to spindle.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.	Pass 260 mA DC. Voltage drop not to exceed 1.63 volts.

WESTINGHOUSE BRAKE & SIGNAL CO.

9 Octave realism

The G.E.C. metal cone loudspeaker gives lifelike reproduction of any type of sound over a range of 9 octaves. This includes the whole musical fundamental range with overtones. This gives the true tonal quality and character that all music lovers demand.

from a single unit

Sound engineers will appreciate the simplification—and the improvement in performance—which has been achieved by combining these qualities in a single unit—*smooth response over a range of 9 octaves with extremely good low frequency response . . . *negligible inter-modulation . . . *unequaled transient response due to special coil and cone construction.

for only £8.15.0

This is a professional instrument but its remarkably low price makes it particularly valuable to the home constructor. It must be used under the correct conditions to obtain optimum results. Cabinets have been specially designed for use with this speaker. Home constructors are invited to write for details.



Metal Cone Loudspeaker



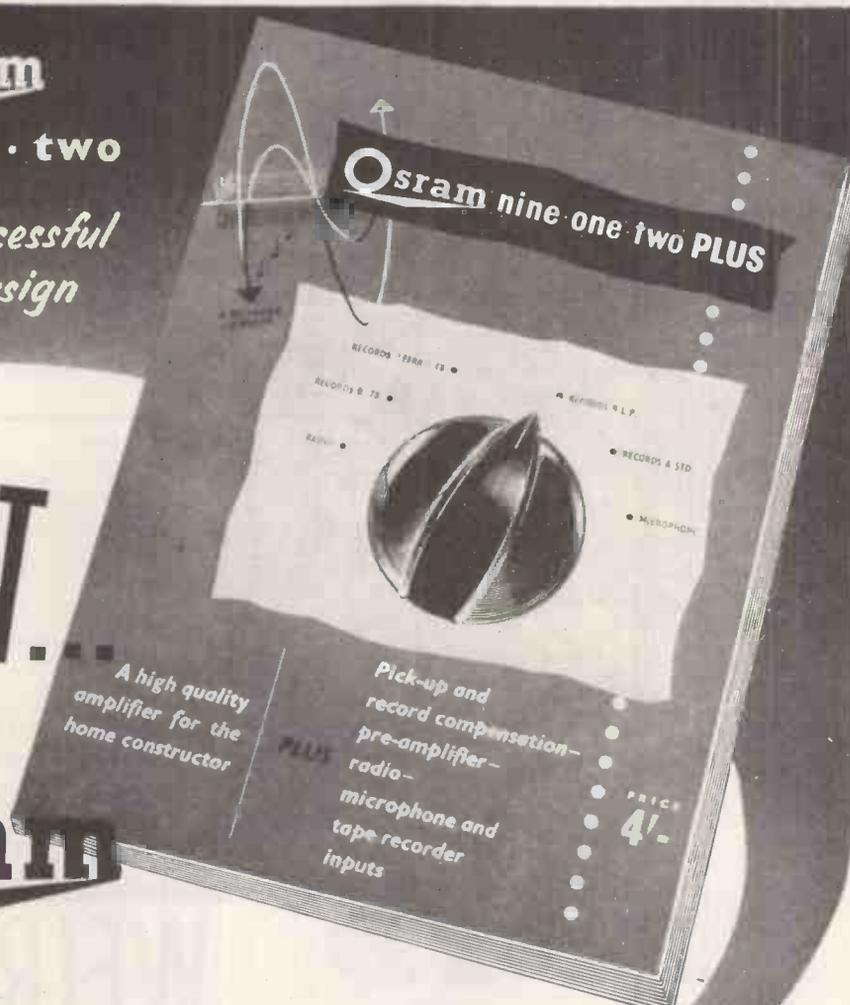
Osram

nine · one · two

*the most successful
amplifier design*

now.

Osram



nine · one · two PLUS

**Six position fully screened
Selector Switch, with or
without pre-amplifier, to
cater for all types
of record, various types
of pick-up, radio and
microphone inputs.**

This book gives details of how to modernise this popular Amplifier. Stage by stage wiring instructions are included for the improved '912', and there are many additional valuable features. By purchasing this book, you can read how to bring up-to-date your existing Osram '912' or obtain full details for constructing this versatile and remarkable Amplifier for High Quality Sound Reproduction. It costs 4s. 0d. from your dealer or by post 3d. extra from Osram Valve & Electronics Dept.

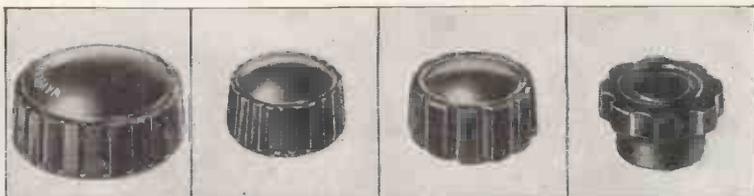
INSTRUMENT CONTROL KNOBS

superb quality — competitive prices — reasonable delivery.

Perfectly moulded with a high polish finish, our range includes a design for practically every purpose. Contact us NOW for fullest information.

All mouldings will accept $\frac{1}{4}$ in. spindle.

Available from your local component stockist. If in difficulty please write direct to:—



TYPE "A"

1½ in. dia. x ½ in. deep. Large ribbed knob in walnut, ivory or black. 4 B.A. grub screw and locknut fixing.

Can be engraved to suit your requirements.

TYPE "B"

1½ in. dia. x ½ in. deep. Small ribbed knob in walnut, ivory or black. 4 B.A. grub screw and locknut fixing. A gold engraving for every purpose.

TYPE 324

1½ in. dia. x ½ in. deep. Medium-sized fluted knob in black or white. Brass insert and one 4 B.A. grub screw for fixing.

TYPE X5/P.1325

1½ in. dia. x ½ in. deep. Black fluted instrument knob with brass insert. Fixing: two 2 B.A. grub screws.

TYPE X9/P.1375

1½ in. dia. x ½ in. deep. Identical to Type X5/P.1325. Ideal for test apparatus, etc.

TYPE 1322/X7

Top 1½ in. dia. Base 1½ in. dia. ½ in. deep. Flanged instrument knob with white pointer. Brass insert. Fixing: 2 grub screws.

TYPE P.1322/X11

Top: 1½ in. dia. Base 2½ in. dia. ½ in. deep.

TYPE 5060

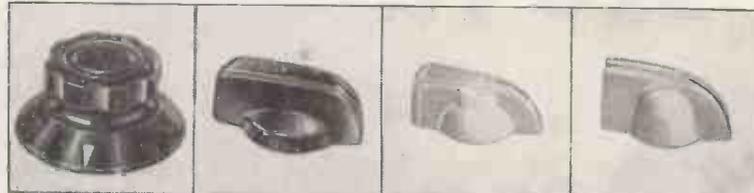
1½ in. long, 1 in. wide, ½ in. deep. Useful pointer control knob in black with white nose marking. Fixing: grub screw and locknut.

TYPE 327

1½ in. long, ¾ in. wide, ½ in. deep. Popular instrument knob in black or white with suitable nose marking. Moulded with brass insert. Fixing: one 4 B.A. grub screw.

TYPE D.2265

1½ in. long, ¾ in. wide, ½ in. deep. A particularly attractive cream pointer knob with black nose marking. Positive fixing by means of one 4 B.A. grub screw.



UNGLES, BLISS & CO. LTD.,

NEW PARADE · CHERRY ORCHARD RD.,
EAST CROYDON · SURREY
Telephone: CROYdon 3379, 6390, 6770.

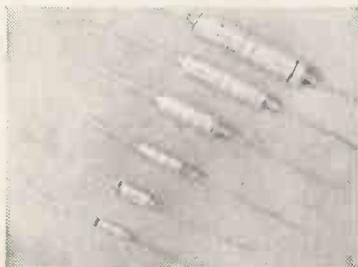
ERO-ID

WORLD FAMOUS
ELECTROLYTIC CONDENSERS

We can supply the complete range of: Subminiature, Minilyt Mico and Panclimat'ic Condensers.

Your enquiries are invited.

Technical specification and catalogues on demand



(Sole Agents for Great Britain)

TRIANON
ELECTRIC LTD.
95, COBOLD ROAD,
WILLESDEN, LONDON, N.W.10
TELEPHONE: WILLESDEN 2116

WEIR

Instruments manufactured in Moving Coil and rectifier types to B.S. 89-1954.



SMALL PANEL INSTRUMENTS

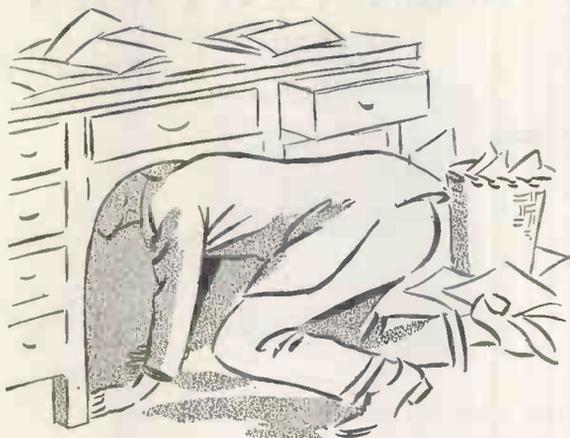


2 in., 2½ in. and 3½ in. enclosed in cases of black moulded insulating material and provided with scales printed in black on matt white enamelled metal dials.

Available as Ammeters, Voltmeters, Milliammeters and Microammeters.

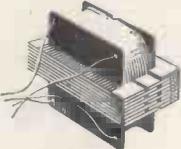
MANUFACTURED BY:
WEIR ELECTRICAL INSTRUMENTS CO. LTD.
BRADFORD-ON-AVON WILTSHIRE
TELEPHONE 2178

Are you searching



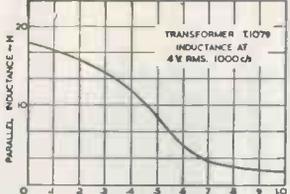
FOR HIGH QUALITY ELECTRONIC MINIATURES

Make contact with Ardenite Acoustic Laboratories Limited, for details of high-quality Miniature Earphones, Transformers, Switches, Volume Controls, Plugs and Sockets; also of the widely-known ARDENITE Hearing Aids.




SIZE
.315" x .425" x .530"

SUB-MINIATURE TRANSFORMER



TRANSFORMER T1079
INDUCTANCE AT
4 V RMS, 1000 C/s

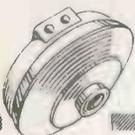
Of robust construction; its unique design of laminations enables Transformer characteristics to be closely controlled, despite its small size. Weight: .12 ozs. Lead-out wires are colour coded for phase sense of windings applications.

Specially designed apparatus, capable of detecting one short-circuited turn of 50 SWG in 5,000 turns, is used in manufacture to safeguard against premature failure caused by electrolytic action on the fine wire at short-circuited points.

A comprehensive range is available. A typical example is a Transformer with primary inductance of 100 Henries with no D.C. in the winding. The graph shows variation of primary inductance with D.C. in a similar unit.

Special designs of Transformers are produced to meet individual requirements.

THE MINIATURE EARPHONE
to be featured in a later advertisement.



ARDENITE

ELECTRONIC COMPONENTS

Details on request to

ARDENITE ACOUSTIC LABORATORIES LTD.
Springfield Works, Horn Lane, Acton, London W.3
Telephone: ACOm 4161-1282



Estd. 1925

EASY TERMS

LEAK QUALITY EQUIPMENT

for the Connoisseur

If you want the *Finest Quality Reproduction* together with *Workmanship of the Highest Order* your choice must be LEAK.

AS USED BY BROADCASTING CORPORATIONS THROUGHOUT THE WORLD.

LEAK "TL/10" AND "POINT ONE" PRE-AMPLIFIER.
Cash Price £28/7/-, or sent for £4/10/- Deposit and 18 monthly payments of 30/-, carr. and crate free.

LEAK TL/10 AND VARISLOPE MK. II PRE-AMPLIFIER.
Cash Price £34/13/- or sent for £6 Deposit and 18 monthly payments of 35/-, carr. and crate free.

LEAK DYNAMIC PICK-UP
Complete with two detachable diamond heads and transformer. Cash Price £20/19/9 or sent for £3 Deposit and 10 monthly payments of 40/-, Post and packing paid.

Delivery of all the above is from stock. We can also supply Wharfedale, Goodmans and Tannoy loudspeakers, etc., Connoisseur Variable 3-speed Motors and all other Quality Equipment on EASY TERMS.

Please let us have your requirements.

14 DAYS FREE TRIAL

with the SUPERB NEW
REMINGTON
'60'



ELECTRIC SHAVER

will convince you

that it really *does* shave quicker and smoother than any other method. The extra long shaving heads are slightly arched to fit easily into those hard-to-shave spots.

SEND DEPOSIT OF ONLY 5/- FOR IMMEDIATE DELIVERY
(Returned if not satisfied)

Balance after 14 DAYS FREE TRIAL 15/-, and 8 monthly payments of 24/- Cash Price £9.17.11. AC/DC 200-250v. Brand new. Sent post paid in silk lined presentation case.

• **WE WILL ALLOW YOU 40/- FOR YOUR OLD ELECTRIC SHAVER** if you decide to keep the REMINGTON after trial.
SEND FOR FREE BROCHURE

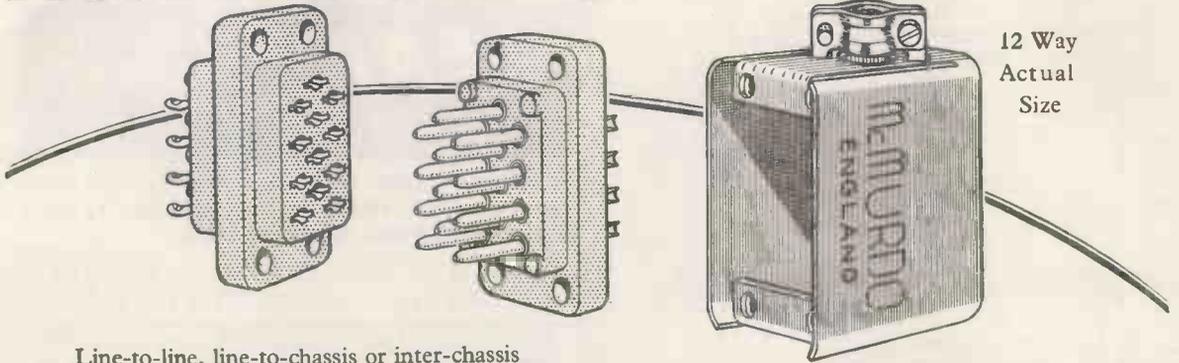


The L. R. SUPPLY Co. Ltd.
BALCOMBE : SUSSEX

Phone 254

McMURDO

STANDARD CONNECTORS

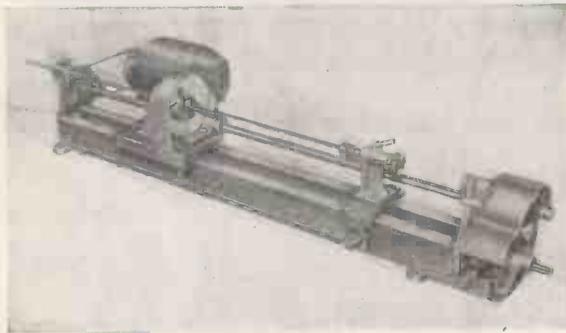


12 Way
Actual
Size

Line-to-line, line-to-chassis or inter-chassis connectors. Adequate contact "float" allows for slight mis-alignment of male or female units. Sockets fitted with McMURDO No. 9 Octal valveholder contacts which have proved their reliability on many jobs. Low contact resistance with reasonable insertion and withdrawal forces. Life tests prove that low contact resistance persists through more than 5,000 insertions. AVAILABLE in 8, 12, 18 AND 25 WAY ALSO COVERS WITH TOP SIDE OR END CABLE ENTRY.

For full details apply to:—

THE McMURDO INSTRUMENT COMPANY LTD · VICTORIA WORKS · ASHTEAD · SURREY. Tel.: ASHTEAD 3401



MODEL "S" FOR STRIP WINDING

ALSO MANUFACTURERS OF

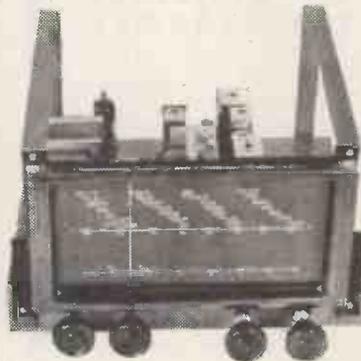
AUTOMATIC AND HAND COIL WINDING MACHINES

ETA TOOL CO.

(LEICESTER) LTD.

29A WELFORD ROAD, LEICESTER

Phone 5386



VHF/FM BROADCAST RECEIVER TYPE CB4

Constructed to VHF standards throughout. Covers the band 2 with RF, Mixer, 2-IF, and ratio detector stages. Provision is made for single or push pull output, or added Short Waveband. Although "hand built" in small quantities, an attractive price is maintained.

Model "A," FM tuner. A popular and small unit, with good sensitivity. These are in use from Bognor to Ely, and little changed since first described by Amos and Johnstone in the "Wireless World." New "hammer" finish front plate and tuning scale carries a magic eye; this and power unit are optional.

Our new Linear Amplifier is condensed to only 12 x 5 in. plan with symmetrical front layout. Linear Hi-Fidelity Amplifier £14 10 0.

CB4 FM/MW feeder unit, mains driven.....	£21 0 0
CB4/2, with push pull output.....	£26 0 0
"A" basic tuner.....	£11 17 6
"A" tuning scale, magic eye.....	£2 0 0
"A" power unit.....	£3 0 0

Welcome to **MARLBOROUGH YARD, N.19**, evening demonstrations also arranged

BEL SOUND PRODUCTS CO. ARC. 5078

A page to remember — WOOLLEYS UNUSED RADIO & COMPONENT BARGAINS

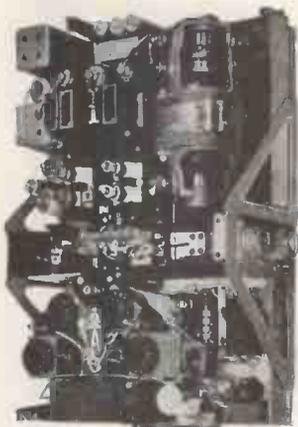


Illustration is with covers removed.

We are offering **AS NEW, COMPLETE TR.1196 TRANSCEIVERS**, as illustrated. Outfit comprises, 6 valve Superhet, 3 Valve Transmitter, Power Unit and Relay Unit. All complete on Chassis. Present range 4-6.5 mc/s. and output 2 watts. Can be easily converted to cover 1.5 mc/s.-7mc/s and power output up to 8 watts. It has a most versatile Receiver which can be easily adapted to cover any band of frequencies from medium broadcast to 30 mc/s. The Transmitter range can also be easily extended and by simply adding 200 pf. condenser to tank circuit will cover 1.5 mc/s. Circuit and conversion details Included with each unit.

Each outfit is despatched in transit case at the amazingly low price of **£3/-** plus carriage **10/-**. If despatched **without Transit Case, £2/10/-** plus carriage **8/6**.

And why not build up the complete mobile outfit, ideal for ship to shore work and convert to 1.5 mcs. to 4 mcs.

Illustration shows converted equipment already in use and passed by P.M.G.

REMEMBER !! 9 Standard Valves, 2 Standard 460 Kc. IF's. 3 relays, a motor generator and a host of useful equipment and for breaking up we have a few with soiled cases but otherwise perfect and complete at **£2** each, plus carriage **8/6**.



BRAND NEW POTS

POTS, 100K, 1/4 spindle .. ea.	1/-
POTS, 1 meg., 1/4 spindle .. ea.	1/-
POTS, 3 gang each, 70K .. ea.	1/-
HUMDINGER POTS, 100 ohm. Miniature wire wound .. ea.	2/-
POTS, COLVERN, 200 ohms 5 watts. Wire wound, N.P. case .. ea.	2/-
100K MINIATURE POTS .. ea.	1/-

RESISTORS

ERIE Resistors, 47K, 2-watt, boxed in 50's and 5's. Also 150K, 70K, 1-watt. Price: 2 w., 3d. ea. 1 w., 2d. ea.
Wire Wound Vitreous 10-watt, wire ends 500 Ω, 9d. ea.
Voltage Regulators 110/30 ma. 4 pin base. Two in series for 230 volts. 3/- ea.

SLEEVING

We are able to offer for immediate delivery Sleaving in various grades, such as Permanoid, Micoflex Plastic and Tenaplas Silk covered. Prices are 20% below present trade.

SLEEVING various colours, 1 mm. and 1.5 mm. Permanoid, in coils of approx. 144 yds. 8/6 per coil.

TENAPLAS SLEEVING silk covered in 1 gross reels 1.5 mm. 15/- per gross yds.

MICOFLEX, Plastic, in 3 gross reels 1.5 mm. 13/- per gross yds.

PERIBRAID Sleaving 1.5 mm. 1,000 yds. reels 15/- per gross yds.

SLEEVING in 3 ft. lengths x 18 mm. dia. 6d. per length.

SLEEVING in 3 ft. lengths x 20 mm. dia. 9d. per length.



ELECTRO-VOICE MOVING COIL MICROPHONES

No. 600 C. with built in matching transformer for direct connection to grid of amplifier valve. These mikes are ex the famous BC.610 transmitter and have an excellent overall frequency response, they are all brand new with 9 ft. screen lead and 3 pin plug, packed in original carton. Price **£2** plus 1/6 postage and packing.

MISCELLANEOUS NEW ITEMS

Ferranti mc. meters boxed 0-5 m/a. flush square 2". 9/- ea.

Valve Holders UX5 Amphenol. 5/- doz.

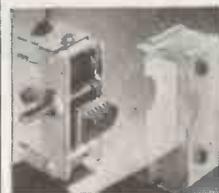
Valve Holders B9G Paxolin. 4/- doz.

Valve Holders Jumbo Giant UX boxed. 2/6 ea.

Zenith 50 w. Bleeders 500 Ω. 2/- ea.

All above items postage extra.

Foreign orders, please verify correct amount from U.K. to destination.



50 PF. VARIABLE CONDENSERS in screening Case, 3 1/2 in. x 1 1/2 in. x 2 1/2 in. Spacing 040. Only **1/-** EA.



CERAMIC VARIABLE CONDENSERS. split stator, plated vanes, spaced .035 ball bearings butterfly 15/15 P.F. extended spindle. EA. **2/6**



VARIABLE CONDENSERS, 100 pF. ceramic insulation. EA. **2/-**



Yaxley type 1-pole, 6-way switches complete, less screws but with knobs. EA. **6d.**

WAVE CHANGE, 2-wafer 6-pole 3-way Switches. EA. **1/3**

CERAMIC TRIMMERS, air spaced silver-plated vanes, 22 pF. Packed in 10s and singles, screwdriver adjustment. DOZ. **5/-**

WOOLLEYS RADIO & ELECTRICAL SUPPLIES LTD.

615 BORDLESLEY GREEN, BIRMINGHAM, 9

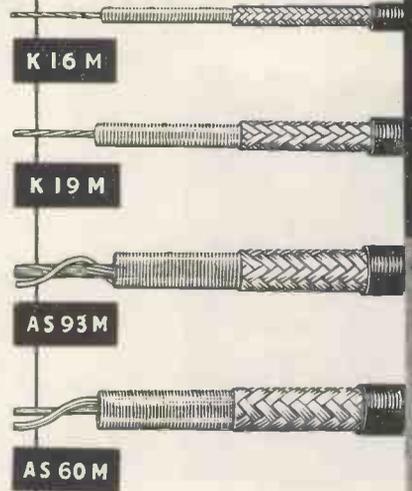
Phone: VIC 2078

TELCON

Television

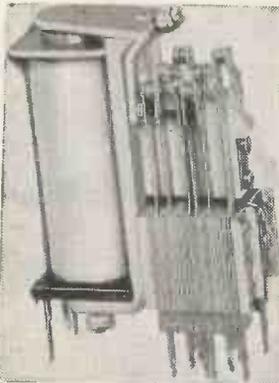
DOWN LEADS

- K 16 M 'Local' 50-ohm co-axial;
atten. 4.8 dB/100 ft. at 45 Mc/s.
 - K 19 M 'Local' 75-ohm co-axial;
atten. 3.7dB/100 ft. at 45 Mc/s.
 - AS 93 M 'Fringe' area 50-ohm co-axial;
1.7 dB/100 ft. at 45 Mc/s.
 - AS 60 M 'Fringe' area 75-ohm co-axial;
1.5 dB/100 ft. at 45 Mc/s.
- Deliveries from stock*



THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD

Head Office: 22 OLD BROAD STREET, LONDON, E C 2 Telephone: LONdon Wall 7104
Enquiries to: TELCON WORKS, GREENWICH, SE 10 Telephone: GREenwich 3291

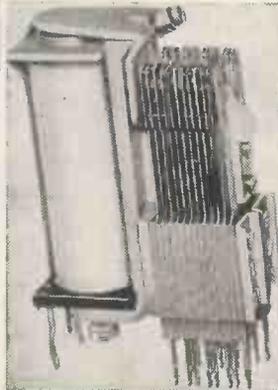


Manufacturers of
**POST OFFICE
TYPE**

MAGNETIC RELAYS
3,000 and 600

Contractors to:
**H.M. GOVERNMENT AND
LEADING
MANUFACTURERS**

COILS up to 80,000Ω.
CONTACTS up to 8 amps.
INSULATION up to 5 kv.



*Specialists in Tropicali-
sation and inter Services
Jungle Finish*

Conforming to A.I.D. and
C.I.E.M.E. standards

PROTOTYPE Relays
made to specification.

**POST OFFICE TYPE
KEYS** supplied to
specification.

Speedy Deliveries—
Enquiries Invited

A.D.S. RELAYS LTD. Dept. W.W.
12, STORE STREET, LONDON, W.C.1.
Tel.: MUSEum 2453



EYELETING and light PUNCHING MACHINES

Autophoenix No. 6

A new and improved treadle operated machine for the automatic insertion and closing of eyelets in either flat or formed work in metals, plastics, fabrics, etc. The deep throat, high vertical gap and projecting base make this machine adaptable for eye-letting radio chassis, cylindrical shells, spinnings, mouldings, etc.



VISIT US ON STAND No. 3
Grand Hall Gallery, Olympia
Engineering, Marine & Welding Exhibition
SEPT. 1st — SEPT. 15th

HUNTON LIMITED

Phoenix Works, 114-116, Euston Road, London, N.W.1
Tel.: EUSton 1477 (3 lines). Grams: Untonexh, London.

EMITAPE

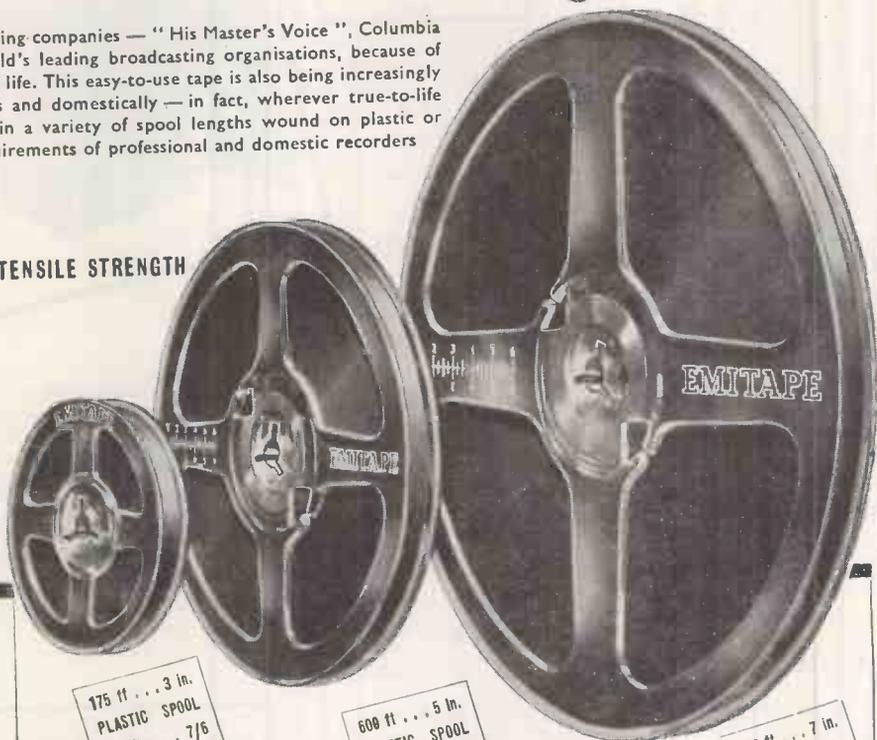
"88"

in ever-increasing demand

Emitape is used by the great recording companies — "His Master's Voice", Columbia and Parlophone — and by the world's leading broadcasting organisations, because of its fidelity, sensitivity and length of life. This easy-to-use tape is also being increasingly employed in laboratories, factories and domestically — in fact, wherever true-to-life recording is required. It is made in a variety of spool lengths wound on plastic or aluminium spools to meet the requirements of professional and domestic recorders with differing hubs.

Special Features

- HIGH SENSITIVITY • HIGH TENSILE STRENGTH
- P.V.C. BASE • ANTI-STATIC
- FREEDOM FROM CURL
- EDITING LEADER AND TRAILER STRIPS



175 ft . . . 3 in.
PLASTIC SPOOL
(88/3) . . . 7/6

608 ft . . . 5 in.
PLASTIC SPOOL
(88/5) . . . 21/-

1200 ft . . . 7 in.
PLASTIC SPOOL
(88/7) . . . 35/-

TAPE ACCESSORIES

7" EMPTY PLASTIC SPOOL
IN CARTON AP.87 5/6

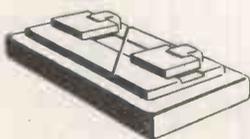
5" EMPTY PLASTIC SPOOL
IN CARTON AP.85 4/6

3" EMPTY PLASTIC SPOOL
IN CARTON AP.93 3/-

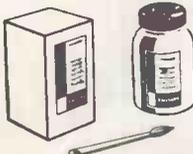
Non-Magnetic Scissors AP.39
Price 16/-



Magnetic Tape Jointing Block
AP.46 Price 8/-



P.V.C. Tape Jointing
Compound AP.77 Price 4/6



Gummed Jointing Tape AP.37
Price 6/6
White P.V.C. Editing Tape
150 ft. Roll AP.38 Price 4/6



VISIT STAND 215 AT THE RADIO SHOW, EARLS COURT

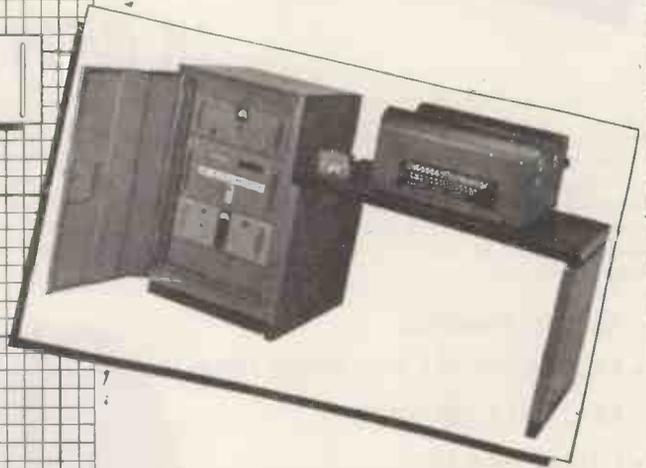
Used by the leading Broadcasting Organisations and for recording the world's greatest artists on
"HIS MASTER'S VOICE," COLUMBIA AND PARLOPHONE RECORDS



Full particulars of Emitape and editing accessories together with literature are obtainable at your local dealer or from:—
E. M. I. SALES & SERVICE LTD. RECORDING EQUIPMENT DIVISION, HAYES, MIDDLESEX. Telephone: SOUTHALL 2468
Export Enquiries for products mentioned in this advertisement should be addressed to:
E. M. I. INTERNATIONAL LTD. (also at Hayes).

Designed and Engineered by
INTERNATIONAL AERADIO LTD.
 AERADIO HOUSE 40, PARK STREET.
 LONDON, W.1. HYDE PARK 5024

THE I-A-L SHORT RANGE RADIO TELEPRINTER TERMINAL



The International Aeradio VHF short range radio teleprinter terminal is designed to combine the highest engineering standard with low initial cost. This equipment is especially valuable where landline facilities are unreliable or not available, as may happen between a town and its airport.

AUTOMATIC COIL WINDING MACHINE

Type A1/L. (25-50 S.W.G.) Type A1/X. (19-46 S.W.G.)

This machine is the most modern on the market and it possesses many exclusive refinements including:

- Dustproof construction throughout
- Provision for winding up to four coils simultaneously.
- Micrometer traverse setting.
- Wire Gauge Indicator engraved with various wire gauges to which the machine can quickly be set.
- All steel parts are either cadmium or chromium plated.
- Instantaneous re-set counter reading up to 100,000 Turns.
- Entirely new Wire Tensioning Stand to hold two reels of wire.

We will be pleased to send you an illustrated leaflet giving a full technical specification on request.



KOLECTRIC LTD

73 UXBRIDGE ROAD, EALING, LONDON, W.5
 Ealing 8322

TUNERS

for BAND III

COMMERCIAL TELEVISION



Valradio tuners cover all 13 British Channels, and have been specially developed for incorporating into new T.V. receivers, or for tuning standard receivers to Band III. Available for AC sets using 6·3 parallel connected valves, and AC/DC with 3 series connected valves. Price **£6.0.0**

Write today for fullest details—or visit us on Stand 118 at the RADIO SHOW

Ask also for details of Valradio T.V. Projection Receivers; DC/DC and DC/AC Converters; Vibrator Units.

Valradio LIMITED

New Chapel Rd., High St., Feltham, Middx. Phone: Feltham 4242

Taking the 'Trial' and costly errors from VACUUM LEAK-TESTING

The cost of a mass-spectrometer is not within the reach of every manufacturer of hermetically-sealed vacuum instruments, such as mercury-arc rectifiers, electron tubes, etc., but wherever ultra-sensitive leak detection facilities combined with simplicity and low costs are required EDWARDS PALLADIUM-BARRIER LEAK DETECTOR meets the most critical needs.

★ A range of other detection units are available to suit every type of vacuum system. The instrument is capable of detecting leaks of the order of 10^{-4} litre microns/second.



EDWARDS HIGH VACUUM LTD. . . . FOR BETTER VACUUM SERVICE

MANOR ROYAL · CRAWLEY · SUSSEX
CRAWLEY 1500 (10 lines) EDOCHIVAC CRAWLEY

BRANCHES: GLASGOW & TORONTO
AGENTS THROUGHOUT THE WORLD

REAL HIGH FIDELITY at modest cost . . .

• **Manufacturer-to-Consumer policy saves you at least one-third cost!**

We are now specialising in the supply of units for making up high fidelity Radio and Record-reproducing Equipment for use in the Home, small Halls, Schools and Gramophone Societies and single items for replacing in existing equipments and radiograms.

Our Chief Engineer, who is operating a Technical Guidance Service, is available

SEND NOW for your free copy of our Bargain Catalogue giving details of the undermentioned and other interesting lines. It is bound to save you money!

NO. 1 "SYMPHONY" AMPLIFIER is a 3-channel 5-watt Gram/Radio Amplifier with astonishingly flexible tone-control. You can lift the treble, the bass, or—and here is the unique feature—the middle frequencies to suit your own ear characteristics and the record or radio programme being heard. It is thus possible to arrange the frequency-response of the amplifier to a curve equal and opposite to the resultant curve of the other items in the chain, so that what finally registers in the brain is as per original. This flexibility of control is even more important than the nominal linear response of the amplifier, as the pickup, speaker, etc., are not linear. Independent Scratch-cut is also fitted and special negative feedback circuit employed. The Amplifier can accommodate a wide variety of records from old 78s to new LPs. Input is for all types of pickup of 0.1 v. output or more and there is full provision (and power) for Radio Tuner. It is available to match 2/3 or 15 ohms speakers. Price 11 gns. (carriage 5/-). Fitted in Portable Steel Cabinet 2 gns. extra.

NO. 2 "SYMPHONY" AMPLIFIER. As No. 1 but with 10-watt Push-Pull Triode output and Triodes throughout. 16 gns. (carriage 5/-). Fitted in Portable Steel Cabinet, 2 gns. extra.

"SYMPHONY" AMPLIFIERS WITH REMOTE CONTROL. To enable either amplifier to be set anywhere in cabinet with controls separate in convenient position. Extra cost 2 gns.

daily including Saturdays from 10 a.m. to 6 p.m., or will deal with enquiries by return of post. Our new illustrated Catalogue and Supplement will be a great boon to those desiring quality equipment for modest expenditure. Send two 2½d. stamps for your copy now. It may well save you pounds!

STUDIO "SYMPHONY" AND DECCA AMPLIFIERS, Models 1 and 2. As above but incorporating extra pre-amp. Stage and precise Std. and LP correction circuits for Collaro Studio and Decca XMS Heads respectively. No. 1, 13 gns. No. 2, 18 gns. carr. 5/- Remote Control 3 gns. extra if required.

GARRARD, COLLARO AND B.S.R. IMMEDIATE DELIVERY. Model TA with Acos HGP37 Head; £10/14/-. Model TB less Heads, £8/11/- or with 2 Decca XMS £14 or 2 Acos HGP55, £12/15/-.

MODEL RC8M AUTOCHANGER. £15/5/- or with GC2 or HGP37, £17/7/6 or 2 Decca XMS, £20/15/- or 2 latest Acos HGP55, £19/10/-.

COLLARO 3-SPEED SINGLE RECORD UNIT AC3/554 and COLLARO 3-SPEED MIXED RECORD AUTOCHANGER RC 54 with Studio "O" or "P" Head, £8/18/4 and £13/4/2 respectively.

COLLARO TRANSCRIPTION UNIT. Model 2010, including Transcription Pickup and PX cartridge, £18/12/-, less pick-up £14/4/2 carr. 5/-.

NEW CONNOISSEUR MOTOR. Variable speed on all 3 speeds. £25/15/5.

GARRARD MODEL 301. 3 speeds (variable), £25/3/6.

B.S.R. MONARCH 3-SPEED MIXER-CHANGER with new Acos Hi-g Head, £13/10/-.

"SYMPHONY" BASS REFLEX CABINET KITS. 8-in. speaker model, 85/-; 10-in. speaker model, 97/6; 12-in. speaker model, £5/7/6. Carriage 7/6. Ready built 10/6 extra, designed for absolutely maximum results from speakers.

"SYMPHONY" BASS REFLEX CABINETS. Fully finished in figured walnut, oak or mahogany 12-in. speaker model, £11/10/-; 10-in., £11; 8-in., £10/10/-. Carriage according to area. The 10-in. model is ideal for WB HF 1012 (see "The Gramophone" review, March 1954), each size gets the best possible response out of appropriate size speaker and provides full, rich, bass.

GOODMANS CORNER CABINETS for the AXIOM 150 Mark 2. Price: complete kit in plain board with lin. thick felt, 8 gns. Price-ready built, 10 gns. Finished in figured walnut, 16 gns.

CONSOLE AMPLIFIER CABINETS. To take any gram unit, amp., pre-amp. and tuner. De luxe veneer, 11 gns. Designed to house all your equipment except speaker.

"SYMPHONY" RADIO FEEDER UNITS.

NO 1 "SYMPHONY" TUNER. L. & M. wave TRF top quality, 7 gns., carriage 5/-.

NO. 2 "SYMPHONY" SUPERHET TUNER L. M. & S. wave Superhet, 11 gns.

NO. 2/VS "SYMPHONY" SUPERHET TUNER. As No. 2 but incorporating on the wave-change switch an extra position for radio, giving TRF band-width. Price 13 gns. Carriage and packing 5/-.

"SYMPHONY" FM TUNER. Wizard quality, 14 gns. Carriage and packing 5/-.

HIRE PURCHASE FACILITIES
NOW AVAILABLE on orders of £15 or over. Send one-third deposit with order, balance over 6 or 12 monthly instalments. State which required.

NORTHERN RADIO SERVICES
11 KINGS COLLEGE RD., ADELAIDE RD., LONDON, N.W.3. Phone: PRImrose 8314.
Tubes: Swiss Cottage and Chalk Farm.
Buses: 2, 13, 31, 113 and 187.

*There's a wonderful future
for you in -*

ELECTRONICS

Train to meet the need for pioneers in this expanding field

Every day the demand for the expert in electronics grows. Radio, television, radar and the whole field of industrial automation are rapidly expanding and the trained specialist assures for

himself a well-paid career in this quickly developing profession. Here is your opportunity to enter for

3-Year course in Telecommunication Engineering

(including opportunity for nine months' practical attachment in E.M.I. Laboratories and Workshops). Final qualification is

the City and Guilds Full Technological Certificate. Next course commences on 14th September, 1955.

E.M.I. INSTITUTES

Dept. 127G, 10 Pembridge Square, London, W.2.

Telephone: BAYswater 5131/2

The College associated with a world-wide electronics industry, including "His Master's Voice," Marconiphone, Columbia, etc.

POLYTHENE

INSULATORS, END CAPS, PLUGS, ETC.

for

T.V. AERIALS

Standard Articles or Special Mouldings

AMPLEX APPLIANCES (KENT) LTD.

19 DARTMOUTH ROAD, HAYES, BROMLEY, KENT
(RAVensbourne 5531)

All export enquiries to

ANTEX LTD., 3 TOWER HILL, LONDON, E.C.3

PHIL-TROL SOLENOIDS

Range covers types 41 and 42 (front 1" x 1½") 38, 39, and 40 (front 1½" x 1½") and power A.C. and D.C. sizes up to 60 inch-lbs.



Most sizes available ex-stock and dispatched same day as receipt of order.

6 v.-460 v. A.C. and D.C. types

WRITE OR PHONE FOR DETAILS

PHILLIPS CONTROL (G.B.) LTD.

Farnborough, HANTS. Telephone: Farnborough 1120
London Office: 59/61 Union St., London, S.E.1. Telephone: HOP 4567

ALWAYS "FIT"



SUSPENSION DRAWER SLIDES, SUN and PLANET FRICTION ELIMINATORS and SHEAVES

Ask for Brochure and pages 47, 49 and 53



Engineers, Patentees and Sole Manufacturers.

AUTOSET (PRODUCTION) LTD., DEPT. "H", STOUR STREET, BIRMINGHAM 18
Tel.: EDG 1143 (3 lines). *Please mention Wireless World* ESTD. over 35 years

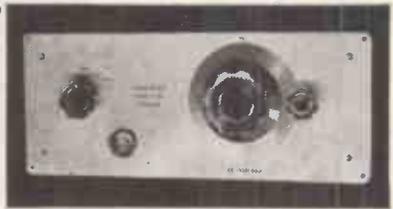
ACCLAIMED... BRITAIN'S FINEST AUDIO REPRODUCER



Type T.P.I. £96 as illustrated. Finished walnut or light oak. Ex works.

- ★ Built as a musical instrument, sounds like a musical instrument.
- ★ Entirely new development in electrical-mechanical-acoustical system.
- ★ The most efficient reproducer of audio frequencies in the world with a single drive unit/compound horn housing.
- ★ Indispensable for studio monitoring, or where definition and quality of reproduction is required.

LOWTHER
F.M. TUNER
Tunable over V.H.F. Band II. Quality reception guaranteed from Wrotham and other sites when ready.



Price £22
Plus purchase tax £7.6.4

COME with LOWTHER'S -towards perfection-
THE LOWTHER MANUFACTURING COMPANY, LOWTHER HOUSE, ST. MARKS RD., BROMLEY, KENT, ENGLAND
Tel.: RAVensbourne 5225

SPECIAL EDITION

Osmor News

OSMOR RADIO PRODUCTS Limited (Dept. W69)
418 BRIGHTON ROAD, SOUTH CROYDON, SURREY.
CROYdon 5148/9 (Trade Enquires Invited)

PUBLISHED MONTHLY VOL. 1. No. 5. SEPTEMBER 1955

FREQUENCY MODULATION COMES TO TOWN— VIA SIMPLE CONSTRUCTIONAL TUNER!

OSMOR have won laurels for their coils, which played such a major part in the established success of Frequency Modulation. Osmor High "Q" Coils are the outcome of manufacturing experience, technical skill and constant experiment... the universal preference of technical experts and experimentalists proves their unquestionable superiority!

OSMOR 'Q' COIL PACKS
Size only 1½ x 3½ x 2½ with variable iron-dust cores and Polystyrene formers. Built-in trimmers. Tropicalised. Prealigned Receiver-tested and guaranteed. Only 5 connections to make. All types for Mains and Battery Superhets and T.R.F. receivers. Ideal for the reliable construction of new sets, also for conversion of the 21 Receiver, TR1196, Type 18, Wartime Utility and others.

The New Osmor 'SWITCH PACK'
Complete and Prealigned full circuit included. State which station required. 2 M.W., 1 L.W. or 3 M.W. 48/- Inc. P. Tax.

SUPER 'Q' CUP COILS For Maximum Selectivity

A full range is available for all popular wavebands and purposes. The magnetic screening of the cup prevents other components from absorbing the coil's power, thus maintaining the high "Q" value. Simple one-hole fixing. ★ Only 1in. high. ★ Packed in damp-proof containers. ★ Adjustable iron-dust cores. ★ Fitted tags for easy connection. L. or M.W. 5/- inc. CIRCUIT.



FREE!
Tuner "The really efficient 5-valve Superhet," 6-valve s'het., 3-valve (plus rectifier) T.R.F. circuit. Battery portable Superhet circuit, Coil and Coilpack leaflets, and full radio and component lists, and interesting miniature circuits, etc.

Send 5d. (stamps) for fully descriptive literature including Circuit and practical Drawings, F.M.

New Coils to our Range

- SCRATCH FILTER type QSF1, 6/9. To get the best from your records.
- WHISTLE FILTER, type QWF1, with circuit, 6/9. Cut out the whistle on the Home Station.
- TAPE RECORDER 45 kc/s. Osc. Coil, type QT8, 7/6.
- DUAL-RANGE High "Q" Coils for T.R.F., 10/6 pair.
- Selective DUAL-RANGE Coil type QCD2. for Crystal Set operation, 5/-.

OSMOR STATION 7/6 SEPARATOR COMPLETE

The Separator may easily be tuned to eliminate any one station within the ranges stated and fitting takes only a few seconds. Sharp tuning is effected by adjusting the brass screw provided.



Plugs into receiver
TYPE METRES TYPE METRES TYPE METRES
1-141-250 4-319-405 7-1460-1550
2-218-283 5-395-492 8-410-550 k/c.
3-267-341 6-455-507
Special Separator to clear Radio Luxembourg, 10/6 each.

NEW ARCOLECTRIC SIGNAL LAMPS

For Low Voltage or Mains

Illustrated are a few signal lamps taken from our wide range. The insulation of every Arcoelectric signal lamp will resist a flash test of 1,500 volts A.C. The S.L.90 illustrated here is a typical Arcoelectric low voltage signal lampholder. It is designed to accept popular M.E.S. bulbs. The bulb is accessible from front or rear of panel. The domed plastic lens surrounded by a polished chrome bezel gives a most attractive panel appearance. This holder can be fixed in a single $\frac{3}{4}$ in. hole. The mains voltage signal lamp SL88/N is supplied complete with an M.E.S. neon tube and a suitable series resistance.

Write for Catalogue No. 130

ARCOLECTRIC
SWITCHES · LTD



S.L.88/N



S.L.90



S.L.86



S.L.82



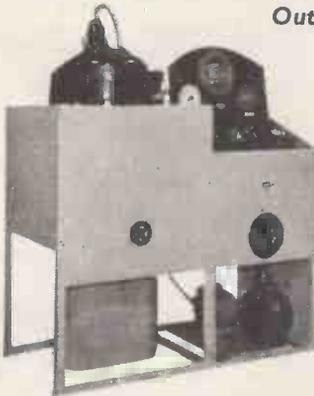
S.L.92

CENTRAL AVENUE, WEST MOLESEY, SURREY. TELEPHONE: MOLESEY 4336 (3 LINES)

IMPREGNATE your coils with ease

BLICKVAC

High Vacuum Impregnators meet the most stringent specifications and yet are easy to handle. Full range of models available to meet the needs of the large-scale producer, the research laboratory or the small Rewind shop.



Outstanding Features:

- Ease in control.
- Ease in cleaning.
- Elimination of vibration.
- Unequalled flexibility and performance.
- Simple attachment of auxiliary autoclaves.
- Units available suitable for Varnish, Wax, Bitumen and Potting Resins.

Users include M.O.S., N.C.B., G.E.C., Pye, Marconi, Micro-Vick.

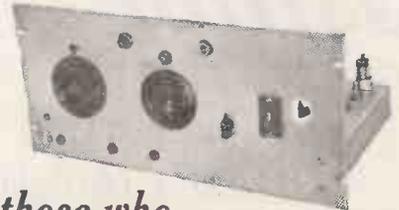
If your problem is COIL IMPREGNATION or impregnating or casting with Potting Resins consult:

BLICKVAC ENGINEERING LTD.

Bede Trading Estate, Jarrow, Co. Durham.
96/100 Aldersgate Street, London, E.C.1.

Jarrow 89/7155
Monarch 6236/8

TAPE PRE-AMPLIFIER



.. for those who
want the best ..

Used with the WEARITE 2B DECK, our Tape Pre-amplifier 4/WRB/2b is capable of giving recorded quality to the highest professional standards; yet at moderate cost.

- ★ Completely separate recording and replay chains with direct/replay monitor comparison switching.
- ★ Correct pre- and post-equalization to C.C.I.R. standards.
- ★ Peak-programme signal metering.
- ★ Positive metering of bias and erase voltages.
- ★ Designed mainly for WEARITE 2B Tape Deck—uses all the facilities provided on this deck.

Price 55 gns.

For full details, write or telephone:

ARIEL SOUND LTD.,

57, LANCASTER MEWS, LONDON, W.2.

Telephone: PADDINGTON 5092

1 Megohm/Volt !
The UNIQUE Instrument—
BPL TRANS RANGER

- Independence from mains voltage.
- Very High Input resistance.
- Equipped with D.C. Transistor amplifier.
- No current drain — instant readings.

This multi-range transistor voltmeter is the *first* instrument of its kind to measure true open circuit voltages in high resistance circuits—having a resistance of one megohm per volt. Independence from valve maintenance results in the instrument being immediately ready for operation, no warming-up period being necessary. Complete specification will be supplied on request.



Circuit covered by British patent No. 710514

BRITISH PHYSICAL LABORATORIES

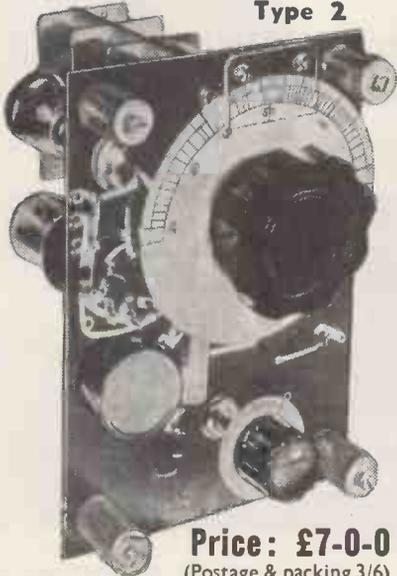
Radlett, HERTS.

Tel.: RADLETT 567415/6.

dmBP.47

AUDIO OSCILLATOR UNIT

Type 2



This compact, pre-calibrated unit is an improved version of the original instrument and is eminently suitable for incorporation in any equipment requiring an accurate source of frequency covering the range 20~ to 20 kc/s. An output of approximately 10 volts r.m.s., is available and Thermistor stabilisation ensures that this remains constant ± 1 dB throughout the entire range. Its power requirements are small and it is supplied complete with drilling template and all accessories required for fitting. When fitted to a high fidelity amplifier it enables rapid checks of performance to be carried out.

Price: £7-0-0
 (Postage & packing 3/6)

SEND FOR FULL DETAILS OF THIS AND OTHER INSTRUMENTS

EASY PAYMENT TERMS AVAILABLE

HOMELAB INSTRUMENTS LIMITED,

615-617, High Road, London, E.10
 Phone; LEY 5651

The Manning-Carr P.53C
MINIATURE
POLARISED RELAY



Actual Size

Now in dust-proof heavy gauge anodised aluminium and with miniature 5 or 9-pin base for plugging in. (Original version still available.)

BOTH TYPES FITTED WITH PLATINUM POINTS IF SPECIFIED

Data—A Sensitivity of 25 milliwatts and capable of handling mains voltage on the contacts with alternating currents up to 0.25 amps. Being polarised it has the advantage that the Armature contact can be biased to lock in either direction by suitable adjustment of the contact screws which provides a useful facility where pulse operation is required. Speed of operation is high and the Relay will follow frequencies appreciably higher than 50 c.p.s. Resistance up to 7,000 ohms which is acceptable for Anode circuits. Alternatives to specification if required Sole Concessionaires.

POST OFFICE TYPES

3,000 & 600 RELAYS TO SPECIFICATION

Tropicalising, Impregnating and Services jungle finish if required. Delivery 3-4 weeks.

Manufacturers to H.M. Govt. Depts. and leading Contractors

L. E. SIMMONDS LTD.

5 BYRON ROAD, HARROW, MIDD.

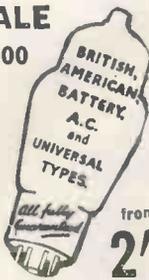
Telephone: Harrow 2524 - 0315

Great Britain's Valve Mail Order House

SALE

2000

VALVES



from 2/-

ARP3	7/-	6N7	10/6
ARP4	5/8	6BF5	14/-
ARP12	3/-	6X4	10/-
CV1124	5/-	7B8	10/-
EP8	17/6	7C7	9/-
HL1820	5/-	7V7	10/-
OIA	2/-	10D1	5/-
OZ4	5/-	11D5	11/7
PD220	17/6	12A	2/-
TT11	2/-	12SCT	9/-
VR18	5/-	12SF5	6/-
VR53	7/-	14BE6	10/-
VR55	8/-	24	17/6
VR56	6/-	31	2/-
VR55	2/-	32	2/-
VR6A	1/-	34	2/-
VR91	7/-	39/44	8/-
VT52	4/-	46	10/6
VU111	5/-	47MG	20/6
1A4	4/-	50Y6	5/-
1B4	4/-	58	10/-
1E6	2/-	71A	2/-
1L4	5/-	84/824	9/6
1LN5	2/-	11Z78	7/-
2A3	10/-	866A	20/-
2A6	2/-	884	10/-
2A7	3/-	954	5/8
3Z4	12/10	955	6/8
6A7	11/-	958	2/-
6AG7	15/-	1299A	9/8
6AK5	10/-	1625	5/8
6E5	11/-	1904	10/-

Post 9d.

Please enquire for any number not listed.

One Year's Guarantee

AZ1	13/3	1A7GT	18/11
AZ31	13/3	1C6GT	14/6
AZ50	13/3	1H5GT	14/6
CB1	22/1	1NG5T	14/6
CL4	20/2	1R5	16/5
CY1	30/3	1R4	14/6
EA50	11/4	1R5	16/5
EBC90	9/5	1R3	14/6
EAF42	17/5	PL31	22/1
EB41	11/4	PL82	16/5
EB91	11/4	PL83	22/1
EBC33	15/1	PY30	15/9
EBC41	15/1	PY81	18/11
EBC90	15/1	PY32	13/3
EBC90	18/11	UAF43	17/3
EBL1	22/1	UBC41	15/1
EBL21	20/2	UHL21	20/2
ECC40	22/1	UCH21	20/2
ECC81	22/1	UCH42	20/2
ECC82	22/1	UF41	16/5
ECC83	22/1	UF42	16/5
ECC91	31/6	UL41	16/5
ECH3	22/8	UL44	25/2
ECC35	20/2	UY41	13/3
ECH42	20/2	3A4	18/11
ECH50	23/4	3A5	31/6
EP3	19/5	384	14/6
EP37A	22/1	3V4	14/6
EP39	16/5	5Y3GT	13/3
EP40	22/1	6A4	15/1
EP41	16/5	6AL5	11/4
EP42	22/1	6A3Q	16/5
EP50	22/1	6AT6	15/1
EP60	22/1	6AU6	22/1
EP80	22/1	6RA6	16/5
EP91	22/1	6BE6	20/2
EP92	16/5	6J6	31/6
EP93	22/8	6S4TGT	20/2
EP94	20/2	6SK7GT	16/5
ELN20	5/-	68QGT	15/1
ELN3	16/5	6V6GT	16/5
EL37	22/1	6X4	13/3
EL38	25/2	6X5GT	13/3
EL41	16/5	12AT7	22/1
EL42	16/5	12AU7	22/1
EL84	16/5	12AX7	22/1
EL90	16/5	12SA7GT	20/2
EM1	16/5	12SK7GT	16/5
EM4	16/5	12SQ7GT	16/5
EM54	16/5	25L6GT	15/1
EY61	25/2	35Z9T	13/3
EZ35	13/3	50L6GT	16/5
EZ35	13/3	80	13/3
EZ40	13/3		Post 8d.
EZ41	13/3		
EZ80	13/3		
EZ90	13/3		
GZ34	18/11		

DEMOBDED VALVES MANUAL

2/6

Giving equivalents of British and American Service and Cross Reference of Commercial Types with an Appendix of B.Y.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. (1951 rate.)

PIFCO

All-in-one Radiometer A.C./D.C. Tests everything in Radio. Complete with Test prods. Still



29/6

New price 32/6. Post 1/6.



Chassis Cutters with Keys

The easiest and quickest way of cutting holes in sheet metal. The cutter consists of three parts: a die, a punch and an Allen screw. The operation is quite simple. Prices incl. key (in. 12/4; 1in. 12/4; 1in. 13/4; 1in. 14in. and 1in. 16/- each; 1 1/2in. and 1 1/4in. 18/- each; 1 1/2in., 1 1/8in., 31/8in., 3/8in. square, 24/3, Post 1/-.

All prices are with keys.

UNIQUE SERVICE



SERVICE SHEETS The one you require enclosed if available in a dozen assorted of our best choice. 10/6

SALE

shop soiled

RADIO BULL VALVES

246, HIGH ST., HARLESDEAN, NEW

METERS

AVO minor Universal, 27/- Ferranti Universal, 26/- E.I.O. Universal, 25/- T.Y.O. 110B, 26/- U.S.A. Triplet, 29/- AVO 40, 21/6.

9" TUBE CRT 516 magnetic 4v heater 4.5 k V. Octal base Car. 29/6 4/6.

5/- U.S.A. MICROPHONE 5/- This U.S.A. Throat Mike made by Universal Microphone Company, in California, is highly sensitive. Complete with neck piece clip and illustrated 4-page specification and in original carton. Bargain price. Only fraction of original cost. Limited quantity. Post 9d. (Ideal for Electric Guitars, etc.) Unrepeatable. Only 5/-

B.T.H. GERMANIUM CRYSTAL DIODE. Complete with Blue print and operating instruction. 2/-

High Fidelity. High frequency Electrostatic Loudspeakers. True response from 3,000 to 20,000 cycles, miniature and lightweight. 3in. 12/6. 6in. 21/- Full data on request.

Self-Powered ELECTRO SAW

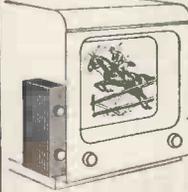


Cuts 1in. wood, also metal and plastic. Complete with 4 blades and plan converting to jig saw. 10/- Deposit 5 mthly of 10/6 or 56/- cash. Post 1/-.



A compact unit of saws. One for every job. SPRING STEEL Tapered and Hardened. Wood Saw, Pruning Saw, Tenon Saw, Key Hole, Metal Saw. Post 1/-.

G9AED! The New Commercial T.V.



Daily Test Transmissions are already taking place

Our adapter which fixes to the side or back of your T.V. will give you the new station or the old by the flick of a switch. You do nothing to your existing set; just plug in mains and aerial leads. Suitable for any T.V. Price 26/10/-, or 30/- deposit and six payments of 2/.

BUILD YOUR OWN CONVERTOR

This Band III Converter has given very satisfactory results from the experimental Beulah Hill station. It uses 2-valves, is not at all difficult to make. Price for all the components including constructional data is 23/10/- data available separately, price 2/6.

HANNEY OF BATH

OSRAM 912. Lab. resistors, 32/4; T.C.C. condensers, 55/-; PARTRIDGE Components with loose lead terminations. Mains trans., 44/-; Choke, 29/6; Output trans., 76/9 (price includes Partridge carriage/packing charge). Denco 16 S.W.G. All chassis with bronze printed panel, 21/-; W.B. output trans., 32/-; A.B. Switches, 14/-; pr. VALVES: Z.729, 23/3; V.739, 16/7; B.309, 23/3; Two N.709 matched, 34/6. Small parts (each), T.17, 5d.; L.734, 2/8; L.358, 3/8; L.1001/W, 4/6 pr.; K.370, 1/6; V8P/392/0, 2/-; D.170/E, 2/6; P.73, 4/6; P.437, 6/6; C.114, 4/-; 8.300 PD, 6/-; McMurdo valveholders, 1/-.

Complete kit of parts for the 912, as above, 22/1.

MULLARD 510. Eric resistor/pots, 37/6; T.C.C. Condensers, 45/-; Elstone mains trans., 36/-; Elstone output trans. (8000 or 80000), 45/-; Denco drilled chassis, 14/6; Printed front panel, 6/6; VALVES: EF.86, 23/3; ECC.83, 23/3; GZ.30, 13/11; EZ.80, 13/11; Two EL.84, matched, 34/6; Small parts (Bulgian and Belling-Lee), each. Knob with dial, 3/-; Mains switch, 3/9; Fuse holder, 4/-; Pilot lamp holders, 2/6; Mains Fiskel, 4/6; Input P/S, 2/6; Output P/S, 4/-; V.1 tag board, 2/3; V2-34 tag board, 4/-; McMurdo valveholders, 1/- Complete set of parts for the Mullard 510, as above, 214/14/-.

WILLIAMSON AMPLIFIER. All parts available as previously advertised.

MAXI-Q-DENCO F.M. FEEDER UNIT. Chassis set 7/6; Collect, 11/9; 10.7 Mc/ F's, 6/- each; Ratio discrim. trans 12/6; Phase discrim. trans., 9/- Technical Bulletin giving circuit, point-to-point wiring, etc., 1/9 P.F.

COLPACKS. DENCO, CP 4/L and CP 4/M, 33/4; CP 3/370 pf. and CP 3/500 pf., 42/8. OSBMOE "Q" HO. 48/-; LM. 40/-; Batt. 50/-; TRF. 40/-; HF stage for HO pack, 20/-; ETA 4-station pack, 43/8. We stock COILS by Weymouth, Osmor, Wearite, Denco and R.E.P.

WIDE ANGLE COMPONENTS. ALLEN. Telexing Chassis, 50/-; Collects (TK and Super-Visor), 44/8; LO.308, 40/-; FO.305, 21/-; DC.300c., 39/6; FC302, 31/-; GL.16 and 18, 7/6 each; SC.312, 21/-; AT.310, 30/-; OP.17, 9/-; BT.314, 15/-; DENCO Chassis Magnaview, 37/6; Chassis, Super-Visor, 51/6; Coll sets Magnaview, 41/2; WA/DAL1, 43/-; WA/FCA1, 31/-; WA/LCL and WCL, 7/6 each; WA/FMA1, 21/-; WA/LOTT, 42/-; WA/FBT1, 16/-.

SUNDRIES. Pre-set controls, 3-watt wire wound, all values 10 to 30K, 3/- each. D120 1-watt carbon, 50K to 2M, 3/- each. Denco MTO.1 Test Oscillator with valve, 75/-; Denco TPA.1 TV pre-amp, with valve, 29/6. Also over 100 values in close tolerance Silver Micas. 20,000 Eric resistors ex-stock in all preferred values and wattage.

Send S.A.E. for list. Please add 2/- to all orders under 25 (any excess returned)

L. F. HANNEY

77 LOWER BRISTOL ROAD, BATH

Tel.: 3811



Designed for those who seek the superlative in fidelity reproduction -

THE BJ arm

marks an advance in pick-up Arm technique.

BURNE-JONES & CO. LTD., HOUSE, LONDON, ENGLAND



BASF

MAGNETIC RECORDING

TAPE

GIVES ALL for that little extra...

1,000 metre for professional use
 1,200 ft. on plastic spool
 600 ft. on plastic spool
 300 ft. on plastic spool
 150 ft. miniature tape for postal recordings
 Special tapes for GRUNDIG TK.9, TK.819 and STENOLETTE and The New Thin Long Playing Tape on the same spool, giving 50% more tape.

... because it possesses *ALL* the qualities essential to a product that is outstanding in its field. This PVC based recording tape is naturally a little more expensive than some other makes . . . but the initial cost is more than offset by its performance and extra-long life.

F. A. HUGHES & CO. LTD

DEVONSHIRE HOUSE · PICCADILLY · LONDON · W1

Telephone: Mayfair 8867

BASF

Trade only supplied

BK

Non-Resonant Sand Filled Corner Assemblies

TYPE MVC for 12" units "Contemporary" or "Traditional" designs in oak, walnut, mahogany, maple, etc. **£16.16.0**

◀ CONTEMPORARY
 TRADITIONAL ▼



Complete with Wharfedale W12/CS bass unit, cross-over, Super 5 or Super 8 CS/AL, HF level control and top baffle, from **£37.0.0**

ALSO AVAILABLE
 TYPE SVC/A for 8" and TYPE SVC/B for 10" units

£12.12.0

These and other high fidelity equipments are demonstrated at our show-rooms. Daily 10.30 a.m.-5.30 p.m. Saturdays 10.30 a.m.-12.30 p.m.

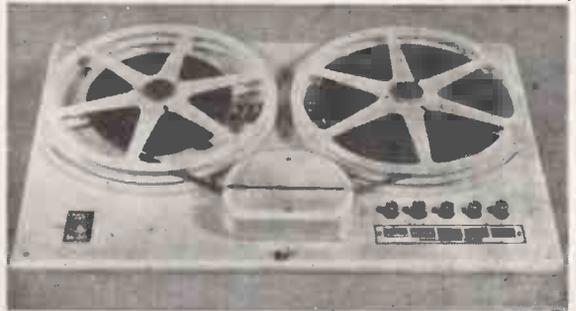
H.P. TERMS AVAILABLE

★ Send for Illustrated brochures

B. K. PARTNERS LTD.

229 REGENT ST., LONDON, W.1. (Entrance Hanover St.) Phone: REG 7363

MOTEK



TWO SPEED—SIMPLE PUSH BUTTON CONTROL

THE NEW K6 UNIT

List Price **19 GNS.**

SEE AND HEAR IT AT YOUR LOCAL DEALER

MODERN TECHNIQUES

138-144 Petherton Road, London, N.5

Tel. : Canonbury 5896

SENIOR ELECTRONIC ENGINEER

required by

The Research Department

SHORT BROTHERS & HARLAND LIMITED

for work on

AUTOMATIC CONTROLS, GUIDED MISSILES, FLIGHT SIMULATORS

and kindred projects.

Qualifications: University Degree. Capacity to control a development team.

Experience: several years of one of the following: Electronic, Radio or Radar circuits and equipment; Analogue Computing devices and Servo-mechanisms.

The appointment is permanent and pensionable.

The organisation is expanding and has new laboratories. Salaries and prospects are good.

Housing and removal assistance.

Apply with full details including required salary to:—Staff Appointments Officer, P.O. Box 241, Belfast, quoting S.A.73.

NO ORDINARY TAPE RECORDER

GELSONIC



The Celsonic High Fidelity Magnetic Tape Recorder gives you precise reproduction with the advantages of Superimposing device for recording words over music. Synchronising unit for converting silent films to "talkies."

4,920ft. of tape at one session.

Two hours, ten minutes uninterrupted playback.

Send for details of this unique instrument to:

EXCEL SOUND SERVICES LTD., (Dept. W.D.Y.),
Celsonic Works, Garfield Avenue, Bradford. 8.
Tel.: 45027.

H.P. Terms now available from HOLDINGS OF BLACKBURN LTD.
Please PRINT your name and address

JASON for F.M.

STANDARD TUNER £15.17.0

(including tax)

Four valves type Osram Z.77, one being used as a limiter. This tuner has better than average sensitivity, and the tuning drift is negligible. Useful range at least 60 miles from Wrotham.

Ask your local high fidelity dealer for a demonstration or visit one of the following:—

Arthurs (Arthur Gray Ltd.), 150-152, Charing Cross Road, W.C.2. TEMple Bar 5833.

City Sale & Exchange Ltd., 93-94, Fleet Street, E.C.4. CENTral 9391.

Classic Electrical Co. Ltd., 352/364, Lower Addiscombe Road, Croydon, Surrey. ADDiscombe 6061.

Clyne Radio Ltd., 18, Tottenham Court Road, W.1. MUSeum 5929.

H. C. Harridge, 8, Moor Street, W.1. GERrard 7108.

Holley's Radio, 285, Camberwell Road, S.E.5. RODney 4988.

Home Radio of Mitcham, 187, London Road, Mitcham MITcham 3282.

A. Imhof Ltd., 112-116, New Oxford St., W.C.1. MUS 7878.

Lanes Radio, 11, Gardner St., Brighton. BRIGHTon 20773

Rogers Developments Co., 116, Blackheath Road, S.E.10. TIDeway 1723.

Tele-Radio (1943) Ltd., 189, Edgware Road, W.2. PAD 4455.

The Gramophone Exchange Ltd., Astra House, 121-123, Shaftesbury Avenue, W.C.2. TEM 3007.

Vortexion Ltd., 257-263, The Broadway, Wimbledon, S.W.19 LIBerty 2814.

Webbs Radio, 100, Dean St., W.1. GER 7308.

In case of difficulty please contact:—

THE JASON MOTOR & ELECTRONIC CO.
328, Cricklewood Lane, London, N.W.2
SPEedwell 7050.

"You can rely on us"

Stockists of all Radio and Electronic components for manufacturers, laboratories, Educational authorities, and the amateur.

Stockists of Bulgin, Denco, Hunt, T.C.C., Belling and Lee, W.B., Whiteley, Wharfedale, etc., etc.

Mullard 510 amplifier and G.E.C. 912 amplifier—all parts stocked and available on H.P.

Taylor and Avo instruments from stock. (H.P. terms available.)

RADIO SERVICING COMPANY

82, SOUTH EALING ROAD, LONDON, W.5.

Telephone: EAL. 5737

Next to South Ealing Tube (TURN LEFT) 9 to 6 p.m. Wed. 1 o'clock.

Connoisseur VARIABLE 3-SPEED GRAMOPHONE MOTOR



NEW SUPER LIGHTWEIGHT PICKUP MARK II giving an extended frequency range on L.P. disc.

Head only (Standard or Microgroove) £7 + P.T. £2 9s. 10d Total £9 9s. 10d.

Pickup with one head £9 3s. 0d. + P.T. £3 5s. 2d. Total £12 8s. 2d.

We present an entirely new three-speed unit operating at 33 $\frac{1}{3}$, 45 and 78 r.p.m. The full 12in. turntable is lathe-turned and manufactured of non-ferrous material. The main spindle is precision ground and lapped to mirror finish and runs in phosphor bronze bearings. The synchronous motor is dynamically balanced and resiliently mounted, making it virtually vibrationless, with low noise level and low hum induction.

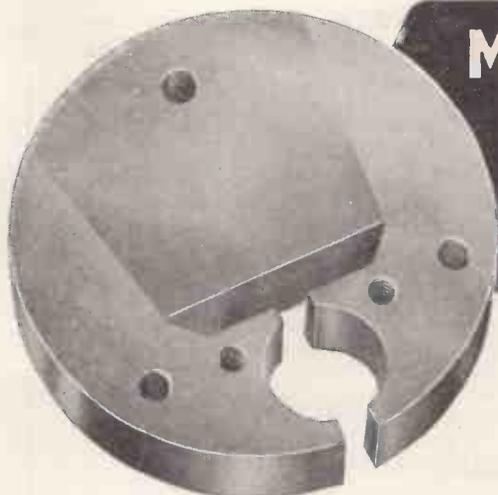
The speed change is arranged mechanically and gives a 2% variation on all speeds, the synchronous motor running at constant speed at all settings. No braking action is employed to obtain speed change.

It is suitable for playing standard transcription and micro-groove recordings. Input voltages 200/250 v. A.C. 50 cycles or, as specified to order for 200/250 v. A.C. 60 cycles, or 110 v. A.C. 50 or 60 cycles. Mounted on $\frac{1}{2}$ in. die-cast board 15 $\frac{1}{2}$ in. x 13 $\frac{1}{2}$ in. with 3 $\frac{1}{2}$ in. clearance distance below motorboard. Speed selector turret is fitted at left rear of motorboard. On-off switch at left front also releases pressure on the rubber drive assembly. All motorboards are drilled to take Connoisseur Standard and Super Lightweight Pickups unless otherwise ordered. When used with these pickups mounted in position, 3 $\frac{1}{2}$ in. clearance above motorboard is recommended.

Price: £20 + P.T. £7 2s. 6d. Total £27 2s. 6d.

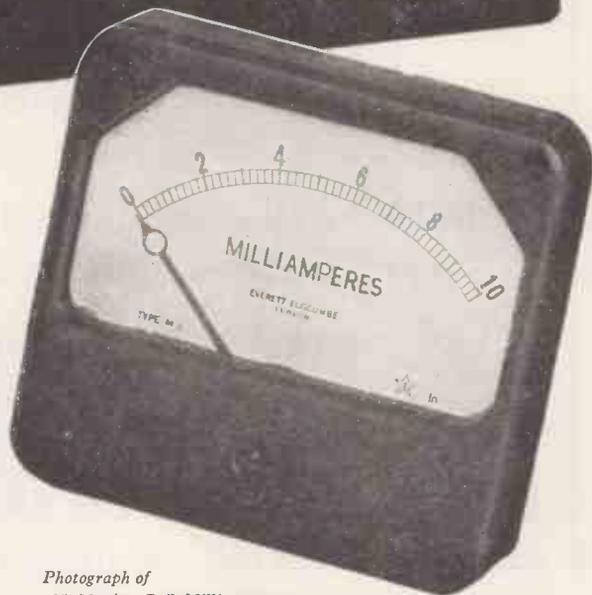
A. R. SUGDEN & CO. (Engineers) LTD.
WELL GREEN LANE : BRIGHOUSE : YORKSHIRE
 Phone : Halifax 69169. Grams : Connoisseur, Brighouse

OVERSEAS AGENTS: S. Africa: W. L. Proctor (Pty.) Ltd., 63 Strand Street, Cape Town. Australia: J. H. Magrath & Co. (Pty.) Ltd., 208 Little Lonsdale Street, Melbourne. Canada: The Astral Electric Co. Ltd., 44 Danforth Road, Toronto 13, Ontario. New Zealand: Turnbull & Jones Ltd., Head Office, 12/14 Courtenay Place, Wellington. Hong Kong: The Radio People Ltd., 31 Nathan Road, Hong Kong. Malaya: (Main Distributors) Eastland Trading Co., 1 Prince Street, Singapore. U.S.A.: (Main Distributors) Danby Radio Corporation, 19 South 21st Street, Philadelphia, 3. Pa. Audio Supply Laboratories, Nickels Arcade Buildings, Ann Arbor, Michigan.



MUREX 'SINCOMAX' MAGNETS

are used in this EVERETT, EDGCUMBE
MOVING COIL MILLIAMMETER



Photograph of
3 1/2" Moving Coil Milliammeter
by courtesy of Everett, Edgcumbe & Co. Ltd.

A further example of the use of Murex 'Sincomax' Magnets where a high energy product with high magnetic stability is essential.

Murex 'Sincomax' Magnets, with an alloyed bond between magnet and soft iron, continue to give accurate and reliable service in this and many other applications.

MUREX LIMITED (Powder Metallurgy Division)
RAINHAM • ESSEX • Rainham, Essex 3322
Telex: London 8632. Telegraphic Address: Murex, Rainham, Romford Telex.
LONDON SALES OFFICE: CENTRAL HOUSE
UPPER WOBURN PLACE, W.C.1 EUSon 8265

R.C.A. TRANSMITTERS. Type ET-1331. 1 kW. (telephone); 1.4 kW. (telegraph). Frequency range 3 Mc. to 20 Mc.

BC610 TRANSMITTERS with speech amplifier, aerial tuning unit, etc. Brand new.

RCA TRANSMITTERS. Type ET-4336. Complete with original 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.

MULTI CHANNEL TRANSMITTER T-4/FRC, with modulators MD-1/FRC, 2 Mc/s to 18 Mc/s. Each channel 400 w. output. **W.S. No. 19 & 22.** Both complete with installation kit. Tropicalised. New.

MAGNETO 10 LINE U.C., 40 Line F & F TELEPHONE SWITCHBOARDS (complete).

MARCONI SIGNAL GENERATORS Type T.F. 144G. As new, checked.

A.R.88D's, A.R.77's, S27's, BC.312, BC.342, R.109 and others.

METAL RECTIFIERS Type IB, D.C. output 10 amps at 22 v. input 220/250 v., 50 c/s.

All above items in excellent working condition. Working demonstration upon request.

SPARES A large selection available for SCR399 (BC610), ET4336, SCR610, EEB Telephones, and Teleprinters type 7B.

TX VALVES 805, 807, 813, 861, 56A, 100TH, 250TH, and many others.

Large stock of Tx condensers, crystals and other components.

P.C.A. RADIO

New Address, Offices and Works

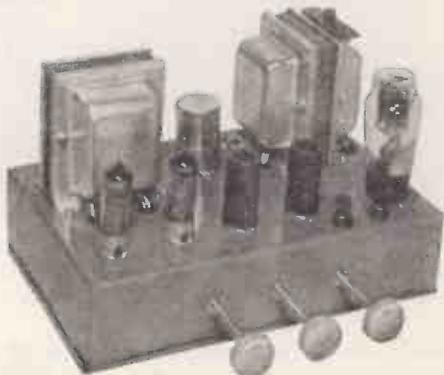
BEAVER LANE, HAMMERSMITH, LONDON, W.6

Telephone : RIV 8006/7

NOT JUST ANOTHER HIGH FIDELITY AMPLIFIER

The STANLEY Model HFI25 is a scientifically designed instrument which will provide perfection of sound reproduction. Read the Brief Specification :—

Frequency response 10-20,000 c/s within less than 1db. Total harmonic distortion 0.2% at 400 c/s., 0.1% at 5,000 c/s. Hum and noise -74 db. Power output 12 watts, bass and treble controls providing 10 db. lift and cut. Input impedance 1M ohm. Power supply 110/250v. 40/100 c/s. A.C. Provision for connection of tuner unit.



Our technical department is at your service. Send for details of this brilliant instrument to-day.

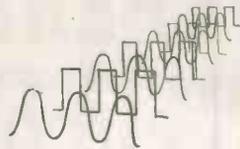
LIST 18 GNS. PRICE

STANLEY SOUND & VISION PRODUCTS LTD.

Stanley Works, The Green, Pirbright, Surrey.

Phone: Pirbright 1426

Sub-Audio to Supersonic..... in ONE INSTRUMENT



SINE OR SQUARE WAVE

1.4 c/s to 30 kc/s.

Constant output, controllable from 1mv to 10v.

Low harmonic content.

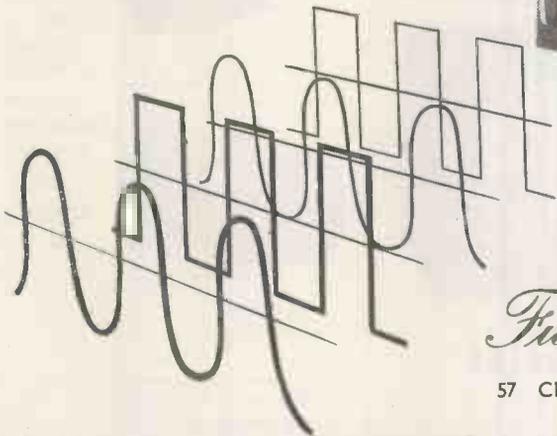
Rapid rise time (1 μsec) on square waves.



**WIDE BAND
L.F. OSCILLATOR**

TYPE G425

£60



Furzehill Laboratories Ltd.

57 Clarendon Road, WATFORD, HERTS.

Gadebrook 4686

ASK ARTHURS FIRST

Valves and C.R.T.s in great variety
AVO METERS IN STOCK

- Avo Model 7 £19 10 0
- Avo Model 8 £23 10 0
- COSSOR Oscilloscope Model 1035 ...£120 0 0
- COSSOR Oscilloscope Model 1052 ...£104 0 0
- ADVANCE AND TAYLOR Meters always in STOCK
- LEAK TL/10 Amplifier and "Point One"
Pre-Amplifier. Complete £28 7 0
- LEAK F.M. Unit with built in Power
Supply £33 15 0
- JASON F.M. Unit with Power Pack £19 7 0

CHAPMAN F.M. 81 Unit ... £21 0 0

VALVE MANUALS

- Mullard 5 0
- Osram 5 0
- Osram Part 2 10 0
- Brimar No. 6 5 0
- Mullard Replacement Guide 2 6
- Art and Science in Sound reproduction by F. H. Brittain, D.F.H. 2 6

Postage 6d. extra.

FULL RANGE GOODMANS LOUDSPEAKERS

Goods offered subject to being unsold and to price alteration.

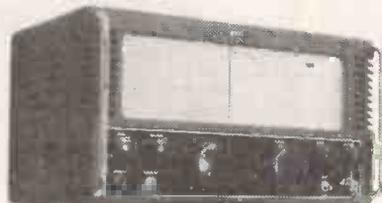
DEMONSTRATIONS OF HIGH FIDELITY SOUND REPRODUCTION

WE WELCOME YOUR ENQUIRIES on Radio and Electrical

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

EDDYSTONE COMMUNICATION RECEIVERS



Model 840A illustrated

Now available on attractive Hire Purchase Terms

	Deposit	Monthly
840A	£49 0 0	£19 0 0
750	£68 0 0	£23 0 0
680X	£106 0 0	£36 0 0
		£2 15 0
		£4 2 6
		£6 8 5

CARRIAGE PAID

Model 840A, is for A.C. or D.C. 110/250 v. making it especially suitable for universal use. 750 and 680X 110/240 v. A.C. The very large tuning dials are clearly marked with band spread logging. Silky gear driven flywheel loaded tuning mechanism. These sets are the choice of the discerning professional and amateur users. Descriptive literature gladly forwarded.

Latest EDDYSTONE Component Catalogue 1/-.



The
**Eddystone
Specialists**

SERVICES LTD.,

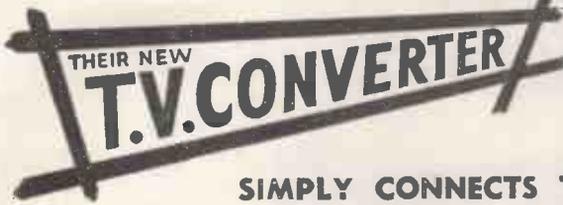
55 COUNTY ROAD, LIVERPOOL, 4

Telephone: AINTREE 1445

ESTAB. 193

Branch Address: MARKET CROSS, ORMSKIRK

DEPENDABLE PRESENTS



NO ALTERATIONS TO CIRCUIT REQUIRED

SIMPLY CONNECTS TO AERIAL

Demonstrations Daily

RETAILS AT 9 Gns.

Installed **COMPLETE** with Aerial within 15-mile radius of the transmitter, **14 GNS. NO EXTRAS.**

CHECK THESE FEATURES

200/250 A.C. Tunable Over Band III
Aerial Imp. 80 ohms.
Output 45 Mc/s. Freq. Tunable.

VALVES—1-U78, 1-B309, 2-Z77. Unit guaranteed 6 months. Valves 90 days.

TRADE ENQUIRIES INVITED

BEAUTIFULLY FINISHED Medium Oak CABINET



Size 10 x 8 x 5.

DEPENDABLE RADIO SUPPLIES

12^A TOTTENHAM ST., LONDON, W.1. LANgham 7391/2

OPEN 9.30 - 5.30 Mon to Fri. Sat 9.30 to 1 p.m.

ROTARY TRANSFORMERS



H.T.31
Input 11.5 v.
Output 250 v. at 125 mA

H.T.32
Input 11.5 v.
Output 490 v. at 65 mA

H.T. 31, 55/- Post 2/- H.T. 32 37/- Postage 2/-

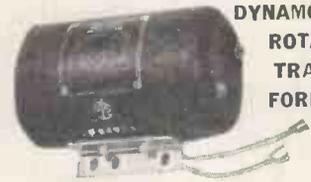


FRACTIONAL H.P. MOTOR BRAND NEW

HAS MANY USES

12 or 24 volts
19/6. P.P. 2/-

1,000/1,200 Revs per minute



DYNAMOTOR ROTARY TRANSFORMER

D.C. Input 27 Volts or 12v. 1.75 Amps.

D.C. Output 285 Volts .075 Amps. Price 37/6 ea. P.P. 2/-

TERMS—CASH WITH ORDER OR C.O.D. **DEPENDABLE—ALWAYS DEPENDABLE.**

ELECTRONICS DEVELOPMENT ENGINEER REQUIRED

An excellent permanent position occurs with a well-known electrical manufacturing company for an experienced Development Engineer for the home field. The applicant will be solely concerned with the development of sound recording and reproducing instruments of a leading U.S.A. company which will be manufactured in the U.K. by an old-established British firm. The position is progressive, congenial and highly interesting to a man of vision. A background of modern production methods is desirable. Salary will depend on experience and qualifications. The factory is situated on the outskirts of London.

Write, giving full details of experience and type of work on which at present employed to Box 5534.

CHAFFEY CABINET CO.

THE CHAFFEY TROLLEY



Made to the highest standards of materials, workmanship and finish. Size 32in. wide, 29½in. high, 16in. deep. Motor board 16in. x 13½in.

- Separate lids.
 - Back veneered and pol.
 - Ample record storage.
- Oak, Mahogany or Walnut, Natural, Medium or Dark. (Ill. Contemporary Oak.)

PRICE **£22-10-0**

OTHER CHAFFEY QUALITY CABINETS

Player and Tape Recorder Consoles from £11.
Sand-filled Baffles—for 8in. L.S. £8, 10in. and 12in. £11.
Reflex cabinets—e.g., for 12in. L.S. £11.
Queen Anne Bureau cabinets—every refinement—from 35 gns.
Instrument cases to specification.
All types of cabinets and cases to specification, including Demonstration, Show, Record Storage, Display, etc.
PLEASE SEND SPECIFICATION OR SKETCH FOR QUOTATION.

Examples of Chaffey cabinets for HI-FI can be seen at CITY SALE & EXCHANGE LTD., FLEET STREET, E.C.4.

THE CHAFFEY CABINET COMPANY
63a, CHELTENHAM ROAD, LONDON, S.E.15 NEW CROSS 4766

Z & I AERO SERVICES LTD.

offer the following rebuilt and new Test Equipment

SPECIAL OFFER

FULLY REBUILT TYPE 804 ULTRA HIGH FREQUENCY SIGNAL GENERATORS



Range: 7.5 to 330 Mc. in five bands Calibrated Capacitive Attenuator
Output: 1 μ V to 20 mV Output Impedance 75 ohms

Internal Modulation with modulation depth meter
Power Supplies: 115/230 V A.C.
PRICE, delivered free in U.K. £65 0 0

Type I-222A SIGNAL GENERATORS/FREQUENCY METERS, SUITABLE FOR BAND III, individually calibrated with Crystal Check Points: Range 8-15 and 150-230 Mc.
Output 100 mV. Power Supplies 115 V. A.C.
We are offering these instruments, brand new, at an extremely low price of..... £12 0 0
Packing and carriage extra at cost.

22-RANGE UNIVERSAL METERS

of well-known Canadian make.
Sensitivity 400 ohms per Volt.
AC/DC Volts: 5-25-100-500-1,500 or 3,000
DC Amps: 2.5-5-25-100-500 mA
Single Resistance Range
Dimensions: 5 1/2 in. x 5 1/2 in. x 5 in.



PRICE BRAND NEW, in polished wooden case and complete with set of test leads, post free £5 7 6

AMERICAN UNIVERSAL METERS

type ME-9B/U (TS-352/U), manufactured by Phaestron Co. of U.S.A. Sensitivity 1,000 and 20,000 ohms per Volt-AC/DC Volts: 2.5-10-50-250-500-1,000 Volts; built-in multiplier extending the range to 5,000 Volts.
DC Amps: 0.25-2.5-10-50-100-500 mA-2.5-10 Amps.
Resistance Ranges: direct, x10, x100, x1,000, x10,000.
PRICE, tested and guaranteed, post free £19 0 0

VACUUM CONDENSERS, 50 μ F, 32,000 Volts.
Brand New. Price, post free £0 17 6

The new edition of our Catalogue of Test Equipment is now ready.

Please write to:— **Z. & I. AERO SERVICES LTD.**
19, BUCKINGHAM STREET, LONDON, W.C.2

Telephone: TRAFalgar 237112.

UNIVERSAL ELECTRONICS

OFFERS A COMPREHENSIVE RANGE OF QUALITY EQUIPMENT which, whether new or used, is guaranteed to be in perfect condition.

RECEIVERS

All receivers are in good working order and condition unless stated.
Hallicrafters Portable Mains or battery Receiver as new £50. SX28, 550 kc/s.-42 Mc/s., £45. SX24, 550-42 Mc/s., £28. S20R, 550-42 Mc/s., £25. S20, £20. S29, A.C./D.C. portable battery 550-32 Mc/s., £25. S38, A.C./D.C. 110-250 v. 550-30 Mc/s., £20. Also in stock, S27, 30 Mc/s.-150 Mc/s., S27CA, 150-230 Mc/s., HT11 A Marine 12 v. radiotelephones. HRO receivers junior and senior types with all coils and power supplies from £27, complete, National NC44, NR100, NC81X, N2C00. National NC173, 550-32 Mc/s., as NEW, £65. Marconi CR100, 60 kc/s.-30 Mc/s., reconditioned £32, RME69, £35. Eddystone receivers: types 640, 1.2-30 Mc/s., £22/10/-: 740, 550 kc/s.-32 Mc/s., £35; 750, £48; 680, £65; 670, £35; 504, £25. Hammland Super Pro., £45. RCA receivers, AR88D and LF from £55. Set of three dials for model D, £1/10/-. Many other makes in stock.

MANUALS

For RECEIVERS AR88D-LF, AR77E, R107, Marconi CR100, S20R, SX24, SX28, B2, TX/RX, HROs, etc., photostatic copies, per copy £1 7 6

BRITISH TEST EQUIPMENT

AVO model 7, as NEW, £15. Avo 40, £12/10/-. Taylor TV wobblulator, 260A, as NEW, £27. AVO Roller panel Valve tester, £10. Evershed Wee Meggers, 500 v., £12/10/-. Bridge types in stock. Marconi Signal Generators. TF144G. TF390G. TF517. Cossor Double Beam Scopes. Type 339 from £35. Type 1049 also in stock. Many other instruments in stock.

SERVICE AND REALIGNMENT
of all British and U.S.A. types
COMMUNICATIONS RECEIVERS
to makers' specifications **AT LOW COST**

U.S.A. MICROWAVE TEST GEAR

No technical manuals for sale. Please write for prices.
3CM. TS3. S band power frequency meter TS10. APNI Test set. TS13. AP. X band signal generator. TS14. S band signal generator. TS34. Radar Synroscope. TS36. X band power meter. TS62. X band echo box. TS69. 300-100 Mc/s. frequency meter. TS127. 300-700 Mc/s. frequency meter. TS226. 300-1,000 Mc/s. power meter. BC221. Frequency meter (Bendix). BC1277. S band signal generator. TS45/AP. 3 cm. signal generator. 1-222A. 8-15 Mc/s. 150-230 Mc/s. signal generator. IE-19 signal generator. TS89. Pulse voltage divider. TS47. 40-500 Mc/s. signal generator. TS174. (V.H.F. version of BC221) 20-250 Mc/s. TS175. 80-1,000 Mc/s.
GENERAL RADIO 804B. 30-300 Mc/s. signal generator, £70.
All laboratory equipment may be inspected by appointment.

★ U.S.A. FREQUENCY METERS

TYPE BC221

125 kc/s.-20 Mc/s. Complete with calibration charts.
Available from stock. **CONDITION PERFECT.**

REQUIRED URGENTLY

Hallicrafters S27, S27CA, SX28, etc. RCA AR88, R1359 and R1294 VHF receivers.
Transmitters APT5 and receivers ASB8.
Frequency meters. Type BC221, top price paid.
All U.S.A. TS prefix equipment. TS13, TS35, TS69, TSX-4SE, TS174 and TS175, £80 given.
All British and U.S.A. Microwave equipment and valves type. 707A, 707B, 2K33, 2K45, 2K25, 723/AB.
Any manuals for any equipment purchased.
Please write, call or 'phone and our offer will be given.

PROMPT CASH PAID

22 & 27 LISLE STREET, LEICESTER SQ., LONDON, W.C.2

Shop hours, 9.30 a.m. to 6 p.m.

OPEN ALL DAY SATURDAY.

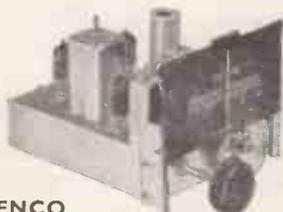
Thursday 9.30 a.m. to 1 p.m.

Write. Call or Telephone:
GERrard 4447 and 8410 (Day)
MEAdway 3145 (Night)

LASKY'S RADIO

SAVE POUNDS! ORDER BY POST IF YOU CANNOT CALL

EVERYTHING FOR THE HI-FI ENTHUSIAST!



DENCO F.M. FEEDER UNIT

All components and valves in stock. Uses 6AM6, 12AH8, EB91, and two 6BA6.
COMPLETE PARCEL £67/7/6
 Post extra. DATA BOOK, 1/6 post free.
 All components available separately.

DENCO F.M. COMPONENTS

Coils, each 3/11 I.F.s., each 7/-
 Ratio Discriminator, 12/6
 Chassis and Screens, 7/6
 Dial and Drive, 9/-
 Valves, complete set of five, 42/6. Post 1/-

JASON F.M. FEEDER

Special Parcel containing Data Booklet, chassis, front plate, dial, drive, tuning condenser, full set of coils, I.F.s., ratio detector, etc., 68/9. Post 2/6
 Data Book only 2/- post free.

TELETRON BAND III CONVERTER COIL SET. For use with TRF and superhet Band I TV receivers. Used two Z719. Circuit, wiring diagram, alignments, full details with each set. 15/-. Post 1/6.

VALRADIO BAND III TUNERS. Full range in stock. Price £6.

CERAMIC CONDENSERS for F.M. All values, 1/- each, 10/6 per doz. Post extra.

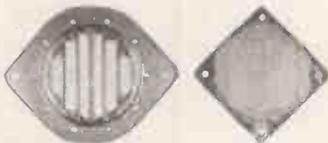
HI-FI SPEAKERS

The fullest range of W/B, Stentorian, Wharfedale, G.E.C., Goodmans, Baker, etc., all sizes, 3-15 ohms. We have the one to suit your purpose and pocket.

HI-FI AMPLIFIERS

A very large and comprehensive range. A few examples:—
 LEAK, Point One. £28/7/0
 R.D. Junior. £26
 R.D. Minor. £12/17/6
 UNITELEX. .8½ and 9½ gns.

HI-FI at a price you can afford



"TWEETERS" Electrostatic H.F. Speakers for use with amplifiers or sets. Supplied with full data and circuit diagrams.

LSH75. (As left illus.) 7-18 kc/s, 20 dbs, inherent cap. 800 p.f. Polarising voltage 300v D.C., maximum A.C. voltage 60v. For outputs up to 7 watts. Size 2½ x 2½ x ½ in. 12/6

LSH100 (As right illus.) As above, inherent cap. 1100 p.f. For outputs up to 20 watts. Size 5 x 3 x ½ in. 21/- Post Free.

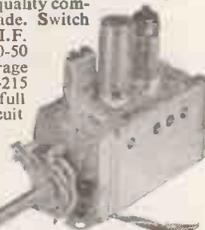
12 CHANNEL T.V. TUNER

Famous make. Covers Bands I & III. Complete with valves EF80 and ECC81. Ceramic valveholders, finest quality components, precision made. Switch and fine tuning. I.F. output 20-25 & 40-50 Mc/s. Freq. coverage 50-87 Mc/s & 175-215 Mc/s. Supplied with full details and circuit diagram.

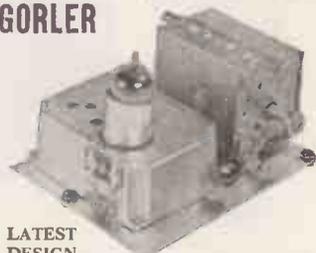
LASKY'S PRICE

89/6

Post 3/6.
 Knobs, 2/9 extra



FREQUENCY MODULATION BY GORLER



LATEST DESIGN CONTINENTAL F.M. COMPONENTS

UT.340 (as illustrated). A self-contained V.H.F. front end Unit incorporating a grounded grid amplifier, mixer oscillator (ECC85) and first I.F. amplifier. Completely wired and tested, 59/9. (Valve extra).

UT.341. As above but with baseplate and 2-gang condenser incorporating 1.3 reduction drive. Supplied pre-aligned 95/5.

TA.350. 6-button Coil Pack for long, med, and short waves, gram and off, together with a F.M. position which incorporates switching for change over from A.M. to F.M. Designed for use with UT.340 or UT.341. 85/-.

Ratio Discriminator Coils, URF, 10/- each.

10.7 mc/s. I.F. Trans., UF376, 7/- each.

SET OF 3 COMBINED I.F. TRANS. for A.M. and F.M. 456/470 Kc/s. A.M.; 10.7 Mc/s. F.M. Variable selectivity on A.M., ratio discriminator on F.M. The set of 3 (KF360, KRF362, KSF361), 42/-.

As above but for 2 stages of I.F. amplification. No variable selectivity on A.M. Types KF363 and KRF364, the pair, 26/3.

"WIRELESS WORLD" F. M. Feeder (Amos & Johnson) Reprint. .2/- post free.

THE "UNIVERTER" A new book just published, giving full details of a new Band III Converter for any TV receiver home constructed or factory made. All components and valves in stock, prices on request. Also available as a complete unit. Uses two 6AM6, one 12AT7, one 6X4. Contains its own power supplies. **THE BOOK**, containing full circuit diagram, wiring instructions and component lists. 3/6 post free.

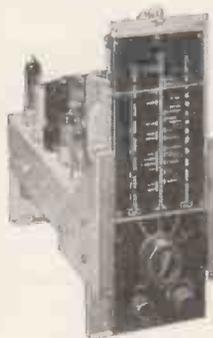


FAMOUS MAKE 3-SPD. AUTO CHANGERS

LATEST 1955 MODEL, NEW & UNUSED

Takes 10 records of all sizes (mixed) in one loading. HGP.37 crystal turnover-pick up. Handsome cream finish. Supplied complete in maker's carton.

LASKY'S PRICE Post free **£9/19/6**



6-VALVE RADIOGRAM CHASSIS COMPLETE WITH VALVES

Famous Manufacturer's Surplus. 6 valve 3-wave Superhet, 13-50 m. short, 200-550 m. medium, 1,000-2,000 m. long. Brand new Mullard valves: ECH42, EF41, L63, EB41, 6V6 g.t., EZ40, and finest quality components. Gram. switch, 465 Kc/s I.F. tone control, 3-colour dial. Overall size: 13½ x 5, height 12½. Aperture required for dial and controls 11 x 3½ in. Complete with valves, output trans., knobs etc.

LASKY'S PRICE **£10/19/6** Carr. & Pkg. 7/6 extra

SPECIAL COMBINED OFFER.

The above 3-speed Auto-Changer and the 6-valve Radiogram Chassis together for Carr. extra **£18/19/6**

CABINET NOW AVAILABLE.

An attractive contemporary design Cabinet, oak veneer, to take the above Auto-changer and Radiogram Chassis **£9/19/6** Carr. 17/6

YOU CAN BUILD A COMPLETE RADIOGRAM FOR £29. 18. 0. by taking advantage of the above Special Offers, together with the offer of a suitable Cabinet.

MORE MONEY-SAVING LASKY BARGAINS ON NEXT PAGE

RADIO · TELEVISION · HI-FI · ELECTRONICS · RECORDERS

THIS TRF 3-VALVE RECEIVER CAN BE BUILT FOR £5.10.0



(Carr. & Pkg. 2/6 extra)
 Latest type circuit for 200/250 A.C. Mains, medium and long wave. Uses 6K7G, 6J7, 6V6, and Metal Rectifiers. Handsome Plastic Cabinet, 12x6½x5½in. deep, Walnut or Ivory finish. If preferred a Wood Cabinet is available (see lower illus.) FULL DATA, wiring and circuit diagrams and price list of components, 1/- post free. CABINET only, plastic or wood 17/6. Carr. & Pkg. 2/6 extra.

THIS 4-VALVE, 3-WAVE SUPERHET CAN BE BUILT FOR £7.19.6

(Carr. & Pkg. 2/6 extra)
 Very efficient Superhet Circuit for 200/250 A.C. Mains, long, medium and short wavebands. Uses 6K8 freq. changer, 6K7 I.F. amp., 6Q7 det., A.V.C., AF-amp., and 6V6 output valves. Wood cabinet, Walnut veneer, size 12x6½x5½in. deep, or Plastic Cabinet as illus. above. FULL DATA, wiring and circuit diagrams and price list of components, 1/- post free. CABINET only, plastic or wood, 17/6. Carr. & Pkg. 2/6 extra.



HIRE PURCHASE TERMS ON CERTAIN ITEMS

Please give details of your requirements.



FAMOUS AMPLIFIERS BUILT ON T.C.C. PRINTED CIRCUITS

The latest advance in Amplifier design. We can now supply from stock two famous Amplifiers, the Osram 912 and Mullard 5/10, built on the new printed circuit technique. All specified components, T.C.C. condensers, Lab. resistors, etc., are used and you have your choice of transformers and chokes by Partridge, Haddon, W/B or Ellison. Demonstrations given any time.



The OSRAM 912 Amplifier, built on printed circuit, supplied fully assembled, complete with valves, ready for use. Prices from **19 gns.** depending on make of transformer used.

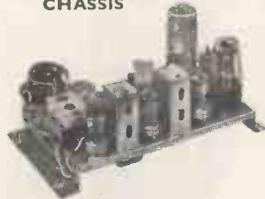
PRINTED CIRCUIT available separately, 50/- BOOK of the Osram 912, 3/6 post free.

DRILLED CHASSIS AND DIAL ASSEMBLY

Size 13½ x 7 x 2½in., drilled for five latest type miniature valves mains trans., I.F., etc. Dial 13 x 14in., for horizontal or vertical mounting. Spin wheel tuning. All pulleys and spindle supplied. LASKY'S PRICE **19/6** Post 3/-

DULCI RADIO CHASSIS, full range 3 & 6 wave, £6/19/6 to 21 gns. Also **DULCI AM/FM CHASSIS**, F.M. FEEDER UNIT, BAND III CONVERTER.

COMPLETE 5-VALVE RADIO CHASSIS



Brand new and unused. A.C./D.C. 200/250 volts. I.F. 465 kc/s.—A.V.C.—4 watts output—3 station pre set—frame aerial—fully aligned—chassis 10x5½in.—max. height 5½in. Completely wired and ready for use, with the addition of a speaker and output transformer. Two controls—volume and station switch. Valves used: 10C1, 10F9 or UF41, 10LD11, 10P14, U404 or UY41.

LASKY'S PRICE **69/6** less valves Post 3/6 extra. With valves £5/19/6.

ALUMINIUM CHASSIS
 18 S.W.G., undrilled, 4 sides, reinforced corners. Depth 2½in.
 6x4 4/- 12x8 7/- 16x10 8/3
 8x6 5/- 14x9 7/6 12x3 4/9
 10x7 6/- 16x9 8/- 12x6 6/6
 Post 1/- per chassis extra.



MICROPHONE BARGAINS
ACOS MIC.22/2. Complete with stand as illus. List 4 gns. LASKY'S PRICE **42/-**
ACOS Crystal, MIC. 33/1. List 50/-. LASKY'S PRICE **32/6**

Moving Coil Hand Type with switch. List 5 gns. LASKY'S PRICE **45/-** All above, post 2/6

TABLE MIKE STANDS. Chrome, heavy base, 2 sections. 12/6. Post 2/6



SPECIAL PURCHASE
ACOS TURNOVER CRYSTAL CARTRIDGES, complete with styli. Studio (G.P.29), listed 42/11 LASKY'S PRICE 21/- Post 1/-

GANG CONDENSERS
 .0005, less trimmers.
 2-gang, standard, 5/6, min., 6/6
 3-gang, standard, 7/6, min., 10/6
 4-gang, standard, 10/6.
 With Trimmers:—
 2-gang, standard 7/11, min., 7/6. Post extra.

PICK-UPS, HEADS, ARMS. L.P. or standard, by Collaro, Garrard, Goldring, Acos, B/J, Decca, etc., all types. Full stocks of all styli.



The MULLARD 5/10 Amplifier, built on printed circuit, supplied fully assembled, complete with valves, ready for use. Prices from **15 gns.** depending on make of transformer used.

PRINTED CIRCUIT separately, 22/6 BOOK of the Mullard 5/10, 2/6 post free.



All Components for either Amplifier supplied separately, for printed circuit or conventional construction. Price Lists on request.

3-WATT MIDGET AC/DC AMPLIFIERS

PUSH PULL. VERY HIGH GAIN
 4 valves: 2UL41 in push pull, 1 UCH42 and 1 UAF42. Input voltage 100/110 A.C./D.C. Very easily converted to 230 volts. Supplied with circuit diagram and full details. Size: 9x4x4ins. Uses 2 metal rectifiers, 1 each RM1 and RM2. Ideal for ships' record players, tape recorders, home record players, baby alarms, etc. etc. Supplied complete, fully assembled and wired, with 4 valves. **65/-** Post Free.



LASKY'S 4-WATT A.C. AMPLIFIER KIT
 Uses 1 each 6SL7, 6V6, 5Z4. All components, chassis, valves, output trans., mains trans., £4/5/-. Carriage and packing 2/6 **INSTRUCTION BOOK** and shopping list, 1/- post free.

TELETRON COILS
 All types in stock.

TELETRON FERRITE ROD AERIALS
 Med. wave, 5in. long, 8/9
 Long wave, 8in. long, 12/6

P.M. SPEAKERS. 6½in. .17/6 8in. .19/6. 10in. .19/-. Plessey H.D. 10in. .25/- 6x4 Elliptical. .18/6. Plessey 12in. .37/6. Post extra.

MORE MONEY-SAVING LASKY BARGAINS ON NEXT PAGE

LASKY'S RADIO

SAVE POUNDS! ORDER BY POST IF YOU CANNOT CALL

★ SPECIAL OFFER OF TAPE DECK CASES ★

As illustrated. Will take Truvox Tape Deck with space for amplifier, radio feeder unit and speaker. Overall dim. with lid closed, 19x14x13in.

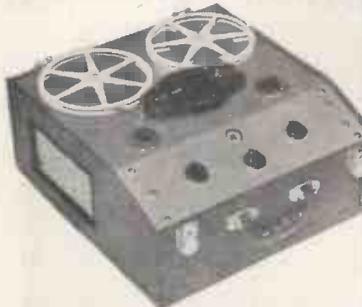
LASKY'S PRICE **59/6** Carr. 5/-



TRUVOX TAPE DECKS. Latest model Mk. III NU, twin track, 2-speed, 3 motors, press button control. **£23/2/-**

SPECIAL COMBINED OFFER

The above Tape Deck Case together with the above Truvox Tape Deck **£24/10** Carr. Free.



THE LATEST BRENNEL TAPE EQUIPMENT

The **DECK.** 3-speed, 3 $\frac{1}{2}$, 7 $\frac{1}{2}$ and 15in. per sec., 3 motors, record and play-back. All latest refinements. Price **18 Gns.**

The **AMPLIFIER.** 4 watts, for use with 3 ohms speakers. Magic eye, high fidelity. **16 $\frac{1}{2}$ Gns.**

The **CARRYING CASE,** **£5/18/-**
Write for details.

LANE TAPE DECKS

Mk. VI, 2-speed, 7 $\frac{1}{2}$ & 3 $\frac{1}{2}$ in. per sec. 3 high grade motors. Takes standard reels up to 1200 ft. capacity. **£18/10/-**

LATEST GRUNDIG TAPE RECORDER in Stock. Price 45 Gns.

RECORDING TAPE

Craft base, length 1200 ft. Cyldon metal spools. 12/11. Post 1/-. All makes of Tape stocked—Scotch Boy, EMI, Grundig, Puretone, Ferrograph, Basf, Agfa, Gevaert, etc., and the new Scotch Boy Thin Tape 190M. All types of Spools stocked.



PORTABLE CASES

Solidly made of laminated wood, inside dim. 17 $\frac{1}{2}$ x 14 x 6 $\frac{1}{2}$ in. deep. Originally made for portable radiogram, with space (14 x 5 x 5in.) for radio or amplifier and speaker. Motor board size 14 x 12 $\frac{1}{2}$ in. Takes any standard size gram unit. Rexine type finish in various colours. Fitted handle and locks, 2 keys supplied.

LASKY'S PRICE **25/-**
Post 3/6

SPECIAL! PLASTIC COVERED WIRE, stranded copper, B07. All colours in 100 ft. lengths. Per coil 2/9. Post 9d.

LATEST COLLARO RC.54

3-speed High Fidelity Mixer Changer, Studio crystal turnover p.u., in leatherette covered carrying case. **£13/5/-**

EX-GOVT. ACCUMULATORS, 2 volt, 10 a.h. Size 1 $\frac{1}{2}$ in. square, 5 $\frac{1}{2}$ in. high. Made by Canadian Exide. LASKY'S PRICE 4/6 Post 1/-.

3 for 13/- post free.
12 for 40/- post free.

AERIAL ROD SECTIONS. Steel heavily copper plated. 12in. long, $\frac{1}{4}$ in. diam. Any number may be fitted together. Per doz. 2/6 post free.

SET OF 3 MOTORS (Collaro) for Tape Decks. Clock, anti-clock and capstan. Lasky's Price, the set, **£5/15/-**. Post extra

HEAVY FLYWHEELS for Tape Decks, $\frac{1}{4}$ in. hole. 2/6 post 1/-

COUNTERS up to 9999, cable drive, each, 5/- Post 1/-



YOU CAN BUILD THIS PROFESSIONAL TAPE RECORDER FOR LESS THAN **£39**, using Truvox Tape Deck. Write for full details and list.

COLLARO 3-SPD. RECORD PLAYING UNIT (motor and pick-up), orthodynamic head **£6/19/6**. Post 3/6.

RECORD PLAYING UNITS, 3-sp., auto and hand change. All types in stock—Garrard, Collaro, B.S.R., etc.

FEW ONLY. Plessey 3-sp. mixer type Auto-Changers, slightly imperfect. **£6/19/6**. Post 3/6.

TABLE RADIOGRAM CABINETS

Solidly made of $\frac{1}{4}$ in. laminated wood, finished beautiful Walnut veneer. Panel (3in. x 16in.) for dial and controls, baffle for 8 in. speaker, gold finish metal grille, fully hinged lid. Overall size: 18in deep, 18in. wide, 13in. high. Slightly soiled.

LASKY'S PRICE **79/6**
Carriage 7/6.

SPECIAL PURCHASE BUREAU RADIO-GRAM CABINETS

Handsome design, solidly constructed, beautiful Walnut veneer finish, with generous record storage space. Further details and illustration on request. LASKY'S PRICE 14 gns. Carr. 17/6. Available on H.P. Terms.

OCTAGONAL SPEAKER CABINETS

Special design for use with the G.E.C. metal cone Speaker. Exactly per specification **£12/10/-** Carr. 6/6.

MINIATURE CRYSTAL DIODES

Glass type, wire ends, each 1/6 GEX. 45 and equivalent types, various makes, 3/6.

TRANSISTORS AND GERMANIUM DIODES.

All types available.

SPEAKER FRET

Large selection of materials for frets—plastic, tygan, cloth, expanded metal.

OVER 50,000 VALVES

Our valve stock is one of the largest in England. All makes and types, B.V.A. and ex-Govt.



COLLARO TAPE DECK MOTORS,

anti-clockwise, shaded pole. Special Offer. Limited quantity only.

LASKY'S PRICE **25/-**
Post extra.

TRANSCRIPTION TURNTABLES

in stock for immediate delivery.

Garrard 301 **£25/3/6**
Connoisseur **£25/17/2**
Collaro 2010 **£18/3/9**
Collaro 2000 **£13/9/6**

Post extra.



MORE MONEY-SAVING LASKY BARGAINS ON NEXT PAGE

EVERYTHING FOR HOME CONSTRUCTOR & SERVICEMAN



MULTI-TEST METERS

1,000 ohms per volt. Basic movement 400 microamp, 3in. A.C./D.C. 0-5,000 v. 0-1 amp. 11 switched ranges: 100,000 ohms and 1 meg., also decibel range, in polished wood carrying case (6x6½x4in. closed) with leather handle and space for test leads.

LASKY'S PRICE 95/- Post & ins. 3/6
Battery 6d. extra. **TEST LEADS, 3/6 extra.**

MAINS TRANSFORMERS.

All 200-250 v. 50 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. 18/-
MBA/6. 325-0-325 v. 100 mA. 6.3 v. 3 a., 5 v. 2 a. With mains tapping board. 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. 18/-
MBA/10. 500-0-500 v. 150 mA. 6.3 v. 4 a., 5 v. 3 a. 32/6.
AT/3. Auto trans. 0-10-120. 200-230-240 v. 100 watts. 17/6.

OUTPUT TRANSFORMERS

Min. type (3S4, etc.)..... 3/6
 Midget, 3/3 multi ratio .. 3/11
 Standard pentode, 4/6.
 All other types by Partridge, Ellison, etc., in stock.

FILAMENT TRANSFORMERS

6.3 v., 1.5 amp..... 5/11
 6.3 v., 3 amp..... 9/6
 200-250 v., special 0-30 v. tapped, 17/6.

BRIMISTORS

CZ1 3/6 **CZ2** 1/6 **CZ3** 6d. **WX6** 1/6

CONDENSERS & RESISTORS

Full range of types in stock.

FOR CALLERS ONLY. Sale of

VCR97 C.R. Tubes, 6½in., electrostatic. To clear, each 5/11

R1155 RECEIVERS now available on Easy Terms. Ask for details.

5 Frequency 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. Supplied in maker's original wood transit case.

LASKY'S PRICE
BRAND NEW £11 19 6
 Secondhand. Grade 1 £9 19 6
 Secondhand. Grade 2 £7 19 6
 Carriage 17/6 extra, including 10/- returnable on packing case.

ASSEMBLED POWER PACK-OUTPUT STAGE FOR R.1155 RECEIVER

For use on 200-250 v. A.C. mains. Complete with 2 valves. In metal case; size: 12x7x5½in.
LASKY'S PRICE 79/6. Carr. 5/-.



Power Pack for above. Fitted with 6½in. p.m. speaker.
LASKY'S PRICE £5/5/-. Carr. 5/-

MAKERS' SURPLUS TV COMPONENT BARGAINS

WIDE ANGLE 38 mm. Line E.H.T. Trans., Ferro-cube, core 9-16kV 25/-
Scanning Coils, low imp. line and frame 25/-
Frame Output Transformer 10/6
Scanning Coils low imp. line and frame 17/6
Frame or line blocking osc. Trans 4/6
Focus Magnets Ferro-dure 25/-
P.M. Focus Magnets, Iron Cored 19/6
Duomag Focalisers 29/6
300 m/a. Smoothing chokes 15/-
Electromagnetic focus coil with combined scan coils 25/-
STANDARD 35 mm. Line Output Trans. No. E.H.T. 12/6
Line Output Trans. 6-9Vk. E.H.T. and 6.3 v. winding. Ferro-cube 19/6
Scanning Coils. Low Imp. line and frame 12/6
Ditto by Igranite 14/6
Frame or line blocking oscillator transformer 4/6
Frame output transformer 7/6
Focus Magnets without Vernier 12/6
With Vernier 17/6
Focus Coils, Electro-magnetic 12/6
200 m/a. Smoothing chokes 10/6

C.R.T. MASKS

12in. rubber, complete with armour plate glass. Dustproof. Black, 7/6, White, 10/-,
 Plastic Masks, 14in., 6/6, 17in., 7/6, De Luxe, 17in., 15/-,
 E.E. 16in. polystyrene. List 42/-.
Lasky's Price 29/6. Post extra.

12in. MOULDED IMPLOSION GUARDS, 7/6. Post extra.

HIRE PURCHASE TERMS ON CERTAIN ITEMS
 Please give details of your requirements.

LASKY'S RADIO

VALUE IN MAGNIFICENT TV CABINETS

Complete with mask, glass, castors, shelf, bearers, C.R.T. neck and protector, back, speaker fret and baffle board. Finished in beautiful figured medium light or dark walnut veneer, with high polish. Suitable for most home constructor TV Receivers, including the "Viewmaster" "Practical Television", "Tele-King", "Magnaview", "Wireless World", etc. Supplied with cut-out for 14in., 16in. and 17in. C.R. tubes at no extra cost.

An allowance of 4/6 will be made if the mask is not required.
 Inside Dim.: Depth 16½in., width 17½in., Height 28in. Overall height 32in.: Width 18½in.

WHY NOT CONVERT YOUR TABLE RECEIVER TO A CONSOLE MODEL?
 Adaptor frames for fitting 9in. or 10in. C.R. tubes available if required.

LASKY'S PRICE £8/10/0
 Carriage 12/6 extra.
H.P. Terms. Deposit £2/17/- plus carriage. Balance plus charges spread over 12 months.

THE DE LUXE



THE ROTHESAY



The last word in outstanding contemporary design. Absolutely rigid construction throughout with the finest laminated woods, veneered in walnut, polished light, medium or dark shade. Fitted with gold anodised speaker grille. The C.R.T. aperture frame is detachable, supplied to suit any size tube to order.

NOTE THESE GENEROUS SIZES.
 Outside dim.: 34½in. high, 21½in. wide, 21½in. deep. Inside dim.: 18½in. wide, 19½in. deep. Size of top; 22½x21½in. Thickness ½in.

LASKY'S PRICE £9/19/6
 Carriage 15/- extra.
H.P. Terms. Deposit £3/10/- plus carriage charge. Balance plus charges spread over 12 months.

THE ROTHESAY CABINET WITH FULL-LENGTH DOORS veneered both sides, polished to match the cabinet and mounted with full-length piano hinges. Price £14/9/6.

LIMITED NUMBER TALLON TV CABINETS

16-17in. aperture, pre-fabricated ready for home assembly. Solidly constructed of ½in. laminated wood, Walnut veneer finish, ½in. top. Suitable for the Tele-King, Wide-angle Viewmaster and other home constructor TV sets. List £14/10/-.
LASKY'S PRICE £8/10/0
 Carr. 10/6.

ARMOUR PLATE GLASS

12in., actual size 13x10½x½in. 3/6
 14in., actual size 13½x10½x½in. 5/6
 17in., actual size 17½x15x½in. 7/6
 Post extra.

SENTERCEL METAL RECTIFIERS

RM1 3/8 **RM2** 4/3 **RM3** 5/6 **RM4** 16/-
 Post extra.

SENTERCEL E.H.T. RECTIFIERS

K3/40 6/- **K3/45** 8/2 **K3/50** 8/8 **K3/100** 14/8
 Post extra.

L.V. RECTIFIERS

12v., all types in stock.
 1 amp., ½-wave, 3/6. 2 amp., ½-wave 4/11. 4 amp., full wave, 15/-.
 6 amp., full wave, 21/- Post extra.

AERIALS of all types stocked, TV, Band III, F.M.
 300 ohms FEEDER, per yard, 9d.
 80 ohms Co-axial, doz yds., 7/6
 Co-axial Cable, air cored, yard 9d.
 Any length supplied.

AERIAL MASTS in 2 telescopic sections, extending to 15 ft. Light alloy construction.
 Complete with guys and ropes. 25/-
 Carr. 3/6

TWO ADDRESSES FOR PERSONAL CALLERS

Open all day Saturday. Early closing: Thursday.

42 TOTTENHAM COURT ROAD, W.1.

Between T.C.R. and Goodge St. Stns. MUSEum 2605.

370 HARROW ROAD, PADDINGTON, W.9.

(Opposite Paddington Hospital) CUNningham 1979/7214.

LASKY'S RADIO

LASKY'S (HARROW RD.) LTD.

ALL MAIL ORDERS TO HARROW ROAD PLEASE

WIRE RADIO LTD.

18, TOTTENHAM COURT ROAD, LONDON, W.1.

MUSEum 5929/0095.

(50 yards only from Tottenham Court Road Tube 1)

All post orders please to:— 24-26, HAMPSTEAD ROAD, LONDON, N.W.1.

EUSTon 5533/4/5.

HIRE PURCHASE

We are pleased to announce advantageous hire purchase facilities on any single item over £5. Ask for details, mentioning what you are interested in. We regret we cannot extend this facility to kits.

R1155A RECEIVERS guaranteed serviceable in original packing cases, £7/19/6. Fully assembled Power Pack and output stage, to plug straight into R1155 for A.C. 200/250 volts at 79/6. We have a few brand new R1155A at £11/19/6, also in original packing cases—Deduct 10/- if purchasing either receiver together with power pack. Plus 10/- packing and carriage.

R1124 RECEIVER UNIT. Coverage 30-40 Mc/s. Including 6 valves—3 type 9D2, 1 each 8D2, 15D2 and 4D1—6 valve screening cans, 24 ceramic trimmers, 6 ceramic valve holders, resistors, condensers, 1.F.T.'s coils, etc. In very good condition, a bargain at 16/6 each only, plus 3/6 packing and postage.

RECEIVER TYPE 25/73. (The receiver section of TR1196). Supplied complete with full data for conversion to 3-wave-superhet receiver. Unit is complete with 6 valves 2-EF39, 2-EF36, FK32 and EB33, also standard I.F.T.'s 465 Kc/s. Price 27/6 plus 2/6 P. and 12/- P.

TR106 TRANSMITTER PORTION. We can also supply the transmitter portion of the above receiver incorporating valves, EL32, EF50, CV501. Type 600 relay transformer, coils, switches, etc. Limited quantity at 12/6 only, plus 2/6 P.

CO-AXIAL CABLE. Standard 80 ohms, brown, stranded cnet, conductor, 8d. per yard only! Not Govt. Surplus. Min. 12 yds. Also the latest air-spaced type for Band III. 9d. per yd.

22 SET POWER UNITS. No. 4MK1 ZA10478—Complete with 4 metal rectifiers each 250 v. 60 mA. 2-12 v. 4 pin Mallory Vibrators, transformers, condensers, resistors, signal 1 amp. indicator, etc., etc., in good condition. Complete in metal box size 10 1/2 in. x 6 in. x 8 in. Weight 19lb., 27/6, plus 5/- P. & P.

L.T. RECTIFIERS TYPE R.K. A newly manufactured range guaranteed 12 months.

6 or 12 v. 1 a. F.W. bridge type... 7/6
6 or 12 v. 1.5 a. F.W. bridge type... 9/6
6 or 12 v. 2 a. F.W. bridge type... 11/3
6 or 12 v. 4 a. F.W. bridge type... 15/-

CHARGER TRANSFORMERS. Input 230 v. 6/12 v. 1 a. ... 9/9
2/6/12 v. 2 a. ... 14/6
2/6/12 v. 4 a. ... 17/6

METER SPECIAL I We have a limited quantity of aircraft electrical thermometers. Brand new by Weston. 2 in. moving coil meter, flush square fitting. These meters have a luminous scale graduated 40-140 degrees centigrade. but the full-scale deflection is approximately 150 microamps. Price 12/6 each only, plus 2/- P. & P.

VIBRATOR PACK. Brand new, by Mallory. 12 volt input, 150 v. 40 mA. output. Complete with synchronous vibrator, 27/6.

DECCA LIGHTWEIGHT PICKUPS. Complete with either standard or L.P. Crystal Cartridge inserts. Complete with Rest and Tracking instructions, 32/6 plus 1/6 P. & P. Also their very latest type, as above, but with turn-over head, 47/6 only 1/5 plus 1/6 P. & P.

6-VOLT THERMO PACK. Ex-W.D. 6-volt input, output 140 v. 30 mA. Fully smoothed and rectified, incorporating Wearite 6 volt 4 pin vibrator type NSB6. Unit size only 6 in. x 5 in. x 2 1/2 in. Price 15/- plus 1/- P. & P. New condition.

R.F. UNITS. All new condition and complete. Case size 9 1/2 in. x 7 1/2 in. x 5 in. Type 24 20-30 Mc/s. 15/- Switched Tuning. Type 25, 40-50 Mc/s. 19/6. Switched Tuning. Type 27, 65-86 Mc/s. 45/- Variable Tuning. Type 26, 50-65 Mc/s. Variable Tuning. 35/- We have a limited supply of R.F.27 new condition units, complete, but tuning dial damaged. Price only 30/- each. ALL these units Post Free!

I.F. TRANSFORMERS SPECIAL OFFER. All iron-cored 465 Kc/s. By Invicta—Cylindrical 2 1/2 in. x 1 1/2 in. diam., 8 1/2 in. long. Also our new special ultra-midget size 1 1/2 in. x 1 3/16 in. x 1 3/16 in. Only 9/9 pr. By Wearite, Type 501 and 502 12/6 pr. M800 12/6 pair.

AMERICAN CONTROL UNIT CS8/APTI. Box measures only 5 in. x 3 1/2 in. x 2 in. Incorporating 2 in. round 0-1 mA. meter, 200 ohm p.d. 100 ohm variable, indicator lamp, etc. Price 22/6 post free.

HEADPHONES. Brand new, ex-Govt., by S.G. Brown. Type CLR. Low resistance, 7/6 per pair. Type CHR high resistance, 12/6 per pair.

No. 38 TRANSMITTER/RECEIVER WALKIE-TALKIE. Range approx. 5 miles. Coverage 7.9 to 7.5 Mc/s. Unit only complete with valves at 30/-, in very good condition.

F.M. !! (Frequency Modulation)

We are pleased to announce our complete Kit for the "Denco" F.M. Feeder Unit. This unit provides an A.F. output suitable for feeding into the audio section of a standard broadcast receiver where triode/pentode output are available. Within an average of 30 miles from a V.H.F. transmitter one I.F. stage should be adequate, but our complete kit supplied includes all components and valves for an extra I.F. stage if necessary, or if the unit is used at greater distances. Full Constructional details, theoretical circuit and point-to-point wiring diagram can be supplied for 1/6 post free, or the complete kit right down to the last nut and bolt at only £5/7/6, plus 2/6 packing and postage. This unit can be supplied, if desired, ready assembled, aligned and tested, at £8/10/-, plus 2/6 packing and postage. If required we shall be pleased to align this unit for constructors not possessing the necessary equipment for a charge of 7/6. N.B.—Valve line-up is 6AM6, 12AH8, 2-6BA6 and 6AL5. Chassis measures only 6 1/2 x 5 1/4 x 1 1/2 in. Demonstrations at 18 Tottenham Court Road!



The Jason F.M. Tuner Kit!



This kit has been based on the booklet by Data Publications, price 2/- post free. With each booklet is enclosed our individually priced parts list. The construction and alignment of this tuner are no more difficult than a normal medium wave tuner. It is highly sensitive and free from drift. Incorporates 4 valves type 6AM6 and 2 specially graded G.E.C. Crystals. The kit supplied includes drilled chassis with tuning condenser, scale calibrated in megacycles, and attractive bronze stove enamelled front plate already mounted (as illustrated) front plate size 8 in. x 4 in., chassis size 7 in. x 4 1/2 in. x 1 1/2 in.

N.B. The standard model is at present operating satisfactorily up to 80 miles from Wrotham. Our price for the complete standard kit is £6/15/- only! Plus 2/6 p. & p. Fringe area model including extra valve, coil, etc. (results could be expected up to 150 miles from Wrotham!), is £7/15/-, plus 2/6 p. & p. The Standard Model Tuner can be supplied ready built, aligned, tested and manufactured by the Jason Meter and Electronic Company at a price of £15/17/-, purchase tax paid.

N.B.—THESE TUNERS ARE BEING DEMONSTRATED AT 18 TOTTENHAM COURT ROAD.

F.M. AERIALS. Indoor two-element type by Lumex. Brand new 11/6 each only, plus 2/- postage and packing. Other types available.

F.M. POWER PACK KIT.—We can now supply complete kit for power pack suitable for either of the above F.M. tuners or any other similar type. Price for the complete kit is 42/- only, or 52/6 for ready assembled unit. This pack is extremely small incorporating valve rectifier type 6X4 and built on chassis size only 6 in. x 4 in. x 1 1/2 in. Optional extra for power pack, Bulgin Octo Plug 2/3.

F.S.D.		METERS			
	Size	Type	Fitting		Price
50 microamp	D.C. 2in.	M.C.	R.P.		50/-
50 microamp	D.C. 2 1/2in.	M.C.	F.Sq.		65/-
100 microamp	D.C. 2 1/2in.	M.C.	F.R.		45/-
500 microamp	D.C. 2in.	M.C.	F.R.		13/6
500 microamp	D.C. 2in.	M.C.	F.R.		18/6
1 mA.	D.C. 2in.	M.C.	F.R.		17/6
1 mA.	D.C. 2in.	M.C.	F. Sq.		22/6
1 mA.	D.C. 2 1/2in.	M.C.	F.R.		27/6
1 mA.	D.C. 2 1/2in.	M.C.	Desk Type		30/-
5 mA.	D.C. 2in.	M.C.	F. Sq.		7/6
10 mA.	D.C. 2 1/2in.	M.C.	R.P.		8/-
10 mA.	D.C. 2 1/2in.	M.C.	F.R.		10/-
30 mA.	D.C. 2in.	M.C.	F. Sq.		7/6
150 mA.	D.C. 2in.	M.C.	F. Sq.		8/6
200 mA.	D.C. 2 1/2in.	M.C.	R.P.		10/-
1 amp.	R.F. 2 1/2in.	Thermo	R.P.		10/-
3 amp.	R.F. 2in.	Thermo	F. Sq.		6/-
5 amp.	D.C. 2in.	M.C.	F. Sq.		13/6
6 amp.	R.F. 2 1/2in.	M.C.	Thermo F.R.		7/6
20 amp.	D.C. 2in.	M.C.	R.P. (with shunt)		10/6
25 amp.	D.C. 2 1/2in.	M.I.	F.R.		10/6
30 amp.	D.C. 2 1/2in.	M.I.	F.R.		12/6
15 volt	A.C. 2 1/2in.	M.I.	F.R.		10/-
20 volt	D.C. 2in.	M.C.	F. Sq.		7/6
15.0-15 volt	D.C. 2 1/2in.	M.C.	F.R.		17/6
300 volt	A.C. 2 1/2in.	M.C.	F.R.		15/-

R.P. = Round Projection. M.C. = Moving Coil. Thermo = Thermo-coupled. F. Sq. = Flush Square. F.R. = Flush Round. M.I. = Moving Iron.

METER RECTIFIERS. 1 mA. by G.E.C., at 8/6, also 5 mA. by Westinghouse at 8/6.

THE "TELETRON" BAND III CONVERTER !!

This converter which is built around two valves type EF80 (Z719) is for use with T.R.F. or Superhet band I Television receivers. Complete set of TELETRON coils only, with practical and theoretical wiring diagram 15/- post free. Chassis measuring 7 in. x 3 1/2 in. x 1 1/2 in. ready drilled to specification, 3/9 plus 9d. packing and post. Alternatively construction details only with separate individually priced parts list, 6d. post paid. The complete kit as specified, including all the above valves, etc., down to the last nut and bolt, can be supplied at 48/6 only, plus 2/- packing and post. N.B. We can supply from stock the full range of Band III aerials by Aerialite, Selling Lee, etc., etc., etc. Please state your requirements.

No. 17 Mk. II TRANSMITTER/RECEIVER. Built into strong wooden cabinet 15 in. x 14 in. x 9 in. Complete with headphones and microphone. Range 5-8 miles with simple aerial. 44-61 mcs. (5-7 metres). Uses standard 120 v. I.L.T. and Auto lead 230 v. Input, 250-0-250 120 mA. 6.3 v. 4 A. 5 v. 2 A. Upright mounting, 21/- plus 2/- P. & P. 230 v. Input. 300-0-300 80 mA. 6.3 v. 3 A. 4 v. 2 A. Tropicalised drop-through type, 9/6 only, plus 1/6 P. & P. Input 110/230 v. Auto lead 230 v. 750 mA. 350-0-350 130 mA. Tapped filament winding 6 v. 3 A. 15 v. 3 A. 21.5 v. 6 A. also 5 v. 2 A. Tropicalised drop-through type, 21/- plus 2/6 P. & P. 270-0-270, 100 mA. 6.3 v. 3 A. 5 v. 2 A. 200/250 v. Input universal mounting 16/6, plus 1/6 P. & P.

U.S.A. PACKARD-BELL PRE-AMPLIFIER. Incorporating valves. 6SL7GT, 28D7GT, relay-plugs, sockets, condensers, etc. Brand new, with instruction booklet, 12/6 only.

MAINS TRANSFORMER BARGAINS! Limited quantities. Manufacturers' Surplus 350-0-350, 80 mA., 6.3 v. 3 a., 5 v. 2 a. Half shrouded, drop-through, 14/6 only, plus 1/6 P. & P. 110/210/240 v. Input. 350-0-350, 120 mA., 6.3 v. 6 A., 6.3 v. 1.5 A., 5 v. 3 A., tropicalised drop-through type, 21/- only, plus 2/6 P. & P. 110/210/240 v. Input. 350-0-350, 120 mA., 6.3 v. 6 A., 6.3 v. 1.5 A., 5 v. 3 A., tropicalised drop-through type, 9/6 only, plus 1/6 P. & P. Input 110/230 v. Auto lead 230 v. 750 mA. 350-0-350 130 mA. Tapped filament winding 6 v. 3 A. 15 v. 3 A. 21.5 v. 6 A. also 5 v. 2 A. Tropicalised drop-through type, 21/- plus 2/6 P. & P. 270-0-270, 100 mA. 6.3 v. 3 A. 5 v. 2 A. 200/250 v. Input universal mounting 16/6, plus 1/6 P. & P.

L.T. TRANSFORMER — ADMIRALTY. Heavy duty type, 180 230 v. Input, 4.2 v. plus 4.2 v. at 10 amp. 25/- only, plus 1/6 P. & P. Also manufacturers' surplus. Input 180/200/220/250 v. Output 6 v. 2 a. and 6 v. 6 a. 15/- only, plus 1/6 P. & P.

TELESCOPIC AERIAL MAST. EX-R.F. dinghy transmitter mast. Total length when extended, 17ft. Collapses into two sections each approx. 24in. Complete with dies and lashings, lightweight duralumin construction, dia. at thickest point, 1 1/2 in. approx., tapering to 1/2 in. New condition, 32/6, plus 2/- post and packing.

EX-W.D. CATHODE RAY TUBES. Guaranteed full picture. VCR97 at 40/- VCR517C at 25/-. Also VCR139A. Ideal for oscilloscopes. 2 1/2 in. screen at 35/-. We also have VCR97 with slight cut-off very suitable for oscilloscopes, testing purposes, etc., at 15/- only. All these tubes are brand new, in original packing, and tested before despatch. Please add 2/6 packing and carriage for any of the above tubes.

TRANSISTORS. Mullard Type OC71 available from stock, 40/- post free.

AMERICAN INDICATOR UNIT TYPE BC929A. Brand new incorporating 3 in. tube 3BP1 with mu-metal shielded 2-6SN7GT, 2-6HG6GT, 6XS6, 2X2, 6G6G, 9 potentiometers 24 v. aerial switch motor, transformer and a host of small components. The whole unit which measures 1 1/2 in. x 8 1/2 in. x 1 3/4 in. is brand new, enclosed in black crackle box, and can be supplied at 65/-, plus 5/- P. & P.

PORTABLE CABINETS. Manufacturers' surplus. Well made brown rexine covered. Will take any standard single player with bottom clearance of 3 in. Total size closed 15 in. x 13 1/2 in. x 5 1/2 in., fitted with snap catches and carrying handle. 22/6 only, plus 2/6 P. and P.

THE R.C. 3/4 WATT AMPLIFIER KIT. Just released! Compare the advantages! Triple bass AND middle tone controls! For crystal or magnet pick-up. A.C. Mains. 200/250 v. Valve line-up, 6V6GT, 6SG7, metal 6X5GT. Negative feedback. Built on stove enamelled steel chassis, measuring only 8in. x 4in. x 1 1/2in. Four engraved cream knobs are included in the price of the complete kit with all necessary practical and theoretical diagrams, at £4/5/- only, plus 2/6 packing and post, or Instruction Book fully illustrated, for 1/-, post free! This amplifier can be supplied assembled, tested, and ready for use at £5/5/-, plus p. and p. Hearing is believing!



THE R.E.P. ONE-VALVE BATTERY RECEIVER KIT. Simple one-valve all dry battery receiver for headphones, easily built in one evening. All required components including headphones, can be supplied at inclusive cost of 42/- plus 2/- p. and p. Operated by Ever-Ready B114 type battery available at 7/9. Full assembly details available separately at 9d. plus 3d. post.

T.S.L. ELECTROSTATIC LOUD-SPEAKERS! A much-wanted need in High Fidelity reproduction! Model LSH75. Size only 3in. x 3in. x 1 1/2in. Weight 1 1/2oz. only. Capacity 800 pf. D.C. voltage 300 max. Tone frequency A.C. voltage, 60 volts max. effective. Test voltage at 50 cycles, 440 volts. Price only 12/6, plus 1/- p. and p. Model LSH100. Size 5in. x 4in. x 2in. Capacity 1100 pf. Response identical to LSH75. Weight 3 1/2oz. Price 21/-, plus 1/- p. and p. Fitted an electrostatic speaker to an ordinary loud-speaker system merely entails the use of two condensers and two resistors. These speakers have a high efficiency in the range of 5,000-20,000 cycles, and are a must for F.M., high quality recordings, and T.V. sound! Each speaker is supplied with full technical data, response curve, and wiring diagram.

PLAYING DESK! Two-speed 33 and 78 r.p.m. player by famous manufacturer. Complete with turn-over crystal pick-up. Already mounted on platform, ready to use. £5/19/6 only, plus 5/- p. and p.

COLLARO RC/54 PLAYER! Just released. Fawn leatherette covered portable case incorporating very latest Collaro 3-speed mixer-changer. Cream finish. Lightweight turn-over crystal pick-up head. Only £13/5/- cash, plus 5/- p. and p. complete, or 65/- deposit plus p. and p. and 12 monthly payments of 18/7/-.



Carrying cases in black leatherette finish. An extremely well-made case with chrome locks and corner-pieces for extra strength. This cabinet will house any 12in. Hi-Fi speaker, but can be put to a number of uses. Front panel and lid are removable. Size 18 1/2in. x 10 1/2in. x 16 1/2in. high, 47/6, plus 5/- post and packing. N.B. To the many previous purchasers of this cabinet at 55/- we are now no longer able to supply the baffle with cabinet. Thus the reduction!

LATEST IMPORTED F.M. COMPONENTS
UT.340. A self-contained V.H.F. front end Unit incorporating a grounded grid amplifier, mixer oscillator (ECC85) and first I.F. amplifier. Completely wired and tested. 59/9.
UT.341. As above but with baseplate and 2-gang condenser incorporating 1.3 reduction drive. Supplied pre-aligned. 95/5.
TA.350. 6-button Coil Pack for long, med. and short waves, gram and off, together with a F.M. position which incorporates switching for change over from A.M. to F.M. Designed for use with UT.340 or UT.341. 85/-.
Ratio Discriminator Colls. URF 10/- each.
10.7 mc/s. I.F. Trans., UF376, 7/- each.
AM/FM. We are now demonstrating the Chapman all wave FM/AM Tuner at £32/10/- tax paid. For those unable to call, illustrated literature is available. H.P. terms £8/10/- deposit, 12 monthly payments of 44/-. Also FM Tuner model FM81 by Chapman at £21. Model FM56 by Armstrong, also £21. H.P. Terms available.

VALVES
 We have perhaps the most up-to-date valve stocks in the trade. A stamp will bring complete list, but the following is selection only of brand new imported valve types, fully guaranteed. Purchase Tax Paid.

EABC80	EL41	10/6	PY81	10/-	
10/-	EL84	11/6	PY82	9/6	
EB41	7/6	EM80	9/-	PY83	11/6
EB91	7/6	EY51	UBC41	10/6	
EBC41	10/6	(large)	11/-	UCH4211/6	
EBF80	11/6	EY51	UF41	10/6	
ECC81	9/-	(small)	12/6	UL41	10/6
ECC82	9/-	EZ40	8/6	UY41	9/-
ECC83	9/-	EZ80	8/6	6AQ5	8/6
ECC85	10/-	PCF80	12/6	6AT6	8/6
ECH4211/6	PCF82	12/6	6AU6	9/-	
ECH8111/6	PCC84	12/6	6BA6	8/6	
ECL80	11/6	PL81	13/6	6BE6	9/-
EF41	10/6	PL82	10/6	6BW6	8/6
EF80	10/6	PL83	11/6	6X4	7/6
EF85	10/6	PY80	10/6	etc.	etc.
EF89	10/-				

THE "SUPERIOR" FOUR KIT. Our new four-valve receiver. A.C. mains. 200/250 v. M. and Long waves. As with our very successful "Economy Four" all required components are supplied. Valve line-up: 2 6SG7, 6 X5GT and 6 V6GT. Chassis ready drilled. Cabinet size: 10 1/2 in. x 10 in. wide. Maximum depth at base 5 in. tapering to 3 1/2 in. at top. Sloping front. Very attractively finished in light walnut and peach. Each component brand new and tested prior to packing. Complete instruction booklet with practical and theoretical diagrams is provided. Booklet available at 1/6 post free. Our price for complete kit, £6/9/6! Please add 2/6 packing and carriage. If preferred, we can supply Cabinet Assembly only, complete with Cabinet and bracket wave-change switch, dial, pointer, drum pulleys, drive spindle, drive spring and knobs, at 45/-, plus 2/6 packing and carriage. N.B.—Our kits are even supplied with sufficient solder for the job.



N.B. All our T.R.F. Kit circuits now include specially wound Denco "Maxi-Q" coils on polystyrene formers, improved performance! Price remains the same.

THE "ECONOMY FOUR" T.R.F. KIT
 A three-valve plus metal rectifier receiver. A.C. mains 200/250 v. Medium and Long waves. We can supply all required components right down to the last nut and bolt. Valve line-up 6K7 6J7 and 6V6. Chassis ready drilled—Cabinet size 12in. long by 6in. high by 5in. deep—Choice of Ivory or brown Bakelite, or wooden, walnut finish cabinet. Complete instruction booklet with practical and theoretical diagrams. Each component brand new and tested prior to packing. Our price £5/10/- complete—Remember this set is being demonstrated at our shop premises! We proudly claim that our fully illustrated instruction booklet is the most comprehensive available for this type of receiver—Booklet available at 1/6 post free. This is allowed if kit is purchased later. Please, 2/6 packing and carriage for complete kit.

THE R.C. GRAM REPLACEMENT CHASSIS KIT
 To meet the very great demand for this type of receiver, we have produced this unit. For Long, Medium and Short Waves. Valve line-up: 6K8 Frequency changer, 6K7, I.F. Amplifier, 6Q7 1st Audio Detector and A.V.C. 6V6 Output, 6X5 Full-wave rectifier. For A.C. mains 200/250 volts. A valve output. Excellent quality. High sensitivity. Provision for gram. Attractive illuminated black, red, green and gold dial for horizontal tuning. Four controls are: Tuning, L/M/S. Gram. Vol./on/off. Tone (variable). Drilled chassis, complete with wiring diagrams. Attractive illuminated black, red, green and gold dial for horizontal tuning. Four controls are: Tuning, L/M/S. Gram. Vol./on/off. Tone (variable). Chassis size: 13 1/2 in. x 5 1/2 in. x 2 1/2 in. Dial size: 10in. x 4 1/2 in. Assembly is simplified by the use of a 3-waveband coil pack, and pre-aligned 465 Kc/s. I.F. transformers—high-grade drop-through half-shrouded Mains Transformer, with voltage adjuster panel. This chassis can easily be assembled in one evening. Illustrated pamphlet with full assembly instructions, practical and theoretical wiring diagrams and itemised price list, 1/6 post free. The main items for this receiver can be supplied separately, as untested. Drilled chassis, complete with valve-holders, A/B panel, P/U panel, tuning condenser and ready-assembled dial and drive at 39/6. 3-waveband coil pack with gram position, 39/6, tax paid. Pair of 465 Kc/s. I.F. Transformers, 9/6 pair. Half shrouded drop-through Mains Transformer, 22/6. The total cost of ALL items purchased separately is nearly £10, but we shall be pleased to supply all the required components right down to the last nut and bolt at a special inclusive price of £8/8/-, plus 2/6 packing and postage. A set of four small brown and cream engraved knobs to suit is available at 1/2 each knob. This chassis is a professional job in every respect and can be seen and heard at our premises. This chassis can also be supplied, ready assembled in very limited quantities at £9/19/6, plus 5/- carriage and packing.

ARMSTRONG F.C.48. Their very latest high quality replacement chassis having provision for F.M. feeder unit, 8 valves, 4 wavebands. Independent bass and treble with unique thermometer visual indicator. Ready for use £23/18/- plus 5/- package and postage or £5/18/- deposit and 12 monthly payments at 33/9. Illustrated leaflet available.

DULCI RADIO/RADIOGRAM CHASSIS. All latest models including F.3 and F.3 push-pull are in stock. Cash or H.P. Ask for illustrated leaflet.

COLLARO 2010. Transcription motor with Studio Pick-up. This very popular unit can now be supplied from stock. £18/5/3 cash or 95/3 deposit, and 12 payments of 25/8.

London's largest selection of Amplifiers, Recording equipment, etc., etc.

THE R.C. RAMBLER ALL-DRY PORTABLE KIT
 Full assembly details with practical and theoretical diagrams can be supplied at 1/6 post free. This is a truly professional 4-valve superhet—all dry—for medium and long waves. A cream plastic top panel, with dial engraved in red and green, adds to the very imposing appearance of this model which is housed in an attractive cream and grey leatherette covered attache-case type cabinet; measuring only 9in. x 7in. x 5 1/2in. Weight less batteries 4 1/2lb., with batteries 6 1/2lb. This set really has everything! Built-in frame aerial, high quality, extremely sensitive, and very adequate volume from the 5in. speaker. Valve line-up 3V4, 1R5, 1S5, IT4. Also the required components, exactly as specified, including cabinet, can be supplied from stock at the special inclusive price of £7/7/- plus 2/6 p. and p. (less batteries). Uses Ever-Ready 90 v. H.T. type B126 at 9/3. Also L.T. 1.5 v. A.D. 35 at 1/4.



RAMBLER MAINS UNIT! At last we are able to offer our special mains units kit for using our popular all-dry "Rambler" on A.C. Mains. Complete kit, which when assembled fits snugly into battery compartment, can be supplied at 47/6, plus 1/6 packing and postage. Price includes all required components, and full assembly instructions. N.B.—This unit is completely self-contained in a metal box measuring 7in. x 2 1/2in. x 1 1/2in. and is ideally suitable for ANY all-dry battery portable requiring 90 v. H.T. and 1.5 v. L.T.

SUPER-QUALITY 6-VALVE RADIOGRAM CHASSIS
 Very limited quantity by Britain's leading quality manufacturers, 3 waveband, superhet, valve line-up, 6V6G, E240, ECH42, L63, EF41, and EBC41. Combined pick-up amplifier and A.F. amplifier on Radio and Gram. Employs a special circuit for gramophone pre-amplification. Large glass dial horizontal tuning measuring 1 1/2in. x 3 1/2in. Chassis superior: 14 1/2 x 9 x 8in. This is a measure chassis designed to sell originally in a Radiogram costing £79. Our price is £12/19/6 only, tax paid, plus 5/- packing and carriage. We will gladly demonstrate this chassis or any other working item from our stocks, to personal callers!

REGAL. A well-made cabinet in medium coloured walnut veneer. Size 29 1/2 x 14 1/2 x 29 1/2in. Uncut motor-board measures 25 1/2 x 13 1/2in. Record or tape storage aperture located on side motor-board measures 3 1/2in. wide x 12in. deep. Price £9/19/6 plus 10/- p. and p. H.P. terms available.



CLYNE RADIO LTD.
 18, Tottenham Court Road, London, W.1.



SELENIUM RECTIFIERS

L.T. Types	H.T. Type H.W.	
2/6 v. 1/2 a.h.w. . . . 1/9	120 v. 40 mA. . . . 3/11	
6/12 v. 1/2 a.h.w. . . . 2/9	250 v. 50 mA. . . . 5/9	
	250 v. 80 mA. . . . 7/9	
F.W. Bridge Types	250 v. 150 mA. . . . 9/9	
6/12 v. 1 a. . . . 5/9	RM4 250 v. 250	
6/12 v. 2 a. . . . 8/9	mA. . . . 11/9	
6/12 v. 4 a. . . . 15/9	300 v. 275 mA. 12/11	

CO-AXIAL CABLE. 75 ohms $\frac{1}{2}$ in., 7d. yard. Twin screened feeder, 10d. yard.

SILVER MICA CONDENSERS. 5, 10, 15, 20, 25, 30, 35, 50, 100, 120, 150, 180, 200, 230, 300, 330, 400, 470, 500, 1,000 pfd. (.001 μ F), .002 mfd. (2,000 pfd.). All at 5d. each, 3/9 dozen one type.

DIAL BULBS, M.E.S., 8 v. 0.15 a., 6/9 doz.; 6.5 v. 0.3 a., 6/9 doz.; 4 v. 0.3 a., 6/- doz.

ELECTROLYTICS (current production). NOT ex-Govt.

Tubular Types	Can Types
8 μ F 450 v. . . . 1/9	16 mfd. 350 v. . . . 1/11
8 mfd. 500 v. . . . 2/6	16 μ F. 450 v. . . . 2/9
16 μ F 350 v. . . . 2/3	24 μ F 350 v. . . . 2/11
16 μ F 450 v. . . . 2/9	32 μ F 350 v. . . . 2/11
16 μ F 500 v. . . . 3/9	32 mfd. 450 v. . . . 4/9
32 μ F 350 v. . . . 3/9	64 mfd. 450 v. . . . 3/11
32 mfd. 500 v. . . . 5/9	64 mfd. 450 v. . . . 4/9
8-16 μ F 500 v. . . . 4/11	100 mfd. 450 v. . . . 4/9
25 μ F 25 v. . . . 1/3	8-8 μ F 450 v. . . . 3/6
50 μ F 12 v. . . . 1/3	8-8 mfd. 500 v. . . . 4/9
50 μ F 50 v. . . . 2/3	8-16 μ F 450 v. . . . 2/11
100 mfd. 12 v. . . . 1/9	16-16 μ F 450 v. . . . 4/11
100 mfd. 25 v. . . . 2/3	16-32 μ F 350 v. . . . 4/9
	32-32 μ F 350 v. . . . 4/9
	32-32 μ F 450 v. . . . 5/9

Many others in stock.

VOLUME CONTROLS with long spindles, all values, less switch, 2/9; with S.P. switch, 3/9.

WIRE WOUND POTS: 20 ohms, 500 ohms, 5K, 20K, 100K (medium length spindles), 2/9. 220 ohms, 2K, 10K, 20K. Preset type, 1/9 each.

VIBRATORS. Wearite 12 v. 4 pin. Non-synchronous, 6/9. Oak 2 v. 7 pin, synchronous, 7/9.

EX GOV. E.H.T. SMOOTHING CONDENSERS
 .25 mfd., 4,000 v. Blocks 4/9
 .5 mfd., 2,500 v. Blocks 3/9
 .5 mfd., 3,500 v. Cans 3/3
 1 mfd. plus 1 mfd. 8,000 v., large blocks (common negative isolated) 9/6
 1.5 mfd., 4,000 v. Blocks 5/9

EX GOVT. METAL BLOCK PAPER CONDENSERS
 2 mfd. 800 v. . . . 1/9 6-6 mfd. 450 v. . . . 5/9
 4 mfd. 500 v. . . . 2/9 8 mfd. 500 v. . . . 5/9
 4 mfd. 1,000 v. . . . 4/3 8-8 mfd. 500 v. . . . 5/11
 4 mfd. 1,500 v. . . . 4/9 15 mfd. 500 v. . . . 7/9
 4 mfd. 400 v. plus 2 mfd. 250 v. . . . 1/11

EX GOVT. VALVES. VR137 11d., EA50, EB34, 12H6, 9d.

EX GOV. UNITS, type RF26 in original sealed cartons 39/6. Transmitter Receivers type TR9D complete with all valves 45/-, Carr. 6/6.

CONTROL PANEL with 1 six-position 3-wafer Yaxley switch, 1 pointer knob, 2 S.P.S.T. switches, various plugs and sockets. Only 1/6.

M.E. SPEAKERS. All 2-3 ohms, 8in. R.A. field, 600 ohms, 11/9. 10in. R.A. field, 1,000 ohms, 23/9.

MANUFACTURERS SURPLUS TRANSFORMERS

Fully shrouded upright. Primary 200-230-250 v. Sec. 425-0-425 v. 150 mA. 6.3 v. 3 a. 5 v. 3 a. 37/9.

HEAVY DUTY BATTERY CHARGER
 For normal 200/250 v. A.C. mains input. To charge 12 v. battery. Variable charge rate up to 10 amps. Fitted Meter and Fuses. Guaranteed 12 months. Carr. 10/-, £6/19/6.

OIL FILLED BLOCK CONDENSERS

Bryce 11-7 mfd. 500 v. New unused Govt. surplus, only 5/9 each.

H.T. ELIMINATOR AND TRICKLE CHARGER KIT with louvred crackle finished case. Mains input 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.

R.S.C. TRANSFORMERS

FULLY GUARANTEED, INTERLEAVED AND IMPREGNATED

MAINS TRANSFORMERS

Primaries 200-230-250 v. 50 c/s.

FULLY SHROUDED UPRIGHT MOUNTING

250-0-250 v. 60 mA. 6.3 v. 2 a., 5 v. 2 a., Midget type, 2 1/2-3 in. . . . 17/6

350-0-350 v. 70 mA., 6.3 v. 2 a., 5 v. 2 a. . . . 19/9

250-0-250 v. 100 mA., 6.3 v.-6.4 v. 4 a., c.t., 0-4-5 v. 3 a. . . . 26/9

250-0-250 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 23/9

250-0-250 v. 100 mA., 6.3 v. 6 a., 5 v. 3 a., for R1355 conversion 31/-

300-0-300 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 23/9

300-0-300 v. 100 mA., 6.3 v.-4 v. 4 a., c.t., 0-4-5 v. 3 a. . . . 28/9

350-0-350 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 23/9

350-0-350 v. 100 mA., 6.3 v. 4 v., 4 a., c.t., 0-4-5 v. 3 a. . . . 26/9

350-0-350 v. 150 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 33/9

350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a. . . . 33/9

425-0-425 v. 200 mA., 6.3 v. 4 a., c.t., 6.3 v. 4 a., c.t., 5 v. 3 a., suitable Williamson Amplifier, etc. . . . 49/9

450-0-450 v. 250 mA., 6.3 v. 6 a., 6.3 v. 6 a., 5 v. 3 a. . . . 69/6

TOP SHROUDED DROP-THROUGH TYPE

250-0-250 v. 70 mA., 6.3 v. 2.5 a. . . . 13/9

260-0-260 v. 70 mA., 6.3 v. 2 a., 5 v. 2 a. . . . 16/9

350-0-350 v. 80 mA., 6.3 v. 2 a., 5 v. 2 a. . . . 18/9

250-0-250 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 22/9

300-0-300 v. 100 mA., 6.3 v.-4 v. 4 a., c.t., 0-4-5 v. 3 a. . . . 23/9

350-0-350 v. 100 mA., 6.3 v. 4 a., c.t., 5 v. 3 a. . . . 22/9

350-0-350 v. 100 mA., 6.3 v.-4 v. 4 a., c.t., 0-4-5 v. 3 a. . . . 23/9

350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a. . . . 29/11

350-0-350 v. 150 mA., 6.3 v. 4 a., 5 v. 3 a. . . . 29/9

E.H.T. TRANSFORMERS, 2,500 v. 5 mA., 2-0-2 v. 1.1 a., 2-0-2 v. 1.1 a., for VCR97, VCR517 37/6

FILAMENT TRANSFORMERS

Primaries 200-250 v. 50 c/s. 0-4-6.3 v. 2 a. . . . 7/9

6.3 v. 1.5 a. . . . 5/9 0-2-4-5-6.3 v. 4 a. . . . 16/9

6.3 v. 3 a. . . . 8/11 6.3 v. 6 a. . . . 17/6

12 v. 1 a. . . . 7/9 12 v. 3 a. or 24 v. . . . 17/6

6.3 v. 2 a. . . . 7/6 1.5 a. . . . 17/6

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s. Primaries: 0-9-15 v. 1 1/2 a., 11/9; 0-9-15 v. 3 a., 0-3.5-9-17 v. 4 a., 18/9; 0-9-15 v. 5 a., 19/9; 0-9-15 v. 6 a., 23/9.

ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s. 120 v. 40 mA. 7/11

130 v. 50 mA., 6.3 v. 3 a. . . . 14/9

120 v. 40 mA., 5-0-5 v. 1 a. . . . 14/9

90 v. 15 mA., 6-0-6 v., 250 mA. . . . 9/11

OUTPUT TRANSFORMERS

Midget Battery Pentode 66:1 for 3S4, etc. . . . 3/6

Small Pentode, 5,000 Ω to 3 Ω 3/9

Standard Pentode, 5,000 Ω to 3 Ω 4/9

Battery Pentode, 8,000 to 3 Ω 4/9

Multi-ratio 40 mA. 30:1, 45:1, 60:1, 90:1, Class B Push-Pull 5/6

Push-Pull 8 Watts 6V6 to 3 ohms 8/9

Push-Pull 10-12 Watts 6V6 to 3 Ω to 15 Ω , sectionally wound 16/9

Push-Pull 10-12 Watts to match 6V6 to 3.5-8 or 15 Ω 16/9

Push-Pull 15-18 Watt, sectionally wound, 6L6, KT66, etc., to 3 or 15 ohms 21/9

Push-Pull 20 Watt high-quality sectionally wound, 606, KT66, etc., to 3 or 15 Ω 47/9

SMOOTHING CHOKES

250 mA., 3 H., 100 ohms 11/9

150 mA., 7-10 H., 250 ohms 11/9

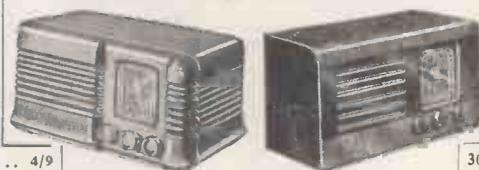
100 mA., 10 H., 150 ohms potted 9/9

100 mA., 10 H., 200 ohms 8/9

80 mA., 10 H., 350 ohms 5/6

60 mA., 10 H., 400 ohms 4/11

THE SKY FOUR T.R.F. RECEIVER



A design of a 3-valve 200-250 v. A.C. Mains receiver with selenium rectifier. For inclusion in either of cabinets illustrated above. It employs valves 6K7, SP61, 6F6G, and is specially designed for simplicity in wiring. Sensitivity and quality is well up to standard. Point-to-point wiring diagrams, instructions and parts list, 2/- This receiver can be built for a maximum of £4/19/6 including cabinet. Available in brown or cream bakelite, or veneered walnut.

P.M. SPEAKERS. All 2-3 ohms. 6 $\frac{1}{2}$ in. R.A. 13/9. 6 $\frac{1}{2}$ in. Plessy with 5,000 ohm output transformer, 16/11. 8in. Rola Heavy Magnet, 19/9. 10in. Rola with Trans., 29/6.

R.S.C. BATTERY CHARGER KITS.

For mains input 200-250 v. 50 c/s. To charge 6 v. accumulator at 2 amps., 25/9.

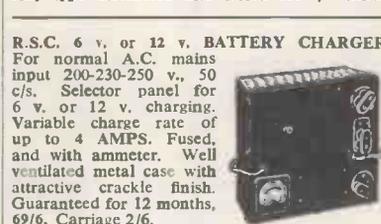
To charge 6 v. or 12 v. battery at 2 a., 31/6.

To charge 6 v. or 12 v. battery at 4 a., 49/9.

ABOVE KITS CONSIST OF GREEN CRACKLE LOUVRED STEEL CASE, MAINS TRANSFORMER, FULL WAVE METAL RECTIFIER, FUSES, FUSE-HOLDERS AND CIRCUIT.

Any type assembled and tested for 6/9 extra.

R.S.C. 6 v. or 12 v. BATTERY CHARGER
 For normal A.C. mains input 200-230-250 v., 50 c/s. Selector panel for 6 v. or 12 v. charging. Variable charge rate of up to 4 AMPS. Fused, and with ammeter. Well ventilated metal case with attractive crackle finish. Guaranteed for 12 months, 69/6. Carriage 2/6.



EX GOVT. MAINS TRANSFORMERS

All 230 v. 50 c/s. Input. 48 v. 1 a. . . . 9/9

8.8 v. 4 a. . . . 7/9

978 v. 200 mA. . . . 7/9

Carriage on following types 5/- extra.

0-11-22 v. 30 a. . . . 72/6

16-18-20 v. 35 a. . . . 79/6

7.7 v. C.T. 7 amps., 4 times 25/9

460 v. 200 mA., 6.3 v. 5 a. . . . 27/9

300-0-300 v. 150 mA., 610-0-610 v. 150 mA., 1,200 v. 250 mA. . . . 29/6

400 v. C.T. 150 mA. 4 v. 5 a., 6.3 v. 6 a., 6.3 v. 0-6 a., 4 v. 6 a., 4 v. 6 a., 4 v. 3 a., 4 v. 3 a., 5 v. 2 a. . . . 22/9

325-0-325 v. 150 mA., 6.3 v. 4-6 a., 5 v. 2-3 a. . . . 29/9

EX GOVT. AUTO TRANSFORMERS

15-10-5-0-195-215-235 v. 500 Watts 27/9

Double wound 10-0-100-200-240 v. to 10-0-275-295-315 v. 1,000 watts 69/6

Double wound 0-110-240 v. to 0-130-140-150-160-170 v. 1,500 watts 69/6

Carriage on any of above 5/- extra.

EX GOVT. SMOOTHING CHOKES

250 mA., 10 H., 50 ohms 14/9

250 mA., 10 H., 100 ohms 14/9

250 mA., 3 H., 50 ohms 8/9

100 mA., 10 H., 100 ohms 10/11

100 mA., 10 H., 100 ohms, Tropicalised 6/9

100 mA., 5 H., 100 ohms, Tropicalised 3/11

50 mA., 50 H., 1,000 ohms, Potted 8/11

90/100 mA., 10 H., 100 ohms, Potted 8/9

50 mA., 5-10 H. . . . 2/9

L.T. type 1 amp. . . . 2/9

SPECIAL OFFER

Potted Mains Transformer. (Ex New Equip.). Primary 0-10-80-180-200-220-240 v., 50 c/s. secs. 250-0-250 v. 60 mA., 6.3 v. 2a., 5 v. 2 a. Size approximately 3 1/2 x 3 x 4 1/2 in. . . . 10/11

CHASSIS

18 s.w.g. undrilled aluminium amplifier type (4-sided).

14in. x 10in. x 3in. 7/11

16in. x 10in. x 3in. 8/3

18 s.w.g. aluminium receiver type.

6in. x 3 1/2 in. x 1 1/2 in. 1/11

7 1/2 in. x 4 1/2 in. x 2 in. 2/9

10in. x 5 1/2 in. x 2 in. 3/3

11in. x 6in. x 2 1/2 in. 3/11

16 s.w.g. aluminium amplifier type.

12in. x 8in. x 2 1/2 in. 5/3

16in. x 8in. x 2 1/2 in. 7/6

20in. x 8in. x 2 1/2 in. 8/11

16 s.w.g. aluminium amplifier type, 4-sided.

12in. x 8in. x 2 1/2 in. 7/11

16in. x 8in. x 2 1/2 in. 10/11

20in. x 8in. x 2 1/2 in. 13/6

14in. x 10in. x 3in. 13/6

R.S.C. HIGH FIDELITY 25 watt AMPLIFIER A4

A NEW DESIGN FOR 1955 HIGH GAIN "PUSH PULL OUTPUT". BUILT-IN PRE-AMP. TONE CONTROL STAGES. INCLUDES 7 valves, sectionally wound output transformer, block paper reservoir condenser, and reliable small components. AN INPUT OF ONLY 20 millivolts IS REQUIRED FOR FULL OUTPUT. THIS MEANS THAT ANY TYPE OF MICROPHONE OR PICK-UP IS SUITABLE. Two separate inputs controlled by separate volume controls allow simultaneous use of "Mike" and Gram., or Tape and Radio, etc., etc. Individual controls for Bass and Treble "lift" and "cut". Six negative feedback loops giving total



Hum level 66 D.B. down. Certified total harmonic distortion of only 0.35% measured at 10 watts. Comparable with the very best designs. SUITABLE FOR SMALL HOMES OR LARGE HALLS, CLUBS, GARDEN PARTIES, DANCE HALLS, etc., etc. For ELECTRONIC ORGAN OR GUITAR. For STANDARD OR LONG PLAYING RECORDS. Size 12 x 10 x 9 in. For mains A.C. 200-250 v. 50 c/s. Power consumption 175 watts. Outputs for 3 and 15 ohm speakers. The kit is complete in every detail. Chassis is fully punched. Easy to follow point-to-point wiring diagrams are supplied. EXTRA

loops giving total 30-20,000 c/s.

HIGH SENSITIVITY, HIGHEST QUALITY for 9 Gns. Or assembled ready for use 50/- extra.

H.P. Terms on assembled units. Deposit 26/- and 12 monthly payments of £1. Plus carr. 10/- Terms to include cover, mike, speakers, etc., on request. Cover as illustrated if required, price 17/6 extra.



BRAND NEW B.S.R. MONARCH 3-SPEED MIXER AUTO-CHANGERS. With crystal pick-up and dual point sapphire stylus for standard or long playing records. Plays ten 7in., 10in. or 12in. intermixed. For A.C. mains 200-250 v. 50 c/s. Supplied in sealed cartons with template and operating instructions. Only 9 gns. plus 5/- carr., or 2 gns. deposit and 11 monthly payments 17/6.

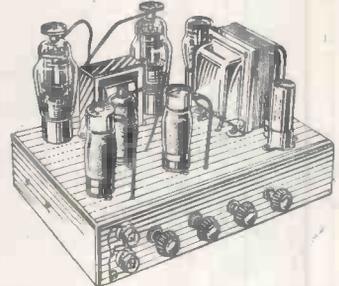
COLLARO HIGH FIDELITY MAGNETIC PICK-UPS. High impedance type. Limited number, brand new, boxed and perfect at fraction of normal price. Only 35/-.

COLLARO 3-SPEED AUTO-CHANGERS. New guaranteed units. Fitted "Plug in" crystal pick-up heads for standard or long playing records. Very limited number available at approx. half price. For A.C. mains 200-250 v. 50 c/s. Only £7/19/6. Carr. 7/6

DEFIANT RECORD PLAYING TURNTABLE COMPLETE WITH MAGNETIC PICK-UP. Pick-up is high impedance type. Unit is housed in a beautiful walnut veneered cabinet of attractive design. For all standard records (78 r.p.m.). Limited number. Brand new, cartoned, £5/19/6. Carr. 7/6.

ACOS HIGH FIDELITY CRYSTAL MICROPHONES. Type 22-2. Complete with table stand. Normal price 4 gns. Limited stocks, brand new, boxed £2/19/6.

R.S.C. A3 10 WATT "PUSH-PULL" HIGH FIDELITY AMPLIFIER With Self-Contained Pre-amplifier and Tone Control



A PUSH PULL 3-4 WATT HIGH GAIN ASSEMBLED AMPLIFIER FOR £3/19/6. For mains input 200-250 v. 50 c/s. Complete kit of parts, including point-to-point wiring diagrams and instructions. Amplifier can be used with any type of feeder unit or pick-up. This is not A.C./D.C. with "live" chassis but A.C. only with 400-0-400 v. Trans. Output is for 2-3 ohm speaker. Supplied ready for use. £3/19/6. Full descriptive leaflet 6d.

H.M.V. LONG PLAYING RECORD TURNTABLE COMPLETE WITH CRYSTAL PICK-UP (SAPPHIRE STYLUS). Speed 33 1/3 r.p.m. BRAND NEW, CARTONED. Only £3/19/6 (approx. half price). Carr. 5/- (for 200-250 v. A.C. Mains).

R.S.C. A7 3-4 WATT QUALITY AMPLIFIER A highly sensitive 4-valve amplifier using negative feedback and having an excellent frequency response. Pre-amplifier and Tone Control stages are incorporated with separate Base and Treble controls giving full tone compensation for Long Playing records. Suitable for any kind of pick-up including latest high fidelity types. H.T. of 250 v. 20 mA. and L.T. 6.3 v. 1a. available for supply of Radio Feeder Unit, etc. ONLY 40 millivolts input required for full output. Fully isolated chassis with baseplate. For A.C. mains 200-250 v. 50 cycles. Output for 2-3 ohm speaker. Complete kit of parts with point-to-point wiring diagrams and instructions. Only £3/15/-.

R.S.C. 4-5 WATT HIGH GAIN AMPLIFIER TYPE A5

A highly sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high-fidelity pick-up heads, in addition to all other types of pick-ups and practically all mikes. Separate Base and Treble controls are provided. These give full long playing record equalisation. Hum level is negligible being 71 D.B. down. 15 D.B. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape Deck pre-amplifier. For A.C. mains input of 200-230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate), with green crackerie finish, and point-to-point wiring diagrams and instructions. Exceptional value at only £4/15/-, or assembled ready for use 25/- extra, plus 3/6 carriage.



R.S.C. MASTER INTERCOMM. UNIT. with provision for up to 4 "Listen-Talk Back Units" individually switched. A high gain amplifier enables speech and other sounds emanating from the rooms containing remote control units to be heard at the master control. Supplied with walnut veneered wood or brown bakelite cabinet. Mains input is 200-250 v. 50 c/s. H.T. line 300 v. CHASSIS IS NOT "ALIVE." Ideal for use as "Baby Alarm." Sound amplification 4 watts. Price only £7/15/-. "Listen-Talk Back Unit" in bakelite or walnut veneered cabinet, can be supplied at 35/- each.



ALL DRY RECEIVER BATTERY SUPER-SEDER KIT

All parts for an "All Dry" Battery Eliminator, complete with case. Completely replaces 1.4 v. and 90 v. batteries where normal mains supply of 200-250 v. 50 c/s. is available. Price with circuit, 38/9 Or ready for use, 45/6

Size of unit 5 1/2 x 4 1/2 x 2 1/2 in. Suitable for receivers with L.T. loads of 125 mA. to 250 mA., thereby covering latest low consumption types.

BATTERY SET CONVERTER KIT. 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 0.4 a. to 1 a. Price complete with circuit and instructions only 48/9. Supplied ready for use for 8/9 extra.

Large safety factors in every component A.C. and H.T. fuses, punched chassis with baseplate, screened input plugs, 6 valves, and with easy-to-follow point-to-point wiring diagrams. Everything supplied to last nut. Two independent inputs are provided with two associated independent volume controls so that programmes can be mixed together if desired, such as microphonic announcements superimposed on a musical programme, or two independently controlled microphones, or even just gramophone/radio, fading over from one to the other. Variable base lift and cut with variable treble lift and cut tone controls are fitted, giving full long playing record equalisation for uncorrected pick-ups. They are also provided so that the user can alter the tone value to suit his personal taste and surroundings. Terminals are provided for 3 ohm and 15 ohm loudspeakers. H.T. and L.T. available for the supply of a Radio Feeder Unit. Six Negative Feedback Loops. 150 millivolts input only required for full output. Frequency response 50-20,000 cycles. Negligible hum and distortion. For A.C. mains input 200/230/250 v. 50 c/s.

COMPLETE Kit of Parts 7 GNS. (carriage 7/6). Supplied, assembled and tested for 45/- extra. Cover as for A4 amplifier 17/6 extra if required. H.P. TERMS on assembled units. Deposit 23/6 and 9 monthly payments 21/-.

FOUR-STAGE RADIO FEEDER UNIT Design of a HIGH FIDELITY L. and M. wave T.R.F. Unit with self-contained heater supply and thorough H.T. decoupling. Only 250-400 v. 15-20 mA. H.T. required from main amplifier. Three valves and Low Distortion Germanium Diode Detector. Flat topped response characteristic. Loaded H.F. coils. Two variable Mu controlled H.F. stages, 3 gang condenser tuning. Cathode follower output stage. Switch position for Gram. and Gram. input and output sockets. Performance comparable with the best in Feeder Units. For A.C. mains 200-230-250 v. operation. Size 11-6-7/16 in. Illustration, full set of easy-to-follow wiring diagrams and instructions and individually priced parts list 2/6. This unit can be built for only £3/15/-, including Dial and Drive Knobs and every item required.

W.B. "STENTORIAN" HIGH FIDELITY P.M. SPEAKERS. HF1012, 10 watts, 15 ohm (or 3 ohm) speech coil. Where a really good quality speaker at a low price is required we highly recommend this unit with an amazing performance. £3/17/6.

MICROPHONES. Crystal, hand or Desk type, high fidelity Acos, 50/-. Stand type with base and adjustable stem, £6/19/6. Both suitable for use with our amplifiers.

GOLDRING MAGNETIC PICK-UPS. Due to a fortunate purchase we can offer these popular high impedance pick-ups. Brand new, boxed, at only 23/9

Radio Supply Co. (LEEDS) LTD.

32 THE GALLS. — LEEDS, 2.

Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/- extra under 10/-, 1/- extra under £2, 2/6 extra under £3. Full Price List 6d. Trade List 5d. Open to Callers: 9 a.m. to 5.30 p.m. Saturday until 1 p.m.

RECEIVER CHASSIS

Modernise your old Radiogram

RECORD PLAYERS

COMPLETE RADIOGRAM EQUIPMENT—QUALITY AT LOW COST

STERN'S DESIGN FOR HOME CONSTRUCTORS

The "SUPER-SIX"

A compact and highly efficient superhet Radio-Radiogram chassis of outstanding quality.

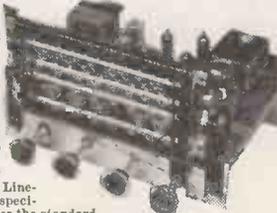
YOU CAN BUILD IT FOR £10/7/6

Including the OCTAL VALVE LINE-UP (£12/7/6 with the miniature valves).

Incorporating the new B.V.A. Miniature Valve Line-up. This receiver is designed to the very latest specification and provision is made to incorporate either the standard Octal Valve line-up or the new B.V.A. range of miniature valves. Great attention has been paid to the quality of the reproduction of both Radio reception and Record playings, and excellent clarity of speech and music is obtained.

- Covers 3 wavebands 18-50 metres, 190-550 metres and 800-2,000 metres.
- Employs 6 valves having PUSH-PULL for 5-6 watts output.
- Incorporates delayed A.V.C. on all wavebands and pre-selective feedback.
- A 4 position Tone Control operation on both Radio and Gram.
- Has independent mains supply socket for a Record Player.
- Size of Assembled Chassis 12x8x8in. Dial aperture 8 1/2 x 4 1/2 in.
- For operation A.C. mains 200-250 volts 50 cycles.

THE INSTRUCTION and ASSEMBLY MANUAL is available for 1/6. It contains very detailed practical drawings and circuit diagrams and a complete Component Price List.



A BULK PURCHASE ENABLES US TO OFFER THIS "PUSH-PULL" 7-VALVE SUPERHET RECEIVER For only £12/19/6

(Carr. & ins. 7/6 extra)
H.P.—£4/6/8 Dep. 70 mths. at 19/2.
These receivers Models AW3-7 are made by a well-known set of manufacturers and incorporate the latest Osram Valve Line-up of X79—W77—DH77—H77—U78 and two N78s in Push-Pull for approx. 7 watts output. They cover 3 wavebands 18-50 metres, 190-550 and 800-2,000 metres, and are for operation on A.C. mains 200-250 volts. A Gram. position is on the Wave-change Switch.

They make an excellent replacement Radiogram Chassis having a P.U. connection on the Chassis. Extension speaker connection is also provided. Overall size of chassis: 12in. long x 7 1/2 in. x 6 1/2 in. high, dial aperture 8 1/2 x 4 1/2 in. (Dial Escutcheon available for 4/6).

THE MODEL F3PP. RADIO-RADIOGRAM CHASSIS

Model F3PP. A 7-valve 3-waveband Superhet Chassis with a Push-Pull Stage. This Chassis has been designed with particular regard to the quality of reproduction. It incorporates SEPARATE BASS and TREBLE CONTROLS, thereby ensuring the utmost flexibility of Tone on both Radio and Gram.

- Waveband coverage 16-50, 190-550 and 900-2,000 metres.
- Valve line-up X79, 6BA6, 6AT6, ECC83, GZ30 and two AQ5s in push-pull for approx. 6 watts output.
- Negative feedback and delayed A.V.C.
- Has independent mains supply socket for gram. connection.
- Overall size of Chassis 12x8in. high x 7in. with dial size 11 1/2 in. long x 4 1/2 in.

For use on A.C. Mains 100 110 volts and 200 250 volts.
Cash Price, tested and ready for use **£17/17/0**
H.P. Terms; Deposit £5/19/- and 12 monthly payments of £1/1/10 (plus 7/6 carr. and ins.)

WE RECOMMEND THE W.B. "STENTORIAN" P.M. SPEAKERS
They have the NEW CAMBRIC CONE and a matching device for 3 ohm-7.5 and 15 ohm outputs.

(a) 5in. Model HF510	£1 19 6	(d) 9in. Model HF912	£3 9 6
(b) 6in. " HF610	£2 12 6	(e) 10in. " HF1012	£3 17 6
(c) 8in. " HF810	£3 5 6	(f) 12in. " HF1214	£9 15 6

OTHER TYPES IN STOCK

3 1/2in. P.M. 3 ohm V/Coil	15 9	8in. P.M. 3 ohm V/Coil 18/9, 19/6 & 25/-	
5in. P.M. 3 ohm V/Coil	16 6	10in. P.M. 3 ohm V/Coil	25/- & 37/6
6 1/2in. P.M. 3 ohm V/Coil	16 9	12in. P.M. 15ohm V/Coil	£5 5 0

All are NEW and FULLY GUARANTEED

SPECIAL REDUCTIONS FOR COMPLETE EQUIPMENT

SUMMARY—Select a RECEIVER CHASSIS and we will supply it TOGETHER WITH A 3-SPEED CHANGER AND AN 8in. or 10in. P.M. SPEAKER as follows:—

THE B.S.R. MONARCH, P.M. SPEAKER and:—

(a) With Model B3PP Chassis	Cash Price £7 1 3	Deposit £5 15 0	Monthly (12) £1 8 1
(b) With Model AW3-7 Chassis	£8 0 0	£6 0 0	£1 9 3
(c) With Model F3PP Chassis	£9 12 6	£7 4 6	£1 15 2
(d) With Model FC48 Chassis (includes Goodmans 10in. P.M.)	£11 16 0	£8 17 6	£2 3 3

THE COLLARO MODEL R.C.54, P.M. SPEAKER and:—

(a) With Model B3PP Chassis	£8 3 0	£6 2 0	£1 9 11
(b) With Model AW3-7 Chassis	£8 10 0	£6 7 0	£1 11 1
(c) With Model F3PP Chassis } Includes latest Goodmans	£10 6 0	£7 14 0	£1 17 8
(d) With Model FC48 Chassis } 10-in. P.M. Speaker	£12 6 0	£9 4 0	£2 5 1

This 3-SPEED AUTOCHANGER is by

a Famous Manufacturer and is offered for **£9/19/6** (Plus 7/6 carr. & ins.) Normal Price £13/10/-

Hire Purchase Terms £3/6/8 Dep. and 8 months at 18/10.

- These units will autochange on all three speeds, 7in., 10in and 12in
- They play MIXED 7in., 10in. and 12in. records.
- They have separate sapphire for L.P. and 78 r.p.m., which are moved into position by a simple switch.
- Minimum baseboard size required 14x12in., with height above 5 1/2 in. and height below baseboard 2 1/2 in. A bulk purchase enables us to offer these BRAND NEW UNITS At this exceptional price.



WE CAN ALSO SUPPLY

- (a) THE GARRARD 3-SPEED CHANGER MODEL R.C.80M.
- (b) THE GARRARD 3-SPEED NON-AUTO MODEL "T."
- (c) THE COLLARO 3-SPEED CHANGER MODEL R.C.54.
- (d) THE COLLARO 3-SPEED NON-AUTO MODEL 3/554.
- (e) THE B.S.R. 3-SPEED NON-AUTO MODEL HF100.

All of these are the very latest models. Send S.A.E. for details.

WE CAN SUPPLY FROM STOCK



The COLLARO 3-SPEED "TRANSCRIPTION" PLAYERS

MODEL 2010 with the NEW LIGHTWEIGHT "STUDIO P" CRYSTAL PICK-UP.

PRICE £18/5/3 (plus 7/6 carriage and insurance)

H.P. TERMS: Deposit £6/1/9, 12 monthly payments of £12/4.

!!! EARLY NEWS !!!

About Mid-September we will have available

A COMBINED "A.M.-F.M."

RADIO-RADIOGRAM REPLACEMENT CHASSIS

It is designed to the very latest specification, incorporating the NEW VALVE LINE-UP—AN INDUCTANCE TUNING UNIT (for FM)—generous sized OUTPUT TRANSFORMER providing matching for 3 and 15 ohm SPEAKERS—PERITE ROD Internal AERIAL (for AM)—"MAGIC EYE" INDICATOR and other outstanding features.

In designing this chassis particular regard has been paid to achieving really high quality reproduction of both RADIO and GRAMOPHONE.

Descriptive leaflets will be available in late September. Send S.A.E. for one.

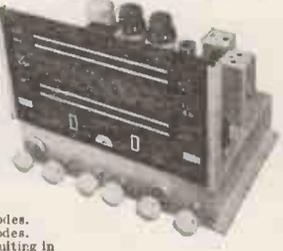
THE NEW

ARMSTRONG F.C. 48

A high quality replacement Radio or Radiogram Chassis having provision for an F.M. Feeder Unit.
PRICE ASSEMBLED AND READY FOR USE.

£23/18/0

(Plus 7/6 Carr. and Ins.)
H.P. Terms: £8 Deposit and 12 months at £1/9/2.



- 8 Valves including 2 double Triodes.
- 8 Watts output from push-pull tetrodes.
- Heavy negative feedback is used, resulting in negligible distortion and high damping factor.
- Provision for using FM adaptor to receive the present high quality transmissions from Wrotham and the new B.B.C. V.H.F. stations.
- An accessible socket at rear provides the power supply for this unit.
- Independent controls give BASS and TREBLE lift and cut with unique Thermometer visual indicator.
- Gram. position on a wavechange switch.
- 4 Wavebands Coverage 16-51, 50-120, 190-550, 1,000-2,000 metres.
- Large four-colour illuminated dial.

When submitting orders please include postage and packing.

STERN RADIO LTD.

"High Fidelity" Reproduction

RADIO TUNING UNITS
A.M. & F.M. DESIGNS

AMPLIFIERS ASSEMBLED OR KITS OF PARTS

'STERN'S' HIGH QUALITY 8-10 WATT AMPLIFIER

Having a front panel which is very attractively finished in deep gold, and on which the controls are clearly identified. The ideal amplifier for general home use and for small halls, etc.

Price of COMPLETE KIT including Valves and Drilled Chassis, etc. (Plus 2/6 carr. and Ins.) **£7/10/-**

We will supply it Completely Built for (Plus 5/- Carr. & Ins.) **£9/10/-**

H.P. Terms £2/10/0 Deposit, 8 months at 19/6.

Designed for high quality reproduction up to an output level of 10 watts, having 6V6s in Push-Pull and incorporating negative feedback. It is suitable for use with all types of Pick-ups and most types of microphones and the output transformer provides for use of 3 and 15 ohm speakers.

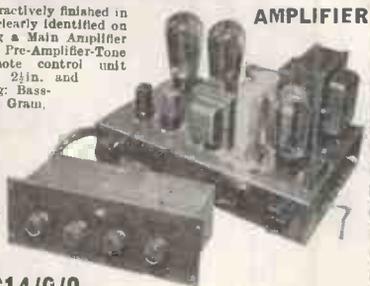
BRIEF FEATURES

- Valve line-up 6Z5, 6SN7, 5Z4, with 6V6s in push-pull.
- The understated output level of up to 10 watts is produced from an input of .25 volts.
- First class reproduction of Radio (where a Tuning Unit is used) and Record Playing.
- Separate Bass Boost and Treble Controls provide an excellent range of frequency control.
- Very satisfactory results are obtained with an average type of high impedance Moving Coil or Crystal Microphone, a clear speech level of approx. 5 watts output being obtained.
- Power supplies (HT and LT) are available for a Tuning Unit.
- For operation on A.C. Mains 200-250 volts 50 cycles.

THE ASSEMBLY MANUAL is available for 1/- and includes detailed layouts and component Price List.

'STERN'S' 12 WATT "HIGH FIDELITY" Push-Pull AMPLIFIER

A very high quality Unit attractively finished in deep gold with each control clearly identified on the front panel. Comprising a Main Amplifier Chassis and a Remote Control Pre-Amplifier-Tone Control Unit. The remote control unit measures only 9 x 4 x 2 1/2 in. and contains four controls, being: Bass-Treble-Volume and a Radio, Gram, Microphone Switch control. It incorporates its own feedback circuit on the Bass Channel. Loop negative feedback is employed on the Main Amplifier which has a valve line-up of 6J5-6N7-5U4 with two 6X25s in push-pull and 6J5 and 6SN7 are used in the remote control unit.



THE COMPLETE KIT IS AVAILABLE FOR (Carr. & Ins. 6/ extra.) **£14/0/0**

THE COMPLETE UNIT ASSEMBLED AND READY FOR USE (Carr. & Ins. 7/6 extra.) **£17/0/0**

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 and 6.3 volts at 2 amps, and 30 mA. H.T. is provided for tuning unit, etc. This Amplifier compares well with the Williamson and similar designs at a fraction of their cost. The complete set of assembly instructions is available for 2/-.

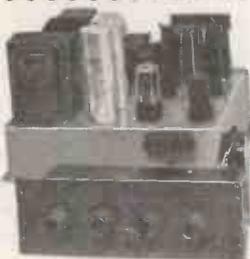
A COMPLETELY ASSEMBLED "HIGH FIDELITY" PUSH-PULL

AMPLIFIER. Supplied Complete with THE STERN'S DUAL CHANNEL TONE CONTROL PRE-AMPLIFIER UNIT FOR ONLY £13'13'/-

(plus 7/6 Carr. & Ins.) H.P. TERMS DEPOSIT £3/8/- and 12 monthly payments of 19/10. We are able to offer this equipment at such an attractive price only because of a bulk purchase of PARMEKO TRANSFORMERS, CHOKES, etc.

It is designed for really good reproduction employing two 6V6s in push-pull for approximately 10 watts output. A total of 7 valves are employed, the main Amplifier having 6J5-6SN7-two 6V6s and 5 Volt Rectifier and the separate Control Unit, which is identical to that supplied with the 12 Watt "Hi Fi" Amplifier described above has types 6J5 and 6SN7. Loop Feedback is employed over the whole of the main Amplifier and the PARMEKO OUTPUT TRANSFORMER ensures really good reproduction. Power take-off socket is provided for an external Radio Tuning Unit, the POWER SUPPLY AVAILABLE being 200 to 250 Volts at 45 mA. and 6.3 Volts at 14 amps.

WHEN ORDERING PLEASE STATE WHETHER FOR 3 OR 15 ohm SPEAKER.



The NEW "LEAK" TL/10 AMPLIFIER and "Point One" PRE-AMPLIFIER

This Amplifier has a maximum output of 10 watts and maintains in every respect the world renowned LEAK reputation for precision engineering, fine appearance and fastidious wiring. The Pre-Amplifier will operate from any make or type of pick-up. A continuously variable input attenuator at the rear of the Pre-amp. permits the instantaneous use of crystal, moving iron and moving coil pick-ups. H.T. and L.T. supplies are available for a Radio Tuning Unit. An input attenuator is fitted. S.A.E. for descriptive leaflet.

PRICES :

- (a) THE COMPLETE AMPLIFIER WITH PRE-AMPLIFIER £28/7/- or £7/2/- Deposit and 12 months at £1/19/-.
- (b) THE TL/10 MAIN AMPLIFIER ONLY: £17/17/-, or £4/7/- Deposit and 12 months at £1/4/9.
- (c) THE "POINT ONE" PRE-AMPLIFIER ONLY: £10/10/-, or £2/12/6 Deposit and 9 months at 19/6.



!! STERN'S AMAZING BARGAIN OFFER !!

WE HAVE BOUGHT THE ENTIRE STOCK OF THE FAMOUS MODEL B3PP RADIO or RADIOGRAM CHASSIS

A 6 VALVE 3 WAVEBAND SUPERHET with PUSH-PULL OUTPUT

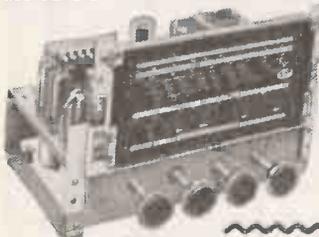
Thousands of these successful and very popular Receiver Chassis have been sold for **£15/15/-** each.

WE CAN NOW OFFER THEM FOR £11'19'6

(plus 7/6 carriage and insurance) H.P. Terms, Deposit £4 and 10 monthly payment of 17/10.

GENERAL DETAILS

- For use on A.C. Mains 100/110 Volts and 300/250 volts.
- Employs the latest Valves 6BE6, 6BA6, 6AT6, two 6W6Gs in push-pull and 6X4 (or similar) Rectifier.
- It has a Mains socket on the chassis for connection to Gram unit.
- Incorporates extension speaker and Pick-up sockets.
- Overall size of Chassis is 11in. x 7 1/2in. 8 1/2in. high. Dial size 8 1/2in. x 4 1/2in. (A Bronze coloured Dial Escutcheon is available for 4/6.)
- Waveband coverage is Short-wave 16 to 30 metres, Medium 187 to 550 and Long-wave 900 to 2,000 metres.
- Has four controls: (1) Volume Control with on-off switch. (2) Tone Control (operative on Gram and Radio). (3) Wavechange Switch with Gram position. (4) Tuning Control (Flywheel type drive).
- Negative Feedback is employed over the entire audio stages.
- Excellent reproduction up to approximately 6 watts output.



These Receiver Chassis have undoubtedly proved to be about the most popular and successful yet offered. They are designed to the most modern specification with great attention having been given to the quality of reproduction which gives really excellent clarity of speech and music or both Radio, and Gram.

THEY ARE THE IDEAL REPLACEMENT CHASSIS FOR THAT "OLD RADIOGRAM" ETC.

ALL CHASSIS ARE BRAND NEW and GUARANTEED FOR 12 MONTHS (B.V.A. VALVES 90 DAYS).

WILLIAMSON AMPLIFIERS BY GOODSSELL

These Amplifiers hardly need enlarging upon, being sufficient to say that they have now become the accepted standard for quality reproduction by which all others are judged. Two Models are available. SEND S.A.E. FOR ILLUSTRATED LEAFLETS.

SPECIAL PRICE REDUCTIONS

SELECT ANY TUNING UNIT (see page 147) and an assembled AMPLIFIER (or a TUNING UNIT, AMPLIFIER and RECORD PLAYER) and we will quote you a REDUCED PRICE for the combined order. H.P. TERMS ALSO QUOTED. . . . As an example we offer:

- (a) STERN'S 8-10 WATT AMPLIFIER and the Model CP34 (or DENCO F.M. TUNER) as assembled for £17/- (plus 10/- carriage & insurance). H.P. TERMS. Deposit £5/14/- 12 months of £1/0/9.
 - (b) The above Units with the B.S.E. MONARCH 3-SPEED CHANGER for . . . £26/10/- H.P. TERMS. Deposit £8/17/- 12 months of £1/12/5.
- EQUIPMENT OF THIS NATURE ENSURES "FIDELITY" REPRODUCTION ON BOTH RADIO AND GRAM.

109 & 115 FLEET ST.

LONDON, E.C.4. Phone: CENTRAL 5812-3-4

Stern's Tape Recorder

HOME CONSTRUCTORS
Build it
for **£40'-'**

!! IT ONLY NEEDS CONNECTING UP !!

H.P. Terms are shown below.



Buy it assembled and ready for use

for **£43'-'**

(Plus £1/10/- carriage and insurance £1 is refunded when packing case is returned to us.)

H.P. terms. Deposit £11 and 12 monthly payments of £2/18/8.

We are completely satisfied that this Tape Recorder, although supplied at a genuinely low price, provides absolute Fidelity Recordings and, in addition to being completely dependable, has a performance at least equal to recorders marketed at a far higher price. The actual assembly of the Tape Recorder is extremely simple and only involves a few connections. The Truvox Tape Deck and the Quality Amplifier are supplied tested and ready for use, and all that is required to complete the Recorder is to connect the two together (a connection chart is supplied for this purpose) and secure them by the screws provided into the Attache Case. The items illustrated and described below form the complete equipment.



MODEL T.R.I./F. QUALITY AMPLIFIER

This amplifier has been expressly designed to meet the requirements of enthusiasts for fidelity reproduction, and in particular to CORRECTLY operate the above TRUVOX DECK. It is supplied complete with a matched Elliptical 3 ohm P.M. Speaker, it incorporates an efficient Tone Control arrangement and has a Magic Eye Level Indicator (Operative on Record). In addition it can be used as a general purpose Amplifier for high quality reproduction of gramophone records direct from a Gram Unit.

SEND S.A.E. FOR DESCRIPTIVE LEAFLET

THE NEW TRUVOX MODEL TR7U TAPE DECK

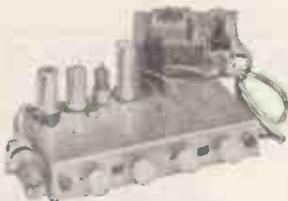
THE NEW TRUVOX MODEL TR7U TAPE DECK. 3 Shaded-Pole motors. Drop-in Tape Loading. Push Button Control. Separate Push Button Brake. Fast forward and fast reverse. Silent drive eliminating Wow and Flutter. Half Track working and 2 speeds, 3 1/2 in. and 7 1/2 in. per sec. Positive Azimuth Adjustment. Overall size only 14 1/2 x 12 1/2 in.

• WILL TAKE ALL STANDARD TAPES UP TO 1,200ft.

• WILL PLAY THE NEW PRE-RECORDED TAPES.

• WILL PROVIDE 2 HOURS' PLAYING AT 3 1/2 in. or 1 hour at 7 1/2 in. per second.

• INCORPORATES AN ELLIPTICAL P.M. SPEAKER 7 x 4 in., with EXTENDED FREQUENCY RANGE.



GUARANTEED FOR 12 MONTHS (B.V.A. VALVES 90 DAYS)

PRICE SUMMARY

WE WILL SUPPLY ALL FIVE UNITS LISTED ABOVE, i.e., THE COMPLETE BUT UNASSEMBLED RECORDER FOR £40/-, H.P. Terms: Deposit £10 and 12 monthly payments of £2/15/- or in two parts as follows:-

	CASH PRICE	12 monthly DEPOSIT payments of
(a) TRUVOX Mk. TR7U TAPE DECK MODEL TRIF AMPLIFIER WITH SPEAKER, 1,200ft. REEL OF TAPE	£33 10 0	£8 10 0 £2 6 4
(b) ATTACHE CASE AS ILLUSTRATED	£6 10 0	—
ACOS CRYSTAL MICROPHONE	—	—

NOTE: Please send 30/- to cover cost of packing, carriage and insurance. We will refund £1 if the packing case is returned to us intact.

EACH UNIT IS AVAILABLE SEPARATELY AS FOLLOWS:

	CASH PRICE	12 monthly DEPOSIT payments of
(a) TRUVOX Mk. TR7U TAPE DECK	£23 2 0	£5 17 0 £1 12 0
(b) AMPLIFIER MODEL TRIF WITH SPEAKER	£14 14 0	£4 16 6 18 4
(c) PORTABLE ATTACHE CASE	£5 0 0	—
(d) ACOS CRYSTAL MIKE "33"	£2 10 0	—
(e) REEL OF TAPE 1,200ft.	£1 15 0	—

Please include £1 when ordering (a) or (c) for packing charge, this whole amount will be refunded if case is returned to us intact.

ACOS CRYSTAL MICROPHONE MODEL MIC.33.1

1,200 ft. REEL OF SCOTCHBOY MAGNETIC RECORDING TAPE.

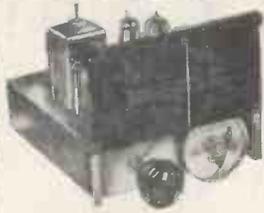


PORTABLE ATTACHE CASE

This, as may be judged from the illustration above, is a neat, compact and attractively finished case, being covered with maroon rexine and having an ivory coloured speaker escutcheon. It contains concealed pockets to accommodate the Microphone, Mains Lead and a spare 1,200ft. reel of tape.

STERN RADIO LTD.

!! A SELECTION OF HIGH QUALITY TUNING UNITS !!



THE DENCO F.M. FEEDER UNIT INCORPORATING AN R.F. STAGE

A 5 VALVE SUPERHET DESIGN having a frequency coverage of 88 to 100 mc/s. This F.M. Receiver is designed to operate with any type of Amplifier and most Radio Receivers. It incorporates R.F.—F/Changer and two I.F. Stages followed by a Ratio Discriminator, the valve line-up being 6AM6—12AB6—two 6BA6s and 6AQ5. Overall size of assembled Chassis 7in. x 5 1/2 in. x 4 1/2 in. high excluding power supply, or 7in. x 8 1/2 in. x 4 1/2 in. high with power supply. THE CONSTRUCTOR'S MANUAL, containing Circuit Diagram and Component Lay-out, etc., is available for 1/6. WE CAN SUPPLY ALL SPECIFIED COMPONENTS Including Valves and Drilled Chassis for Assembly as Illustrated.

or for £7/2/6 with Dial **£6/13/6** (plus 2/6 carriage and ins.)

WE WILL ALSO SUPPLY IT . . .

- (a) Assembled and Ready for use, excluding Dial-Assembly, £8/17/6.
- (b) Assembled and Ready for use including Dial Assembly (as illustrated), £9/10/-
- (c) Assembled and ready for use, with Dial Assembly and "Magic Eye" Indicator mounted in centre of Dial, £10/10/-.
- (d) We can also supply (a), (b), and (c) with and including an HT/LT Power Supply for an additional £2/17/6. The Supply Unit is also available as a separate Unit, size 6 1/2 in. x 3 in. x 6 in. high. Provides 250 volts at 50 mA. and 6.3 volts at 2 amps.

THE DULCI F.M. TUNER

This Unit will be available early in September. It is a completely self-contained Tuner of outstanding performance providing F.M. coverage and incorporating:—

- (a) The very efficient GEBLER INDUCTANCE type TUNING HEART.
- (b) Its own Power Supply arrangement.
- (c) PICK UP SOCKETS for direct connection to Record Player.
- (d) "Magic Eye" Tuning Indicator.
- (e) Latest valve line-up—EABC80, ECC85, two EP39's, 6x4 (Rectifier) and E.M.80. Complete details of the Tuner are not available at time of going to press but will be to hand early in September—send S.A.E. for leaflet.

SPECIAL PRICE REDUCTION OF THE FAMOUS

SHAFTESBURY PORTABLE AMPLIFIER



Suitable for home use and small Halls. Has matched inputs for both Record Players and Microphone. Also provides facilities for the "mixing" and "fading" of both Gram. and speech as requested. COMPRISING

- (a) A 4-Valve High Gain Amplifier for use on A.C. or D.C. mains. 200-250 volts with 5 watts output. Incorporating Independent Volume Controls for Mike and Gram., either of which can be faded at will, a variable Tone Control and independent input sockets for Mike and Gram.
- (b) A Transverse Carbon microphone which obtains its polarizing current from the amplifier—no batteries are necessary.
- (c) A 8in. Goodmans P.M. Speaker with the "Ticonal" magnet for first-class reproduction.

THE COMPLETE EQUIPMENT is all contained in the PORTABLE CARRYING CASE **£18/0/0**

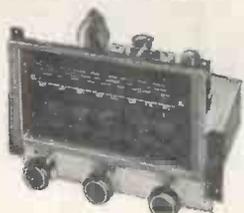
Having been reduced from £30/9/- HIRE PURCHASE TERMS DEPOSIT £4/10/- and 12 monthly payments of £1/4/9.

A DUAL-CHANNEL PRE-AMPLIFIER and TONE CONTROL UNIT

Attractively finished in "Old Gold" and providing full control of BASS and TREBLE in conjunction with a main volume 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 ups and all nature of recordings, i.e., English, American and long playing without recourse to pick up correction. The extreme flexibility of the bass and treble control 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 9in. x 4 1/2 in. x 2 1/2 in., 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), £3/16/9. Complete assembly data are available separately for 1/- . Completely assembled and ready for use. £5/5/-.



"STERN'S" MODEL CP3G/AM 3 WAVEBAND SUPERHET TUNING UNIT



A highly sensitive A.C. Mains Tuning Unit providing for excellent reception of stations on the short wavebands (16-50 metres) medium waveband (200-550 metres) and the long waveband (800-2,000 metres).

- Valve line-up: 6K8G (Frequency Changer), 6BK7g (I.F. Amplifier), 6Q7g (Detector, A.V.C. and 1st A.F. Amplifier), and 5Z4g (Rectifier).
- A gramophone position is incorporated with the wavechange switch.
- This tuner is normally supplied with four controls—Tuning, Volume, Tone and the Wavelength Switch (Tone and Volume operate as both Radio and Gram.)—but if your Amplifier already has the Tone and Volume Controls we can omit both. When ordering please state what is required.
- Overall chassis dimensions are 12in. x 8 1/2 in. x 8 in. including the full vision dial. Size 8 1/2 in. x 4 1/2 in.

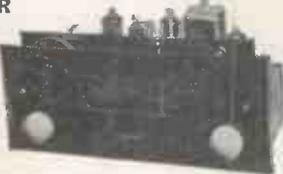
Price completely assembled and including built-in power supply £10/10/- H.P. Terms. Deposit £3/10/-, 8 months at 10/9. Price completely assembled excluding Power Supply £9. Carriage and Insurance 7/6 extra. (Dial Escutcheon is 4/6 extra.)

THE GOODSSELL F.M.I. TUNER

A 5 Valve Superhet Unit incorporating the NEW MULLARD INDUCTANCE type TUNING HEART. A really excellent Tuner giving full F.M. coverage and incorporating a "Magic Eye" Indicator. Requires Power Supply of 250 volts at 25 m/a. and 6.3 Volts 2 amps.

PRICE **£18/14/8** (plus 7/6 carr. and ins.)

H.P. TERMS. Deposit £6/5/- and 12 monthly payments of £12/11.



"PERSONAL SET" BATTERY ELIMINATOR

A complete Kit of parts to build a Midget "Alldry" Battery Eliminator, giving approx. 69 volts at 10 mA. and 1.4 volts at 250 mA. 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 volt at 10 mA. and 1.4 volts at 250 mA. Size of assembled unit 7in. x 2 1/2 in. x 1 1/2 in. Price 47/6.



COMMERCIAL T/V CONVERTERS

Completely self-contained Units designed to operate with commercially made Television Receivers to enable the immediate reception of both the B.B.C. (Band I) and the Commercial (Band III) programmes.

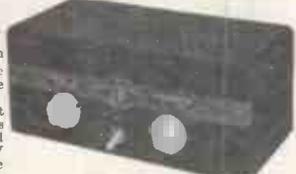
No actual fitting and no alteration is required to your present receiver, it simply being a matter of connecting the Mains Supply, Band I and Band III Aerials to the sockets provided on the Converter, which is then connected to your T/V Receiver by a lead which is plugged into a Socket on the Converter and then into the T/V Receiver Aerial Socket.

The Controls on the Unit are:—

- (a) Station Selector Switch which immediately selects either Transmitting Station.
- (b) An On-Off Switch which also switches the T/V Receiver on or off.
- (c) Band III Station Tuning Control.

THESE CONVERTERS ARE AVAILABLE:—

1. THE AERIALITE MODEL TA3 (illustrated here). Contained in a brown cracked finished case size 9in. long x 4 1/2 in. deep. Price £9/10/-
2. THE DULCI T/V CONVERTER. In polished walnut case size 9 1/2 in. long x 6 1/2 in. high x 4 1/2 in. deep. Price £9/9/-
3. VALRADIO TUNER. A turret type Converter (without case) for direct incorporation into an existing T/V receiver. In this instance it is essential that, when ordering, we are advised of either the I.F. frequency or the make and model number of the T/V receiver. Price £6.



YOU CAN BUILD A COMPLETE PORTABLE RECORD PLAYER for **£11/9/6**

SALVAGE BARGAIN !!!

DUE TO DAMAGE SUSTAINED IN OUR OWN WAREHOUSE WE ARE ABLE TO OFFER THE PORTABLE CASE ILLUSTRATED TOGETHER WITH THE COLLARO MODEL R.C.54 3-SPEED AUTOCHANGER for £6/19/6 (plus 10/- carriage and insurance) or separately CASE ONLY £1/5/- (plus 7/6 carriage and insurance).

The Portable Case is robustly constructed and finished in good quality grey varnish. It will accommodate the R.C.54 Autochanger and a small amplifier. The case is physically undamaged but the outer and internal covering are soiled.

The MODEL R.C.54 is Collaro's latest 3-speed "mixer" Autochanger incorporating the famous Studio "O" Crystal Pick Up. These offered are not physically damaged but were subjected to dampness and need thorough cleaning. It will be understood that they are not covered by a guarantee, but WE ENSURE THAT EACH AUTOCHANGER IS WORKING SATISFACTORILY BEFORE WE SUPPLY.

We can also offer a 3 Valve A.C. MAINS AMPLIFIER complete with P.M. SPEAKER for £4/10/- (plus 7/6 carr. and ins.). This will fit the Amplifier compartment of the above Portable Case and is designed to produce approx. 3 watts from a 6K6 output valve. It incorporates separate TONE and VOLUME CONTROLS, and a pilot indicator lamp.

Accordingly a complete portable record player can be made up for £11-9-6



109 and 115 FLEET ST.
LONDON, E.C.4. Phone: CENTRAL 5812-3-4

GEE RADIO LTD

VALVES—SPECIAL BARGAINS IN GOVT. SURPLUS

VU.120A	12A6	6H6m	6L6m	12/6
VR91	6X57gt	12EG6	574m	10/6
Sylvania	6SN7gt	VU.111	1T4	7/6
VR.53	6N7gt	VR.91	any	12SK7
VR.58	VR.130	VT.501	1619	10/-
VT.52	VR.55	VR.65A	VU.508(U19)	8/6
12SH7	S.130	ARP.12	854	2/6
12SJ7	6V6gt	any	E.1149	2/6
2X2	VR.150/30	any	1G6gt	10/-
9004	any	type	VS.70	5/-
8K7B	807	type	958	any
6J5G	860	type	12J5gt	12/6
1299(3D6)	12SR7	type	8D2	8011
3A4	6X5gt	type	1616	105gt
024	CV.78	type	105gt	7/6

VALVE ORDERS OVER £5, less 5% discount, post free.

20 WATT R.C.A. AMPLIFIER: For mike and Gram. A.C. mains 200-250v; 2-6L6's in push-pull; Input impd. 250 or 30 ohms; output impd. 500-600/15/7.5/3 ohms. This model is undoubtedly one of the finest amplifiers ever produced. Brand new and tested, limited quantity only. Our price only £18/10/-, plus 10/- carriage.

R.1132A RECEIVERS. In perfect condition, £3/17/6, carr. 7/6.

50 WATT AMPLIFIER, EX-GOVT. With 4-KT66's in paralleled push-pull. Standard 200-250 v. mains input, A.C. Output impedance 600 ohms line. For high imp. gram. and mike input. Bass boost control fitted. This excellent quality amplifier is housed in a strong metal case and is ready for use. Terrific performance. Bargain value £25, carr. paid. **VITAVOX PRESSURE UNITS COMPLETE WITH 42in. EXPONENTIAL HORN,** £7/12/6, carriage 10/-. Pressure Unit can be supplied separately at £4/9/6, carriage 5/-.

WAVEMETER CLASS D. Frequency hand covered: 1,900 kc/s to 8,000 kc/s (158-37.5 m.) in two ranges, 19,000 kc/s-4,000 kc/s and 4,000 kc/s-8,000 kc/s. In perfect working condition, £8/5/-, carriage paid.

ROTARY CONVERTERS. 24 v. D.C. input, 230 v. A.C. output at 50 cycles, 100 watt. Brand new, £4/17/6, carriage 7/6.

VARIABLE VOLTAGE REGULATOR TRANSFORMERS. Input 230 v. A.C. at 21 amps. Output 57.5 in 16 equal steps to 230 v. at 21 amps. Ex-Govt. In perfect condition. £12, carriage 10/-.

CRYSTAL CALIBRATOR BY MARCONI INSTRUMENTS. NO. 5, MK. II. Brand new and unused, complete with set of 5 spare valves, operation manual and aerial. Frequency range: 52-90 Mc/s with 9 fixed frequencies: 52, 56, 60, 65, 70, 75, 78, 84 and 90 Mc/s. Accuracy: One part 10⁴. Our price £7/9/6, carr. 10/-.

CRYSTAL CALIBRATOR BY MARCONI INSTRUMENTS. NO. 6, MK. III. Brand new and unused, complete with spare set of 5 valves and operating manual. Freq. range 170-240 Mc/s. Accuracy: 1 part in 10,000. Our price £7/9/6, carr. 10/-.

AMERICAN H.F. SIGNAL GENERATORS. Type 122A. Input 110 v. A.C. Freq. range: 8-150 Mc/s and 50-230 Mc/s. New and unused £25, carriage 10/-.

RECEIVER TYPE 109. In good condition. Freq. range 1.8-3.9 Mc/s and 3.9-8.5 Mc/s continuous. Designed to operate on 6 v. battery. Limited quantity only, £4/7/6, carriage 10/-.

HEAVY DUTY L.T. TRANSFORMERS: 230 v. Pri. 50 cycles. Sec. 12 v. @ 70 amps., £4/5/-, carriage paid. DITTO Sec. 15 v. @ 60 amps., same price.

PHOTO-ELECTRIC MULTIPLIER CELLS. Type 931A. £2/10/-, p.p. 1/-. Also 931A complete on chassis with multiplier network and 2-832 valveholders, etc. £3/10/-, p.p. 2/-.

TIME SWITCHES (NEWBRIDGE). 250 v. A.C. Synchronous 5 amp. Used but in good working order, 39/6, p.p. 2/6.

CONDENSERS. 2 mfd. 7.5 kv. working at 15 kv. Test (Dubilier). Brand new, £2/10/- each, carr. 5/-.

MARCONI EX-GOVT. WAVEMETER TYPE W.1310. Coverage 155-230 Mc/s continuous. Complete with chart and test prods. As new, £5/19/6, carriage 8/6.

CATHODE RAY TUBES. Types 3BP1, 3in. new and unused with base and screen, 42/6, p.p. 2/-; Type VCR138 (ECR35), 3½in. w/lt screen and base in new and unused condition, 42/6, p.p. 2/-; Type VCR97, 6in., ex-equip., in good order, 20/-, p.p. 3/6; VCR131, 1in. C.R.T., new and in perfect condition. Miniscope replacement tube, etc., 35/-, p.p. 1/-. Type CV1526, 2½in., 4 v. filament, 3,000 v. anode, complete with base and Mu metal screen, 20/-, p.p. 3/6.

AMERICAN ESPEY "MODEL 100" ALL-PURPOSE TEST METER. 7 D.C. volt ranges, 3v.-6,000v. @ 20,000 and 1,000 ohms per volt. 7 D.C. current ranges, 12 amps.-300 microamps. 7 A.C. volt ranges, 3v. 6,000v. at 1,000 ohms per volt. 3 resistance ranges, 0-6,000 ohms, 0-600,000 ohms, 0-60 meg. 50 microamps. 4in. scale meter. In perfect working condition, tested before despatch. Complete with chart, test prods and batteries. £12, p.p. 3/6.

MASTER CONTACTOR MK. II. REF. 10A/10994. 24 v. new and unused, 10/-, p.p. 2/-.

BRAND NEW CERAMIC V/HOLDERS: 813, 9/6 each; 832, 6/6 each; 805, 5/- each; 1/O, 1/- each; 89A, 1/3 each.

SELENIUM METAL RECTIFIERS BUILT TO SPECIFICATION. ALL TYPES AVAILABLE FULLY GUARANTEED. VERY GOOD DELIVERY. COMPETITIVE PRICES. MAY WE QUOTE YOU? K3/ AND K8 SERIES STILL AVAILABLE FROM STOCK.

MANY OTHER LINES IN STOCK. YOUR ENQUIRIES INVITED. TRADE SUPPLIED.

15 LITTLE NEWPORT ST., LONDON, W.C.2.

ADJOINING LEICESTER SQUARE TUBE STATION

GERrard 6794/1453

WANTED!

the Best
SERVICE MANAGER
in Great Britain

Well known Radio & T.V. firm require highly qualified man as Service Manager. The company consider this a highly responsible position and the appointed man will join the Management team.

Essential qualifications are:—

1. Good education, manner and personality.
2. Outstanding technical ability.
3. Wide experience in business management.

If you can SELECT, CO-ORDINATE, and ENCOURAGE all levels of staff and have the ability to ORGANISE & CONTROL a business then you are invited to write for further particulars and application form.

Apply Box No. 5523

ARE YOU MAKING YOUR OWN RADIO OR TELEVISION ?

WE CAN MAKE THE CABINET FOR YOU IN ANY SHAPE, DESIGN OR FINISH YOU REQUIRE.

WORK EXECUTED BY EXPERT CRAFTSMEN

CALL OR SEND DRAWINGS FOR QUOTATION

B. KOSKIE (DEPT. E.)
72-76 Leather Lane, Holborn, E.C.1

Phone: CHAncery 6691/2



BELCLERE

MINIATURE

INPUT, OUTPUT
AND INTERSTAGE

TRANSFORMERS

We specialise in the manufacture of coupling transformers to customers' requirements. An illustrated brochure describing the range of transformers we manufacture will gladly be sent on request.

Illustrated above is a standard input transformer type "E" size 1in. x 3½in. x 3½in. overall, available with varnish dip finish, encapsulated block form, or in mu-metal screening can.

Quick delivery—low prices—maximum efficiency.

JOHN BELL & CROYDEN, 117 HIGH STREET, OXFORD

Telephone: 47072.

Cables: Belclere, Oxford.

Best Buy at Britain's

RECEIVER R1132A covers 100-124 Mc/s with variable tuning. Ideal for conversion to F.M. Complete with 11 valves and circuit diagram. Brand new condition. Requires external power supply. Regret owing to limited number these are only available for callers. Price 65/6.

COMMUNICATION RECEIVER

PCR2 ex-government surplus manufactured by Pye Ltd. Three wavebands—12-50, 190-570 and 900-2,000 metres. Line-up: RF—EF39, FC—X61, 2 IF's—EF39, Det., AVC, 1st AF—EBC33, Output 6V6. In black case size 17½in. X 9½in. X 8in., with crackle front, illuminated calibrated dial, fly wheel tuning, aerial trimmer. Requires power supply and low impedance speaker. In first class condition, complete with all valves, £4/19/6 plus 10/6 carriage. **SPECIAL OFFER**—can be supplied with built-in A.C. mains power pack, fully re-aligned and tested for £3 extra.

RECEIVER 25/73 (TR1196) superhet receiver with 465 kc/s I.F.s. Complete with all valves—2-EF39, 1-EK32, 2-EF36, 1-EBC33. BRAND NEW with full conversion data. Price 30/- plus 2/6 post.

**R.C.A. AMPLIFIERS
MODEL M1—11220**



- ★ Manufactured by world famous Radio Corporation of America.
- ★ Brand new and unused.
- ★ Power output 12 watts at 5-7.5-15-600Ω.
- ★ Valve line up, 2 of 6L6, 4 of 6J7, 1 of 5U4.
- ★ Tapped transformer for use on 190-250 volts A.C.
- ★ Grey crackled case, size 17 X 11 X 9in.

CIRCUIT SUPPLIED. ONLY £9. 19. 6. Plus 10/6 carriage
(LESS VALVES, AS SHIPPED BY MAKERS)
SET OF VALVES, NEW, BOXED, 5/6 POST FREE.

AVO "ALL DRY" BATTERY ELIMINATOR—government surplus. For A.C. mains 200/250 volts, output 1.4 volts at 300 mA and 65 volts at 10 mA. Employs metal rectifiers and V570 stabiliser. Size 8½in. X 5in. X 3½in. Suitable for all personal portable type sets, full instructions supplied. New, in cartons and all tested prior to despatch. Price 3/6 plus 2/6 postage.

X'TALS

465 kc/s S.T.C., 200 kc/s American G.E.C., ½in. pins, brand new and boxed at 10/- each. 100 kc/s ½in. pins, British at 15/- each.
1,000 kc/s ¾in. pins, British standard 0.01% at 1/6 each.

DU MONT OSCILLOSCOPES. 5in. CRT, standard controls, 50 cycle mains operation. A de Luxe instrument suitable for laboratory use. Price £35. A few only Sylvania scopes, as advertised previously, still available at £30.

MARCONI SIGNAL GENERATORS Type TF390G. Brand new with spares, instruction manual and charts. Price £25.

HIGH VOLTAGE POWER PACKS ex U.S.A. Brand new. Input 115 volts A.C., output 1,000 volts at 250 mA. Brand new complete with two 1616 valves, double choke and paper smoothing. £5/5/- plus 15/- carriage.

COMMUNICATIONS RECEIVER

ADMIRALTY TYPE B.28 (MARCONI CR.100). Valve line up 2 RF, F.C. separate local Osc., 3 I.F.s, 2nd Det., Output, B.F.O. and rectifier. Self contained power supply 200/250 volts A.C. 50 c/s. Variable selectivity (crystal filter). 6,000, 3,000, 1,200, 300 and 100 cycles. Frequency coverage 60 kc/s to 30 Mc/s in six ranges, continuous except for gap between 420 to 500 kc/s. Size 16in. X 13½in. X 12in. Weight 82 lb. The set for the serious operator. Thoroughly overhauled in superb condition, complete with new valves and air tested prior to despatch. A real bargain at only £30 plus £1 carriage.

TRANSMITTER TYPE 12. Frequency coverage 1.2 to 17.5 Mc/s in four bands. M.O., Buffer, P.A., 2 stage Modulator, built-in stabilised A.C. mains power pack, P.A. Anode current meter M.C.W., C.W., and R.T. operation. V.F.O. or crystal controlled. Super "Table Topper" size 24in. X 12½in. X 17½in. Weight 134lb. Complete with all valves ready for operation. In first-class condition and tested before despatch, with circuit and full instructions. Only £20 plus £1 carriage. Can be demonstrated to callers.

COMMUNICATIONS RECEIVER

R1155. BRAND NEW "MINT" condition, R1155A. £11/19/6. R1155B with super slow-motion drive, £12/10/-. R1155A, shop soiled models, as new, £9/19/6. Used models £7/19/6. Carriage on all models 10/6 extra. Re-aligned and aerial-tested before despatch and gladly demonstrated to callers. Send S.A.E. for full details of power packs and receivers or 1/3 for booklet. D/F. Loops and Visual Indicator Meters available.

A.C. MAINS POWER PACKS AND OUTPUT STAGE. All our power packs are guaranteed for 6 months.

Type A. In smart black metal case, size 8½in. X 4½in. X 6½in. less speaker, price £4/10/- plus 3/6 carriage.

Type B. With built-in 5in. speaker in black metal case size 13½in. X 5½in. X 7½in. Price £5/5/- plus 3/6 carriage.

Type C. With an 8in. speaker in specially designed beautiful black crackle cabinet to match receiver, size 11½in. X 10½in. X 6in. A de Luxe job. Price £6/10/- plus 3/6 carriage. **NOTE: 10% REDUCTION WHEN PURCHASING ANY OF THE ABOVE POWER PACKS WITH RECEIVER.**

HEAVY DUTY L.T. TRANSFORMERS.

Standard tapped primary. Type A, 30 v. 36 amp. or Type B, 50 v. 16 amp. Size 6in. X 5½in. X 8in. high. Weight 24lb. BRAND NEW, not ex-Govt. Suitable for soil heating, rectifiers, chargers etc., special offer, 55/- each, plus 5/- carriage.

EX-ADMIRALTY. Primary 250 v. 50 c/s. Secondary 5-0-5 v., 5-0-5 v., and 5-0-5v., all at 5 amps, each winding. This means, in effect that you can have 5, 10, 15, 20, 25, 30 v. at 5 amps or other possible combinations. Size 4½in. X 4½in. X 6in. high. Weight 12lb. BRAND NEW. A very useful transformer at only 3/6.

EX-ADMIRALTY. Primary 230 v. 50 c/s. Secondary 620-550-375-0-375-550-620 v. (620 v. at 200 mA., 550 v. at 250 mA.). Two rectifier windings at 5 v. 3 amps. each. Total rating 278 VA. Upright mtg., weight 24lb. BRAND NEW, 42/6.

METER BARGAINS, ALL BRAND NEW

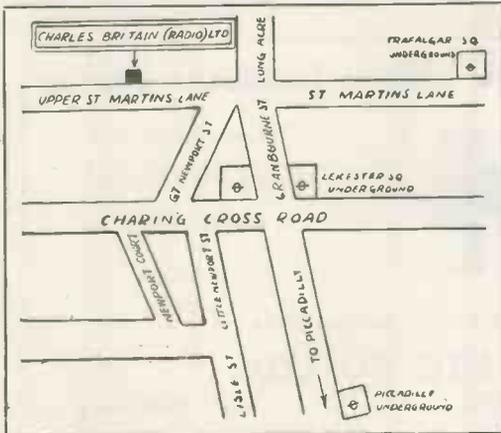
15 v. (50-) mov. iron 2½in. pnl. mtg.	8/6
3,500 volts moving coil 3½in. projection 18/-	
150 milli-amp. 2in. sq. pnl. mtg.	7/6
5 milli-amp. moving coil 2in. sq. pnl. mtg.	7/6
20 amp. moving coil 2½in. dia.	7/6
1 mA. 2½in. barrel flush pnl. mtg.	22/6
1 milli-amp. 2½in. barrel desk type	25/-
100 micro-amps. barrel pnl. mtg. scaled	
0-1,500 in 15 clear divisions. Only ...	42/6
500 mA. Thermo Couple 2in. sq. pnl. mtg. 5/-	

METER RECTIFIERS. 1 mA. Salford Instruments, 8/6; 5 mA. Salford Instruments, 6/9; 2 mA., S.T.C., as used in E.M.I. Output Meter, 5/6. All are full wave bridge and brand new. **BARGAINS, BARGAINS, BARGAINS. HUGE STOCKS OF COMPONENTS, RECEIVERS, VALVES, AT SPECIAL REDUCED PRICES FOR CALLERS.**

HEAVY DUTY SLIDING RESISTORS.

250 watts rated to carry 25 amps., resistance 0.4 ohms, suitable for physics labs., charging board, etc. Laboratory type with worm drive, on metal stand, size 9in. X 4in. X 6in. high. Price 7/6 each. BRAND NEW.

B.F.O.s. Ganging Oscillators, 18-19-21 & 22 sets; 1403 Transmitters, Indicators 233, Valve voltmeters at Clearance Prices.



CHARLES BRITAIN (Radio) Ltd.

11 UPPER SAINT MARTIN'S LANE LONDON, W.C.2. TEMple Bar 0545
One Minute from Leicester Sq. Station (up Cranbourn St.)
Shop Hours: 9-6 p.m. (9-1 p.m. Thursday) Open all day Saturday

SUPERIOR RADIO SUPPLIES

OFFER CONSTRUCTORS TWO FIRST CLASS RECEIVERS

The SUPEREX

55 ATTACHE PORTABLE

BUILDING COST £7.15.0 plus 3/6 P. & P.



- Really outstanding quality.
- Four Valve Battery Superhet.
- Long and Medium Wave-Lengths.
- Perfect Reception in All Areas.
- Rexined Cabinet 10 1/2 in. x 8 1/2 in. x 5 in.
- Very Simple Construction.

Send 1/6 for Superex "55" Construction Booklet and Price List.

Ideal for Tape Recorders

S. R. BUREAU



A fine multi-purpose cabinet, finished in well figured walnut veneer and built to the highest standards of workmanship. A blank motor-board size (16 in. long x 15 in. deep). Available prepared Unpolished or Polished.

Price £16/10/- Polished. £13/10/- Unpolished. Plus 15/- Carr. Send for Cabinet Leaflet.

The "SUPERIOR FOUR" T.R.F. RECEIVER

BUILDING COST £6.17.6 Inc. Postage.



- A.C. Mains 200-240 volts.
- Long and Medium Wave-Lengths.
- Well Tried Reliable Circuit.
- Uses 7 in. x 4 in. Elliptical Speaker.
- Handsome Cabinet 10 1/2 in. x 10 1/2 in. x 5 in.
- All Parts Available Separately.

Send 1/6 for Construction Booklet and Price List.

TERMS: Cash with order or C.O.D. Extra charge for C.O.D. U.K. and N. Ireland only.

(WWS) 37, HILLSIDE, STONEBRIDGE, LONDON, N.W.10.

TEL.: ELGAR 3644

Shop open 9 a.m. to 6 p.m. Monday to Saturday. 1 p.m. Thursday.

THE WORLD'S GREATEST BOOKSHOP

FOYLES

★ ★ FOR BOOKS ★ ★

NEW AND SECONDHAND Technical Books

Foyles have Departments for Gramophone Records, Stationery, Handicraft Tools and Materials, Music, Magazine Subscriptions, Lending Library.

119-125 CHARING CROSS ROAD LONDON, W.C.2

Gerrard 5660 (16 lines) ★ Open 9-6 (Thurs. 9-7)

Nearest Station: Tottenham Court Road

PRE-SET CONTROL LOCK

Designed to lock the spindles of pre-set potentiometers or trimmers without rotational or lateral displacement of shaft.



Will accept wide range of panel thicknesses.

TYPE P

Very attractive appearance for panel mounting. Send for leaflet 12.



TYPE C

SHORTLY AVAILABLE

THE KNOB-LOCK
for panel mounting.



SUTTON GOLDFIELD ELECTRICAL ENGINEERS
Clifton Street, Sutton Goldfield. 'phone SUT 5666

There are 12 different types of "ACRU" Neon Indicator Lamps

During the past five years over 1/4 million "ACRU" Neons have been sold with not a single complaint about short life.



The Minimum life of "ACRU" Neons is 25,000 hours.

Ask for leaflets.

With incorporated resistance they can be connected directly to the mains voltage.

THE ACRU ELECTRIC TOOL MFG. CO. LTD.,
CHAPEL STREET, LEVENSHULME, MANCHESTER.

Tel.: Rusholme 4613

G.W. SMITH & CO (RADIO) LIMITED

Phone: GERRARD 82049155
3-34, LISLE ST., LONDON, W.C.2.

TRADE ENQUIRIES INVITED FOR ALL RADIO BARGAINS WE PURCHASE ALL TYPES OF RECEIVERS AND TEST GEAR

R.1132 FREQUENCY MODULATION RECEIVERS. 11-valve receiver covering 100-124 mc/s. Super slow motion drive, 5 ma. tuning meter, RF and LF controls, attractive grey case with chrome handles, complete with all valves and circuit diagram. Only 65/- each.

AVO ELIMINATOR POWER PACKS. Input 230 volts A.C. Output 90 volts (stabilised, VS70) and 1.4 volts. Supplied brand new in bakelite case. 39/6 each.

MIDGET REVERSIBLE MOTORS. For operation on 4, 6, 12 or 24 volts D.C. Size 2 x 1 1/2 in., spindle length 1/2 x 3/4 in. Ideal for model makers, locos., boats, etc. 10/6.

TRANSMITTERS. BENDIX TA-12c. Frequency range 300-600 kc/s. and 3-12 mc/s. 2 807 P.A. stage, 807 buffer and 4 12SK7 oscillator stage. An absolute bargain at 44/19/6. Supplied brand new.

COLLINS TCS. Frequency range on 3 bands 1.5-12 mc/s. 2 1625 P.A. stage, 1625 buffer, 1625 modulator stage, 3 12A6 oscillator stage. Radio telephone or radio telegraph. V.F.O. and 4 Xtal. positions. Supplied in brand new condition. 42/5 each.

INSTRUMENT POTENTIOMETERS. Brand new American type. 10,000 ohms, 5 1/2 in. dia. Ideal for bridge. 22/6 each. Brand new Colvern type, 3 1/2 in. dia. 50,000 or 100,000 ohms. 10/6 each.

P.40 ROTARY POWER UNITS. 12 volt D.C. input. Output 180 volts 60 ma. Complete with all smoothing. 19/6 each. P & P 2/6d.

WESTERN ELECTRIC HANDSETS. Standard P.O. type. 12/6 each.

METER SWITCHES. Standard "YAXLEY" type, 8 bank, single pole, 9, 11 or 12 way. 7/6 each.

HALLICRAFTER POWER UNITS. Brand new and boxed. 12 volt D.C. input. Output 250 volts 70 ma. (supplied by vibrator unit) and 350 volts 165 ma. (supplied by rotary transformer). Complete with all smoothing and send receive relays. Ideal for portable or marine transmitter-receiver. 62/6 each.

TRANSFORMER BARGAINS.
1. Primary 230 volts 50 cycle. Secondary 620-0-620 volts, 250 ma. tapped 550-0-550 and 375-0-375 volts. Two 5 volt 3 amp. windings. Ample space for 6.3 volt windings. Supplied brand new. 39/6. 2. Primary 230 volts 50 cycle. Secondary 5-0-5 volts, 5-0-5 volts, and 5-0-5 volts, all at 5 amps. This will give any voltage between 5 and 30 volts in 5 volt steps at 5 amps. Supplied brand new. 42/6. 3. Primary 200-250 volts 50 cycle. Secondary 350-0-350 volts 180 ma. 6.3 volt 4 amp. and 5 volt 3 amp. Only 29/6 each. 4. Primary 200-250 volt 50 cycle. Secondary 4 volts 14 amps., and 6.3 volts C.T. 1 1/2 amp., Only 10/6 each. 5. Primary 230 volts 50 cycle. Secondary 2,000 volts 5 ma. Ideal for 'scope. 14/6 each. 6. Primary 230 volts 50 cycle. Secondary 500-0-500 volts 250 ma., 4 volt 4 amps. C.T. 3,000 volt insulation. 22/6 each.

VALVE BARGAINS. 6H6 1/9; VU111 1/9; EA50 1/9; 6AG5 4/-; 6U7 4/6; EF36 4/6; EBC33 6/6; 6V6 6/6; 5Z4 7/6; 5U4 7/6; 5V4 8/6. 2.1 MC/S. L.F.T. Miniature type. 2/- each.

DEAF AIDS. An exceptional offer of deaf aid units complete with 3 miniature valves, crystal mike, etc., but less outside bakelite case. Only 19/6 each. Miniature earpieces 3/6, or with lead and plug 4/6. DEAF AID VALVES. Brand new "RAYTHEON" CK505AX equivalent to DF70. 2/6 each. Holders 6d. each. Deaf aid pots., 1 meg-ohm with switch. 1/- each.

VALVE VOLT-METERS No. 2. A precision laboratory instrument at a fraction of original cost. Specification as follows: A.C. 200-250 volt 50 cycle input. 5 A.C. ranges 0-1.5/0-5/0-15/0-50 and 0-150 volts. D.C. readings can be made to 300 volts. Input impedance 50 megohms. Accuracy 1% at 50 meg. and 5% at 200 meg. Meter is a 3 1/2 in. 200 microamp. movement. All instruments are complete with detachable probe for high frequency measurement. These instruments are supplied as new in transit cases. 47/10/- each.

SUB-STANDARD VOLTMETERS. A portable precision instrument complete with leather carrying case measuring 0-300 volts D.C. on 6 ranges. Accuracy .3% at 680 Fah. A 6 in. mirror scale, calibrated in international volts 0-150. Knife-edged pointer. Current price of similar meter approx. 430. Supplied in perfect condition. 44/19/6 each.

COMMUNICATION RECEIVERS. MARCONI CR 100 RECEIVERS. Frequency coverage 60 kc/s.-30 mc/s. on six bands, gap 420-500 kc/s. Two R.F. and three I.F. stages. Variable selectivity, crystal filter, 6,000, 3,000, 1,200, 300 and 100 kc/s. Self-contained power supply for operation on 200-250 volts A.C. Supplied in absolutely mint condition, calibration checked and sensitivity up to specification. 430 each.

R.1155 RECEIVERS. Frequency coverage 18.5-7.5 mc/s., 7.5-3 mc/s., 1,500-600 kc/s., 500-200 kc/s. and 200-75 kc/s. A really first-class receiver at a price to suit everyone's pocket. Brand-new models in original transit cases. 411/19/6 each. New models but having slightly soiled outer cases. 49/19/6 each. Used models but in perfect working condition. 47/19/6 each.

A combined power unit and audio output stage for the above receiver, for operation on 110-200-250 volts A.C., can be supplied for 79/6.

PYE PCR2 RECEIVERS. Frequency coverage 12-49 metres, 200-600 metres, 800-2100 metres. A first class receiver at only 44/19/6 each.

MARCONI BAND THREE CRYSTAL CALIBRATORS. Frequency coverage 170-240 Mc/s. Supplied brand new and in original transit cases with spare set of five valves. Accuracy .001%, complete with 5 Mc/s. crystal. 45/19/6 each.

HOOR RECORDERS. A time recorder for operation on 200-250 volts A.C. Range from 1/10 to 10,000 hours on five separate scales. Supplied brand new and boxed. 39/6 each.

CRYSTAL MICROPHONE INSERTS. A sensitive high-impedance crystal mike, ideal for tape recorders, amplifiers, etc. 7/6 each.

METERS. All brand new and boxed. 0-50 m/a., 2in. square, F/M, M/coil, 7/6; 0-100 m/a., 2 1/2 in. round, F/M., M/coil, 9/6; 0-150 m/a., 2in. square, F/M., M/coil, 7/6; 0-200 m/a., 2in. square, F/M., M/coil, 7/6; 0-200 m/a., 2 1/2 in. round, F/M., M/coil, 9/6; 0-5 amp., 2 1/2 in. round, F/M., R.F., 7/6; 0-10 amp., 2 1/2 in. round, F/M., M/coil, 12/6; A.C. VOLTMETERS, 50 CYCLE. 0-15 volts, 2 1/2 in. round, F/M., M/l., 8/6; 0-20 volts, 2 1/2 in. round, F/M., M/l., 9/6; 0-300 volts, 2 1/2 in. round, F/M., M/l., 25/-; 0-300 volts, 5in. projection, M/l., 50/-.

100 MICROAMP. METERS. 2 1/2 in. flush mounting meter, scaled 0-1,500 yards, first-grade instruments, brand new and boxed. 39/6 each.

SPECIAL OFFER. MARCONI SIGNAL GENERATORS. TF-390/7. Frequency coverage 4-100 Mc/s. 200-250 volts A.C. mains operation. Supplied brand new and complete with spare valves and calibration charts. 42/5 each. Also TF-517/F1. Frequency coverage 130-260 Mc/s. and 18-58 Mc/s. Brand new. 43/5 each.

H.R.O. 6 VOLT VIBRATOR SUPPLY UNITS. Output 165 volts 80 ma., 6.3 volt 3 amp. 6 x 5 rectifier, choke and condenser smoothed, with clips and leads. 29/6 each.

PYE 45 Mc/s. I.F. STRIPS. Complete London Channel Television I.F. Strip with 6E5F0 valves and 1EA50 valve. Supplied brand new. 59/6 each. Or slightly used but in good condition. 49/6 each.

POWER UNIT. S441B. 200-250 volts input. Output 300 volts 200 ma., 12 volts 3 amp. Fully smoothed, 5U4G rectifier, supplied in attractive grey case. 62/6 each.

AVO CASES. Brand new leather cases for Universal AVO Minor. 7/6 each.

INDICATOR UNITS. TYPE 96. These indicators contain a VCR97 CRT, 6 SP61, 3 VR54, 1 EA50 and thousands of components. Supplied brand new. 39/6. TYPE 157. These contain a VCR97 CRT, 16 SP61, 1 VR54, 1 EA50 and thousands of components. Brand new condition. 52/6 each.

AMERICAN POWER RHEOSTATS. Brand new and boxed. 8 ohm 3.3 amp., 8/6; 8 ohm 2.5 amp., 7/6; 60 ohm 1.3 amp., 7/6; 90 ohm .74 amp., 7/6; 200 ohm .35 amp., 5/6. Ideal for train model or charging control.

BATTERY CHARGING EQUIPMENT. TRANSFORMERS. 200-250 volts input. Output 9 or 15 volts 1 amp., 9/9; 3.5, 9 or 17 volts 1.5 amp., 12/6; 3.5, 9 or 17 volts 2 amp., 14/3; 3.5, 9 or 17 volts 4 amp., 16/6. Rectifiers: full waved and bridged. 12 volts 1 amp., 5/6; 12 volts 2 amp., 11/3; 12 volts 3 amp., 12/9; 12 volts 4 amp., 14/3; 24 volts 1 amp., 9/-; 24 volts 2 amp., 17/6; 24 volts 4 amp., 27/6; 12 volts 10 amp., 32/6.

SMOOTHING CHOKES. American pot type "Collins," 8 henry 100 ma., res. 160 ohms. 8/6. Shrouded type 10 henry, 60 ma. 5/-; Heavy duty 10 henry 275 ma. 10/6.

COLLINS MODULATION TRANSFORMERS. 807 to 807, 20 watts rating, brand new. 12/6 each. BC.610 MODULATION TRANSFORMERS. Brand new in original cases. 44/19/6 each.

CONDENSERS. American oil filled, 4 mfd. 600 v., 4/6; .25 mfd. 2,000 v., 3/6; 5 x .5 mfd. 8,000 v., 7/6; 6 mfd. 50 v., 4/6; complete smoothing unit 8 x 8 x 4 mfd., 650 v., 12/6; .05 mfd. 16,000 v., 10/6. DUBILIER NITROGOL CONDENSERS. 1 mfd. 800 v., 1/9; 2 mfd. 1,000 v., 4/6; 4 mfd. 1,000 v., 6/6; 4 mfd. 1,500 v., 10/6.

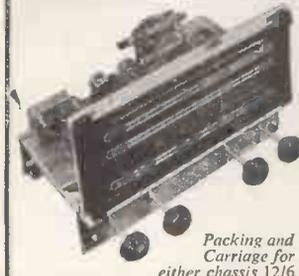
PACKARD BELL AMPLIFIERS. Brand new American units containing a 6SL7 and 28D7 valves, midget relay and hundreds of components. Supplied with circuit. 12/6 each.

"RECORD AMPLIFIERS." A push-pull amplifier giving 8 watts output. For operation on 200-250 volts A.C. Standard gram. input, output matched to 3 or 15 ohms. Tone and volume controls. Complete valve line up: 6SN7, 6V6, 6V6, 5Z4. Supplied in an attractive desk type cabinet, brand new. 46/10/-

HOURS OF BUSINESS: 9 a.m.-6 p.m. Thursday 1 p.m. Open all day Saturday. PLEASE PRINT YOUR NAME AND ADDRESS CLEARLY, ALSO INCLUDE POSTAGE OR CARRIAGE ON ALL ITEMS

SAVE £££'s!

BUY DIRECT FROM A FAMOUS MANUFACTURER



*Packing and
Carriage for
either chassis 12/6*

RADIO RECEIVER CHASSIS
Built to the highest specifications, these chassis offer the finest value to the enthusiast. Supplied with set of selected knobs. Socket panels for aerial, earth, speaker, Pick-up and Gram motor. 200/250v 50 cycles only.

Type A: 5 valves 3 - wavebands Superhet with full negative feedback and A.V.C. Built-in Ferrite antenna. Full range tone control	Type B: 7 valves 3 - wavebands Superhet with specially de- signed Push-pull output stage. Separate Bass and Treble con- trol
£12.12.0	£17.17.0



CABINETS
The magnificent Bureau type Cabinet illustrated is in specially selected walnut veneered exterior with light Sycamore interior with matching Rexine lining. Two full-sized compartments. Overall measurements: 34in. x 17in. x 33in. high.

Price £17.0.0

Other high quality cabinets are available at prices ranging from 10 gns.

Packing and Carr. 15/-.

UNBEATABLE VALUE! TAPE DECK

In a superbly fitted Moroccan grained carrying case, this instrument is the very finest of its class, regardless of price. Latest type TRUVOX twin-speed Tape-deck. Input for Radio, Gram, and Microphone. Built-in, selected elliptical speaker of the very finest quality. Recording (with Recording level indicator) or Play-back. 200/250 v. 50 cycles, A.C. only. Supplied complete with selected Microphone and Recording Tape.

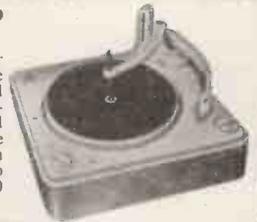


53 gns.

SPECIALLY RECOMMENDED DISC PLAYER

Specially designed for the amateur builder, these Disc Players consist of the latest three-speed Automatic Record Changers, complete with crystal turn-over pickup head for long-playing and standard records, mounted on Sycamore lined base. Supplied complete with fitted Mains lead and screened pick-up lead, ready for connecting up. £10.16.0

Packing and Carr. 7/6.



Write now for fully illustrated catalogue of the complete range of equipment which contains full details of our generous Hire Purchase Terms applicable to all goods above £15.

ALL FULLY GUARANTEED GENEROUS HIRE PURCHASE TERMS

DOMESTIC DIRECT SALES LIMITED

36, SOUTHAMPTON ST. STRAND LONDON W.C.2

PRESSURE DIE-CASTING CAPACITY OFFERED BY EXPERTS

Enquiries are invited for the production of long runs of Mazak Castings up to 5 ozs. Capacity also available for perspex routing.

HOPE & WATERLOW LTD

BEACONSFIELD ROAD · HAYES · MIDDLESEX

Tel: HAYES 0442/3/4

CONSTANT VOLTAGE TRANSFORMERS

MANUFACTURED BY

SOLA OF CHICAGO, U.S.A.

(Catalogue No. 30710)

PRIMARY 90-125v or 190-250v.

SECONDARY 115v precisely at 2 KVA, adjustable for 50 or 60 cycle operation.

Primary and secondary are completely isolated.

For 230v output two can be used with secondaries in series.

FULLY GUARANTEED

Size approx. 20" x 15" x 10"

Gross weight approx. 2 cwt.

PRICE £21 EACH or £40 PER PAIR

UNIVERSAL ELECTRICAL INSTRUMENTS CORPN

138 GRAY'S INN ROAD, LONDON, W.C.1

'Phone: TER. 7937

"MUST HAVE" BARGAINS!

BC.610 MODULATION TRANSFORMERS. Brand New spares for this famous American Transmitter. In Makers Original Cases. ONLY £5 each.

RF UNITS TYPE 26. For use with the R.1355 or any receiver with a 6.3 v supply. This is the variable tuning unit which uses 2 valves EF54 and 1 of EC52. Covers 65-50 Mc/s (5-6 metres). Complete with valves, and BRAND NEW IN MAKER'S CARTONS. ONLY 29/6 each.

"PYE" 45 MC/S I.F. STRIP. Ready made for London Vision Channel, this 5-stage strip contains 6 valves EF50 and 1 EA50. Supplied with circuit and details of very slight mods. required. BRAND NEW, ONLY 69/6 or less valves 50/-.

TRANSFORMERS. Manufactured to our specification and fully guaranteed. Upright mounting, fully shrouded, normal primaries.

425 v.-0-425 v. 250 mA., 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a., 65/-.
 350 v.-0-350 v. 160 mA., 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a., 47/6.
 350 v.-0-350 v. 100 mA., 6.3 v. 5 a., 0-4.5 v. 3 a., 37/6.
 250 v.-0-250 v. 100 mA., 6.3 v. 6 a., 5 v. 3 a., 37/6.
 250 v.-0-250 v. 60 mA., 6.3 v. 3 a., 5 v. 2 a., 21/-.
 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 VCR97 Tube 2,500 v. 5 mA. 2 v.-0-2 v. 1.1 a., 2 v.-0-2 v. 2 a., 42/6.
 EHT 5,500 v. 5 mA., 2 v. 1 a., 79/6.
 EHT 7,000 v. 5 mA., 2 v. 1 a., 89/6.
 EHT 7,000 v. 5 mA., 4 v. 1 a., 89/6.
 Please add 2/- per transformer postage.

TRANSFORMER EHT. Unrepeatable "snip" 250 v. primary, secondary 2,000 v. R.M.S. (approx. 2,800 v. D.C.). Size 2½ x 2½ x 3in. H. + ½in. for tag panel. ONLY 15/- (post, etc. 2/-).

TRANSFORMERS, EX W.D. AND ADMIRALTY, built to more than 50 per cent. safety factor with normal A.C. mains primaries. Brand New and unused. 330-0-330 v. 100 mA. 4 v. 3 a., 22/6.

L.T. 6.3 v. 7.7 amp., 4.2 v. 2.5 amp. 4 v. 1 amp., 19/6.

L.T. HEAVY DUTY. Has 3 separate windings of 5 v.-0-5 v. at 5 amps., and by using combinations will give various voltages at high current. ONLY 39/6. Please add 2/6 per transformer postage.

SPECIAL OFFER. Ex-Admiralty L.T. TRANSFORMER. Normal mains input, output 4 v. 20 amps. C.T. 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 30/-, now offered at 17/6 (post, etc., 2/6).

COMMUNICATIONS RECEIVER R.1155

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 tested before despatch, BRAND NEW AND UNUSED IN MAKER'S TRANSIT CASES, ONLY £11/19/6.

BRAND NEW BUT SHOP-SOILED, also tested working before despatch, £9/19/6 (carriage 10/6).

A.C. MAINS POWER PACK OUTPUT STAGE, in black metal case, enabling the receiver to be operated immediately, by just plugging in, without any modification. Can be supplied as follows, WITH built-in 6½ in. P.M. Speaker, £5/5/-, LESS speaker, £4/10/- (carriage 3/6).

DEDUCT 10/- IF PURCHASING RECEIVER AND POWER PACK TOGETHER.

Send S.A.E. for illustrated leaflet, or 1/3 for 14 page booklet, which gives technical information, circuits, etc., and is supplied free with each receiver.

V.H.F. RECEIVER R.1132.A

An 11-valve receiver, covering 100-124 Mc/s. Has large tuning dial with slow motion drive, R.F. and L.F. gain controls, phone and line output sockets, and 0-5 mA., tuning meter. In grey enamelled metal case with plated handles, size 18in. x 10in. x 11in. Complete with valves, circuit diagram and calibration chart. ONLY 65/- (carriage 10/6).

POWER UNIT TYPE 3

Made for use with the R.1132.A, this is a standard rack mounting job to match the receiver, and is for 200/250 v. 50-cycle mains with outputs of 250 v. D.C. 100 mA., and 6.3 v. 4 amps. Fitted with H.T. current meter and voltmeter, this is a first-class unit, and can be used for a variety of receivers. Used, but tested working before despatch. ONLY 90/- (carriage, etc., 5/-). Connecting Cable with Jones Plugs for receiver and power unit, 10/-.

COMMUNICATIONS RECEIVER P.C.R.2

Manufactured by Pye. 3 switched wave bands: 12-49 meters, 200-600 meters, 800-2100 meters. Valve line up 3 of EF39, 1 each 6K8, EBC33, 6V6. Has large calibrated dial with slow motion tuning, aerial trimmer control and tone control. Output sockets provided for 3 ohms speaker. Requires normal 6.3v. and 250v. supply. Used, tested working before despatch. ONLY £4/19/6 (carriage, etc., 10/6). OR A.C. Mains version £7.5.0 (plus carriage).

BENDIX TRANSMITTER TA-12-C. A magnificent item of American equipment. Wave ranges are 300/600 kc/s 3,000/4,800 kc/s, 4,800/7,680 kc/s, 7,680/12,000 kc/s, and 1 spot frequency on each; can be selected. Valves employed are 3 of 807 and 4 of 12SK7. A superb buy at ONLY £4/19/6 (carriage, etc. 10/6).

"ALL DRY" RECEIVER MAINS UNIT. If your battery portable uses midget 1.4 v. valves of the 1S4-1T4-1R5-3S4 series, then this will save you pounds in batteries. Delivers LT and HT from normal mains. Manufactured by "AVO" for the Ministry of Supply. Fused on mains side, and ready to work. Size 8½in. x 5½in. x 3½in. BRAND NEW. ONLY 39/6 (carriage, etc. 2/6).

METERS

F.S.D.	SIZE AND TYPE	PRICE
100 milliamp.	D.C. 2½in. Flush circular ..	12/6
150 "	D.C. 2in. Flush square ..	7/6
500 "	thermo 2in. Proj. circular ..	5/0
20 amps.	D.C. 2in. Proj. circular ..	7/6
40 amps.	D.C. 2in. Proj. circular ..	7/6
30-0-30 amps.	D.C. Car type moving iron ..	5/0
15 volts.	A.C. 2½in. Flush, circ., mov. iron ..	8/6

All meters Brand New in Maker's Cartons.

MODEL MAKERS MOTOR. Reversible poles. Only 2 in. long and 1½in. diameter, with ½in. long spindle. Will operate on 4, 6, 12 or 24 volts D.C. ONLY 10/6.

100 MICROAMPS METERS. 2½in. circular flush mounting. Widely calibrated scale of 15 divisions marked "yards" which can be rewritten to suit requirements. These movements are almost unobtainable today and being BRAND NEW IN MAKER'S CARTONS are a snip at ONLY 42/6.

POCKET VOLTMETERS. No Ex-Govt. Read 0-15 v. and 0-300 v. A.C. or D.C. BRAND NEW AND UNUSED. ONLY 18/6.

TRIPLETT UNIVERSAL TEST METER.—Made by the famous American meter manufacturers. Size 7½in. x 6½in. x 4½in., and incorporates a unique tilting bakelite container size*5½in. x 3½in. which has two meters, a 5,000 ohms per volt moving coil for D.C. measurements, and a first grade moving iron for A.C. Resistance readings up to 7.5 megohms, A.C. and D.C. volts to 1,500 D.C. current to 250 ma. In addition A.C. meter can be used as an Output meter. Completely portable, with protective face cover. Thoroughly reconditioned. ONLY £9.19.6.

WALKIE TALKIE TYPE 18. Covers 6.0-9.0 Mc/s. Complete with valves, and transmitting and receiving units in metal case. In excellent condition. ONLY 79/6 (carriage, etc., 10/6).

TRANSMITTER RECEIVER TYPE 19 MK. 2. The famous mobile unit as used in tanks, armoured cars, etc., etc. Wave ranges 2.0-8.0 Mc/s in two switched bands. Complete with all valves and 12 v. Power Unit on carrier. In first class condition. ONLY £9.19.6. CALLERS ONLY.

AVOMINOR CARRYING CASES. Size 5in. x 5in. x 2in. with long carrying strap. In high quality leather with press stud fixing flap. Made for UNIVERSAL Avomitor. BRAND NEW. ONLY 7/6. (Postage, etc. 1/-).

CRYSTALS. British Standard 2-pin 500 kc/s. 15/-. Miniature 200 kc/s. and 465 kc/s. 10/- each.

SPEAKERS. P.M., 6½in. less trans., 19/6; 8in. less trans., 16/6; 10in. with trans., 27/6 (postage 2/- ea.).

CHOKES. 10H 60 mA., 4/-, 5H 200 mA., 7/6, 20H 120 mA., 10/6 (post 1/- ea.).

MU-METAL SCREEN FOR VCR97 TUBE, etc., ONLY 8/6.

CABLE. CLEARANCE OFFER of 16/.012 twin polythene. Weatherproof, and suitable for outdoor use, 39/6 per 100 yard coil (carriage, etc., 3/6). S.A.E. for sample, trade enquiries invited.

Cash with order please, and print name and address clearly

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 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross).

RADIO TRADERS LTD.

23 WARDOUR ST., LONDON, W.1. (Coventry Street end)

Phone No. GERrard 3977/8

Grams: "Radiotrade"

BARGAIN OFFER OF BATTERIES

4½ v. Heavy Duty Bell Battery. Size 6½ x 4½ x 2½in.	4/6
72 v. H.T. 1.5 v. L.T. Size 6 x 5 x 1½in.	5/6
150 v. H.T. Size 2½ x 5½ x 1½in.	5/6
67½ v. Size 2½ x 1½ x 3½in.	6/6
All batteries sealed and unused. All plus 1/6 post and pkg. Special reduction for quantities.	

ELECTROLYTIC CONDENSERS

16 mfd. 375 v., 2/- each	21/-
16 x 24 mfd. 350 v. 2/6 each	27/-
20 x 20 mfd. 275 v. 2/3 each	24/-
24 mfd. 350 v. 1/6 each	15/-
24 mfd. 450 v. 2/3 each	24/-
Condenser Clips for above	3/6

BIAS CONDENSERS

50 mfd. 12 v. Single Hole Fixing 1/- each	10/6
100 mfd. 6 v. Tag End 10d. each	9/-
100 mfd. 25 v. Tag End 1/3 each	12/-

BLOCK PAPER CONDENSERS

4 mfd. 400 v. D.C. 3/6 each. Many other types in stock. Your enquiries invited.

LARGE ASSORTMENT OF TUBULAR CONDENSERS	6/-
MIDGET MICA CONDENSERS. .0001, .0002, .0003, .0004, .0005 5/-	
200 Assorted Moulded Micas. Popular Values	£2 10 0
200 Assorted Silver Micas. Popular Values	£2 10 0
200 Assorted Carbon Resistors: ½, ¼ and 1 watt. Good selection	£1 10 0

SPECIAL OFFER

0.1 mfd. 12,000 volts test Mansbridge Condensers. Height 6½in. Width 3½in. Depth 2½in. Fixing Centres 4in. Plus 1/- post ... 5/6

PAXOLIN SHEET

18 x 4½ x 1/16in., 1/- each; 10 x 10 x 1/16in., 1/6 each; 20 x 10 x 1/32in., 1/6 each; 20 x 10 x 1/16in., 3/- each.

RESISTORS

Carbon ½ watt 2/6; ¼ watt 3/-; 1 watt 4/-; 2 watt 6/- per doz. WIRE WOUND AND VITREOUS. 5 watt 1/6; 10 watt 2/6; 15 watt 3/-; 20 watt 3/6 each.

HIGH STABILITY. ½ watt 5% 6d.; ¼ watt 5% 9d.; 1 watt 5% 1/3 each. A few values in 1% and 2% still available.

ALL ORDERS FOR RESISTORS C.O.D. PLEASE AS WE CANNOT GUARANTEE TO STOCK ALL VALUES.

W.W.V. CONTROLS. ALL WELL-KNOWN MAKES. Pre-set 2/6 each Spindle types 3/- each. Values from 5 ohms to 50k.

V/CONTROLS WITH SWITCH 5k, 50k, ½ meg., 1 meg. ... 3/6 each V/Controls Less Switch. Most values spindle and preset ... 2/- each

METERS

0-300 mA. 2½in. Flush Mounting. Brand new. Guaranteed	8/6 each
0-500 mA. 2½in. Flush Mounting. Brand new. Guaranteed	10/6 each

TWIN GANG .0005 Less Trimmers
 6/6 each |

4-Way push button units 2/6 each
 27/- doz. |

Push Button Knobs
 3/- doz. |

TAG STRIPS. 3-way 2/-; 4-way 2/6; 5-way 3/-; 7-way 4/-; 28-way
 12/- doz. |

SLEEVEING. 2 mm. 2/6; 3 mm. 3/6; 4 mm. 4/6; 5 mm.
 5/6 per doz. yd. |

POINTER KNOBS. Small black with white line, standard ½in. spindle
 7/6 doz. |

WANDER PLUGS. Red and Black
 2/- doz. |

PHILIPS TRIMMER TOOLS. 1/- each
 10/6 doz. |

BELLING LEE FUSE HOLDERS. Type L.356 (Pnl. Mfg.)
 2/6 each |

WEARITE COILS. PA4, PO4, PA5, PO5, 1/3 each
 12/- doz. |

VALVE HOLDERS. Moulded B9A 7/6; B7G 6/-; Int. Oct. 9/-; Eng. Oct.
 4/6 doz. |

VALVE HOLDER FITTED WITH LOWER CAN 1/6 per doz. extra.

Screening Cans for B7G and B9A
 6/- doz. |

Paxolin V/H Int. Oct. B9A, B7G 5/- per doz.; Eng. Oct., 5-pin, 7-pin
 3/- doz. |

STANDARD SCREENING CANS 3-piece 1/- each; Spring Loaded
 1/- each |

BELLING LEE PLUGS AND SOCKETS, 5-pin 1/9; 7-pin 2/-; 10-pin
 2/6 each |

AIR SPACED TRIMMERS 5, 10, 15, 20, 25, 50 and 75 of pre-set and spindle types 1/6 each
 15/- doz. |

PYE PLUGS AND SOCKETS 1/6 per pair, "Tee" pieced
 1/9 each |

GROMMETS 1 grs. assorted grommets ½in. to 1in.
 8/6 gross. |

POST OFFICE LAMP JACKS No. 10 1/- each
 9/- doz. |

Lamp covers for same
 3/- doz. |

WESTINGHOUSE KHI Half-wave Rectifier, rating 6 v. at 10 mA., 2/6 each
 27/6 doz. |

OUTPUT TRANSFORMERS. Multi-ratio, 5/- each; Pentode or power
 4/- each |

DRUM DRIVES, 3½in.
 1/- each |

WESTECTORS, WX6, WX12, W1, W12, W4, 1/- each
 9/- doz. |

ARCOLECTRIC (Whitney Lamp), Red, Green, Clear, 1/6 each
 15/- doz. |

SIGNAL LAMP HOLDERS. Panel mounting, complete with adjusting lampholder, 1/9 each
 18/- doz. |

NUTS 8 BA 3/-; 6BA 2/6; 4BA 3/-; 2BA
 4/- per gross |

SOLDER TAGS 2/6 per gross; Shakeproof Washers
 2/- per gross |

JONES PLUGS AND SOCKETS. 4-pin, 2/6; 6-pin, 3/-; 8-pin, 3/6; 10-pin, 4/-; 12-pin
 6/- pair |

CASH WITH ORDER OR C.O.D. ALL ORDERS DEPT. W.1 ALL ORDERS FOR LESS THAN £2 ADD POSTAGE

We Invite your enquiries for items not listed

Trade Counter open 9 to 6 Monday to Friday

Callers Welcomed

WHOLESALE, MANUFACTURERS' AND EXPORT ENQUIRIES INVITED



(REGD. TRADE MARK)

PRECISION HI-FIDELITY

MAGNETIC SOUND HEADS

HALF TRACK HEADS AVAILABLE:

Model 5RP Record/Play Head.....	£3 5 0
Model 6RP Super Fidelity Record/Play Heads...	£3 15 0
Model 5R Record Head	

(Used in conjunction with 6RP head)..... £3 5 0
 Model 5E Erase Head..... £3 5 0
 Commercial "friction" type mounting stems... 4/- extra
 Standard Heads—High Impedance, Low Impedance Heads and Special Heads made to order.

SCREENING CANS:

All Mumetal	8/6 each
Composite (Steel/Mumetal)	4/6 each

We specialise—that is why deck manufacturers standardise our heads.

Model 5 range of desks to take 7in., 9½in. or 10½in. Reels. Push-button control—three heads—two speeds—three motors.

Write for details. Private or Trade supplied

BRADMATIC LIMITED

Station Road, Aston, Birmingham 6.

Telephone: East 2881-2. Telegrams: Bradmatic, Birmingham.

"DIPLOMA" HEADPHONES



Lightweight High Resistance (4,000 ohms). Complete with cord. 16/9
 Ideal for CRYSTAL SETS

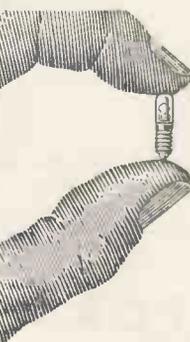
The "TYANA"
Standard Soldering Iron



- Adjustable Bit.
- Weight approx. 4 oz.
- Heating Time 3 min.
- 40 Watt economy Consumption.
- Standard Voltage Ranges. 14/11

Replacement Elements and Bits always available.

KENROY LIMITED
 152/297 UPPER ST., ISLINGTON, LONDON, N.1.
 Telephone: Canonbury 4905-4663



5mm. & 7.5mm. Pea Bulbs

CAP. L.E.S. to British Standard 98/E5. Diameter 5mm. Length 8mm.

BALLOONS. Tubular 5mm. Spherical 7.5mm. OVERALL LENGTH (Balloon and Cap). Tubular 15mm. ± 1mm. Spherical 16mm. ± 1mm. RATINGS. All standard voltages up to 24 volts. Amperage from 0.3 on low voltages to 0.06 on higher voltages.

VITALITY L.E.S. BULBS

Vitality Bulbs Ltd., Neville House, Neville Place, London, N.22.



5 Harrow Road, Paddington, W.2

PADddington 1008/9 and 0401

OPEN MONDAY to SAT. 9-6. THURS. 1 o'clock

SEND STAMPS FOR NEW 1955 28 - PAGE CATALOGUE

"R.F. 26" F.M. CONVERTOR UNIT—88/100 Mc/s.

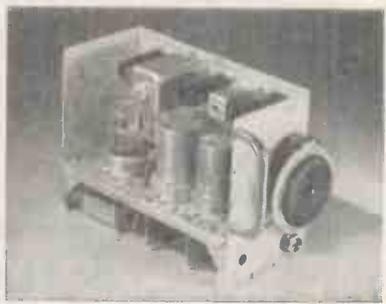
We can now offer this self-contained Unit comprising 6 Valves—2-6BA6, EB91, VR137, EF54, EF54. Two I.F. stages and separate local oscillator also Muirhead graduated vernier drive assuring easy tuning.

COMPONENTS OFFERED TO COMPLETE F.M. UNIT

- New RP26 Unit with 3 valves VR137, EF54, EF54. £1/15/-
- Complete set of all components for conversion including 2 6BA6 and EB91, tuning condenser, I.F.T.s 9w. and coils. Resistors and fixed condensers, plus wire and tag strips. £4/12/6.
- Instruction Book with technical circuit and complete lay-out diagrams. 1/6.
- Voltage required 250 v. 50 mA. 6.3 2 amps.
- Special offer of all above items and RP26, including circuit. £6/5/-, postage 3/6.

ALL ITEMS SOLD SEPARATELY

- Charge for alignment when completed.....
- Assembled, aligned and ready for use.....



7 6
£8 10 0

Call for demonstration.

PHOTO-CELLS

American 4-pin U.X. base. GS18, 71A and 86B. Brand new, 17/6.

BRAND NEW AMERICAN EQUIPMENT

U.S.A. DYNAMOTORS

Input 12 v., output 250 v. 60 m/a., 22/6.
Input 12 v., output 350 v. 180 m/a., 45/-

AMERICAN OIL-FILLED CONDENSERS

2 mfd. 600 v. wkg..... 3/6
4 mfd. 600 v. wkg..... 6/-
8+8+4 mfd., 600 v. wkg..... 12/6

ALSO
8+8 475 v. wkg., tub can..... 4/-
10 mfd., 475 v. wkg., tub can..... 2/-

Telephone Handset (Press Talk)..... 25/-

Co-Axial Conversion Plug.
Converts U.S.A. to British Pye-plug 2/-

HALLICRAFTER Mike Transformer 5/-
HALLICRAFTER Output Transformer 5/-
HALLICRAFTER Modulation Trans. 5/-
HALLICRAFTER 3 gang Condenser 7/6
70 PF..... 7/6
HALLICRAFTER 455 kcs. IFT 10/- per pair
HALLICRAFTER Relays 6/12 volt ... 4/6

JENSEN 5in. P.M. Speaker..... 21/-

RELAY UNIT TYPE BC442..... 17/6

EF50 (VR91A)

The selected EF50, Red Sylvania, original boxes, 10/- each, 90/- for ten.

PYE 45 Mc/s. STRIP TYPE 35B3 UNITS

Size 15in. x 8in. x 2in. Complete with 45 Mc/s. Pye Strip, 12 valves 10 EF50, EB34 and EA50, volume controls, and hosts of Resistors and Condensers. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price 69/6d. Carriage paid.

CRYSTALS

200 kc/s., 2 pin, U.S.A..... 10/-
465 kc/s., 2 pin, U.S.A..... 10/-
500 kc/s., 2 pin, British..... 15/-
Holders for U.S.A. Types 1/6.

PHILIPS COMMUNICATION RECEIVER P.C.R.3

Brand New. In original cartons. Valves. Frequency 12/560 metres. Less power unit. Can be adapted for mains at cost of 35/-.
£10/10/- Carr. 7/6.

MEGGER

EVERSHEED WEE-MEGGER 0-20 meg. 28 0 0
250 volt
RECORD "MINOR" 0-20 meg. 500 volt 28 0 0
BOWTHORPE CONTINUITY METER 0-500 Ω and 100-200,000 Ω £3 5 0
All in new condition and guaranteed.

T.C.C. .1 mfd. 5/7,000 v. wkg., type CP58Q0, Bakelite case. 7/6 each.

B.S.R. RECORD CHANGERS

3-speed Auto-changer. Plays mixed records, cream finish. Crystal Turnover Pick-up. Listed £16/10/-.

OUR PRICE, £7/19/6 CARR. PD.

AN/APA-1 CATHODE RAY INDICATOR AMPLIFIER UNIT. Complete, comprising 3BP1 C.R.T., 7-6SN6g1s, 1-6H6, 1-6G6, 1-2X2, 1-6X5, valves. Brand new, £4/19/6 plus carriage 7/6.

U.S.A. INDICATOR UNIT TYPE BC929A

These Units are in absolutely new condition. In black crackle cabinet 14 1/2in. x 9in. x 9in. Complete with 3 BP1 C/R Tube, Shield and Holder, 2-6SN7GT, 2 6H6GT, 1 6X5GT, 1 2X2, 1 6G6, V/controls, condensers, etc. Ideal for scope. 65/- Carr. Pd.

TRANSMITTER/RECEIVER

"38" WALKIE TALKIE SETS

We have purchased large quantity of the above "38" Sets, and can now offer same complete in case with 5 valves 4-VP23 and ATP4, Throat Microphone, Headphones, Junction Box and Collapsible Aerial in absolutely new condition and guaranteed Air Tested. Freq. range 7.4 to 9 Mc/s. Range approx. 5 miles. Voltage 150 v. and 3 v. L.T. 59/6. Carr. 5/-

Plessey 2 1/2in. P.M. Speaker, 10/- Set 4 miniature Valves 1R5, 1R5, 1T4, 384 (or 3V4 or 184), 27/6. Miniature 2-gang .0005 condenser, 5/-.

HS30 LIGHTWEIGHT HEADPHONES 12 1/2 pair

CRYSTAL MICROPHONE INSERTS



Ideal for tape recording and amplifiers. No matching transformer required.

62A INDICATOR UNIT

Containing VCR97 with Mu-Metal Screen 21 valves:- 12-EF50, 4-5P61, 3-EA50, 2-EB34. Plus Pots. Switches, H.V. Cond., Resistors, Muirhead 5/M. Dial, Xtal, Double Deck Chassis. BRAND NEW ORIGINAL CASES 67/6d. carr. 7/6d.

VIBRATOR PACKS, ETC.

Input 12 v., output 300 v. at 100 mA. 25/-
Input 6 v., output 180 v. at 40 mA. 21/-
Vibrator Transformers 6 v. 180 v. 40 mA. 7/6
Vibrator Transformers 6 v. 250 v. 80 mA. 8/6
Vibrators 12 v. 250 v. 80 mA. 8/6
Vibrators 6, 12 or 24 v. 4 pin. 5/-
Vibrators 6 v. 7 pin synchronous. 12/6
Vibrators 12 v. 7 pin synchronous. 12/6
Vibrators 2 v. 7 pin synchronous. 7/6

BC966A I.F.F.

Containing 13 valves 3-7193, 7-65H7, 3-6H6 metal. 18 v. dynamotor and fan output 450 v. 60 mA. with three speed geared motor plus 4 relays, condensers and resistors, in good condition. 35/- carr. 5/-

"426" CONTROL UNIT

Containing 4-Red EF50, 2-8P61, 2-EA50, 1-EB34, 2-Single-gang .0005 Condensers, W/W Volume Controls and Switches, etc. Size 12 x 9 x 5in. 35/- carr. 3/-

INDICATOR UNIT TYPE 182A

Unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen, 3 EF50, 4 8P61, and 1 5U4G 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 cases at 67/6. Plus 7/6 carr. "Radio-Constructor" scope circuit included.

R.F. UNITS

R.F.24 20/30 Mc/s..... 12/6
R.F.25 40/50 Mc/s..... 15/-
R.F.26 50/65 Mc/s..... 30/-
R.F.27 60/80 Mc/s..... 35/-
Brand new, carr. free.

RT40/APNIX (Tail End Charlie)

U.S.A. Altmeter containing 13 valves. 3-129J7, 4-12SH7, 1-12H6, VR150/30, 2-955, 2-9004, plus 4 relays, magnetic sounder condensers and precision resistors. Also 12 volt dynamotor output 285 v. 75mA. BRAND NEW ORIGINAL CARTONS 65/-

CATHODE RAY TUBES

VCR139A. 2 1/2in. C/R Tube. Brand new in original cartons (carr. free). £1 15 0
VCR97. Guaranteed full T/V picture (carr. 2/-) £2 0 0
VCR517C. Guaranteed full T/V picture. £1 15 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
VCR97. Slight cut-off. Carr. 2/- 15 0
3BP1 Brand New..... £1 10 0

ALL GOODS POST FREE UNLESS OTHERWISE STATED.

Transformers
Transformers
Transformers

QUALITY-RELIABILITY

For the Mullard Amplifier.
For the Osram 912 Amplifier.
For the Williamson Amplifier.
C. R. Tube Isolation Transformers.
Instrument Transformers,
and all popular types.

FROM

Ellison Transformers

LIMITED

62, BRIDGE ST. NORTHAMPTON
AND ALL LEADING COMPONENT DEALERS

Solder with

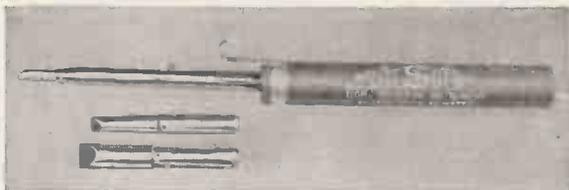


• NO TRANSFORMER NECESSARY • FOR MAINS OR LOW VOLTAGES.
Rapid Heating—Extreme Lightness—Twenty models—Bit sizes, 1/8", 3/16", 1/4", 5/16", 3/8"—Prices from 19/6. Voltages from 8/7 v. to 230/50 v.

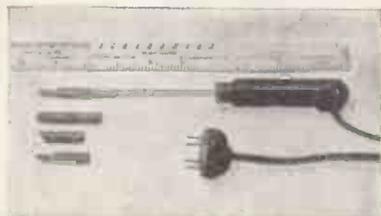
Have you tried our "Permatip" instruments or our "Permatip" bits? (Illustrated below). They need no maintenance and last indefinitely. Details in folder S.P.5, sent on request.

Sole Manufacturers and Distributors:

LIGHT SOLDERING DEVELOPMENTS LTD.,
106, GEORGE STREET, CROYDON, SURREY. Tel. CROYdon 8589.



PRODUCTION SOLDERING INSTALLATION USED AS STANDARD BY MAJORITY OF LARGEST RADIO & TELEVISION MANUFACTURERS



ELREMO Low Voltage Soldering Irons and Busbar Installation makes possible plugging-in of Soldering Irons anywhere along assembly line, assures safety from electric shock.

LV20 Soldering Irons weighing 3 oz. and rated 40 w. have the performance of average 65 w. Soldering Irons. Replacement elements cost under 2s.

ELECTRICAL REMOTE CONTROL CO LTD

HARLOW, ESSEX

Tel.: Harlow 24032

RHEOSTATS. 12 v. 1 a., 2/6. 12 v. 5 a., 10/6.
NEW AC/DC MOTORS. 24 v. 2 a. 6" x 2 1/2". Spindle 1" x 1/4", 18/6.
NEW FREQUENCY CRYSTALS. 9100 kc., 10/6. 4250 kc., 6/6.
Also Type TF243 from 5675-8650 kc. in 25 kc. intervals. 10/6 each.
NEW ROTARY TRANSFORMERS. Inputs 6 or 12 volts, output 250 v. 80 mA., 17/6.
NEW VR65, SP61 VALVES 5 for £1.
CYLDON 5-CHANNEL PRE-TUNER. Gives 26 D.B. gain. Fit one of these to your T.V. for better pictures. I.F. Output 9.5-14 Mc/s., 15.5-22 Mc/s. With valves EF80, ECC81, 52/6. Less valves, 15/-.
MAINS TRANSFORMERS. Input 200/240 v. Output 350-0-350 or 250-0-250 volts 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 amp., 21/6. Output 17-11-5 volts 5 amp., 22/6. Output 17;11-5 v. 1 1/2 a., 16/6. 6.3 v. 2 1/2 a., 8/6. All with one year's guarantee.
D.P.D.T. RELAYS. Operate at 209/300 volts D.C., 8/6. We can supply any type of voltage and contacts at varying prices.
NEW SELENIUM RECTIFIERS. F.W. 12/6 volts 3 amps., 14/6; 4 amp., 23/6; 6 amp., 30/-; 1 amp., 8/6; 12 v. 100 mA., 3/-; H.W., 250 v. 100 mA., 9/-; 250 v. 275 mA., 17/6; 250 v. 60 mA., 6/6.
GERMANIUM or SILICON CRYSTAL DIODES, 3/9.
M/C MICROPHONES with matched Trans., 15/6.
NEW ELECTROLYTIC CONDENSERS, 60-250 MFD. 275 v., 12/6.
TR1196 TRANSMITTER SECTION. New and complete but less valves. 4.6-6.8 Mc/s. Easily converted, 15/- With valves TT11, EL32, EF50, £2. Circuit included.
L.R. ARMY HEADPHONES, 9/6.
TIME DELAY RELAYS. We specialise in units giving varying time constants. Please send us your requirements or problems.
FISHING ROD AERIALS. Set of 3, 8/6. Plus 1/6 rail charge
P.O. FEEDER COUNTERS 0-9999, 24/50 volts D.C., 15/6.
NEW BROWNS M/C HEADPHONES. (Ex-W.D.) With earpads and 6ft. lead and plug, list price £5/5/- Our price 18/6.
VCR97 TUBES. Brand new, in original crates, picture tested, 45/-.
SPECIAL OFFER SELENIUM RECTIFIERS, 12 v. 16 amp., full wave, 50/-, 24 volt 4 a., 50/-.
CARBON TWIST DRILLS. Set of 9, 1/16 to 3/16, or 1/16 to 1/4 set 7, 3/6.
All Carriage Paid in the U.K. from Dept. W.W.
UNISELECTOR SWITCHES. 50-point 3-level 24-50 volt D.C. working, 17/6. Post paid.
MINIATURE RELAYS. 10 amp. Silver Contacts, 12 or 6 v. D.C. Types S.M. 7/6, S.M. or B. or S.C.O., 8/6. Post paid.
No. 19 POWER UNITS. Mk. III, with 2 rotary transformers, HT31 and HT32, £3.
Carriage on above items extra.

THE RADIO AND ELECTRICAL MART
253B PORTOBELLO ROAD, LONDON, W.11.
Phone: PARK 6026.

TO OVERSEAS BUYERS, LABORATORIES AND OTHER USERS.

We invite your enquiries for all types of U.S.A. surplus electronic equipment.

ALTHAM RADIO COMPANY,

Jersey House, Jersey Street, Manchester, 4.
Telephone: Central 7834/5/6

Largest stocks of Government surplus equipment in Europe.



HIGH FIDELITY PLUS HIGH VERSATILITY

Behind the new RCA High Fidelity Amplifier stands nearly a quarter of a century's skill and experience in designing professional sound reproducing equipment. This Amplifier includes several exclusive features entirely new to audio engineering, thus making it many years ahead of its time both in design and construction.

The resulting performance will be found to give a new meaning to high fidelity reception and a new realism to recorded music.

The RCA High Fidelity Amplifier can be incorporated successfully into any existing home audio system. The versatility of its input and output facilities coupled with the wide measure of control afforded by the Pre-Amplifier means that it can be used in conjunction with most high quality audio equipment.



RCA PHOTOPHONE LIMITED
Lincoln Way, Windmill Road,
Sunbury-on-Thames,
Middlesex.



PRE-AMPLIFIER

INPUTS—Magnetic Pickup

B.78. 16 mv input for rated output. 300 c/s Turnover. 6 DB Roll-off at 10 Kc/s.

A.78. 14 mv input for rated output. 500 c/s Turnover. 16 DB Roll-off at 10 Kc/s.

L.P. 13.5 mv input for rated output. 500 c/s Turnover. 12 DB Roll-off at 10 Kc/s. Flattened LF at 50 c/s to + 13 DB.

R.I.A.A. 11.5 mv input for rated output. 500 c/s Turnover. 14 DB Roll-off at 10 Kc/s. 3 DB Flattening at 50 c/s.

Crystal Pickup. .35 volt with inbuilt equalisation from constant amplitude to constant velocity output enabling switched replaying characteristics to be accurately employed.

Radio/Tape High Level 200 mv. Flat characteristic. Low Level 50 mv. Flat characteristic.

Microphone 6.5 mv for rated output. Flat characteristic.

Mixer Facilities for microphone input, with radio/tape/gramo inputs.

OUTPUT. 1.2 volts from cathode follower stage.

TAPE RECORDING OUTPUT. 1.2 volts cathode follower independent of monitoring.

BASS & TREBLE. Plus and minus 14 DB at 50 c/s and 10,000 c/s.

VOLUME. Twin ganged control giving correct gradation.

LOW-PASS FILTER. Switched 10 Kc/s, 7 Kc/s, 5 Kc/s and Flat.

HIGH-PASS FILTER. Inbuilt, attenuating below 20 c/s.

FILTER SLOPE. Variable to 35 DB per octave.

POWER REQUIREMENTS. 375 $\sqrt{7}$ ma, 6.3 v/1 amp.

MAIN AMPLIFIER

OUTPUT. 12 watts rated. Peak in excess of 20 watts over 20-25,000 c/s.

DISTORTION. Total harmonic less than .1% at 10 watts—700 cycles.

NOISE LEVEL. 85 DB below rated output.

DAMPING FACTOR. 50—also variable from positive to negative values.

FREQUENCY RESPONSE. Within 0.2 DB 20—25,000 c/s \pm 0.5 DB 10—60,000 c/s.

FEEDBACK. 40 DB total.

OUTPUT IMPEDANCES. 4 ohms, 7 ohms, 15 ohms.

INPUT VOLTAGE. 1.2 v for rated output.

ANCILLARY POWER SUPPLIES. 375 volts 45 milliamps, 6.3 volts 2.5 amps available for VHF Tuner, Pre-amplifier and Tape Reproducer amplifier.

POWER CONSUMPTION. 130 VA at full load. AC input 100/150 and 200/250 volts.

PRICE £48 . 0 . 0 COMPLETE.

MAINS TRANSFORMERS

FULLY INTERLEAVED

SCREENED AND IMPREGNATED. ALL GUARANTEED

ALL PRIMARIES ARE 200/250 v. Half Shrouded

HSM 63 (Midget). Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. at 2 amps.	16/3
HS63. Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 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/-
HS75. 275-0-275 v. 100 m/a.	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.	16/9
FSM66 (Midget). Output 250-0-250 v. at 60 m/a., 6.3 v. at 3 amps., 6.3 v. at 2 amps. Output.	17/3
FS2. 250-0-250 v. 80 m/a.	21/-
FS3. 300-0-300 v. 80 m/a.	21/-
FS2X. 250-0-250 v. 100 m/a., 23/-.	23/-
FS75. 275-0-275 v. 100 m/a.	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 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.
 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.
 FS5X. 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.
 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.
 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.
 HS150. Output 350-0-350 v. 150 m/a., 6.3 v. 3 amps., C.T. 5 v. 3 amps. Half shrouded.
 F36. Output 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. Fully shrouded.
 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.
 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.
 The above have inputs of 200/250 v.

OUTPUT TRANSFORMERS

MIDGET OP. 5,000Ω to 3Ω.....	3/9
8,000Ω to 3Ω.....	3/9
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.....	£4/13/6
Chokes for Williamson's Amplifier, 30 H. at 20 m/a.....	16/6
10 H. at 150 m/a.....	32/-

FILAMENT TRANSFORMERS

All 200/250 v. Input

F3. 6.3 v. @ 3 amp. 8/11. F3X. 6.3 v. @ 1.5 amp.....	5/9
F4. 4 v. @ 2 amp. 7/6. F6. 6.3 v. @ 2 amp.....	7/6
F6X. 6.3 v. @ 0.3 amp. 5/-. F12X. 12 v. @ 1 amp.....	7/9
FU6. 0-2-4-5-6.3 v. @ 2 amp. 10/-. F12. 12.6 v. tapped 6.3 v. @ 3 amp.....	16/6
F24. 24 v. tapped 12 v. @ 3 amp.....	23/6
F29. 0-2-4-5-6.3 v. @ 4 amp.....	17/9
FU12. 0-4-6.3 v. @ 3 amp.....	17/6
FU24. 0-12-24 v. @ 1 amp.....	17/6
F27. Two windings 12 v. @ 1.5 amp.....	21/-
F34. 4-9-15-24 v. @ 3 amp.....	26/6
F39. 9-15 v. @ 6 amp.....	29/-

Transformers suitable for Low Voltage Lighting. Fully shrouded with terminal blocks, 230 v. Input. 12 v. @ 20 amp. £6. 12 v. @ 10 amp. £4/10/-

F5. 6.3 v. @ 10 amps. or 5 v. @ 10 amps., or 12.6 v. @ 5 amps., or 10 v. @ 5 amps.....	34/-
F6/4. Four windings at 6.3 v. tapped 5 v. @ 5 amps. each, giving by suitable series and parallel connections up to 6.3 v. @ 20 amps.....	51/6

Quotations, etc., stamped addressed envelope please

C.W.O. (add 1/6 in £ for carriage)

Export enquiries invited

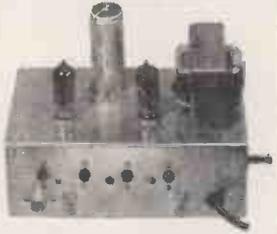
H. ASHWORTH (Dept. W.W),
 676, Gt. Horton Road, Bradford 7, Yorks.

BAND 3 T.V. CONVERTOR 186/196 Mc/s.

("W. World," May 1954).

Kit of parts complete to build this most successful unit comprising drilled chassis, 7" x 4" x 2 1/2", valves, wound coils, and all necessary components, slightly modified version using 8D3 instead of EF80 valves. £2/5/-, post free. Send for blue print and wiring diagram, 1/6 post free.

Provision has been allowed on chassis for small power pack and AE switching. Power Pack Components, including Mains Transf., 30/- extra.



RADIO-GRAM CHASSIS 5 VALVE, SUPERHET, LATEST B.V.A. MIDGET SERIES VALVES

3 WAVEBANDS:—L.W. 800m-2000m, M.W. 200m-550m, S.W. 16m-50m. Chassis size 13 1/2 in. x 5 1/2 in. x 2 1/2 in. Attractive Glass Dial 10 in. x 4 1/2 in. edge lit by 2 pilot lamps. Horizontal or Vertical Station Names and 4 control knobs, walnut or ivory to choice. 4 position W/C switch, L.M.S. and Gram. P.U. sockets. Modern circuitry, all coils adjustable dust cored and only quality components used throughout. Delayed A.V.C. and neg. feed-back. A.C. mains 200/250 v. Double wound transf. isolates chassis from mains. Aligned and calibrated ready for use.

BRAND NEW & GUARANTEED £9.15.0 Carr. and ins. 4/6.

3-ohm speakers suitable for this chassis available 8" 19/6, 10" 25/-

This chassis is a genuine bargain and delivery is reasonably good.

BEST EVER VALUE IN RECORD PLAYERS

Latest B.S.R. Model. 3 speed Autochanger Mixer Unit. Famous Magidisc 7 in., 10 in. and 12 in. record selector. Modern cream styling. Dual X141 cartridge stylus for high fidelity reproduction. As used by leading Radiogram Manufacturers. Complete with full instructions and templates.

OUR BARGAIN PRICE 9 1/2 gns. post free.

ELECTROLYTICS Leading Makes New Stock

TUBULAR	CAN TYPES	80 ohm CO-AXIAL CABLE
25/25 v. 50/12 v. 1/9	8+8/450 v. 4/8	SPECIAL.—Semi-air spaced polythene-standard 1/4 in. diam. Stranded core-Feeder losses cut 50%. 9d. yd.
50/50 v. 4/500 v. 2/-	8+16/450 v. 5/-	COAX PLUGS 1/2
100/25 v. 2/-	16+16/275 v. 4/8	SOCKETS 1/6
8/500 v. 2/6	16+16/450 v. 5/6	COUPLERS 4/8
8+8/500 v. 4/6	16+16/450 v. 6/-	OUTLET BOXES 1/3
8+16/450 v. 5/-	32/350 v. 4/-	BALANCED TWIN FEEDER per yd. (80 ohms) 6d.
16/450 v. 3/6	32+32/450 v. 6/8	TWIN SCREENED FEEDER per yd. (80 ohms) 10/-
16+16/450 v. 5/6	60+250 v. 6/8	50 OHM CO-AXIAL CABLE 8d. per yd. 1/4 in. dia.
32/350 v. 4/-	60+100/350 v. 11/6	
32/500 v. 5/-	60+250/275 v. 12/6	
32+32/350 v. 5/6	100+200/275 v. 12/6	
32+32/500 v. 7/6	1000+1000/6 v. 6/8	

CONDENSERS.—Mica, S. Mica, ceramics. All pref. values, 3 pf. to 880 pf. 6d. ea. Tubulars, 450 v., Hunts and T.O.O. 0005, .001, .005, .01, .02 and 1.350 v., 9d. .05, 1.500 v., Hunts, 1/-, .25 Hunts, 1/6. 5 Hunts, 1/9.

SPEAKER FRET.—Expanded Bronze anodised metal 8 in. x 8 in., 2/3; 12 in. x 8 in., 3/-; 12 in. x 12 in., 4/3; 12 in. x 16 in., 6/-; 24 in. x 12 in., 8/6. etc.

JASON F.M. TUNER UNIT 87-105 mc/s

Kit of parts to build this modern and highly successful unit complete with drilled chassis and J.B. dial, wound coils and screening cans, 4BY4 miniature valves, and all necessary quality components etc., for only £8/10/- post free. Superior dial calibrated mc/s., edge lit by 2 pilot lamps, 12/6 extra. Power Pack components kit, including double wound mains transformer, £2/5/- extra.

Tested and approved by "Radio Constructor," etc. Illustrated handbook with full details 2/-, post free.



RESISTORS

Carbon type. Pref. values 10 ohms-1000 megohms. 20% Tol. ± w. 3d.; ± w. 6d.; 1 w. 6d.; 2 w. 9d. 10% Tol. ± w. 9d.; 5% Tol. ± w. 1/-; 1% Hi-Stab. ± w. 2/-.

WIRE WOUND TYPES

Wire ends. Silicone coated, 25 ohms-10000 ohms, 5 w., 1/3; 10 w., 1/6; 15 w., 2/-; 15000 ohms-33000 ohms, 5 w., 1/9; 10 w., 2/3.

ALUMINIUM CHASSIS

18 g. Plain un drilled. Folded 4 sides. Riveted corners. Lattice fixing holes. Depth 2 1/2 in., 7 in. x 4 in., 4/6; 9 in. x 6 in., 5/9; 11 in. x 7 in., 6/9; 13 in. x 9 in., 8/6; 14 in. x 11 in., 10/6, etc.

S.T.C. RECTIFIERS

K3/25 2 kV., 4/3; K3/40 3.2 kV., 6/-; K3/45 3.6 kV., 6/6; K3/50 4 kV., 7/3; K3/100 8 kV., 12/6; K3/160 14 kV., 18/-; RM1 125 v. 80 mA., 4/-; RM2 125 v. 100 mA., 4/9; RM3 125 v. 120 mA., 5/9; RM4 250 v. 275 mA., 16/-; HT59 250 v. 200 mA., 26/6.

PRE-SET W/W POTS

T.V. knurled slotted knob type. 25 ohms to 30000 ohms, 3/-; 50000 ohms, 4/-; 50000 ohms to 2 Megohms (carbon) 3/-.

VOLUME CONTROLS

1 1/2 in. semi Midget Type, Long spindles. All values 10000 ohms to 2 Megohms. Less sw., 3/-; S.P. sw., 4/-; D.P. sw., 4/9. All individually boxed. Guar. 12 months.



RADIO COMPONENT SPECIALISTS

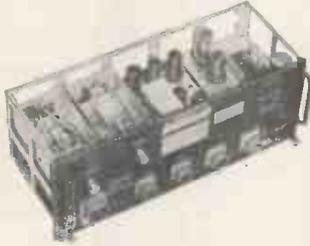
70 BRIGSTOCK RD., THORNTON HEATH, SURREY

Phone: THO 2188 Hours 9 am-6 pm. 1 pm. Wed. Open all day Saturday. BY THORNTON HEATH STATION. BUSES 130A, 133, 159, 166, 190. Terms: C.W.O. or C.O.D. Post & Packing up to 1/6. 6d., 1/6, 1/-, 3/6, 1/8, 5/6, 2/-, 10/6, 2/6. Send for our Bargain Lists, 3d.

PROOPS BROS. LTD.

The Walk-around Shop presents the **AN/APN 1.**

The AN/APN 1 Unit was originally designed for installation in aircraft and provided measurement of altitude during flight. It comprises the following:—



- (1) R.F. TRANSMITTER
 - (2) RECEIVER
 - (3) A.F. AMPLIFIER
- AS DETAILED RIGHT

In addition it also contains a vast amount of useful components including:—3 Relays, one being a 4-pole change-over type. 3 1 megohm 1 per cent wire-wound resistors. One 8×8×20 mfd. 350×350×150V D.C. condenser, 2 Panel mounting Fuse holders. 3 Twin-gang Potentiometers and several other components.

VALVE Line-up:—5×12SH7; 2×12SJ7; 2×955; 2×9004; 1×VR150/30; 2×12H6. Total of 14 valves, most of them are suitable for Car Radios.

THE COMPLETE UNIT is attractively housed in a black crackle metal case, suitable for rack or bench mounting; size 18"×7"×6".

PRICE Complete (less dynamotor) **42/6**
Post & Pkg., 2/6

(1) R.F. TRANSMITTER

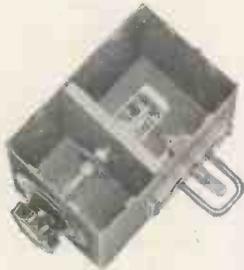
A sub-chassis 3½"×6¼"×2¼" containing a R.F. Transmitter operating 67.42 cm. (445 Mc/s) with a bandwidth of 40 Mc/s. Modulation of its carrier is by means of a Moving Coil Transducer with a metal diaphragm. The proximity of the diaphragm effectively changes the resonant frequency of its tuned circuit, to produce frequency modulation. This transmitter utilises TWO 955 (VT 121) valves, and can quickly be converted for Radio Controlled Models; the frequency for this purpose being in the band, or for 70 cm. work. **PRICE, post paid 18/6**

(2) RECEIVER

A sub-chassis 3½"×6¼"×2¼" houses a Receiver tuned to the transmitting frequency. Contains TWO 9004 valves. For use in 70 cm. band. **PRICE, post paid 12/6**

(3) A.F. AMPLIFIER

An Audio Frequency Amplifier in a sub-chassis 5"×3"×3¼" R/C coupled, using TWO 12SH7 and ONE 12SJ7 valves; and can be used for Telephone Intercom., Pre-Amplifiers, etc. **PRICE, post paid 15/-**



ABSORPTION WAVEMETER

Easily converted to 2 metres or 70 cm. In Copper-plated metal case 3½"×4¼"×5¼" with dial calibrated 0-100 and 120V Neon Tube. Coverage approx. 190-210 Mc/s. New. **6/6** each post paid.

OSCILLOSCOPE CATHODE RAY TUBES

Type 3 BP 1., 3" short persistence, complete with Mumetal screen and base. **NEW. Post paid. Only 22/6**

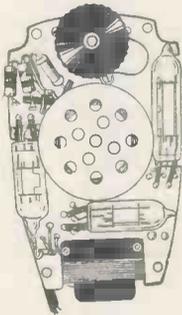
REFLECTOR

in bakelite case fitted with small bayonet cap holder. Size 5 inches in diameter by 3 inches deep. **2/6** post paid



ACCUMULATORS

Of well known manufacture. 2 volt, 10 ampere/hour. Lead Acid. **5/-** Post and packing paid.



Miniature POCKET RADIO

Incorporating high "Q" technique using the New Ferrite rod. Made possible by simple conversion of an ex-Govt. Hearing Aid.

Technical Details. A Germanium Diode Detector circuit followed by the existing 3 valve Amplifier, giving adequate amplification throughout the medium wave band.

This conversion can be carried out in approximately 30 minutes.

SEE and HEAR this Miniature POCKET RADIO demonstrated.

THE COMPLETE KIT OF PARTS includes a Type OL10 Hearing Aid (with Crystal microphone) in perfect working order with miniature ear phone and moulded ear insert attached; ferrite rod, germanium diode, components, circuit diagram and full instructions. Price **£2 6s. 0d.** post paid (or without crystal microphone **£2 2s.**); Batteries extra: 1.5v. L.T. (Type D18), 8d.; 30v. H.T. (Type B119), 4/3.

NOTE: As the crystal microphone is not used in the Pocket Radio, it can, if desired, be used as a general microphone and it does not require a matching transformer.



NOTE: Orders and Enquiries to Dept. 'W.'

Shop hours: 9 a.m. to 6 p.m.

Thursday: 9 a.m. to 1 p.m.

OPEN ALL DAY SATURDAY

PROOPS BROS. LTD.

52 TOTTENHAM COURT ROAD

LONDON

W.I.

The Walk-around Shop

Telephone: LANgham 0141

There's a wonderful future
for you in -

ELECTRONICS

Train to meet the need for pioneers in this expanding field.

Every day the demand for the expert in electronics grows. Radio, television, radar and the whole field of industrial automation are rapidly expanding, and the trained specialist assures for himself a well-paid career in this quickly developing profession. Here is your opportunity to enter for

4-year Course in Electronic Engineering.
Intended for outstanding Science sixth-formers who are capable of training into future team leaders in scientific applications. Final qualifications are B.Sc. and City and Guilds Full Technological Certificate in Telecommunication Engineering. Next course commences on 4th October, 1955.

E. M. I. INSTITUTES

Dept. 127AA, 10 Pembridge Square, London, W.2.
Telephone: BAYswater 5131/2.

The College associated with a world-wide electronics industry, including 'His Master's Voice,' Marconiophone, Columbia, etc.

IA.49

A. C. SOLENOID TYPE SA/T.



Continuous $\frac{3}{4}$ lb. at $\frac{3}{4}$ "
Instantaneous to 6 lbs.

100% PRODUCTION
INSPECTION

Larger and Smaller Sizes
Available. Also Trans-
formers to 6kVA 3 Phase.

R. A. WEBBER LTD.

18, FOREST ROAD, KINGSWOOD, BRISTOL. Phone: 74065

H. WHITAKER G3SJ.

SYCAMORE WORKS, SYCAMORE AVENUE, BURNLEY

Phone: BURNLEY 4924 (A.R.B. APPROVED)

Manufacturers of precision Quartz Crystals in a wide variety of bases covering the complete range 40 Kc. to 18 Mc. in fundamental frequencies. All are made to extremely fine tolerances, and frequency adjustment can be given up to .005%. Plated electrodes of gold, silver or aluminium with wired in spot welded contacts are available. Quotations can be given for any type of cut or mode of oscillation including a complete range for filter circuits with zero temperature co-efficient over a sensibly wide temperature range. Our new works is equipped with up-to-the-minute production technique methods, X-ray orientation ensuring accuracy of all cuts. Artificial aging by etching and plating by evaporation under vacuum ensure long term stability of the final calibration. Early delivery can be given in most types. Our regrind service is still available and in some cases we are prepared to quote for lowering the frequency of your existing crystals.

SPECIAL OFFER:

200 kc. DT cut, zero temperature co-efficient over the range -30° centigrade to +55° centigrade. Frequency adjustment .005% or better. Mode: Face shear. Silver-plated electrodes, wire mounted. Basing 1in. pin spaced. Other bases to order. £1 each.

TECHNICAL TRADING CO.

SPECIAL BARGAINS—SATISFACTION GUARANTEED

T.V. CABINETS. Large purchase enables us to offer new top-grade table cabinets at keenest prices, famous 1954 models complete mask, glass, spkr., fret in front 14in (size 17 1/2in. H. x 17 1/2in. W. x 16 1/2in. D.). 35/- (carr. 6/-). 17in. 39/- (carr. 6/-). Large 1954 de luxe consoles with doors, beautifully matched walnut finish, mask glass, castors, 14in. or 17in. (size 28 1/2in. H. x 24in. W. x 20in. D.). £8/15/- (carr. 13/-). (P. & P. 1/-). 8in. speakers with trans. 17/6 (P. & P. 1/3).

H AERIALS. 35/- complete all lashings, famous make, original wrappings, listed export. £4/5/-, complete all lashings (carr. 5/-).

AUTO CHANGE GRAMS. Latest 3 speed, 3 valve, 10in. speaker, compact rexine cases. 16 pins (carr. 10/-).

DST100 RECEIVERS. 7 waveband, with 13 valves, 10 m.-4,000 m. continuous. mains operation, B.F.O., "S" meter, noise limiter, vernier dial, 4 w. output. £19 (carr. 12/6).

VALVE VOLTMETERS No. 2. Excellent condition. £12/10/- 339A Cossor DB scopes complete, untested. £14. Ditto 3339 £10. Mullard E900 scope, tested, £16. Marconi TF386/2, wide band B.F.O., £12 (all carr. paid).

B.G.1000 TRANSCEIVERS with 16 all-dry valves, beautifully compact. £9/10/- (carr. 5/-).

No. 22 SETS. Excellent condition. £7/10/- No. 18 sets complete £3/10/-.

HALLICRAFTERS K.T.11 20 w. radio telephones complete, less power pack, £9/10/- (carr. 7/6).

10/20 WATT AMPLIFIERS. Mobile 12 volt operation, 5 stage, push-pull 6L6, complete in compact case, cost approx. £30. Good condition, untested, £5/10/- Ditto 115/230 v. A.C. operation £5/10/- (carr. 7/6).

RETENTRANT SPEAKERS to match above, tested, £3/15/- (carr. 5/-). Double-ended retentrant speakers, famous manufacture, compact, bassrain, 35/- (carr. 4/-).

SOUND POWER MIC/HEADSETS. Complete 9/6. Standard telephone handsets 7/6. Complete sound power telephones, Ad. Pat., 35/- (carr. 3/-).

3 GANG CONDENSERS. Cer. insul. 3/6. With trimmers 3/6. Small tuning conds., 15 + 15, 30 + 30, 15, 50, 100 pf., 1/- each.

MAINS TRANS. 230-0-230 109 m.a. 6 v. 4 a. 5 v. 2 a. 17/6 (post 1/6). Ditto, less 5 volt winding, excellent quality, new, 9/6 (post 1/6).

CHROME-VANADIUM SCREWDRIVER BITS. 6 different heads, pocket case, 6/9. Ditto, 7 tool de luxe, 9/6 (post 8/1).

T.V. CHASSIS. With circuits of complete T.V. Consisting 3-valve H.F. unit and 4-valve I.F. strip, recent famous make, using EF91, etc. 25/- less valves.

GUARANTEED VALVES. EA50, VR78 1/6, SP41, SP210, VR135, VR54 2/-, 6B8 3/-, KTWE13, 6X7G, 6J5G, 128GT 4/-, EP50, PY31 4/6, 6AL5, 6SK7, 128K7 5/-, EL01, 6BE6, 6AC7, 6C6, 6D6, 6SH7, 12AG 5/6, KT44, EF91, 6BS7, 12C8 6/-, EOC91, 6A6, EY91, 807 6/6, 12A37, 6SA7, 128J7 7/-, 6V6GT, 6C4, W77, 6SN7GT 7/6, 12AX7, 12AU7, 6F33, 6K8G 8/-, 6Q7GT, 5Z4, 6L6 8/6, 6AG7, 12AH7 9/6, 832, 805, 808 17/6, 829B 25/-, 813 45/-, etc., etc.

M MOTORS MARK X (repeater). Unused 3/6 (post 1/-). 1/20th H.P. A.C./D.C. series motors, long double spindle, 19/- (post 1/-). Mallory 12 v. vibrapacks, complete, 12/6 (1/6 post).

SEMI MIDGET CABINETS. Rexine back, dial, knobs, fret, new, 9/6.

25 UNITS. complete, 12/6. .002 18 kV Visconol condensers 4/9. 20H 150 m.a. chokes 9/6. Mu-metal VCR97 screens 5/- Resistor 1-j w. 3d., 1 w. 4d., 2/3 w. 6d. 1,000 other snips to callers.

Technical Trading Co., 181 Lake Road, Portsmouth

PHONE: 5785



- ★ 14 ranges
- ★ Linear scale
- ★ 200/250 volts A.C. mains operation
- ★ Condenser leakage test
- ★ Internal standards of 1%
- ★ Full guaranteed

The MODEL CR50 BRIDGE measures from 10pF to 100 mFd and from 1 ohm to 10 megohms in fourteen ranges, having a total scale length of 120

inches. Indication of balance is given by a magic eye fed from a high gain pentode amplifier. Designed for bench use with case and panel of steel, finished black crackle. Complete with valves and instructions ready for use from A.C. mains. ONLY £7/18/- plus 4/6 carr./packing. Over 600 of these instruments have now been sold.

SG50 SIGNAL GENERATOR covers 100 kc/s to 80 Mc/s in six ranges on fundamentals (not harmonics), modulated or CW. Uses two type EF91 valves and SenTerCel rectifier. Mains transformer. The directly calibrated scale length is greater than 60 inches. In olive green case 9in. x 13in. x 4in. with front panel of green Perspex engraved white. ONLY £8/10/-, plus 6/- carr./packing.

VV50 VALVE VOLTMETER measures up to 250 volts A.C., R.F., and D.C. with input impedance of 11 megohms. ONLY £7/19/6, plus 4/6 carr./packing.

Please send a stamped and self addressed envelope for further details, sent by return post. H.P. terms available. Callers only—Charles Britain (Radio) Ltd., 11 Upper Saint Martin's Lane, W.C.2.

Post and H.P. orders to—

GRAYSHAW INSTRUMENTS
PARK STABLE YARD, LEYTON ROAD, HARPENDEN, HERTS.

MAINS TRANSFORMERS

Primary, 200-250 v. P. & P. 2/-
300-0-300, 100 mA. 6 v. 3 amp.
5 v. 2 amp., 22/6.
Semi-Shrouded, drop-through 380-0-
380 v., 120 mA., 6.5 v. 4 amp., 5 v.
2.5 amp., 22/6.
Drop thro' 350-0-350 v. 70 mA. 6 v.
2.5 amp., 5 v. 2 amp., 14/6.
Chassis mounting or drop-thro'. Pri.
110 250 v. Sec. 300-0-350, 250 mA.,
6.3 v. 7 amp., 6.3 v. 0.5 amp., 5 v.
C.T. 0.5 amp. 4 v. 0.5 amp. P. & P. 3/6,
32/6.

Chassis mounted and fully shrouded,
80 mA., 6 v. 3 amp., 5 v. 2 amp., 14/6.
250-0-250 80 mA., 6 v. 4 amp., 14/-
Drop thro' 270-0-270, 80 mA. 6 v.
3 amp., 4 v. 1.5 amp., 13/6.
Drop thro' 270-0-270 60 mA., 6 v.
3 amp., 11/6.
250 v. 350 mA., 6.3 v. 4 a., twice 2 v.
2 a., 19/6.

Auto-Trans. Output 200/250 H.T. 500 v.
250 mA., 6 v. 4 a., twice 2 v. 2 a., 19/6.
250-0-250, 60 mA., 6.3 v. 1.5 a.,
0.5-6.3 v. 1.5 a., 10/6.
Auto Trans. Input 200/250. H.T.
250 v. 350 mA. Separate L.T. 6.3 v.
7 a., 6.3 v. 11 amp., 5 v. 3 amp., 14/-
P. & P. 3/-.

Primary, 230 v., fully shrouded, screened
primary, 13 v. 1 amp., 7/6.
Pri. 200 v. Sec. 500-0-500 and 500-0-500
250 mA., both windings. 4 v. 3 amp.
4 v. 3 amp., 39/6. P. & P. 5/-.

Mains Transformer, fully impregnated.
Input 210, 220, 230, 240. Sec. 350-0-350
100 mA., with separate heater trans-
former. Pri. 210, 220, 230, 240. Sec.
6.3 v. 2 amp., 6.3 v. 3 amp., 4 v. 6 amp.
and 5 v. 2 amp., 30/-. P. & P. 6/-.
350-0-350 75 mA. 6.3 v. 3 a., tap 4 v.
6.3 v. 1 a., 18/6.
500-0-500 125 mA. 4 v. C.T. 4 a., 4 v.
C.T. 4 a., 4 v. C.T. 2.5 a., 27/6.
500-0-500 250 mA. 4 v. C.T. 4 a., 4 v.
C.T. 5 a., 4 v. C.T. 4 a., 39/6.

6 1/2 in. M.E. Speaker, 1,000 ohm field.
15/-.
R. & A. T.V. energized 6 1/2 in. speaker
with O.P. trans, field coil, 175 ohms
9/6. P. & P. 2/6.

R. & A. 6 1/2 in. M.E. speaker, with O.P.
trans, field 440 ohms, 10/6. P. & P. 2/6.

Volume Controls. Long spindles less
switch, 50K, 600K, 1 meg., 2/6 each.
P. & P. 3d. each.

Volume Controls. Long spindle and
switch, 1/2, 1 and 2 meg., 4/- each.
10K and 50K, 3/6 each. 1 and 1 meg.,
long spindle double pole switch, mini-
ature, 5/- P. & P. 3d. each.

Trimmers, 5-40 pf., 5d 10-110, 10-250,
10-450 pf., 10d.

Twin-Gang .0005 Tuning Condenser, 5/-
With trimmers, 7/6.

Twin Gang .0005, with feet, size
3 1/2 x 1 1/2 in., 6/6.

3-gang .0005, with feet, size 4 1/2 x
1 1/2 in., 7/6.

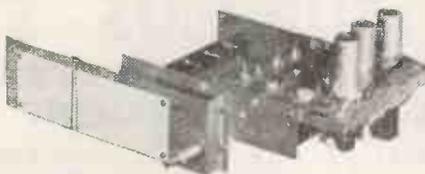
T.V. Coils, moulded former, iron-cored
wound for re-winding purposes only.
All-can 1 1/2 in., 1/- each, 2 iron-core
All-can 2 1/2 in., 1/6 each.

Used Metal Rectifier, 250 v. 150 mA.,
6/6. Metal Rectifier, 230 v. 45 mA., 6/-.
Metal Rectifier, RM2, 125 v. 100 mA.,
3/6.

OUTPUT TRANSFORMERS. Standard
type 5,000 ohms imp., 4/9; 43-1 with
extra feed-back windings, 2/3. Mini-
ature 42-1, 3/3. Mini-ratio 3,300,
7,000 and 14,000, 5/6. 10-watt push-
pull, 6V8 matching, 7/- 90-1 3 ohm
speech coil, 6/6.

PUSH-BACK CONNECTING WIRE.
Doz. yds., 1/6. Post paid.

**STANDARD WAVE-CHANGE
SWITCHES.** 4-pole 3-way, 1/9; 6-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, 4-pole 3-way and
4-pole 2-way, 2/6 each. 2-pole 11-way,
twin-wafer 5/-; 1-pole 12-way single
wafer 5/-. P. & P. 3d.

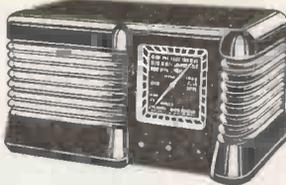


6 1/2 in. deep, 4in. high, 9in. blank-scale. Width including scale-overlap
measurability tuned. Complete with 3 valves. Post and Pkg. 3/-. £2/18/6.

T.V. CONVERTER for the new commercial stations, complete with 2 valves. Existing can
be set to any channel within the 180-190 Mc/s. band. I.F. will work into any existing T.V.
receiver between 42-68 Mc/s. Input arranged for 80 ohm feeder. EF80 as EF amplifier, ECC81
as local oscillator and mixer. The gain of the first stage, R.F. amplifier 10DB. Required
power supply of 200 D.C. at 25 mA., 6.3 v. A.C. at 0.5 amp. Input filter ensuring freedom from
unwanted signals. Simple adjustments only, no instruments required for trimming. Will
work into any T.R.F. or superhet. Size 4 1/2 x 2 1/2 in. P. & P. 3/6. £2/18/6. Double sound
mains transformer, 200/250 v. metal rectifier, and smoothing condenser to suit above 18/6.

R.F. E.H.T. OSCILLATOR COIL. 6-9 KV with EY51 rectifier winding, and circuit diagram, 15/-
As above but complete with 6V8, EY51 and associated resistors and condensers. Circuit diagram,
£2/19/6. P. & P. 3/.

PLASTIC CABINET, as illustrated, 1 1/2 in. x
6 1/2 in. x 5 1/2 in. In Walnut and Cream, also in
polished Walnut complete with T.R.F.
chassis, 2 waveband scale, station names,
new wave-band, back-plate, drum, pointer,
spring, drive spindle, 2 knobs and back,
22/6. P. & P. 3/6. AS ABOVE, with superhet
chassis, 23/6. P. & P. 3/6. Either of the
above items complete with 5" P.M. speaker
and O.P. transformer, 17/6 extra.



Used metal rectifier, 230 v. 50 mA., 3/6;
gang with trimmers, 6/6; M. and L.T.R.F.
coils, 5/-; 3 obsolete ex-Govt. valves, 3 v/6
and circuit, 4/6; heater, trans., 6/-; volume
control with switch, 3/6; wave-change
switch, 2/-; 32 x 32 mfd., 4/-; bias condenser,
1/-; resistor kit, 2/-; condenser kit, 4/-.

Used A.C. mains 200/250 volts, 4 valve plus metal rectifier, medium wave superhet in polished
wood cabinet, size 14 x 9 1/2 x 7 1/2" complete with valves 6X8, 6X7 6Q7 and 6F8. 6 1/2 P.M.
speaker. Fully guaranteed. P. & P. 7/6. £3/15/6.

P.M. SPEAKERS. 6 1/2" closed field 18/6. 8" closed field 20/6. 10" closed field 25/- 3 1/2" 16/6.
P. & P. on each 2/-.

EXTENSION SPEAKER in polished walnut, complete with 8in. P.M. P. & P. 3/- 24/6.
SINGLE SPEED PLAYER. A.C. mains 200/250 v., complete with needle armature pick-up
in a really wonderful polished walnut cabinet, will take up to a 12 inch record. Pull-out draw on
steel runners. Original list price £8/17/6, our price £4/19/6, post and packing 10/-.

Three speed automatic changer by a very famous manufacturer, current model. Will take
7in., 10in. or 12in. records mixed. Turnover crystal head. Cream finish.
VERY LIMITED QUANTITY.
A.C. Mains 200/250. £7/19/6. P. & P. 4/6.

1,200 ft. High impedance recording tape on aluminium spool, 12/6 post paid.
CRU one-sixth h.p. A.C. 220/230 v. by Brook Motors. Reversible for continuous running, 24/9/6
Post and pkg. 7/6.

Diagram Chassis, 5 valve A.C./D.C. 3 wave-band superhet 195/255 v. 19-49, 200-550 and
1,000-2,000 mtrs., I.F. 470 Kc. size of chassis 13 x 6 1/2 x 2 1/2 in. size of scale 7 1/2 x 3 1/2 in. Valve
line-up 10C1, 10F9, 10L1D1, U404 and 10P14. Twin mains filter input, 2 dial lights and 8in.
P.M., £8/17/6. P. & P. 5/-.

SPECIAL OFFER 8in. P.M. speakers, removed from chassis, fully guaranteed. All by
famous manufacturers. P. & P. 1/6. 12/6.

CONSTRUCTOR'S PARCEL, medium and long wave A.C. mains 230/250 2-valve plus metal
rectifier, comprising chassis 10 1/2 x 4 1/2 x 1 1/2 in., 2 wave-band scale, tuning condenser, wave-
change switch, volume control, heater trans., metal rectifier, 2 valves and vholders, smoothing
and bias condensers, resistors and small condensers, and medium and long wave coil, litz
wound 22/8. P. & P. 3/9 extra. Circuit and point-to-point, 1/3.

CONSTRUCTOR'S PARCEL, comprising chassis 12 1/2 x 8 x 9 1/2 in., cad. plated, 18 gauge, v/h.
I.F. and out-put, back-plate, 2 supporting brackets, 3 wave-band scale, new waveband
station names. Size of scale 11 1/2 x 4 1/2 in., drive, sp. drum, 2 pulleys, pointer, 2 bulb holders, 5
pax. I.O. v/h., 4 knobs and pair of 465 I.F.s, twin gang, 16 x 16 mfd. 350 wkg., mains trans.
250-0-250 60 mA. 6.3 v., 2 amp., 5 v. 2 amp. and 6 1/2 in. M.E. speaker with O.P. trans. 39/6.
P. & P. 3/6.

CR100 Coil packs in first-class condition less oscillator section, complete with 4-gang tuning
condenser, 19/6. P. & P. 3/6.

CR100 465 Kc. I.F.s. types 3, 4 and 5 and F.B.O., new condition, 7/6 each. 465 Kc. Xtal for
CR100, 12/6.

4-gang tuning condenser for CR100, 9/6.
POLISHING ATTACHMENT for electric drills. Quarter inch spindle, chromium plated 5in.
brush, 3 polishing cloths and one sheepskin mout mounted on a 3in. rubber cup. Post and pkg.
1/6. 12/6. Spare sheepskin tops, 2/6 each.

POTATO AND VEGETABLE PEELER. By famous manufacturer. To suit models A200 and
A700. Capacity 4 1/2 lbs. complete with water pump. All aluminium construction, white stove-
enamelled finish. Originally intended for adaptation on an electric food-mixer, can be easily
converted for hand operation, 39/6. P. & P. 3/-.

USED A.C. MAINS 5 VALVE, 3 WAVE-BAND SUPERHET CHASSIS
Size 1 1/2 x 8 1/2 x 3 1/2 in., complete with 3 wave-band scale, size 10 1/2 x 5 1/2 in., pair of 465 Kc/s I.F.s,
tuning condenser, mains transformer, volume control with switch, tone control. 3 waveband
coil pack (this is a completely detachable coil pack on separate small chassis), various small
condensers and resistors and biasing condensers. 19/6. Post & Pkg. 3/6.
40-WATT FLUORESCENT KIT, A.C. mains 230/240. Comprising choke, power-factor con-
denser, 2 tube holders, starter and starter-holder. P. & P. 3/- 17/6.
90 watt A.C. or D.C. 200/250 v. FLUORESCENT KIT comprising trough in white stoved enamel
finish, two tube holders, starter and holder and ballast. Post and packing 1/6. 12/6.

**PERMEABILITY
TUNED T.V. UNIT**

Input 300 ohm bal-
anced line, coverage
54 Mc/s-89 Mc/s and
174 Mc/s-217 Mc/s.
Vision I.F.—45 Mc/s.,
sound 40.5 Mc/s. Use
6AK5 RF valve, 6AK5
as mixer and 6C4
Oscillator. Provision
for auto-gain control,
Dimensions 9in. wide
1 1/4 in. Four stages per-
meability tuned. Complete with 3 valves. Post and Pkg. 3/-. £2/18/6.

Mains Droppers. 0.3 amps., 460 ohms.
tapped 280 and 410, 1/6; 0.2 amp., 717
ohms, tapped at 100 ohms, vitreous, 1/6;
0.3 amps. 950 ohms, tapped 700 and
825, 2/6; 0.2 amp., 1,000 ohms,
vitreous, tapped 2/6; vitreous, 0.3
amp., 700 tapped 650, 640, 600, 3/6.
P. & P. on each 3d.

T.V. Width Controls, 3/6.
PERSONAL SHOPPERS ONLY. 9th.
Enlarger, 17/6. 12in. 27/6.

Germanium Crystal Diode, 1/6, post paid.
P. & P. Tube with ion burn, 17/6,
post paid.

Line O.P. Transformer in aluminium can
mounted in rubber, 12/6.

Speaker Matching Unit on aluminium
chassis, 3-15 ohms reversible, 12/6.
Line and E.H.T. Transformer, 14 Kv.,
using ferrocat core, complete with
line and width control, and corona
shields 67 rectifier winding, 35/-.
Line and O.P. Transformer, 9 Kv.,
using ferrocat core, complete with
built-in line and width control. Mounted
on small all-chassis. Overall size
4 1/2 x 1 1/2 in. EV51 rec. winding, 27/6.

Scan coils, low line low impedance
frame, complete with frame transformer,
to match above. 27/6. P. & P. 2/-.

Line and E.H.T. Transformer, 9 Kv.
ferrocat core, EV51, heater winding,
complete with scan coils and frame
output transformer, and line and width
control, £2/5/- P. & P. 3/-.

As above, but complete with line and
frame blocking transformers, 5 Henry
250 mA. choke, 100 mfd. and 150 mfd.
250 wkg. 380 mA. A.C. ripple, £2/19/6.
P. & P. 3/-.

Valve Holders, moulded ekt Mazda and
local, 7d. each. Parolin, octal
Mazda and local, 4d. each. Moulde-
d B7G, B8A and B9A, 7d. each. B79
moulded and B8A with screening can
1/6 each.

32 mfd. 350 wkg.	2/-
16 x 24, 350 wkg.	4/-
4 mfd. 200 wkg.	1/3
16 x 8 mid., 500 wkg.	4/6
16 x 16 mid., 500 wkg.	5/9
16 x 16 mid., 450 wkg.	3/9
32 x 32 mid., 350 wkg.	4/-
25 mfd. 12 wkg.	11d
25 mfd. 12 wkg.	4d
16 mfd., 500 wkg., wire ends.	2/6
8 mfd., 600 v. wkg., wire ends.	3/8
8 mfd., 250 v. wkg., tag ends.	1/6
50 mfd., 25 v. wkg., wire ends.	1/9
100 mfd., 350 wkg.	4/-
100 mfd., 450 v. wkg. 280 mA.	3/11
A.C. ripple	3/11
150 mfd., 350 v. wkg., 280 mA.	4/6
A.C. ripple	7/6
200 mfd., 275 wkg.	1/9
15 x 16 mfd., 35 wkg.	3/3
50 mfd., 180 wkg.	1/6
65 mfd., 220 wkg.	1/6
8 mfd., 150 wkg.	1/6
60 x 100 mfd., 280 wkg.	7/6
50 mfd., 12 wkg.	11d
50 mfd., 50 wkg.	1/9

Miniature wire ends moulded, 100 pf.,
500 pf., and .001, each, 7d.

Combined 12in. mask and escutcheon,
in lightly tinted Perspex. New aspect
eased in brown. Fits on front of
cabinet, 12/6. As above for 15 in. tube,
17/6.

Frame Oscillator Blocking Trans. 4/6.
Line Osc. Blocking Trans. 4/6.

CHOKES:
2-20 Hen. 150 mA., 15/- P. & P. 3/-
6 Hen., 275 mA., 15/- P. & P. 3/-
100 Hen. 40 mA., 15/- P. & P. 3/-
2 Henry 150 mA., 3/6; 250 mA., 10 Henry
10/6; 5 Henry 230 mA., 60 ohms,
8/6.

Wide Angle P.M. Focus Units. Vernier
adj. state tube, 15/-.

Energised Focus Coil, low resistance
mounting bracket, 17/6.

Ion Traps for Mullard or English Electric
tubes, 5/-, post paid.

Standard 465 Kc. iron-cored I.F.s.,
4 x 1 1/2 x 1 1/2 in., per pr., 7/6. Wire-
stand, iron-cored, 465 Kc. I.F.s.
3 x 1 1/2 x 1 1/2 in., per pr., 8/6.

Iron-Cored 465 Kc. Whistle Filter, 2/6.
465 Kc. MIDGE I.F.s. Q.120 size
1 1/2 in. long, 1 1/2 in. wide, 1/2 in. deep by
various manufacturer. Pre-aligned
adjustable iron-dust cores, per pair,
12/6.

**SIGNAL
GENERATOR**
Coverage 120 Kc/s-84 Mc/s,
£4-19-6
or 34/- deposit, 3 pyts. of 25/-
P. & P. 4/-.

R. AND T.V. COMPONENTS (ACTON) LTD.
23 HIGH STREET, ACTON, LONDON, W.3
Telephone: ACOrn 5901 (Opposite Granada Cinema)
GOODS NOT DESPATCHED WHERE CUSTOMS DECLARATION
IS APPLICABLE
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 1/6 up to 10/-, 2/- up to £1, and 2/6 up to £2. All
enquiries S.A.E., lists 5d. each.

**PATTERN
GENERATOR**
Coverage 40 Mc/s-70 Mc/s,
£3-19-6
or 29/- deposit, 3 pyts. of £1
P. & P. 4/-.

SAMSON'S SURPLUS STORES

LONDON'S GREATEST DEALERS IN RADIO AND ELECTRONIC EQUIPMENT

HEAVY DUTY TRANSFORMERS by famous Manufacturers. All tropically rated. Pri. 230 v., Sec. 50 v., 20 amp. completely enclosed. £6/10/- plus carr.
Pri. 230 v., Sec. 11 v. 150 amp. £7/10/-, plus carr.
Pri. 115 v., Sec. 17.5 v. 15 amp., and 2.2 v. 18 amp., 35/-, carr. 4/-
Pri. 200-250 v., Sec. 8.2 v. CT 10 amp., 25/-, carr. 4/-
Pri. 200-250 Sec. tapped 10-12 v., 16 amp., 32/6, carr. 4/-

A.M. H.T. Transformers, Pri. 230 v., Sec. 1,500 v., 1.6 KVA, 65/-, carr. 7/6.

I154 TX HT Transformers, Pri. 200-250 v., Sec. tapped 1250-1300 v., 350 mA., 35/-, carr. 4/-
Smoothing chokes to match, 10/6, carr. 2/-

HEAVY DUTY SLIDING RESISTORS. We have London's largest selection. Listed below are a few types of our range.

5.3 ohms., 8 amp. with geared control, 35/-
0.4 ohm. 25 amp. with geared control, 17/6
1 ohm. 12 amp. Slider control, 12/6. 7.5 ohm. 4 amp. geared control, 15/-
50 ohm. 1 amp. very fine slow motion control, 8/6. 100 ohm. 1.5 amp. slider control, 22/6. Carr. on all resistors, 2/-

ALKALINE BATTERIES. Crates of five cells giving 6 v. at 58 A.H. Size of wood crate 15 x 5½ x 11¼ inches, £5/19/6, plus carr. 7/6. Single cells 2.4 v. 18/20 A.H. Size 4½ x 6 x 3½ inches, 15/-, carr. 2/-
Brand new meters by famous Makers, 4in. Round Flush MI Ammeters, 0-40 amp., 500 c/s. Maker's tolerance slightly less at 50 c/s., 35/-
P.P. 2/-
3½in. Round Flush MC 0-400 MA, 30/-
P.P. 2/-
2½in. Round Flush 500 MA, 100 MA., 50 MA, 15/- ea.
P.P. 1/6. 0-20 c. A.C. 50 c/s. 2½in. Round Flush Blank Scale or Calibrated 10/6. P.P. 1/6.

0.5 amp. RF Tin. Sq. Flush, 8/6. P.P. 1/-
Many other types of High Grade Meters available. Let us know your requirements.

H.T. SUPPLY KIT includes Transformer, pri. 200-250 v., and Metal Rectifiers to give 220 v. D.C. 110 mA, as used in the A.M. 1155 Receiver power supply unit, 17/6, pp. 2/-

COMMANDO ASSAULT TELEPHONE CABLE, P.V.C., 1,000 yard drums. Ideal telephone cable and very useful for the home and garden, 12/6 per drum, P.P. 1/6.

EXIDE 10 VOLT 5 A.H. GLASS ACCUMULATORS. Size: 7in. x 2½in. x 5in. Suitable for H.T. unit construction and models, etc. Brand new in maker's cartons, 7/6, pp. 1/6.

WILLARD 24 V. 11 A.H. AIRCRAFT BATTERIES. Size: 8in. x 7½in. x 7½in., 47/6, carr. 7/6.

ARMY FIELD TELEPHONES, TYPE DS. Buzzer calling, complete with hand set and batteries. Built-in strong metal cases. Suitable for farms, building sites, workshops, etc., 49/6, carr. 3/-

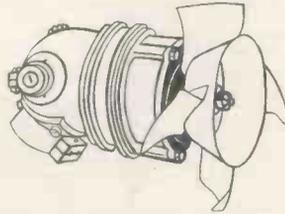
INSTRUMENTS, ADMIRALTY INTEGRATORS, TYPE A 591. Incorporating very fine Galvo movement, coil 40 ohms. Centre zero to F.S.D. 1 microamp. Small mirror one metre radius. A very useful laboratory instrument, 65/-, carr. 2/6.
METRO-VICKERS MASTER VOLTMETERS, 0-20 volts A.C. 50 cy. M.I 6in. mirrored scale, 25/-, P.P. 1/6.

36FT. AERIAL MASTS. Comprising nine tubular steel sections, length 4ft., dia. 2in. Top plate and base. Pickets and guys not supplied. £5/10/-, carr. 7/6.

HEAVY DUTY CANADIAN ADMIRALTY 6in. BLOWERS. Motor Spec. 220 A.C. D.C. 1 h.p. R.P.M. 2,600. Series wound, continuous rating. £17/10/-, plus carr.

ALL MAIL ORDERS TO OUR EDGWARE ROAD BRANCH PLEASE. THIS IS OPEN ALL DAY SATURDAY. HOURS 9-6. 9-1 THURSDAY.

12 VOLT D.C. FANS BY G.E.C.



Very powerful 5½in. blades, overall length 7½in. Will operate on 15-20 volts. A.C. Brand new at a fraction of maker's price. 35/-, P.P. 2/-

AMERICAN MINIATURE GEARED MOTORS



Overall length of motor 7½in. Brand New. 39/6, P.P. 2/-

CROYDON ENG. CO., GEARED CAPACITOR/INDUCTION MOTORS



A.C. 220-240 v. Motor shaft 1,400 r.p.m. Geared right angle shaft 300 r.p.m. Continuously rated. With capacitor, £3/19/6, carr. 5/-

I154 TX H.T. TRANSFORMERS. Pri. 200-250 v. Sec. 1250-1300 v. 350 mA., 35/-, carr. 4/-

CONSTANT VOLTAGE TRANSFORMERS BY SOLA, U.S.A. Pri. 90-125 v. or 190-250 v. Sec. 115 v. at 2 kVA. Pri. and Sec. are completely isolated for 50 or 60 cycle operation. Approx. weight 200lb., £19/10/- each, £37/10/- per pair, carriage according to distance, limited supply only.

S.T.C. D.C. SUPPLY UNITS. A.C. input 200-250 volts, D.C. output 220 volts 1.5 amps. at 50 degrees C. Built in strong metal grey cabinet completely fused, £15, plus carr.

S.T.C. HEAVY DUTY D.C. SUPPLY UNIT. A.C. input 200-240 volt, output D.C. 50 volts 24 amps. with ammeter, fuses and control switching. Built in strong grey metal cabinet size 2ft. 6in. x 1ft. 7in. £27/10/-, plus carr.

ROLLS-ROYCE COOLANT PUMPS. A heavy duty Turbine type pump driven directly from a splined socket 1,000-1,500 G.P.H. 1½in. bore outlet. Brand new in maker's carton, 47/6.

12in. COPPER PLATED AERIAL RODS. Push-in sleeve joint, 8/6 per half gross, 15/- per gross. P.P. 1/6. SPECIAL PRICE FOR LARGER QUANTITIES.

LOOK! CO-AXIAL CABLE—LOWEST PRICE EVER. Super quality Ex Govt. 80 ohm. 100 yards, 50/-, carr. 4/-
1,000 yards £17/10/-, carr. 15/-

Amazing offer! First time on Surplus Market. MINIATURE ACCUMULATORS made by Willard Co., 36 v. 0.2 amp. Size 3½ x 1½ x ¾. Weight 5½ oz. 5/-, P.P. 6d. 6 v. 1.2 amp. Size 3½ x 1½ x ¾. Weight 4½ oz. 7/6, P.P. 6d.; or set of three 36 v. and one 6 v. In sealed container, £1, P.P. 1/3. Brand new and uncharged. Easily filled with hypodermic syringe.

BRAND NEW EX-ARMY HYPODERMIC SYRINGES. Complete with 1 needle. 4/9 P.P. 6d. Extra needles 6d. ea.

PAINTON ATTENUATORS. Standard ½in. dia. spindle 500 ohm or 5,000 ohm, 10/6, P.P. 1/6
BANKS OF FOUR RESISTANCE MATS. 690, 150 and two at 80 ohms. Size of each mat 8 x 6½in. 10 6 per set, P.P. 1/6. U.S.A. 20 Amp. OVERLOAD SWITCHES. 5/6. P.P. 6d.
VARLEY 6 VOLT DELAY SWITCHES. 5/-, P.P. 6d.
SUNVIC CONTROL TYPE 602A, 4 pin Hot Wire replacement tubes, 7/6, P.P. 9d.
FERRANTI 5 AMP KWH METERS, less case, brand new, 13/6, P.P. 1/6.

BRAND NEW A.M. CONDENSERS BY FAMOUS MAKERS. 6 mfd. 1,500 v. wkg. Tropical, 5/-, carr. 1/6. 2.25 mfd. 2,000 v. wkg. tropical, 5/-, P.P. 1/6. 4 mfd. 800 v. wkg. 160 deg. F., 5/6. P.P. 6d. 4 mfd., 400 v. wkg., at 160 deg. F., 3/6. P.P. 6d. 4 mfd. 350 v. wkg. at 160 deg. F., 3/-, P.P. 6d. Sprague 1 mfd., 750 v. wkg. tropical, 2/6, P.P. 6d. 2 mfd. 1,000 v. wkg., 140 deg. F., 2/9, P.P. 6d. 0.01 mfd. tubular 5,000 v. wkg. 60 deg. C., 2/-, P.P. 6d.

SPECIAL OFFER—OFFICE INTER-COMM. SETS. FAMOUS MANUFACTURER'S EXPORT SURPLUS. Includes Master and two extensions built in highly polished wood cabinets in Oak or Mahogany. Operates from 200-250 volts A.C. Valve line-up 1 UF41, UL42, and metal rectifier. The Master is designed to operate four extensions. Brand new in Maker's cartons with installation instructions. £8/19/6, originally sold at 16 gns. Extra Extensions 27/6 each.

WESTINGHOUSE HEAVY DUTY CHARGERS. A.C. input 200-250 v. D.C. output 144 volts 6 amps. Built in metal cabinets, size 2ft. x 1ft. 10in. x 1ft. 8in. With ammeter. Fine and coarse switch. Variable control fuses, and mains switch. £18/10/-, plus carr.

BRAND NEW EX-ARMY TELEPHONE LOUDSPEAKING UNITS. Type 4, YA4930 in makers' cartons. Comprising wall-mounting Speaker unit with Breast Mike, one Telephone unit with Handset, and one Telephone unit with Hand-mike and Headphones. Any pair of units can be used for two-way communication, or all three for a multi-station link-up. Ideal for Fairground announcing, Garages, Workshops, Sports events, etc., etc. Will operate over a distance of 5 miles with the utmost efficiency. No calling device is incorporated, but a simple buzzer circuit can easily be installed. Complete with full working instructions and batteries. Complete, £7/10/-, carr. 10/-
OR stations B and C only, £6, carr. 7/6. OR two type A stations, ideal for two-way telephone communication, £3/10/-, carr. 5/-
Callers welcomed for demonstration at either branch.

169/171 EDGWARE ROAD, LONDON, W.2.

TEL.: PAD 7851

AND

125 TOTTENHAM COURT ROAD, W.1.

TEL.: EUS 4982

PERSONAL SHOPPERS WELCOME.

ORDERS ACCEPTED M/A FROM COLLEGES, SCHOOLS, LABORATORIES, ETC.

ALPHA OFFER A SELECTION

OF GOVERNMENT SURPLUS VALVES ALL TESTED BEFORE DESPATCH

Full list available 2/6d. stamp. Complete catalogue 6d.

OA24	6/-	6K7GT	6/6	2524G	9/-
I45GT	6/6	6K7M	6/9	35L6GT	8/9
IA7	1/16	6K8G	8/-	3524GT	8/6
IC5GT	8/-	6K8GT	9/6	50L6GT	8/6
IL4	7/6	6L6G	9/-	AC6/PEN	5/6
IN5	10/-	6L7M	7/6	ATP4	6/6
IR5	7/6	6N7	7/6	E1148	2/-
IS5	7/6	6Q7G	9/-	EBC41	11/-
IT4	7/6	6R7G	8/-	ECH42	10/6
IU5	8/-	6SA7GT	8/-	ECL80	12/6
220V5G	6/9	6S7G	7/6	EF80	11/-
2A3	6/9	6SH7	6/-	EL41	11/6
2X2	5/-	6S17GT	8/-	EY51	13/6
3A4	8/-	6SK7	6/3	FW4/500	10/-
3Q4	9/-	6SL7	8/-	GZ32	12/6
3Q5	10/-	6SN7GT	9/-	H30	5/-
3D6	5/9	6SQ7	9/-	HL23DD	7/6
354	8/6	6SS7	8/-	KT2	5/-
3V4	9/-	6U4	14/-	KT33C	11/6
4D1	3/-	6U5G	8/6	KT66	10/6
42	8/-	6U7G	9/-	MS/PEN	5/-
5U4	8/6	6V6G	7/6	PCB84	11/6
5Y3GT	8/6	6V6GT	7/6	PCF80	11/-
5Z3	8/6	6X5GT	7/9	PCF82	11/-
5Z4G	8/6	7B7	8/6	PEN25	8/-
6A7	10/6	7C5	8/6	PEN46	8/6
6A8G	10/6	7C6	8/6	PEN220A	4/-
6AC7	6/6	7H7	8/-	PM12M	10/-
6AG5	7/6	7Q7	8/-	QP21	7/6
6AJ5	9/-	7R7	8/6	S130	8/6
6AK5	7/-	7S7	8/6	VR53(EF39)	6/6
6AL5	7/-	7Y4	8/6	V454(EB34)	2/-
6AM5	5/6	80	8/6	VR55(EBC33)	7/6
6AM6	7/6	807	7/6	VR56(EF36)	6/-
6AQ5	8/6	8D2	2/9	VR57(EK32)	8/-
6AT6	8/-	9001	5/6	VR65(SP61)	3/9
6B4	5/-	9002	5/6	VR65A(SP41)	3/6
6BBG	4/-	9003	5/6	VR66(P61)	3/9
6BA6	8/6	9004	5/6	VR91(EF50)	6/-
6BE6	8/-	9006	6/-	VR91(EF505y1)	8/-
6BR7	9/6	954	2/-	VR92(EA50)	2/-
6BRV6	8/6	955	4/9	VR105(30C3)	5/6
6C4	8/-	956	3/6	VR116(BD72)	4/-
6CSGT	7/6	12A6	6/9	VR119(DDL4)	4/-
6C6	6/6	12A7	9/-	VR123(EF8)	6/6
6CD6G	13/6	12A7	9/-	VR136(EF54)	7/-
6D3	7/6	12A7	10/-	VR137(EC52)	6/3
6D6	7/3	12C8	8/-	VR150(30OD3)	9/-
6F6G	7/6	12H6	5/-	VP23	8/-
6F6M	8/6	12J5	6/-	VT52(EL32)	8/-
6F8G	7/-	12K7	9/-	VT501(TT11)	6/-
6G6G	6/6	12K8GT	9/-	VU39(MU12/14)	8/6
6H6	3/6	12Q7GT	9/-	VU64(U12)	8/6
6I5G	5/-	12S17	8/6	VU111(V1907)	3/6
6I5GT	5/6	12SK7	6/6	VU120A	3/-
6I5M	6/6	12SQ7	8/6	X65	10/-
6I6	8/-	12SR7	7/6	X66	11/6
6I7G	6/6	25A6G	10/6	Y63	9/-
6K6GT	6/6	25L6GT	8/6	Barreter	
6K7G	6/-	25Y5G	9/-	Atlas 150A	4/6

Wire Wound Controls B.O.A.
Pre Set 25 ohms 2/6
Colvern CLR90 10K ohms 2/-
Colvern CLR1232/268 50 ohms 2/6
Colvern 1,000 ohms, spindle Hn. 2/6

HEATER TRANSFORMERS
230 v. Input 2 volt. 5 amp. 4/6
230 v. Input 2 volt. 3.0 amp. 7/6
230 v. Input 4 volt. 1.5 amp. 5/-
230 v. Input 4 volt. 3.0 amp. 10/-
230 v. Input 5 volt. 2.0 amp. 10/6
230 v. Input 6.3 volt. .5 amp. 5/-
230 v. Input 6.3 volt. 1.5 amp. 6/-
230 v. Input 6.3 volt. 3.0 amp. 9/-
230 v. Input 12 volt. 75 amp. 5/-

SENERCEL RECTIFIERS
RM1, 3/9 ea.; RM2, 4/2 ea.; RM3, 5/- ea.; RM4, 16/- ea.

METAL RECTIFIERS
12 v. ± amp., 1/6 ea.; 12 v. 1 amp., 4/6 ea.; 2 v. 1 amp., 3/- ea.; 250 v. 45 mA., 6/3 ea.; 250 v. 75 mA., 7/6 ea.; 300 v. 60 mA., 7/6 ea.

CRYSTAL DIODES

Plastic case, wire ends, 2 for 2/1
"Another Alpha Kit for you to build"



3 Valve (6K7, 6J7, 6V8GT) Plus Metal Rectifier, 2 Wave Band Midget radio A.O. Malna, complete in every detail, full instructions, circuit diagram and shopping list 1/8. Complete kit down to nuts, bolts and solder £5/10/- Post 2/6

POCKET TEST METER
Ex-Govt. volt meter two ranges 0-15 v.; 0-250 v. D.C. Complete in case, 17/6 each.

IRON ELEMENTS
Standard adaptable type, 230 v. 450 w., 1/8 ea. Morphy Richards replacement type, 3/9 ea. H.M.V. replacement type 3/- ea.
FLIERS, with side cutters, 4/3 pair.

PUBLICATIONS Each
Midget Radio Construction Manual 3/6
Radiofolder "F" An inexpensive tape recorder 2/6
Radiofolder "B" A practical Oscilloscope 2/6
Radio Calculations Manual 3/6
Practical Circuits Manual 3/6
Radio and Television Laboratory Manual 2/6

L.E.M. Silver Mica 1,000 pF 10% 3/6
L.E.M. Silver Mica 100 pF 5% 3/6
T.C.C. Silver Mica 50 pF 10% 3/6
L.E.M. Silver Mica 300 pF 10% 3/6
Hunts Silver Mica 374 pF 1% 3/6
L.E.M. Silver Mica 350 pF 10% 3/6
L.E.M. Silver Mica 25 pF 20% 3/6
T.C.C. Silver Mica 1,000 pF 10% 3/6

Each
Tubular Condenser 5 mfd. 500 v. 350 v. 10/-
Vaxley Switch 1 pole 8 way 1 1/2 in. spindle 1/9
Arrow Toggle Slotted Dolly S.P. 1/9
Single Screened Cable yard 6d.

Eric Mains Dropper 725 ohms 7/6 tapped, 1/8
Dublier Moulded Mica AP9 .005 4/6
HF Pile Wound Chokes 1/-
Vibrator Clips 5d.
Dublier Nitrogen B45 12 mfd. 350 v. 5/6
International Octal Valve Holders
Paxolin 4/6
Vitroous Enamelled Resistors 20 w. 5,000 ohms. 1/-

B.S.R. MONARCH AUTOMATIC RECORD CHANGER
These units will autochange on all three speeds, 7in., 10in. and 12in. They play MIXED 7in., 10in. and 12in. records.
They have separate sapphire for L.P. and 70 r.p.m. which are moved into position by a simple switch.
Minimum baseboard size required 14in. x 12 1/2 in., with height above 5 1/2 in. and height below baseboard 2 1/2 in. A bulk purchase enables us to offer these BRAND NEW UNITS at this exceptional price. These units are beautifully finished in cream enamel with cream bakelite arm.
COMPLETE WITH FULL INSTRUCTIONS, £9/19/6.

AMERICAN INDICATOR UNIT TYPE BC989A
Brand new incorporating 5in. tube 3RF1, with mu-metal shield, 2-68N7GT, 2-48G0T, 6X5G, 2X2, 666G, 9 potentiometers, 24 v. aerial switch motor, transformer, and a host of small components. The whole unit which measures only 8 1/2 in. x 8 1/2 in. in. is brand new enclosed in black crackle box, and can be supplied at 65/- plus 5/- P. & P.

Standard 1 1/2 in. Brown Knobs, per dozen 5/6
Zenith Dropper, £10 ohms, each Bakelite case. Double Coil Buzzers, each 2/6
Eric Dropper, 1,340 ohms, 150 ohms, each 2/6
Box, 4 EA Nuts and Bolts, each 1/-
Interval Transformers: Ex. Equip, each 7/6
Hand Microphone Bakelite switch in handle, each 7/6
High to low impedance headphone units (insert in lead) each 3/6
Rubber grommets, assorted, per dozen 9d.
Bakelite Needle cups, each 1d.
Sleeving, various colours, 1 MM. length 1d.
Mains Switch, 2 hole fixing, S.P., each 1/8
Vaxley Switch, 3 P., 3 B., 3 W., each 1/8
Vaxley Switch, 1 Pole, 9 Way, each 1/8
Waxed Carton, 6 H.F.D., 450 v., each 1/9
Waxcoater, WX12 W4, WX16, each 3d.
Collaro HI FI Pickup, each 32/6

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 9d.; 20/- add 1/-; 40/- add 1/6; £5 add 2/- unless otherwise stated. Minimum C.O.D. fee and postage 2/3.

MAIL ORDER ONLY

MAINS TRANSFORMERS
3-WAY MOUNTING TYPE
MT1
Primary; 200-220-240 v.
Secondaries; 275-0-275 v. 80 mA. 0-6.3 v. 4 amp. 0-5 v. 2 amp. Both tapped at 4 v. 17/8 ea.

MT2
Primary; 200-220-240 v.
Secondaries; 350-0-350 v. 80 mA. 0-6.3 v. 4 amp. 0-5 v. 2 amp. Both tapped at 4 v. 17/8 ea.

PENOL RECTIFIERS
K3/25 5/8; K3/40, 7/6; K3/45, 8/2; K3/50, 8/8; K3/60, 9/8; K3/100, 14/8.

CONDENSERS Each

8 x 8 mfd. 450 v.	4 -	32 x 32 mfd. 450 v.	6/11
8 x 16 mfd. 450 v.	4 -	32 x 32 mfd. 350 v.	5/6
8 x 24 mfd. 350 v.	3/-	25 mfd. 25 v.	5/9
8 x 32 mfd. 475 v.	3/9	60 mfd. 450 v.	2/8
12 x 4 mfd. 450 v.	2/-	64 mfd. 350 v.	2/8
16 mfd. 450 v.	3/-	Dublier (B.R. Range);	
16 x 8 mfd. 350 v.	4/-	BR 850. 8 mfd. 500 v.	2/9
16 x 16 mfd. 250 v.	3/3	BR 1650. 16 mfd. 500 v.	3/3
16 x 16 x 8 mfd. 350 v.	3/6	BR 2050. 20 mfd. 500 v.	3/6
20 x 20 mfd. 500 v.	4/3	8 x 8 mfd. 500 v.	1/9
24 mfd. 450 v.	2/9	BR 501. 50 mfd. 12 v.	4/8
24 x 16 mfd. 350 v.	3/6	18 x 16 mfd. 500 v.	5/-
32 mfd. 450 v.	3/-	16 x 8 mfd. 500 v.	4/9
32 x 8 mfd. 350 v.	3/6		
32 x 16 mfd. 350 v.	4/6		

OSMOR COIL PACKS
Type H.O., 48/- each. Type L.M., 40/- each. Type T.B., 50/- each. Type TRF, 40/- each.

SPRAGUE CONDENSERS
.05 mfd., 500 v.; 0.1 mfd., 1,000 v.; 1 mfd., 350 v.; .02 mfd., 750 v. All 9/- doz.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

★ ★ ★ ★ ★ ★ ★ ★ ★ ★



LOUDSPEAKER CABINETS ★

★ This attractive walnut finished cabinet is available for 6 1/2 in. or 8 in. speaker units. Metal speaker fret, complete with back and rubber feet.

★ 6 1/2 in. type: Measures 8 1/2 in. x 8 1/2 in. x 4 1/2 in. at base. Price 16/6 each.

★ 8 in. type: Measures 10 1/2 in. x 10 1/2 in. x 5 1/2 in. at base. Price 20/6 each.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

LOUDSPEAKER UNITS

Rola 5in. Speaker	17/6 ea.
Goodmans 5in. unit	18/6 ea.
Plessey 6 1/2 in. light weight unit	16/6 ea.
Rola 6 1/2 in. standard type	17/6 ea.
Lectrona 6 1/2 in. with transformer	18/- ea.
Truvox 6 1/2 in. wafer type	20/- ea.
Plessey 8 in. lightweight unit	17/6 ea.
R. & L. 10in. unit	25/6 ea.
Eliphtical 4in. x 7in. unit	21/10 ea.
Mains energised 8in. unit, 1,000Ω	21/6 ea.
Mains energised 6in. unit, 600Ω	17/6 ea.

CHASSIS
Aluminium Un drilled with Reinforced Corners. Available in the following sizes:

6in. x 4in. x 2 1/2 in.	4/6 ea.
8in. x 6in. x 2 1/2 in.	6/3 ea.
10in. x 7in. x 2 1/2 in.	7/3 ea.
12in. x 8in. x 2 1/2 in.	8/6 ea.
14in. x 8in. x 2 1/2 in.	9/6 ea.
16in. x 8in. x 2 1/2 in.	12/- ea.
All are four sided—ideal for radio receivers — amplifiers — powerpacs.	

PERSPEX IMPLOSION GUARDS
Incorporates escutcheon and filter.
12in. type, 11/6 ea.; 16in. type, 14/6 ea.

EX GOVERNMENT AND SURPLUS CONTROLS
This popular range is suitable for all Television constructors, etc. Keep your costs down when building the "Argus" or "Simplex" receivers. Available 500Ω, 600Ω, 1,500Ω double type, 2 KΩ, 5 KΩ, 10 KΩ, 20 KΩ, 25 KΩ, 50 KΩ, 200 KΩ, 100 KΩ. ± meg. Ω, ± meg. Ω. 1 meg. Ω, 2 meg. Ω, 50 KΩ double type. All 1/2 each.

ALPHA RADIO SUPPLY CO.

5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS 1.

WHEN ORDERING PLEASE QUOTE "DEPT. W.W."

OPENING FOR A

young electronic brain

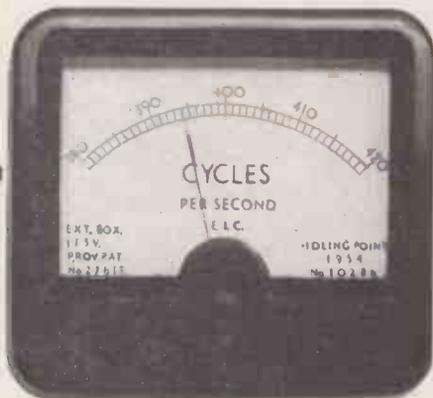
If yours is a knowledgeable mind in the ways of modern ELECTRICAL AND ELECTRONIC PRODUCTION METHODS and if you seek to apply that knowledge more fruitfully in an organisation whose resources and activities are as broad as its horizons—then let us hear from you.

Men of the right calibre will find this opportunity unusually rewarding both in salary and opportunity. And as a matter of additional interest to prospective personnel, many of the people engaged in this specialised work at Plessey are given the chance to travel extensively in the world's large industrial centres in search of new and better production methods.

Write in the first instance, to the

PERSONNEL MANAGER

THE PLESSEY COMPANY LIMITED
ILFORD · ESSEX



FREQUENCY METERS

2½-8" up to 10,000 cycles

DIFFERENTIAL A.C. CURRENT METERS

COMPARING THE MAGNITUDE OF TWO CURRENTS.

A full range of switchboard and portable instruments, including four types of Millirange Meters.

THE ELECTRICAL INSTRUMENT CO. (HILLINGTON), LTD.

Boswell Square Industrial Estate, Hillington, Glasgow, S.W.2. Halfway 1166 and 2194

LEEVERS RICH

HEAVY DUTY

MAGNETIC TAPE RECORDER

for Film, Radio or TV production and other professional uses.

ADVANCED DESIGN

FINE WORKMANSHIP

PEERLESS PERFORMANCE

LEEVERS-RICH EQUIPMENT Ltd.
78, Hampstead Rd., London, N.W.1. EUSton 1481

CABINETS!!

Many and varied types (Table and Console) and Console Tape Recorder Types.

The "Empress" DE LUXE CONSOLE CABINET

Beautifully styled, elegantly veneered in medium full grain walnut, highly polished finish, interior finished in light polished sycamore. Ample storage space. Designed to our own specification, it will accommodate the largest tape desk on the market. It has many applications, e.g. good quality amplifier, etc. O.A. dimensions 3ft. x 1ft. 6½in. x 2ft. 10in. high with lid closed. Send for our cabinet list which gives details of this and many other types.



Send for our current monthly bulletin of Replacement Radio/Radiogram chassis, Tape Recording equipment, etc.



Trade Only Supplied

V.E.S. WHOLESALE SERVICES Ltd

Dept (W.W.), 11, Gunnersbury Lane, Acton, W.3.

Tel.: ACOrn 5027.

TRANSFORMERS

COILS

LARGE OR SMALL QUANTITIES

CHOKES

TRADE ENQUIRIES WELCOMED

SPECIALISTS IN

FINE WIRE WINDINGS

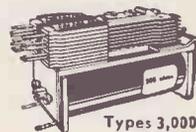
MINIATURE TRANSFORMERS, PICK-UP, CLOCK AND INSTRUMENT COILS, ETC. VACUUM IMPREGNATION TO APPROVED STANDARDS

ELECTRO-WINDS LTD.

CONTRACTORS TO G.P.O., M.O.S., L.E.B., ETC.

123-5-7 PARCHMORE ROAD, THORNTON HEATH, SURREY LIVINGSTONE 2261 EST. 1933

MAGNETIC RELAYS



Types 3,000 and 600.

BUILT TO SPECIFICATION.

Coil Winding and Tropicalizing.

Spring Sets and Coils supplied separately if required.

Send for Price List or quotation.

KAYE ELECTRICAL MANUFACTURING CO.
Havelock Works, Havelock Place,
Harrow, Middlesex.

HAR. 1432

C.R.T. ISOLATION TRANSFORMERS

For Cathode Ray Tubes having Heater/Cathode short circuit or for C.R. Tubes with falling emission. Type A. Low leakage windings. Ratio 1:1.25 giving a 25% boost on Secondary.

2 volt	10/6 each	With Tag
4 volt	10/6 each	Panel and
6.3 volt	10/6 each	Solder Tags
10.8 volt	10/6 each	
13.8 volt	10/6 each	

2. Ditto with mains primaries 12.5 each. No Boost. Type B. Mains Input 220/240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. This transformer is suitable for most Cathode Ray Tubes. With Tag Panel 2/1. each.

Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 230/240 volts. Output 2.21-2.21-2.3 volts at 2 amps. With tag Panel 17/6 each.

All Isolation Transformers are individually boxed, labelled and clearly marked with relevant data.

RESISTORS. All values. 10 ohms to 10 meg., $\frac{1}{2}$ w., 4d; $\frac{1}{4}$ w., 6d; 1 w., 8d; 2 w., 1/-.

HIGH STABILITY. $\frac{1}{2}$ w. 1%, 2/-. Preferred values 100 ohms to 10 meg.

WIRE-WOUND RESISTORS

5 watt	1/3
10 watt	25 ohms-10,000 ohms..... 1/6
15,000 ohms-50,000 ohms, 5 w., 1/9; 10 w., 2/3	

WIRE-WOUND POTS. 3 WATT LAB. COLVERN, ETC. Pre-Set Min. T.V. Type Standard Size Pots, 2 1/2in. Knurled Slotted Knob. Spindle High Grade. All All values 25 ohms to 30 Values, 100 ohms to 50 K., K., 3/- ea. 50 K., 4/-. Ditto Carbon Track 50 K. W/W FXT. SPEAKER to 2 meg. 3/-. CONTROL 10G 3/-.
OPT. TRANSFORMERS. Heavy Duty 50 mA., 4/6. Ditto, 100 mA. primary, 4/9. Multitap, push pull, 6/8. Tapped, small primary, 3/9. Miniature 384, etc., 3/9.

L.F. CHOKES 15/10 H. 60/65 mA., 5/-; 25/20 H. 100/120 mA., 11/6; 20/15 H. 120/150 mA., 12/6.

MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, 21/-.

MIDGET TRANS. 250-0-250 v. 50 mA. 6.3 v. 2 a., 12/6.

HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1 1/2 amp., 7/6; tapped sec. 2, 4, 6.3 v., 1 1/2 amp., 8/6. 6.3 v. 3 amp., 10/6.

CRYSTAL MIKE INSERT. Famous make, precision engineered. Size only 1 1/2 x 1 1/2 in. - Bargain Price 6/6. No transformer required.

EXT. L.S. Switched Socket, on/off and parallel switching complete with plug, 2/-.

COPPER PLATED AERIAL RODS. $\frac{1}{8}$ x 12in. push fitting. 2/8 doz. p. & p. 9d.

AERIAL LITE EARTH RODS, 4/-

ALADDIN FORMERS and cores, $\frac{1}{8}$ in., 8d.; $\frac{1}{4}$ in., 10d

SLOW MOTION DRIVES. Epicyclic ratio 6:1, 2/3.

TYANA. Midget Soldering Iron. 200/220 v. or 230/250 v., 14/-.
TYANA TRIPLE THREE. Complete with detachable bench stand. 13/6. 200/220 v. or 230/250 v.

NEW SLOW MIDGET IRON. 25 w., 22/-. IDEAL FOR RADIO CONSTRUCTORS. 200/220 v. or 230/250 v.

MIKE TRANSF. Ratio 50:1, 3/9 ea., new and boxed.

MAINS DROPPERS 3 x 1 1/2 in. Adj. sliders, 3 amp. 750 ohms, 4/3. 2 amp., 1,000 ohms, 4/3.

LINE CORD. .3 amp., 60 ohms, per foot, 2 amp., 100 ohms per foot, 2 amp., 6d. per foot, 3-way, 7d. per foot.

LOUDSPEAKERS P.M. 3 OHM. 5in. 16/6. 6in. 17/6. Goodmans Elliptical 7 x 4 13/6. 8in. 19/6. 10in. 25/-.

6in. Goodmans with trans. 21/-. Famous make 10 mA. 10 watt heavy duty speakers, 3 ohm, Aluminium voice coil, 39/6. 8in. Mains engraissed 2.5 K or 2 K. ohm field, with tapped output trans., 24/6; less trans. 21/-.

CRYSTAL DIODE. G.E.C. 3/6. Circuit Book 1/-.

H.R. PHONES. (Hi-grade Amer) 15/6 pr.

S. G. BROWN'S. 4,000 ohms 15/6 pr.

COPPER ENAMEL WIRE. $\frac{1}{16}$ in. 16 to 20 s.w.g. 2/-; 22 to 28 s.w.g. 2/6; 30 to 40 s.w.g. 3/6.

SWITCH CLEANER Fluid, squirt spout, 3/9 tin.

TWIN GANG TUNING CONDENSERS. .0005 mfd. midget with trimmers 8/6; 375 pf. midget less trimmers 6/6; .0005 Standard size with trimmers and feet 9/-; less trimmers 8/-; ditto, soldered, 2/6.

RECORDING TAPE

1,200 ft. on standard fittin; 7" Plastic reels. Brand new boxed 17/6

VALVE HOLDERS. Pav. Int. Oct. 4d., EP50, EA50 6d., E13A CRT, 1/3. Eng. and Amer. 4, 5, 6, 7, and 9 pin. 1/-.

MOULDED Muxds and Int. Oct. 6d., BTG, B8A, B9G, B9A 9d., BTG with can 1/6, VCR97 2/6.

CERAMIC. EP50, BTG, B9A, Int. Oct. 1/-, BTG with can 1/6, B9A with can 2/6.

SPEAKER FRET. Woven Plastic Tygan. Walnut tone. 12in. wids. 2/- per foot. Expanded metal, gold or silver, 9/1in. x 12in. 2/- per piece.

7/6 VALVE SALE 7/6

New Imported and ex Government. All guaranteed by us. 1R5, 1N5, 174 184, 384, 3V4, 6AM6, 6P12, 6BE6, 6BW6, 6K7M, 6K8, 684, 6SL7, 6V6, 6X4, 6X5, 787, 8D3, 12AX7, 807, EC91, EP39, EP91, EP92, EL32, EYR2A, PEN25, U22, UF61. AT 8/6; 5U4, 5Z5, 6AK5, 6AT7, 6CG, 6CL6, 6CZ, 6SN, 80, ECH42, Sylvania EP50, MU1A. AT 10/6; ECL80, EP50 EL41.

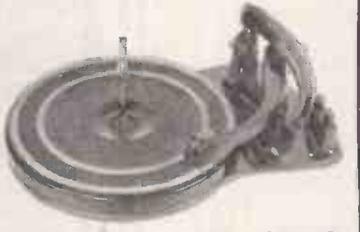


ALL WAVE RADIOGRAM CHASSIS

THREE WAVEBANDS S. W. 200 m.-50 m. M. W. 200 m.-550 m. L. W. 800 m.-2,000 m. 12 month Guarantee, with 10in. P.M. Speaker, A.C. 200/250 v. 4-way Switch. Short-Medium-Long-Gram. A.V.C. and Negative feedback. 4.2 watts. Chassis 13 1/2 x 5 1/2 in. Glass Dial 10 x 4 1/2 in., horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory, aligned and calibrated. Chassis isolated from mains. PRICE £10/15/- Without 10in. Speaker, £9/15/- Carr. & Ins. 4/6.

FIVE VALVES LATEST MULLARD ECH42, EP41, EBC41, EL41, EZ40.

RECOMMENDED FOR ABOVE CHASSIS



Price Carriage Paid **£9.19.6**

Brand new Plessey 3-speed Antechoir Mixer Unit for 7, 10 and 12in. Records. Twin Hi-Fi Xtal Head with Duopoint sapphire stylus. Plays 4,000 records. Sprung mounting. Baseboard required 15 1/2 x 12 1/2 in. Height 5 1/2 in. Depth 2 1/2 in. Super Quality.

FAMOUS MAKE. 3-speed Single Record unit with ACOS 37 Turnover Head, each Sapphire Stylus plays 2,000 records. Starting Switch automatically places Pick-up on records, 7in., 10in. or 12in. Auto Stop. Baseplate 12 x 8 1/2 in. Height 2 1/2 in. Depth 1 1/2 in. Price £7/15/6, post free.

B.S.R. MONARCH 3-SPEED MIXER CHANGER. ACOS GP.37 XTAL HEADS. Baseboard 14 x 12 in. Height 5 1/2 in. Brand new in Makers' Boxes. £9/19/6, post free.



£4/19/6. CONVERT YOUR RADIO. Playing desk 15 x 22 x 7 in. Walnut finish, drawer front with 78 r.p.m. motor, turntable and pick-up. Frass lever start places. High Impedance Magnet pick-up on records 10in. or 12in. Auto Stop. Brand new in original makers' boxes. £4/19/6. carry. free.

SUPERHET COIL PACK 27/6. Miniature size 2 1/2 x 2 1/4 in. High Q dust core coils. SHORT, MED., LONG, GRAM switching. Only 27/6 each with connection diagram and circuit.

F.M. TUNER COIL KIT 97/6. H.F. coil, Aerial Coil Oscillator Coil, two I.F. Transformers 10.7 Mc/s. Detector transformer and heater choke. With circuit and component list for popular F.M. Tuner using four 6AM6 valves and standard components.

COILS. Weartite. "P" type 2/6 each. Osmer Midget "Q" type adj. dust core 3/6 each. All ranges in stock REACTION COND. .0001, .0003, .0005 mfd., 3/6 each.

I.F. TRANSFORMERS WEARITE TYPE 500. 465 Kc/s., adjustable 450-470 Kc/s., size 9 1/2 x 1 1/2 in., 10/6 pair. MIDGET I.F.s., size 1 x 1 1/2 in., 8/9 pair.

BAND 3 T.V. CONVERTER KIT

Ready wound coils, B.V.A. valves, all components punched chassis, circuit diagram, wiring plans, COMPLETE KIT for mains operation 200-250 v. A.C. £3/10/0.

AS ABOVE less POWER PACK. Requires 200 v. 20 ma. H.T. 6.3 v. 1 a. L.T. £2/5/-.

PUNCHED CHASSIS and WOUND COILS, component list, circuit diagram, wiring plans, only 19/6.

TV PRE-AMP. Channel 1. Easily modified for other Channels or Converter use. Midget Chassis 4 1/2 x 2 1/4 in. Complete with EF42 or 6F13 valve. Coaxial lead, Belling plug and Octal plug. Ready for use. Brand new Mfrs. Surplus. Listed £3/15/-. Special Clearance Price 21/-. Buy Yours NOW.

Volume Controls 80 ohm Coaxial

Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Meg. Stranded core. No Br. S.P.S.W. D.P.S.W. EXT. SPKR. TYPE 3/-

3/-	4/-	4/9
3/-	4/-	3/-

SEMI-air spaced Poly-tene insulated. $\frac{1}{8}$ in. dia. 35 strands core. Losses cut 50% 9d. up. STANDARD 7d. up. $\frac{1}{8}$ in. Coaxial.

COAXIAL PLUGS 1/- DOUBBLE SOCKET 1/6 SOCKETS 1/- OUTLET BOXES 3/6

T.V. AERIALS. Aerialite, all channels in stock. Indoor loft type Inv. 7. 13/6. BAND III ADAPTORS, 7/6 pr.

BALANCED TWIN FEEDER per yd. 6d. 500 or 300 Ohm TWIN SCREENED BALANCED FEEDER 9d. yd. 80 ohms: 50 OHM COAXIAL CABLE 8d. per yd. $\frac{1}{8}$ in. dia. 4/8 TRIMMERS, Ceramic, 50, 80, 70 pf. 9d. 100 pf., 150 pf., 1/3; 250 pf., 1/6; 500 pf., 750 pf., 1/9.

PYE Aerial Plug and Socket 1/6 pr. 5in. RADIO SCREWDRIVERS. 4jd. each. NEON MAINS TESTER SCREWDRIVER, 5/6.

CONDENSERS. New stock. .001 mfd. 7 kv. T.C.C., 5/6. Ditto, 12.5 kv., 9/6; 2 pf. to 300 pf. Mica, 6d.; Tubular 500 v., .001 to .01 mfd., 9d.; .05 1, 1/-; 25 1/6; 5 1/9; 1/350 v. 9d.; 1/600 v. 1/3; 1/1,500 v. 2/6.

CERAMIC CONDENSERS, 500 v. 3 pf. to .01 mfd., 1/-.

SILVER MICA CONDENSERS. 10%, 500 v. 5 pf. to 500 pf., 1/-; 800 pf. to 3,000 pf., 1/3. DITTO 15%, 500 v. 1.5 pf. to 500 pf., 1/9. 515 pf. to 5,000 pf., 2/-.

ELECTROLYTICS ALL TYPES NEW STOCK

TUBULAR	CAN TYPES	CAN TYPES
2/450 v. 2/3	16,000 v. 4/-	84-107/450 v. 5/-
5/450 v. 2/3	500/12 v. 3/-	32-32/350 v. 4/8
16/500 v. 2/3	SCREW BASE	32-32/450 v. 6/6
28/25 v. 1/9	TYPE 512	60+100/350 v. 11/6
50/50 v. 2/-	8/500 v. 1/3	1,000+1,000/6v. 6/8
100/25 v. 2/-	16/500 v. 4/-	1,500/8 v. 4/6

SPECIAL CLEARANCE 2/6

BRAND NEW SUB MINIATURE VALVES. Ex Deaf Aid Apparatus.

RF PENTODES	L.F. PENTODES
0.625 v. FIL	1.25 v. FIL
XP710	XPY10
XPW20	HIVAC
DF66	XPY32
DF70	DL66
	DL72
	503AX
505AX	RAYTHEON
	807AX

ALUMINIUM CHASSIS. 18 s.w.g. Plain, undrilled, (folded 4 sides and riveted corners attic fixing holes. Strong and soundly constructed with 2 1/2 in. sides. 7 x 4 in. 4/6; 11 x 7 in. 6/9; 13 x 9 in. 8/-; 14 x 11 in. 10/6; and 18 x 16 x 3 1/2 in. 16/6.

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kv., 4/3; K3/40 3.2 kv., 6/-; K3/45 3.5 kv., 6/6; E3/150 4 kv., 7/2; K3/100 8 kv., 12/6; K3/180 14 kv., 18/-; MAINS TYPE. EM1, 125 v., 60 mA., 4/-; RM2, 100 mA., 4/8; RM3, 120 mA., 5/9; RM4 250 v., 275 mA., 18/-; Westinghouse Miniature 250 v. 25 mA., 7/6.

FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 4 or 12 v. 1 1/2 amp. 8/9; 2 a. 11/3 4 a. 17/6.

CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v. 1 1/2 amp. 13/6. 4 amp. 21/-.

ACID HYDROMETER. New Ex Govt. Unbreakable. Packed in metal case 7 x 1 1/2 in. dia. 4/6.

H.F. MIDGET CHOKES. 14 M.H. 2/6 each.

WAVECHANCE SWITCHES

5 p. 4-way 2 wafers.....	6/6
2 p. 2-way, 3 p. 2-way.....	2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way.....	3/6
3 p. 4-way, 1 p. 12-way.....	3/6

KNOB, GOLD ENGRAVED. Walnut or Ivory, 1 1/2 in. diam., 1/6 each. Focus, "Contrast", "Brilliance", "Brilliance-On/Off", "On-Off", "Volume", "Vol-On-Off", "Tone", "Tuning", "Tremble", "Bass", "Wavechange", "Radio Gram.", "S. M. L. Gram.", "Record-Play", "Brightness". Ditto, not engraved 1/- each.

We have no connection with any other firm. Please address all correspondence correctly as below.

RADIO COMPONENT SPECIALISTS

307 WHITEHORSE RD., WEST CROYDON OPEN ALL DAY—(Wed. 1 p.m.) 10 pp. list S.A.E. P. & P., Ed. £1 orders post free. C.Q.D. Service 1/6

Phone THO 1665, after 6 p.m. 4198. Buses 133 or 68 pass door. 48-hour postal Service.



METERS

LARGE AND VARIED STOCKS AVAILABLE FOR IMMEDIATE DELIVERY

EXAMPLES FROM OUR RANGE OF 2½ in. FLUSH PATTERN MOVING COIL INSTRUMENTS (as illustrated)

AMPERES D.C. 0-1, 2, 3, 5, 10, 15, 20, 25, 30, 50.

MILLIAMPS. 0-1, 1-0-1, 0-5, 10, 15, 20, 25, 30, 50, 100, 250, 500.

MICROAMPS. 0-50, 100, 200, 250, 400, 500, 750, 50-0-50, 100-0-100, 250-0-250, 500-0-500.

AMPS. R.F. 0-1, 3, 5, 10, 15, 25, 30.

VOLTS D.C. 0-1, 5, 10, 15, 25, 50, 100, 250, 500, 750, 1,000, 1,500, 2,500.

VOLTS A.C. 0-5, 10, 15, 25, 50, 100, 250, 500, 750, 1,000.

We can supply meters with NON-STANDARD CURRENT and VOLTAGE RANGES to any specification. DELIVERY 7-14 days.

MOVING IRON, THERMO & ELECTROSTATIC INSTRUMENTS. 2 in. SQUARE FLUSH, 3½ in. ROUND FLUSH AND INDUSTRIAL INSTRUMENTS ALSO AVAILABLE FOR PROMPT DELIVERY.

SPECIAL OFFER

CAMBRIDGE UNIPIVOT

GALVANOMETERS

at **£7.7.0.** each.

FULLY GUARANTEED
(ORIGINAL MAKERS PRICE
£14.10.0.)



Apart from their normal use in Bridge circuits, etc., these instruments are ideal for conversion to Millivoltmeters for use in conjunction with Thermo-couples as Temperature Indicators.

Specification: Moving Coil with a robust permanent magnet, the instrument is fitted with a clamping device, which operates if the Galvanometer is lifted from the bench. F.S.D. 60-0-60 microamps, resistance 50 ohms (6 millivolts), scale 3 in., with knife edge pointer and mirror scale. Diameter 4 in., Depth 2 in. These instruments can be supplied modified to any special range of millivolts required, with normal end zero position at an extra cost of £1.

ANDERS ELECTRONICS LTD.

91, HAMPSTEAD ROAD, LONDON, N.W.1

Telephone: EUSton 1639

Suppliers to Govt. Depts., B.B.C., Tech. Colleges.
Leading Manufacturers & Research Laboratories

WICO KIT

VALVE VOLT-OHM METER

33 RANGES

7 volts ranges 0.01 v. to 1000 v.
D.C. +, D.C. -, A.C., R.M.S. 5
ohms ranges 0.5Ω to 500 MΩ, 7
Db ranges -20Db to + 61Db.

KIT £19. C.W.O., or C.O.D.
WIRED £26.

Write for further details. Export Enquiries
Invited.

WHARTON INSTRUMENT COMPANY

1081 FINCHLEY ROAD, LONDON, N.W.11. Tel.: MEADWAY 3407



THE VESPA TAPE DECK



2 speed 3½ in. and 7½ in.

Twin Track.

Model 521 Compact Deck, 7½ in. x 11 in., 5 in. reels, kit. £7/10/-.

Model 721 Standard Deck, 10½ in. x 11 in., 7 in. reels, kit. £8/10/-.

Easy to assemble, precision machined parts, latest high fidelity heads
First class motors, full assembly instructions.
Either model fully built and tested 27/6 extra.

Send stamp for full details.

E.W.A., 266 WARBRECK DRIVE, BLACKPOOL

HOME RADIO OF MITCHAM for F.M. TUNERS

We can supply all the parts including valves for this attractive F.M. tuner. Standard and fringe versions available and total cost from 28/15/-. Full constructional details with price list, etc., in RR2, price 2/-, post paid.

Components for "Wireless World" F.M. Tuner.

ELECTRO-VOICE

104E transformer £1 8 0

JACKSON BROS.

U102 condenser 14 6

ALUMINIUM

CHASSIS 16 swg

blank 10 0

OSMOB FM COILS Aerial,

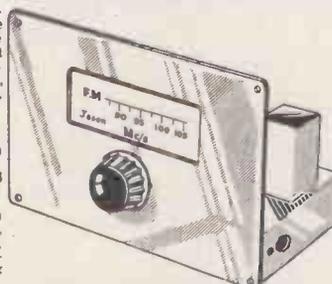
7.6 R.F., 5/-, Oscillator 7/-,

10.7 mc/s., I.F.T., 7/-, Discriminator Q10D, 25/- including diodes.

187, LONDON ROAD, MITCHAM, SURREY.

MIT 3282

"The quality component specialists"



OF INTEREST TO

RESEARCH AND DEVELOPMENT ENGINEERS

POST RADIO SUPPLIES OFFER FROM STOCK

COPPER WIRES. Enamelled, Tinned, Cotton-covered, Silk-covered, Litz. Most gauges from 16 swg-48 swg.

RESISTANCE WIRES. Eureka and Constantan. Enamelled, Silk-covered. All gauges from 16 swg-50 swg.

NICKEL CHROME WIRES. Up to 50 swg.

SMALL ORDERS PROMPTLY DESPATCHED.

LARGE STOCKS.

POST RADIO SUPPLIES

33 BOURNE GARDENS, LONDON, E.4.

Telephone: CLISSOLD 4688.

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

CHELMSFORD • ESSEX

LEADERS IN THE DESIGN AND MANUFACTURE OF ELECTRONIC EQUIPMENT are expanding their development activities. Excellent opportunities therefore exist for both Junior and Senior Engineers and Physicists to make careers in this famous organisation for work on wide range of interesting projects.

In particular there are vacancies in connection with the development of Television Cameras, Transmitters, Telecine and other associated equipment for both black, white pictures and colour. In addition there are also opportunities for working in the field of Marine Radar and Communication equipment.

All the appointments are permanent and pensionable and offer excellent prospects of promotion. In addition, training at the world famous Marconi College will be given to selected applicants.

Please apply giving full details of qualifications and experience to

Dept. C.P.S., 336/7, Strand, W.C.2.

Quoting Ref. S.A. 55C.

LEARN ANOTHER LANGUAGE

THE EASY ASSIMIL WAY

Assimil is the accepted Continental method that teaches you languages as they are spoken—without the drudgery of learning by heart.

Assimil Books alone, or preferably a combination of Books and Records, bring you a thoroughly practical means of home study. For over a quarter of a century the Assimil system has been recognised on the Continent as the easiest modern method of learning languages.



**FIRST TIME
AT THE RADIO SHOW
STAND 312... (FIRST FLOOR)**

Assimil offer Complete Courses in —
FRENCH, ITALIAN, SPANISH, GERMAN, RUSSIAN, ENGLISH

ASSIMIL (England), Dept. A127, 10 Pembridge Sq., London, W.2. Phone: BAYwater 5131

Please send your Free Brochure on
ASSIMIL LANGUAGE COURSES

In French, Italian, Spanish, German, Russian, I am interested in Records Books

NAME

ADDRESS

BKPT. 55

AB 23

Courses also available for those whose native tongue is not English.

EASY TERMS

MIDLAND INSTRUMENT CO.

SELSYN TRANSMITTERS (Magslips), 3in. type, pure synchro. x-y-1-2-3, suitable as master or slave, 50v. 50 cycle single phase A.C. operated. When two or more of these are wired up, the rotation by hand (or other means) of one, will result in a 100 per cent. follow in the other(s), both clockwise or anti-clockwise, supplied brand new with test report, in tropicalised sealed cartons. Value, £8 each, our price 25/-, post 2/-, 2 for 50/-, post paid with wiring diagram.

TELEPHONE SETS, consists of 2 combined receivers and microphones, connected by 20ft. twin flexible, provides perfect 2-way communication (up to 1 mile with extra flex), self-energised, no battery required, complete ready for use, new, boxed, 12/6, post 1/-.

A.C./D.C. MOTORS, 200/250 v. taking .1-amp., fitted reduction gearbox, providing 3 drives of approx. 60, 12 and 1½-r.p.m., also fitted 2 sets cam-operated contacts and governor, new, unused, 30/-, post and packing 2/6.

VIBRATOR PACKS, input 6v., provides all L.T. and H.T. outputs for the 18 and 38 sets, in metal case size 9in. x 6½in. x 3½in., complete with leads, new, unused, 20/-, post 2/3, spare Mallory 6v. type 650 non-sync. vibrators, 5/-, post 6d.

U.S. DINGHY TRANSMITTERS, complete self-contained hand powered, turning the handle by anyone (quite untrained) provides the power for the 2-valve transmitter, also sends out the predetermined s.o.s. signals (long dash for D/F, etc.) on the International Distress band of 500 kc/s. (600 metres), sea range 250-500 miles, complete with aerial, usually suspended by kite or hydrogen balloon (not provided), all contained in a waterproof aluminium case size 10x9x8in., weight 17lb., with operating instructions, new, unused, 45/-, carriage paid.

HIGH-LOW IMMERSION HEATERS, 230-250 v. 2,000 watts, removable link for 3-heat control, plated copper stem 18in. long from fixing screw, requires 1½in. dia. tank hole, removable brass top termination cover with insulated cable bush, new, unused, 45/-, post paid.

Many other bargains; send 3d. with S.A.E. for current lists.

MIDLAND INSTRUMENT CO., MOORPOOL CIRCLE, BIRMINGHAM, 17

Tel.: HAR 1308

A. V. ROE & CO., LTD.,

offer

Applied Research and Development work in the following fields for young Graduates in Science or Engineering:

- Servomechanisms
- Applied Electronics
- Supersonic Aerodynamics
- Mechanical Engineering
- Hydraulic Engineering

Attractive salaries depending on experience and qualifications.

This is an opportunity to join new laboratories situated in rural surroundings.

Apply to:—

The Chief Engineer, Weapons Research Division, A. V. Roe & Co., Limited, Woodford, Cheshire.

TESTOSCOPE MAINS TESTER



For high and low voltage testing. Standard Model: range 100/850 volts A.C. or D.C. Dual Model: range 1/30 and 100/850 volts A.C. or D.C.

Write for interesting leaflet 30F. APPLY FOR 16 PAGE BROOKLET. POST FREE 1/-

Runbaken
MANCHESTER 1

A. V. ROE & CO., LTD.,

have vacancies for

INSTRUMENT ENGINEERS to design and develop small precision mechanisms and gyroscopic apparatus. Applicants should have H.N.C. and suitable design experience. This is an opportunity to join at an attractive salary a new Division situated in a rural area.

Apply to:

The Chief Engineer,
Weapons Research Division,
A. V. Roe and Co., Limited,
Woodford,
Cheshire.

FERRANTI LTD., (LONDON COMPUTER LABORATORY) have a vacancy for an INSPECTION ENGINEER

for electrical and mechanical inspection of prototype computers and allied equipment. The post involves considerable responsibility for immediate test and inspection work and for creating and equipping an inspection group. Essential qualifications are sound practical knowledge of electronic and mechanical measuring instruments and inspection procedure and Higher National Certificate, or equivalent, in Electrical or Mechanical Engineering.

The work is of an interesting nature and working conditions are excellent.

The Company has a Staff Pension Scheme.

Application forms may be obtained from Mr. T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference BGM 1.

SCHOCK

ORNAMENTAL
METAL MOULDINGS
BRASS OR ALU-ANODIZED
METAL FRAMES & GRILLES

FOR RADIO RECEIVER CABINETS
FOR TELEVISION RECEIVER CABINETS
FOR RADIOGRAMS
FOR MUSIC CABINETS
FOR LOUDSPEAKER OPENINGS

SCHOCK BENDABLE TRIM STRIPS AND FRAMES ARE THE DECORATOR'S DELIGHT, ARE UNIQUE IN BEAUTY AND WORKMANSHIP, ARE THE EFFICIENT AND INEXPENSIVE SOLUTION OF DECORATION. FOR BETTER SUCCESS, TRY SCHOCK

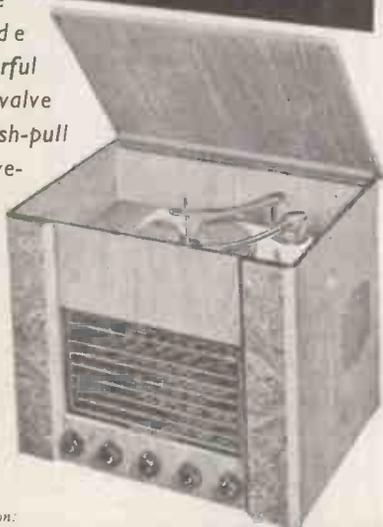
SCHOCK & CO.

SCHORNDORF
b. STUTTGART
W - GERMANY

Manufacturers of metal covered wood or plastic mouldings
REPRESENTED IN U.K. BY:—
Messrs. ABWOODS & CO. (MOULDINGS) LTD. 168 HACKNEY RD., LONDON, E.2.

A New AMBASSADOR VISCOUNT Radiogramophone

Ambassador Viscount Radiogramophones are in world-wide demand. Powerful long range nine-valve receiver with push-pull output. Eight wavebands, six with electrical bandspreading. 3-speed auto changer. Twin speakers. A.C. mains only.



Write for full information:

AMBASSADOR RADIO & TELEVISION LTD.
PRINCESS WORKS, BRIGHOUSE, YORKSHIRE, ENGLAND

SENIOR RADIO ENGINEER (DEVELOPMENT)
required by
SHORT BROTHERS & HARLAND LIMITED

in the
RESEARCH DEPARTMENT

for work on

GUIDED MISSILES, NAVIGATIONAL SYSTEMS
and other interesting advanced projects.

Qualifications : University Degree, or equivalent, and several years' experience of UHF and Centimetric Radio or Radar circuits and equipment.

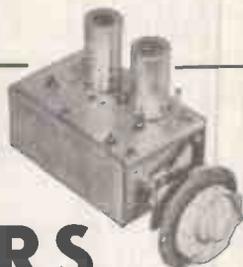
Ability: to develop equipment to prototype with minimum supervision.

The appointment is permanent and pensionable in an expanding organisation offering good salary and prospects.

Housing, and removal, assistance.

Applications with all relevant details, and including salary required, to Staff Appointments Officer, P.O. Box 241, Belfast, quoting No. S.A.72.

Valradio 13 CHANNEL TUNERS



NOW AVAILABLE TO THE
HOME T.V. CONSTRUCTOR

Suitable for home constructed receivers—including "The Wireless World", "Magnaview", "Teleking", "Premier", etc.

Complete with fitting instructions **£6**
Bracket for fixing tuner to cabinet 2/6

Call for a demonstration of our **HI-FI EQUIPMENT** and **LARGE SCREEN T.V.** or send for leaflets and details of **DECCA, G.E.C., PAM, LEAK,** and **VALRADIO** equipment.

SERVICING BY FACTORY TRAINED ENGINEERS

SUPER-VISION LIMITED

136, High Street, Teddington,
Middlesex. Tel: Kingston 4393.

ADVANCE COMPONENTS LIMITED

Design Engineer

for electronic instruments capable of designing complete instruments to production stage. Experience necessary and a knowledge of production problems desirable. Academic qualifications degree national diploma, or equivalent. Permanent situation covered by Company's pension scheme.

Apply to Technical Director,
Advance Components Limited,
Marlowe Road,
Walthamstow, London, E.17.

AERIAL FITTINGS!!

ESPECIALLY DESIGNED FOR CONSTRUCTING
BAND I and BAND III TELEVISION AERIALS
COVERING ALSO THE CONSTRUCTION OF
F.M. and other S.W. aerials.

All fittings are fully guaranteed, being die-cast from high quality aluminium alloys.

Send 9d. in stamps for our illustrated catalogue of fittings, chimney & wall lashings, alloy tubing etc. to:—

FRINGEVISION LTD.
MARLBOROUGH, WILTS. Phone 605

TECHNICAL WRITING

Ferranti Ltd., have a vacancy which will provide the opportunity for a YOUNG GRADUATE in ELECTRICAL ENGINEERING or PHYSICS interested in TECHNICAL WRITING to pursue this career at a high level of technical interest.

The vacancy occurs in the PATENTS DEPT. of the Company and involves close contact with research and development work in the many and varied sections of the Ferranti organization. There would be particular emphasis on ELECTRONICS.

Training would be given in this specialised branch of technical writing and the successful candidate would be encouraged to qualify as a PATENT AGENT. Permanent staff appointment with Pension benefits. Application forms may be obtained from Mr. T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference PD.

AUTOMATIC CONTROL

Development

Interesting systems for Aircraft and Missiles of advanced design. Our Research Department requires for this development:—

SENIOR ENGINEERS: with University Degree, five years' relevant development experience, and ability to control a project involving a team.

ENGINEERS: with degree, relevant experience and ability to develop equipment to prototype stage with minimum supervision.

TECHNICAL ASSISTANTS: with H.N.C. or equivalent and relevant experience.

EXPERIENCE of at least one of: Servo-mechanisms, auto-pilots or auto-stabilisers, analogue computing devices.

These positions are permanent and pensionable. The organisation is expanding and offers good salaries and prospects.

Assistance with removal and with housing.

Applications with relevant details including required salary to—Staff Appointments Officer,

SHORT BROTHERS & HARLAND LTD.,

P.O. Box 241, Belfast, quoting No. S.A.74.



Anybody here seen Kelly?
HEARD
THE NEW R.L.S.I.
H.F. RIBBON LOUDSPEAKER

The latest development in reproducers: a "tweeter" with superb response over a wide frequency range. LIST PRICE 12 GNS.

Response.....	3,000-20,000 c/s	Horn loaded.....	1,000 c/s cut off
Power Capacity.....	10 watts	*Equivalent	} 3.00 gms moving-coil
Impedance.....	15 ohms	units	
Flux.....	10,000 Gauss	Dimensions.....	8½" x 5½" x 4½"
Dynamic Mass.....	0.008 grammes	Weight.....	8 lbs.
Force/mass ratio.....	4x10 ⁷ dynes gm.		

Exclusive world-wide distribution by

THERMIONIC PRODUCTS LIMITED
HYTHE, SOUTHAMPTON, HANTS. Tel.: Hythe 3265

TECHNICAL WRITERS

are required by the

INDUSTRIAL ELECTRONICS DIVISION

of "ENGLISH ELECTRIC"

Subjects covered include INDUSTRIAL CONTROL SYSTEMS, INDUCTION HEATERS, COMPUTERS and general electronic devices.

General qualifications are an interest in industrial electronics and writing, coupled with a background of Electronic Engineering. Houses are available to the successful applicants. This is a rapidly expanding field of engineering and offers first-class opportunities to ambitious people.

Write to Dept. C.P.S., 336/7, Strand, W.C.2
quoting Ref. No. 1377A.

The Patent Department of
THE GENERAL ELECTRIC CO. LTD.
 at their Research Laboratories,
 East Lane, North Wembley,
 Middlesex,
 have openings for young
**PHYSICISTS or ELECTRICAL
 ENGINEERS**

The successful candidates will be given opportunities of being trained to qualify as Patent Agents. Previous experience of Patent work is desirable but not essential. Applicants should have some background and interests in the electronic field, telecommunications or radar.

These appointments carry excellent prospects, and a high level of remuneration can be expected on qualification. Candidates should be free of National Service commitments if under 26 years of age.

Apply in writing to the Staff Manager (ref.: RLO/34) giving full particulars of experience, qualifications and age.

G2AK *This Month's Bargains* **G2AK**

THE IDEAL POWER TRANSFORMER FOR THE TABLE TOP RIG.

This Parmeko-made transformer has the following conservative ratings: Primary, 230 v. 50 c/s. Secondary, 620/550/375/0/375/550/620 V. Rated at 275 VA. It will give 620 or 550 volts at 200 mA. simultaneously with 375 V. at 250 mA. All the H.T. you require for R.F. and Modulator. Also 2-5 v. 3 A. windings for suitable rectifiers such as 5R4GY, 5Z3, 83, 5U4, etc. Weight 24½lb. Size 6½ x 6½ x 5½in. high. Worth at least £7. Our price £3 only. Carr. Paid. C.W.O. only, no C.O.D.

We regret that we cannot accept orders for these from EIRE or abroad.

METERS: 2½in. Scale Flush Mounting. 0-10 mA. Ditto 0-30 mA., ditto 0-100 mA., 12/6 each. 2in. Scale Square Flush Mounting 0-50 mA. Ditto 0-150 mA., ditto 0-3 Amp. Thermo., ditto 0-20 V. d.c., ditto 20/0/20 Amp. d.c., 7/6 each. 2in. Scale Round Flush 0-½ Amp. R.F., ditto 0-350 mA. Thermo., 7/6.

SPECIAL VALVE OFFER: TZ40, 35/-; 6L6G, 10/6; QV06/20 (6146) 35/-; 829/3E29, 60/-; 100TH, 90/-; 866A, 17/6 or 30/- per pair.

PHOTO MULTIPLIERS Type 931A. 35/- each or 2 for £3.

STREAMLINED BUG KEYS by famous maker. Brand new in original cartons. List over £4. Our price only 45/-.

AR88 SPARES. Cabinets £4/15/-. Packing and carr. 7/6. Complete set of 14 valves £5/10/-. Output Transformer 37/6. Mains Transformer £3/10/-. P. & P. 2/6. "D" Type I.F.S. 12/6.

CONDENSERS: 8uF 600 V. Trop. 750 V. normal condensers. New ex-W.D. stock, 5/6, p. & p. 1/6.

Carriage paid on all orders over £1 except where stated. Please include small amount for orders under £1.

Please print your name and address. All Mail Orders to:—

CHAS. H. YOUNG, G2AK

Dept. 'W' 102 HOLLOWAY HEAD, BIRMINGHAM 1

'Phone: MIDLAND 3254

All callers to 110 DALE END, BIRMINGHAM 4

'Phone: CENTRAL 1635

THE OUTPUT MUST BE RESTRICTED

to maintain the waveform, so say all the books. But not so with the HATFIELD oscillator, nor is it necessary to work near the point of instability.

COMPLETE STABILITY, LESS THAN 0.28 of 1% distortion, R.M.S. output voltage 50% greater than the H.T. voltage. 1 valve, 1 coil, simple circuit.

Sounds, incredible, but it is **GUARANTEED.** Send for copy of N.P.L. report and see our ad. in April issue of "W.W." The HATFIELD oscillator is now made with 3 output impedances to suit any Head on the market. 45 Kc/s to 50 Kc/s.

TAPE RECORDISTS! Are you Completely satisfied with your recordings? Bad waveform in an oscillator can cause **DISTORTION** due to intermodulation, **NOISY BACKGROUND** due to D.C. component in an asymmetrical waveform and **INTERFERENCE** with radio due to harmonics beating with incoming signal. The fundamental cannot do this!

COIL, complete with circuit, 10/6 post free. Patent app. for.

BIAS REJECTOR COILS

Even a small amount of bias frequency getting into the amplifier can cause a lot of trouble, and nearly all tape recorders need a rejector coil to prevent this.

COIL, complete with instructions, 5/6 post paid.

MOTEK TAPE DECKS

The famous K6 deck; twin track, two speed, with push buttons and electronic braking, is a beautifully finished job at only £19/19/- Post free. Or £3 down and 12 monthly payments of £1/10/-.

TAPE AMPLIFIERS

The HATFIELD amplifier is complete with oscillator as above, and magic eye, less speaker, at £12/15/-. Or £2/10/- down.

COMPLETE RECORDERS

The **HERGA** recorder incorporates ALL the above items together with a first-class crystal mike and one reel of **SCOTCH BOY** tape in an attractive two-tone portable cabinet, absolutely complete at 39 gns. Or £7 down and 12 payments of £3.

Further details and H.P. forms from:

HATFIELD RADIO

78 STROUD GREEN RD., LONDON, N.4

IF YOU LIVE
 IN THE NORTH OF ENGLAND
LANCASTER HI-FIDELITY

Have the most comprehensive selection
 of Quality Sound Equipment in your area

- | | | |
|---|---|--|
| <p>AMPLIFIERS
and Pre-Amps.</p> <p>Acoustical Quad II
Leak TL/10 and TL/12
Pamphonic 1002
Rogers
Armstrong A 10
Goodsell
Hartley-Turner
Mullard 510
Osram 012
Unitelux</p> <p>E.A.R.
RADIO TUNER
UNITS</p> <p>Sound Sales
Chapman
Quad
and others</p> <p>RADIOGRAM
CHASSIS</p> <p>Armstrong FC 48
Burgoyne
Dulci range</p> | <p>GRAM PICKUPS</p> <p>Ferranti Ribbon
Golding Variulactance
Connoisseur Mk. II
Decca "H"
Collaro Studio
Leak Dynamic
Acos Hi-g
Lowther Moving
coil
B J Arm (both types)</p> <p>MOTORS
(transcription)</p> <p>Connoisseur
Garrard
Collaro
Jasons</p> <p>AUTO-CHANGE
UNITS</p> <p>Garrard RC 80 & 90
Collaro</p> <p>TAPE DECKS</p> <p>Truvox
Wearite</p> | <p>LOUDSPEAKERS</p> <p>Wharfedale 3 speaker
Assembly
Tannoy Dual
concentric
Acoustical Corner
Pamphonic
Victor
Goodmans 2 speaker
System
Barker Duode
Decca Corner
GEC Metal Cone
Sound Sales "P I"
Whiteley HF 1012</p> <p>in addition to the
above speakers we
STOCK ALL the
Wharfedale range and
ALL the Goodmans
range.</p> <p>Tweeters; large selection,
including the
new KELLY RIBBON</p> |
|---|---|--|

Here Purchase Terms if desired. Service after Sales.

PLEASE NOTE CHANGE OF ADDRESS

of the North's Sound Reproduction Specialists

Now at **144 OXFORD ROAD
 MANCHESTER 13**

LANCASTER HI-FIDELITY ACOUSTICAL EQUIPMENT COMPANY

ADW 1/5

LHF

MISSING FREQUENCIES CAPTURED

Now released for the first time in Great Britain

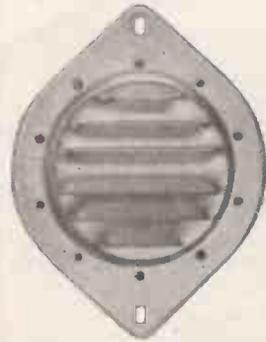
New TSL High Fidelity ELECTROSTATIC SPEAKERS

Give life-like high quality reception and reproduction

An absolute must for

- (1) Receiving F.M. Transmissions.
- (2) High quality recordings.
- (3) Television Sound.
- (4) Modernising old receivers to high fidelity standards.

TSL Electrostatic Speakers reproduce those missing frequencies beyond 8-10,000 cycles and increase the speaker response to 20,000 cycles. While it is realised that the human ear cannot, except in the rarest cases, distinguish sound beyond 15,000 cycles, it must also be remembered, that these high frequencies, even up to 20,000, combine with the audible range to produce balanced, rounded and natural reproduction. Sound, without the additional high fidelity of a TSL Electrostatic Speaker is like a salad without the dressing—it is just not complete.



The responses of the speakers in respect of the various frequency levels are as follows:—

At	3000 cycles response =	+ 0dB
	4000 cycles response =	+ 1dB
	5000 cycles response =	+ 6dB
	6000 cycles response =	+ 11dB
	7000 cycles response =	+ 11dB
	8000 cycles response =	+ 13dB
	9000 cycles response =	+ 13dB
	10000 cycles response =	+ 15dB
	12000 cycles response =	+ 18dB
	14000 cycles response =	+ 18dB
	16000 cycles response =	+ 18dB
	18000 cycles response =	+ 13dB
	20000 cycles response =	+ 10dB

TYPE LSH 100 Electrostatic Loudspeaker
 Size 5 x 4 x 2in.
 Speaker capacity 1100 pF.
 D.C. voltage 400 v. max.
 Tone Frequency (A.C. voltage) 60 v. max.
 effective
 Test Voltage at 50 cycles ... 440 v.
 Weight 3½oz.
 Max. Power handling capacity 20 watts
 Retail at (not subject to P.T.) 21/-

TYPE LSH 75 Electrostatic Loudspeaker
 Size 3 x 3 x 2in.
 Speaker capacity 800 pF.
 D.C. voltage 300 v. max.
 Tone Frequency (A.C. voltage) 60 v. max.
 effective
 Test Voltage at 50 cycles ... 440 v.
 Weight 1½oz.
 Max. Power handling capacity 6 watts
 Retail at (not subject to P.T.) 12/6

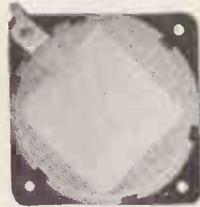
EASY TO FIT

Either type may be fitted in a matter of minutes by suspending, by means of elastic rubber bands, centrally in front of the cone of the normal magnetic speaker. There is no interference between

Ask at your local retailer or in case of difficulty write for details to:—

TECHNICAL SUPPLIERS LIMITED,
HUDSON HOUSE, 63, GOLDHAWK ROAD, LONDON, W.12.

Telephone: SHEpherds Bush 2581 & 4794



MARCONI COLLEGE

Applications are invited for posts on the

LECTURING STAFF

of

**MARCONI COLLEGE
 CHELMSFORD**

The appointments will be to the radio engineering section and candidates should have had experience in modern communications techniques, although applications will be considered from engineers trained in other branches of electronics.

Successful applicants will be required to instruct graduate engineers.

The posts are permanent and pensionable. 5 day week. Excellent working conditions in new building.

Please reply giving full details of age, qualifications and experience and quoting Ref. 2910 to Marconi's Wireless Telegraph Co. Ltd., Dept. C.P.S., 336/7, Strand, W.C.2.

A. V. ROE & CO., LTD.

have the following vacancies in their

WEAPONS RESEARCH DIVISION

at

WOODFORD

TECHNICIANS

For design and development work in a guided weapon project. At least 3 years' experience in electronics or H.N.C. is necessary.

JUNIOR AND SENIOR DRAUGHTSMEN

For design work in precision instrumentation. At least 3 years' experience in design precision engineering or H.N.C. is necessary.

GOOD SALARIES AND PROSPECTS

PENSIONS AND LIFE ASSURANCE SCHEME

Application giving full particulars of age, qualifications and experience to be addressed to:

**A. V. ROE & CO. LTD.,
 WEAPONS RESEARCH
 DIVISION, WOODFORD,
 CHESHIRE.**

The Northern Polytechnic

Holloway Road, London, 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 the Full Technological Certificate of the City and Guilds of London Institute, and Graduateship of the British Institution of Radio Engineers.

Full-time one year course in Radio Servicing and full-time one year course in Television Servicing, also part-time day release and evening classes are held in these subjects in preparation for the City and Guilds of London Institute and the Radio Trades Examination Board's Certificates.

Special short courses are available for qualified Service Engineers interested in Band III Television and Frequency Modulated Sound broadcasting.

All the above courses include practical laboratory and workshop experience. London fees: £28 per year, or £10 per term, plus £2 registration fee, for full-time courses. (No fee for students under 18 years of age.)

Evening class fees range from 35/- to 50/-.

Enrolment for day classes by appointment.

Enrolment for evening classes, 5.30-7.30 p.m. 19th and 20th September, 1955.

New term commences 26th September, 1955.

PROSPECTUS FREE on application to the Secretary.

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED,

have the following vacancies in their Guided Weapons Development Department:—

- (x) **CALIBRATION ENGINEER.** An Engineer is required for work on calibration of electrical and electronic instruments and to investigate associated measurement techniques. Applicants for this position should have a degree or equivalent in engineering or physics and preferably have experience in electrical measurement and allied techniques.
- (y) **ENGINEER DRAUGHTSMAN (Electronic).** A Draughtsman is required to engineer equipment from laboratory circuit information to prototype stage. Adequate facilities are available for the development of original techniques. A knowledge of M.O.S. requirements is desirable. The minimum academic qualification required is Higher National Certificate in Electrical Engineering or equivalent.
- (z) **DRAUGHTSMEN (Electrical).** 2 Draughtsmen are required to engineer prototype electronic equipment under the direction of an engineer draughtsman. A knowledge of M.O.S. requirements is desirable. Minimum qualification Ordinary National Certificate or equivalent.

Applications, quoting date and prefix letter of advertisement, to: Employment Manager, Vickers-Armstrongs (Aircraft) Limited, Weybridge Works, Weybridge, Surrey.

Weybridge is 30 minutes from London on the main Waterloo/Portsmouth Line.

Additional 'buses operate to and from the Works at starting and finishing times.

Canteen facilities.

Applicants should be in a position to arrange their own housing accommodation. Assistance can only be given with individual lodgings.

Holidays already arranged by applicants this year taken into account.

THE MULLARD RADIO VALVE COMPANY LIMITED

has a number of vacancies for Technical Assistants in the following Divisions at its Mitcham factory:

Cathode Ray Tube Division
 Valve Making Division
 Semi-Conductor Division
 Valve Applications and Measurements Division
 Gas Discharge Valve and
 Photo Electric Cell Division

In each field of work vacancies exist in the Production Development and Technical Departments. Applications are invited from persons holding the General Certificate of Education at Ordinary level in science subjects and at Advanced level, and others who possess either the Ordinary or Higher National Certificate in Electrical Engineering.

The posts give an opportunity for further training in the electronic field and there are facilities for further study leading to higher qualifications. There are, in addition, considerable opportunities for promotion in varying and expanding fields of electronic work.

Commencing salaries will be according to age, experience and qualifications and can be considered as progressive. There is a Company Pension Scheme and Long Service Holiday Plan.

Applications in writing, which will be treated with the strictest confidence, should be addressed to the Personnel Officer, The Mullard Radio Valve Co. Ltd., New Road, Mitcham Junction, Surrey, quoting reference JFC/TECH/GEN.

B.O.P.E. Ltd.

RESEARCH, DEVELOPMENT AND DESIGN ENGINEERS

British Optical and Precision Engineers Ltd., is a group of companies within the J. Arthur Rank Organisation. The B.O.P.E. group manufactures high quality precision mechanical, optical and electronic, including sound recording, equipment for the cinematograph and television industries, as well as specialised measuring instruments, radiation instruments and machine tools for industry in general. In addition, research and development work in many fields is carried out under Contract to the Government.

The three main manufacturing companies of B.O.P.E. are British Acoustic Films of London, Taylor, Taylor & Hobson of Leicester, and A. Kershaw & Sons of Leeds. The group is expanding rapidly in selected fields allied to its present work and is increasing its research, development and design staffs at all three centres. In addition, a Central Research Laboratory is being established in West London.

Vacancies are available for first-rate ENGINEERS with good qualifications and experience in the fields of servo-mechanisms of all types, small precision mechanism design, measuring instruments and associated electronics.

Some junior posts are also available for ASSISTANT ENGINEERS and RECENTLY QUALIFIED GRADUATES.

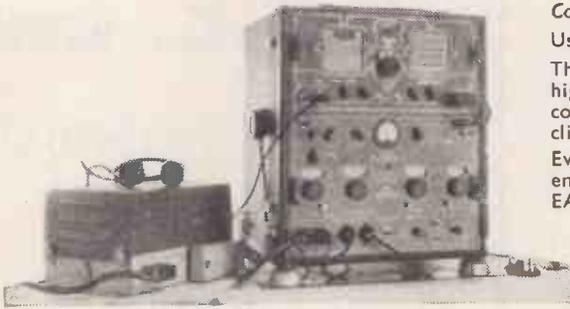
Several senior posts require to be filled and excellent salaries will be paid for good men. The planned expansion offers opportunities for advancement for all grades, and all positions are pensionable.



Please apply to the Personnel Manager, Research & Development Department:

BRITISH OPTICAL & PRECISION ENGINEERS LTD.
 Mortimer House, 37/41,
 Mortimer Street, London, W.1.

INTRODUCING: SHORT WAVE TRANSMITTING/RECEIVING INSTALLATIONS T/R-50 SERIES



AUTO-ALARM SYSTEM—can be supplied on special quantity orders.

ACCESSORIES & SPARE PARTS—All accessories and equipment spares for 3—5 years' operation are supplied with the equipment.

Write for catalogues of our Broadcast Transmitters MI-8167-BRS & MI-8167-BRM.

We still have very large stocks of ex-Govt. Radio, Radar, Signal and aircraft equipment and spares for disposal at very low prices.

Complete in every detail for immediate operation
Use: **MARINE · MOBILE · FIXED STATIONS**

The performance of these installations is of the highest order and meets the requirements of commercial telecommunication working in all climates and conditions.

Every design feature has been incorporated to ensure: **RELIABILITY — ACCESSIBILITY — EASE OF SERVICING.**

Brief Specification:—

TRANSMITTER
FINAL AMPLIFIER PLATE INPUT POWER = 80 WATTS.

FREQUENCY RANGE: 1,500 Kc/s. to 12,500 Kc/s. in 3 bands V.F.O. or CRYSTAL CONTROL with choice of five crystal positions.

EMISSIONS: (a) Radiotelephone (voice) with facilities for full press-to-talk operation.

(b) Radiotelegraph (code) with provision for full break-in keying.

RECEIVER

SUPERHETERODYNE: I.R.F., Mixer, Local Oscillator, 2-I.F.'s, 2nd Detector and 1st Audio, B.F.O., Power Output Stage with built-in Speaker and additional 500-ohm line connections.

Note: The R-50 Mark II can be provided with a muting control (full or partial) on special order.

POWER SUPPLIES

12 v. Dynamotor Unit or A.C. Mains Supply Unit (manufactured to customers' requirement).

BRITISH SAROZAL LIMITED ELECTRONIC WORKS

1-3 MARYLEBONE PASSAGE - MARGARET STREET - LONDON - W.1

Cables: SAROZAL, LONDON

Telephone: LANGham 9351 (3 lines)

A.I.D. and A.R.B. Approved.

THE BRITISH NATIONAL RADIO SCHOOL

ESTD. 1940

NOW IN OUR FIFTEENTH YEAR
AND STILL

NO B.N.R.S. STUDENT HAS EVER FAILED

to pass his examination(s) after completing
our appropriate study course.

What prospects for your C. & G.
Exams?

Let us help you to pass three or four,
NEXT May. We shall be doing it for
lots of your colleagues.

A.M.Brit.I.R.E. and CITY and GUILDS Radio and
Telecommunications Exams., etc., etc.

PLEASE NOTE NEW ADDRESS:

PRINCIPAL, M.I.E.E., M.Brit.I.R.E.
BRITISH NATIONAL RADIO SCHOOL
2, CANYNGE ROAD, CLIFTON, BRISTOL, 8
Tel. BRISTOL 34755

THE MULLARD RADIO VALVE COMPANY LIMITED

has a number of Senior Staff vacancies in the
Television Tube
Production Department

of its Cathode Ray Tube Division.
These posts are for

PRODUCTION ENGINEERS

who, in each case, will later be responsible for the overall efficiency of their section, including a complete range of duties within the production and management function against a highly technical background.

It is felt that these posts would have a particular appeal for young men who possess a good Honours Degree in the Physical Sciences or Engineering, coupled with a short period of industrial experience (or who may be completing National Service), and now feel they wish to further their career in the production field.

There are opportunities for promotion in this expanding field of Company activity.

The commencing salary will be according to individual age, experience and qualifications and can be considered to be progressive.

The hours of work will be forty-four in a five-day week. The Company provides a progressive Holiday Plan and Pension Scheme.

Applications in writing, which will be treated with the strictest confidence, should be addressed to the Personnel Officer, The Mullard Radio Valve Co. Ltd., New Road, Mitcham, Surrey.

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 0000 a/o "Wireless World" Dorset House, Stamford St., London, S.E.1.) Trade discount details available on application. Free Des. Octobr 1955 issue, Thursday, September 1st. No responsibility accepted for errors.

WARNING

Readers are warned that Government surplus components and valves which may be offered for sale through our displayed or classified columns carry no manufacturers' guarantee; Many of these items 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 items purchased.

NEW RECEIVERS AND AMPLIFIERS
C.J.F. ELECTRICAL & ELECTRONIC DEVELOPMENT, Ltd., Bickford Rd., Witton, Birmingham, 6. Tel. East 0822.
SPECIALIZE in the manufacture of High Fidelity Sound Reproducing equipment, including:

WILLIAMSON Amplifiers, Tone Control Stages with variable Steep Cut Filters, Cross-over Units, High Fidelity Portable Tape Recording equipments ideally suitable for replaying the new EMI pre-recorded tapes. Professional Recording Amplifiers, Microphone Mixing Units, etc. Send for details and leaflets. [1015]

SHIRLEY LABORATORIES, Ltd., 125, Tarring Road, Worthing, Sussex, the precision high fidelity specialists; amplifier type SB/1-15E, 15 watts output, response 15 to 80,000 c/s, bass lift 18 db, cut 18db, treble lift 14 db, cut 20 db, B.V.A. valves, complete with engraved panel, 18gns; with 3 position switched input filter 19gns; also the Jupiter reproducers at 34gns, the WB/20 6-watt amplifier, 12gns; the new Mullard 20-watt EL34 amplifier, tape amplifiers to suit most decks; specialized amplifiers to order for the musical and scientific industries. Tel. Worthing 513. 3571. [0095]

RECEIVERS AND AMPLIFIERS—SURPLUS AND SECOND-HAND
R1116, 0.14/20 M/c battery, double S. Het., power pack and A.C.C. available; offers.—Box 5466. [5062]

LOWTHER DT5 tuner, 4 bands, variable selectivity; £20 o.n.o.—Young, Fremantle 0096, London, after 6 p.m. [5064]

CHAPMAN FM81 tuner, 15gns; Seal Variope Mark II, 12gns; both latest types, as new.—Box 5493. [5075]

HRO Rx's and coils in stock, also AR38, BC348R, CR100, etc.—Requirements please to R. T. & I. Service, 254, Grove Green Rd., London, E.11. Lev 4986. [0053]

WIRELESS WORLD 2R.F. 3-valve quality tuner, M.W. and L.W., complete with fully smoothed power supply unit, unused, ideal for use with all high fidelity sets, including 4 valves, approx. half original price; limited number bargain.—Box 2974. [5060]

FIRST offer secures virtually unused Chapman 56 tuner, £21; NRS No. 1 studio symphony amplified, £9, or complete in stove enamel steel cabinet with engraved face panel, power pack and separate stentorian HF912 speaker, £39.—Box 5112. [4992]

RECEIVERS AND AMPLIFIERS—SURPLUS AND SECOND-HAND WANTED.
URGENTLY required, short wave receivers; we pay immediate cash for clean equipment.
K.T. RADIOS, 156, South Ealing Rd., W.5, Ealing 1303. Open Saturdays. [4899]

LOUDSPEAKERS—SURPLUS AND SECOND-HAND
WHARFEDALE, W.10 C.S.B., £8/10; Wharfedale Golden C.S.B., £6; both as new.—Box 5303. [5070]

NEW TEST EQUIPMENT
TV. signal intensity meter (S.I.M.) for aerial checks and installation, etc.—Send for full details, Radio-Aids, Ltd., 29, Market St., Watford, Tel. Watford 5988. [5068]

TEST EQUIPMENT—SURPLUS AND SECOND-HAND
BC221 £24, Avo 40 9 gns., Avo 7 11 gns.—Lawrence, 46, Alpha Rd., Bristol, 3. [5008]
SPEEDI-VAC pumps, Edwards, type 1, with Bin v-pulley, £15. Motorised 230V AC, £21.
VARIACS, type 80C, In: 200-240V, 50c. Out: 220V, 7½ amps, £5/10; Type 500L-2G, In: 180V, 500c. Out: 0-180V, 7+7 amps, £14.
CONSTANT voltage transformers by Advance. In: 204-276V, Out: 240V, 530W, £10.
AUTOMATIC voltage stabilizers for 200-250V AC mains. Ferranti moving coil; 6¼ Kva £70. 1440Va less relay, £28. Ditto 480Va, £18.
MICROMMETERS, 2¼in, M.C., flush, round, centre zero, 250-0-250µa, 22/6 p.t.
ROTARY converters, In: 24V DC, Out: 50V AC, ph. 50c 9 amps, 450W, £7.
MAGSLIPS always in stock. Also Velodynes, Amplydines, Servo-Motors, Selsyns, Torque Amplifiers, Iron cored potentiometers, etc.
P. B. CRAWSHAY, 94, Pixmore Way, Letchworth, Herts. Tel. Letchworth 1851. [0097]

PARTRIDGE Type P.3878

... a 'must' for every constructor of the 20-WATT HIGH-QUALITY AMPLIFIER

designed by W. A. Ferguson *



Optimum conditions are obtained in the form of output stage used in this amplifier when about 40% of the primary winding of the output transformer is common to anode and screen grid circuits. The Partridge Type P.3878 is of C-core design with windings of 43% of primary turns, and is specified by the designer for this amplifier.

* "Design for a 20-Watt High Quality Amplifier" by W. A. Ferguson, B.Sc. (Eng.), A.C.G.I., Grad. I.E.E., Wireless World, June.

Two other Partridge components are necessary for this circuit:

Mains Transformer Type P.3877
 Smoothing Choke Type P.3879

RELEVANT LITERATURE IS AVAILABLE ON REQUEST

**PARTRIDGE
TRANSFORMERS LTD
TOLWORTH SURREY**

Phone: ELMbridge 6137/8

TEST EQUIPMENT—SURPLUS AND SECOND-HAND
OSCILLOSCOPE, Cossor Model 3332; £20.—Carlisle, 32, Rangenfield Rd., Bromley. [5024]

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. Lev. 4986. [0056]

NEW TV COMPONENTS
FOR sale, brand new and unused, one G.E.C. 4603 electrostatic 12in tube, surplus to requirements.—Offers to M.T.R.S., 20, White Hart St., Mansfield, Notts. Tel. Mansfield 1802. [5076]

NEW DYNAMOS, MOTORS, ETC.
1500 cycles alternators 2KVA, 80v.—E.W.S. Co 69, Church Rd., Moseley, Birmingham. [4601]
J.A.P. No. 2A 1.2hp petrol engine, air-cooled. 4-stroke, starting rope, tools. Instruction book; £17/10 delivered.
T. W. PEARCE, 66, Great Percy St., W.C.1 (near Angel). [0013]

DYNAMOS, MOTORS, ETC.—SURPLUS AND SECOND-HAND
2,000c/s motor-alternator sets, input 220v d.c., output 80v, 1ph, 2,000c/s, 6.25amps, 500VA, complete with starter, fuses, control panel and voltmeter, all mounted in ventilated steel cabinet 14in x 26in x 49in high, new in original cases; £16, carr. extra.
P. B. CRAWSHAY, 94, Pixmore Way, Letchworth, Herts. Tel. 1851. [0099]

NEW GRAMOPHONE AND SOUND EQUIPMENT
FERROGRAPH magnetic tape recorder—76gns.

WEARITE tape decks and component parts. DISC recording machines and blank discs. LEAK amplifiers, 10v £17/17; preamp £10/10. GOODSELL, 5v £13/10, preamp £10/10. RESLO ribbon microphones and stands. EVERYTHING for the professional recording studio and quality dealers. SOUND DISCS (SUPPLIES), Ltd., 178, Bishopham Rd., Southampton, Lancs. Tel. 88153. [4731]

TRANSISTOR pre-amps for tape playback. 5gns; valve types from £3/15. TAPE recording amps, 12gns (mag. eye) or 18gns (meter ind.), inc. p. pack; complete T/R amps, 12watts, p.p., 19gns; Swatts, £14; others, 0L output, 19gns. REFLECTOGRAPH decks; £31 (Lodestar). JASON F.M. kits; £5/14, or built £15/17. GRUNDIG, Philips, Ferrograph T/R. BARKER L/S supplied. COM. TV converters available from £5. H.P. terms now available. TEL. Gladstone 1770.

HARDING ELECTRONICS, 120a, Mora Rd., Crickwood, London, N.W.2. [0032]

TAPE recorders for sale, exchange or hire in Greater London good quality tape recorders wanted for cash, all types of repairs, mechanical and electronic, carried out by specialists, all accessories available, we deal exclusively in magnetic recording equipment.

THE MAGNETAPH RECORDING Co., Ltd., 1, Hanway Place, London, W.1. Tel. Langham 2156. [539F]

FERROGRAPH tape recorders as used and supplied by this studio for four years, thoroughly dependable; tape, microphones, blank disks, speakers, new Polyester tapes, 48 minutes recording from a 7in reel; transfer your tapes to our wide dynamic L.P.s; Garrard 301 turntable, used once, £2 off list price.

ERGOICA Recording Services (1949), Peel St., Eccles, Manchester, Eccles 1624. Director: Thurlow Smith, A.R.M.C.M. [0122]

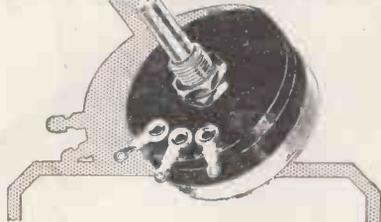
CINE-VOX disc recording equipments, type C7J for high-quality recordings from existing microphone equipment; price from 28gns; also available as a complete channel inclusive of mic., amplifier and playback equipment, at 70gns; type C7 for highest quality professional requirements—recorder mechanism at 48gns, or complete channel at 110gns; demonstrations arranged in London.

PLEASE write for details to K.T.S., Ltd., "Coplow," Park Rd., Braunton, N. Devon. Tel. Braunton 224. Callers by appointment only. [0209]

GRAMOPHONE AND SOUND EQUIPMENT—SURPLUS AND SECOND-HAND
HM.V. 2300H disc recorder complete, microphone, four-channel mixer; nearest offer £140 secures.—Snellgrove, 3, Third Acre Rise, Oxford. [5005]

**FOR
SALE AND WANTED
ADVERTISEMENT FORM
TURN TO
PAGE NO. 193**

POTENTIOMETERS



Wire-wound and Composition types. Single, Ganged, Tandem Units. Characteristics: linear, log., semi-log., non-inductive, etc. Full details on request.

RELIANCE

RELIANCE MFG. CO. (SOUTHWARK), LTD.,
SUTHERLAND ROAD, NICHAM HILL, WALTHAMSTOW, E.12.
Telephone 4 Larkwood 1245

SURPLUS

AERIAL MASTS. American Yagi 5 element array AS-46/APG. 30ft. one piece 4in. dia. hollow wood masts. 36ft. 3 section 2in. dia. tubular steel masts. 45ft. 9 section 1 1/2 in. dia. American steel masts MS-44. 50ft. Bendix plywood masts MT-7A. 70ft. American plywood masts. 200 mcs. Birdcage "H" array. 20ft. American tripod base aluminium masts AS/TPX. 9ft. one piece American police whips. 18ft. BC-610 6 section whips.

DIRECTION FINDERS. SCR-206, SCR-291, SCR-503, DFG-20, DFG-24, etc.

TELEPHONE AND TELEGRAPH APPARATUS. 1 + 1 terminals and bypass filters; 1 + 3 terminals; 1 + 4 terminals and repeaters, S and SX, S and DX, filters; power bays; repeaters; V.F. ringers; perforators; Wheatstone equipment; teleprinters; undulators; switchboards; rectifiers; EE-65, TG-10, etc., etc.

AUDIO EQUIPMENT. R.C.A. squadron announcers (12-25 watt speakers). R.C.A. 25 watt high power speakers. Portable megaphones PA-4.

CONTROL UNITS. RM-6, 7, 12, 13, 21, 25, 29, 42.

AMERICAN TRANSMITTING TRANSFORMERS AND CHOKES. A large variety by Amertran, Kenyon, R.C.A., Thordason, etc., etc.

TRIPLE DIVERSITY RECEIVERS. 1.5 to 30 mcs. Self contained on rack with all refinements. Full details available.

100 WATT BROADCASTING TRANSMITTERS by Woden. Self contained in 4ft. 6in. cabinet £22 1/2 with valves.

RACKS. de luxe, 19 inches wide channel iron sides, 3 x 2, 3ft. 6in., 40" - carr. 10".

Many other items too numerous to mention. Send your requirements. Lists available. All packing and shipping facilities.

P. HARRIS

ORGANFORD DORSET

Telephone: Lychett Minster 212.

NEW COMPONENTS
F.M. new W.W. design coils, parts, available now; BEL FM and transistor pioneers.—Marlborough Yard, London Archway, N.19. Arc. 5078. [0185]

TRANSFORMERS 230v d/w tapped at 4v, 6v, 10v, 16v and 24v at 2 amps, 18/6; carbon microphone inserts, 2/6; push-button red and black motor switches suitable up to 1 1/2hp, 5/phase, 12/6; 1lb reels cord solder, 9/6; every car battery kept in stock fully charged less than half ring prices.

KINGSTON ELECTRICAL SUPPLIES. 134, London Rd., Kingston-on-Thames. [4995]

COMPONENTS—SURPLUS AND SECOND-HAND

RADIO CLEARANCE, Ltd. 27, Tottenham Court Rd., London, W.1. Tel. Museum 9188.

ELECTROLYTICS. capacity, voltage, size, type of mounting, price post paid: 400, 6v, 1x2in. lug, 1/6; 250+250, 6v, 1x2in. lug, 1/6; 25, 25v, 1/4x1 1/2, W/E, 1/6; 500, 12v, 3/4x1 1/2, W/E, 2/-; 1000+2000, 6v, 1x3, clip, 3/9; 250, 12v, 1/4x1 1/2, clip, 1/3; 10, 25v, 1/4x1 1/2, clip, 1/3; 500, 50v, 1x3, clip, 3/9; 50+50, 150v, 1 1/2x2, clip, 2/9; 100, 275v, 1 1/2x3, clip, 3/6; 60+250, 275+350v, 1 1/2x4 1/2, clip, 6/3; 40+40, 275v, 1 1/2x2, clip, 3/3; 24, 275v, 1/4x2, clip, 3/-; 32+32, 275v, 1x3, W/E, 3/3; 64+120, 275v, 1 1/2x4 1/2, clip, 5/6; B, 450v, 1/4x2, clip, 1/3; 24+24+16, 350/425v, 1 1/2x2, clip, 4/9; 16+16+8, 350/425v, 1 1/2x2, lug, 4/3; 32+32, 350/425, 1 1/2x2, clip, 4/3; 100+200, 350v, 2x4 1/2, clip, 6/9; 16+32, 350v, 1 1/2x2, clip, 3/6; 8+8, 350v, 1x2, clip, 3/3; 20+10, 450v, 1x3, clip, 4/-; 15+15, 450v, 20mf 25v, 1x3, lug, 4/3; 8, 500v, 1 1/2x2, 2 1/2, 2/6; 8+8, 500v, 1 1/2x2, clip, 4/-; all all cans, some with sleeves, all voltages WKG. surge V where marked, new stock, guaranteed. 5mA meters, moving coil, bakelite case, 2in square, flush mounting, new, boxed; 7/- post paid; 50mA, 8/6.

MAINS trans. 250-0-250v, 80ma 6.3v, 2.5A, 6.3v, 0.6A, Pri. 0-210-230-250v, 12/- post paid.

TELEVISION chassis, cadmium plated, steel, size 14x13x2 1/4 in, complete with 13 valve holders (9-B9A Pax, 1-B9A Cer, 2-B7G Cer, 1-int. Oct. amp.), 20 various tag strips, cut away for metal rect., line trans., etc.; 9/11 each, post paid.

FRONT and rear tube mounts fit above chassis, 3/- pair, post paid.

P.M. focus rings, wide angle, tetrode tube, fully adjustable, 12/- post paid.

SCANNING coils, wide angle, with mounting lugs, 19/6, post paid; line trans. to suit above coils, gives 12kv EHT, fitted width and line linearity coils, 19/6, post paid; both these items were used with above chassis, etc.

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 181. [0016]

METAL-GLASS seals, single-way, hermetic ally sealed terminals for soldered connections and fixing; mostly 1kv and 2kv sizes, new (surplus). 65/- per 1,000 assorted.—P. B. Crawshaw, 94, Pixmore Way, Letchworth, Herts. Tel. 1851. [0087]

WANTED, EXCHANGE, ETC. EXTRUSIONS by Marley.

BUYERS requiring rigid and flexible tubes and sections in thermoplastic materials should ask for a quotation from Marley Extrusions, Dept. 129, Lenham, Maldstone, Kent. Harrietsham 381. [4735]

WANTED, receivers A.P.R.4, also T.N.16, 17, 18, 19, etc., and any radio test gear.

LESLIE DIXON & Co. 213, Queenstown Rd., Battersea, S.W.8. Macaulay 2159. [00176]

3000 type P.O. relays with 5,000ohm coils wanted in quantity.—Box 4623. [4890]

PROFESSIONAL standard tape equipment, max. 7 1/2 in.—Box 5159. [4997]

WANTED.—Acoustical amplifier, 12v D.C., 110v A.C., 50w output.—J. Spector, I.C.T.A., Trinidad, B.W.I. [5006]

WANTED.—700L tape recorder for school.—Headmaster Boys' Modern School, Barnstaple. [5010]

WANTED, tuning units, TN17, TN18, TN19 for R54/APR4 £50 each offered.—Box 4963. [0261]

WANTED, set manufacturers' or ex-Government radio equipment, large or small quantities of valves, electrolytics, speakers, meters, also components.

LOWE BROS. 9a, Diana Place, Euston Rd., N.W.1. Eus. 1636/7. [4A85]

WANTED, HRO coils, Rxs, etc.—A.R.88s, BS348s, S27s, etc.—Details to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4986. [0163]

WANTED communication equipment, tape recorders, test equipment, valves, radio amplifiers, etc.—Ger. 882, Leed Radio, 193, Lisie St., Leicester Sq., W.O.2. [4993]

WANTED, B.C.610 Halcrafters, E.T.4336 transmitters and spare parts for same; best prices.—P.C.A. Radio, Beaver Lane, Hammersmith, W.6. [0079]

WANTED, output meter, signal generators, valve testers of American type, and capacitance bridges.—R. Gilliland & Co., Ltd., 7, High St., Worthing, Sussex, Tel. Worthing 8719. [4996]

WANTED, good quality communication RYS tape recorders, test equipment, domestic radios, record players, amplifiers, valves, components, etc., estb. 18 years.—Call, send or phone Ger. 4638, Miller's Radio, 36a, Newport Court, Leicester Sq., W.O.2. [4824]

THE INSTRUMENT MODEL

Specially designed for soldering operations in the compact assemblies used in present day radio, television and electronic industries. Weight 3 1/2 oz. excluding flexible. Length 9in. 25 Watts. Voltage range. 12-50 24/- 100-240 22/-

Interesting features

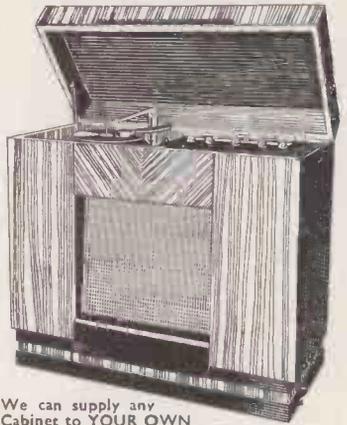
1. Bit 1/8" diameter, to replace.
2. Steel cased element, also replaceable.
3. Detachable hook for suspending iron when not in use.
4. Moulded two part handle, remains cool in use.
5. Six ft. Henley Flexible.



HENLEY SOLON
ELECTRIC SOLDERING IRONS

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51/53, Hatton Garden, London, E.C.1

CABINETS



We can supply any Cabinet to YOUR OWN SPECIFICATION. The one illustrated can be obtained in walnut, oak or mahogany for £19/15/-, or as a COMPLETE RADIOGRAM incorporating:

- 5-VALVE SUPERHET, 3-speed Plessey Autochanger and 10in. W.B. Speaker £48.0.3
- 8-VALVE ARMSTRONG F.C.48, 3-speed Collaro Autochanger and 10in. W.B. Speaker £60.14.8
- 14-VALVE ARMSTRONG EXP 125/c, 3-speed Garrard Autochanger and 12in. Goodmans speaker £95.5.11

Alternative arrangements of Chassis, Speaker and Autochanger can be supplied. Send 1/- for complete Catalogue of Cabinets, Chassis, Autochangers and Speakers (refunded on receipt of order). H.P. can be arranged.

LEWIS RADIO COMPANY
120, GREEN LANES, PALMERS GREEN, LONDON, N.13. BOWEN Park 6064

To get the best possible performance from KT66 triodes in a circuit such as the Williamson use the

GILSON

15-30 WATT TRIODE OUTPUT
TRANSFORMER

REF. WO794



FEATURES:

A 30-watt size core of grain oriented laminations. Approx. 0.05% core harmonic distortion which figure will be still further reduced by the application of negative feed-back.
Level response $\pm 1\text{db}$ 2 c/s to 20 Kc/s at 0.15 w. Zf 2 c/s 20 K Ω , 1 Kc 400 K Ω , 30 Kc/s 22 K Ω . Low winding capacitance. Ratio 10 K Ω A-A, 8 x 0.97 Ω or 8 x 3.75 sec. sections. Max. D.C. 120 mA each anode. Adequate insulation, voltage proof, 3 KV peak overall.

For
Unexcelled performance
from your

OSRAM 912 AMPLIFIER

use the

GILSON ULTRA LINEAR OUTPUT TRANSFORMER

REF. WO710

especially designed for this circuit

FEATURES:

An adequate core of grain oriented laminations. Low winding capacitance. High primary inductance. Very low harmonic distortion. Very low intermodulation distortion. Complete stability under all conditions. Modest cost.

List price **£2.12.6**

Please write for informative leaflets on the above

R. F. GILSON LTD.

11a ST. GEORGE'S RD., WIMBLEDON, S.W.19

Phone: WIMbledon 5695

MAKERS OF NEON SIGN TRANSFORMERS

Specialists in the design and manufacture of small transformers for power and audio frequencies. Contractors to Admiralty, etc., A.I.D. Approved

WANTED, EXCHANGE, ETC.
WANTED, signal generators, types TF144G, TF517F, TF762A, frequency meters type BC221, TS174, TS175; also receivers types R1359 and R1294.—Send price and details to Hatfield Instruments, Ltd., 175, Uxbridge Rd., Hanwell, W.7. Tel. Ealing 0779/9857. [0037]

ALL U.S.A. V.H.F. test and communication equipment; TS174, TS175, TS347, B.C. 221 freq. meters; receivers 1294, 1359, Hallcrafters S.27, S.27CA, U.S.A.; APR4 and tuning units TF16, 17, 18 and 19, RCA AR88D-LF, Hallcrafters SX28; valves 707A-707B, 2K28, 2K39, 2K53, 2K41; highest offers given by return.—Ger. 8410 and 4447, Universal Electronics, 2, Lisle St., Leicester Sq., London, W.C.2. [0229]

VALVES WANTED
NEW valves required for cash, all types, quantities; send list for quotation.—Langrex, 3, New Pk. Rd., London, S.W.2. [4836]

CABINETS
LEWIS RADIO have the best selection and finest finish.—See page 176. [0224]

EXCLUSIVE sale of cabinets in bakelite for television apparatus offered to constructors for different countries.—Apply Box 4928, 14947

WALNUT radioram and television cabinets, soundly constructed; stamp for details.—R. Shaw, 69, Fairlop Rd., Leytonstone, E.11. [4350]

METERS WANTED
WE urgently require meters of all types, meter components, test equipment, etc.; any quantity, large or small; prompt cash.—ANDERS ELECTRONICS, Ltd., 91, Hampstead Rd., London, N.W.1. Euston 1639. [4663]

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. 47888. [0113]

MAINS transformers, E.H.T.s, chokes, field coils, etc., promptly and efficiently rewound or manufactured to any specification. LADBROKE REWIND SERVICE, Ltd., 320a, Harrow Rd., London, N.W.10. [0222]

SERVICE sheets for hire or sale, over 2,000 models, radio and television, s.a.e. enquiries. Always at your service.—W. Gilbert, 24, Frithville Gardens, London, W.12. Tel. She. 3052. [4296]

TRANSFORMER rewind service, mains, E.H.T. transformers and chokes prompt delivery, range of replacement types ex-stock or manufactured to your specification. METROPOLITAN RADIO SERVICE Co., 75, Kilburn Lane, London, W.10. Ladbroke 2296. [0200]

NOTICE that Melton Electronics, Ltd., 387, Ashley Rd., Parkstone, Poole, Dorset, manufacture transformers, chokes, line and frame outputs, R.F. and E.H.T. coils, and a complete range of "C" core types. YOUR enquiries for rewinding all Commercial Types will receive immediate attention. [4910]

REWINDS and conversions to mains and output trans., pick-ups, fields, clock coils, etc., from 4/6; P.P. equipment a speciality; all work guaranteed.—N. L. Rewinds, 173, High Rd., Willesden Green, N.W.10. Tel. Wordsworth 7791. [5033]

24-HOUR service, 6 months' guarantee, any transformer; rewind, mains outputs and i.f.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. [4268]

D C BOULTON for repairs to any loudspeaker, specialists on heavy and P.A. types; cone assemblies, field coils, repair accessories, pressure units, microphones; motor forms rewound and to specification; motor rewinds.—Lumby St., Manchester Rd., Bradford Tel 22838. [0171]

ARMATURE rewinding service to the trade, vacuums, drills, grinders, hood dryers, dental motors, vacuum cleaners, armatures replaced from stock; 24 hours' service; every job guaranteed we also specialize in complete overhauls and rebuilds of vacuum cleaners; all vacuum cleaner parts, hoses, bearings, fans, brushes for any make in stock.—Regani Electric, 95, Park Lane, Leeds, 1. [00228]

WORK WANTED
ELECTRONIC development, small qty. assy.; technical drawing.—Box 5515. [0219]

WIRING and assembly carried out to A.I.D. standards; large or small orders accepted.—W.H.D., 43, Lawrence Drive, Ickenham, Middx. [5074]

CAPACITY available for small plastic moulds and stamping tools; highest limits, clean work, reasonable prices; speciality: hearing aids and electronic components.—Tool maker, 23b, St. Stephens Ave., London, W.12. Appointment by phone. She. 7069. [0064]

CAPACITY AVAILABLE
DUE to further expansion of our works and facilities manufacturers are advised that immediate capacity is available for the manufacture of transformers, chokes, and inductances, including wave-winding of all types. HADFIELDS solventless varnish vacuum impregnation and enveloping processes to approved specifications.

MACHINE engraving on metal and plastics.—Enquiries to Melton Electronics, Ltd., 387, Ashley Rd., Parkstone, Dorset. Tel. Parkstone 231. [4911]

—TELE-RADIO (1943) LTD

STEEL METER CASES WITH ALUMINIUM PANEL, SLOPING FRONT

4in. x 4in. x 4in.	8/6
5in. x 6in. x 8in.	13/6
6in. x 6in. x 12in.	22/6

SMALL STEEL TEST METER CASES WITH ALUMINIUM PANEL

4in. x 4in. x 3in.	8/-
6in. x 4in. x 3in.	8/-
8in. x 6in. x 3in.	10/-
10in. x 6in. x 3in.	12/-

STANDARD STEEL CASES WITH ALUMINIUM PANEL

10in. x 7in. x 7in.	22/6	16in. x 9in. x 8in.	45/-
12in. x 7in. x 7in.	25/-	16in. x 11in. x 8in.	51/6
14in. x 7in. x 7in.	32/6	19in. x 11in. x 10in.	58/-
14in. x 9in. x 8in.	41/6		

18 S.W.G. ALUMINIUM CHASSIS

8in. x 6in. x 2 1/2in.	7/6	14in. x 5in. x 2 1/2in.	9/6
10in. x 6in. x 2 1/2in.	8/3	14in. x 8in. x 2 1/2in.	10/6
12in. x 6in. x 2 1/2in.	8/6	14in. x 10in. x 2 1/2in.	11/-
12in. x 8in. x 2 1/2in.	9/6	17in. x 10in. x 2 1/2in.	12/6

18 S.W.G. STEEL CHASSIS

14in. x 8in. x 2 1/2in.	9/8	17in. x 10in. x 2in.	11/3
14in. x 10in. x 2 1/2in.	10/3	17in. x 10in. x 3in.	12/6

FULLY DRILLED CHASSIS FOR WILLIAMSON AMPLIFIER

	27/6
--	------

G.E.C. OSRAM 912 AMPLIFIER DRILLED CHASSIS

	21/-
--	------

G.E.C. OSRAM 912 FRONT PANEL

	14/6
--	------

"PANEL" CRACKLE PAINT, BLACK, GREEN OR BROWN, 3/- per tin.

SUNDRIES

0-15 v. A.C. Meter	10/6
0-30 M.A. Meter	7/6
London Channel T.V. Pre-amplifier ... (1 valve EF42 or equivalent.)	21/-
813 Valve Bases (new)	10/-
280 v. 80 mA. Half-wave Metal Rectifier	7/6
40 H. 50 mA. Wooden Chokes	12/6
5-pin P/S. Belling Lee, 6 for	10/-
7-pin P/S. Belling Lee, 6 for	10/-
E.M.I. Variable Selectivity I.F.T.s, pair 4K Colvern Preset Wire-wound Potentiometers, 6 for	9/-
6K Colvern Preset Wire-wound Potentiometers, 6 for	9/-
2K Colvern 15-watt Precision Potentiometers	8/6
E.M.I. 100-1 Microphone Transformer, heavy screen	7/6
PEN46. New and boxed	8/6
866A. New and boxed	10/-
HVR2A. New and boxed	8/6

Mains Transformer, drop through, 350-0-350 v. 60 mA., 6.3 v. 2.5 a. 5 v. 2 a. Standard Primary [4/6]

ELLISON TRANSFORMERS ALL UPRIGHT MOUNTING

P20. 200/250 v. Pri. Sec. 250 v. 20 m/a., 6.3 v. 1 a., 5 v. 1.5 a.	23/-
P21. 200/250 v. Pri. Sec. 250 v. 30 m/a., 6.3 v. 2 a., 5 v. 2 a.	24/9
MT162. 200/250 v. Pri. Sec. 250-0-250 v. 60 m/a., 6.3 v. 3 a., 5 v. 2 a.	25/4
MT137. 200/250 v. Pri. Sec. 250-0-250 v. 120 m/a., 6.3 v. 7 a., 5 v. 3 a.	40/6
MT123. 200/250 v. Pri. Sec. 300-0-300 v. 110 m/a., 6.3 v. 2 a. C.T., 0-5-6.3 v. 2 a.	43/-
MT190. 200/250 v. Pri. Sec. 350-0-350 v. 120 m/a., 6.3 v. 5 a. C.T., 5 v. 3 a.	43/9
MT178. 200/250 v. Pri. Sec. 350-0-350 v. 150 m/a., 6.3 v. 5 a. C.T., 5 v. 5 a.	53/-

FULL RANGE OF TELETRON COILS

Postage & Packing extra. C.W.O. or C.O.D

TELE-RADIO

(1943) LTD

189 EDGWARE ROAD,
LONDON, W.2.

Phone: PAD. 4455/6.

Shop hours: Mon.-Sat. 9 a.m.-6 p.m. Thursday 9 a.m.-1 p.m.

THE MODERN BOOK CO.

Britain's Largest Stockists of British and American Technical Books

Servomechanisms and Regulating System Design Vol. II by H. Chestnut and R. W. Mayer. 68s. Postage Free.

Frequency Modulation Tuner Units for Fringe and Local Area Reception, a Data Publication by G. Blundell. 2s. Postage 3d.

Practical Wireless Service Manual by F. J. Camm. 17s. 6d. Postage 6d.

An Introduction to Colour Television by G. G. Gouriet. 8s. 6d. Postage 4d.

Electronic Musical Instruments by R. H. Dorf. 55s. Postage 1s.

The Radio Amateur's Handbook, 1955 by A.R.R.L. 30s. Postage 1s.

Television Engineers' Pocket Book edited by E. Molloy and J. P. Hawker. 10s. 6d. Postage 4d.

Mullard 5 Valve 10 Watt High Quality Amplifier Circuit. 2s. 6d. Postage 3d.

Sound Recording and Reproduction by J. W. Godfrey and S. W. Amos. 30s. Postage 6d.

Fundamentals of Transistors by L. M. Krugman. 21s. Postage 6d.

Radio Valve Data compiled by "Wireless World." 3s. 6d. Postage 3d.

Principles of Radar by J. F. Reintjes and G. T. Coate. 55s. 6d. Postage 1s.

Please write or call for our catalogue.

19-23 PRAED STREET

(Dept. W.6)

LONDON, W.2

*Phone: PADdington 4185

Open 6 days 9-6 p.m.

BENSON'S BETTER BARGAINS

BRAND NEW ORIGINAL CARTONS R.F. UNITS.

Types 26 or 27, 27/16; 24 10/. (Postage 2/6.) RF26, Solided, 10/. DYNAMOTORS, D.C. (approx. 250 v. 80 mA., at 6 v.), 5/6. 12 v. Input, 250 v. 60 mA. and 6.3 v. outputs, P.M. field, 7/6. Filters for these, 2/6. Eddytones, cased, smoothed, 12 v. D.C. to 190 v. 75 mA., 15/-. 12 v. to 300 v. 200 mA., 17/6 (carr. 7/6). Ballastres, 12 v. to 250 v. 75 mA. (vibra-pack) and 300 v. 165 mA. dyn., both on cased chassis, smoothed and filtered, new, 50/. (carr. 8/6). RK116, valves 2/EF54, 1/1/ES32, 1/0V66, VHF, with rotary coil selector, 17/6. I.F. Amplifier Type 178 new, 22/6. Relays small 6 v. 2 br. 1 m., 1/6. CO-AXIAL RELAYS 12 24 v. Type G, 7/6; R1155 Coil packs, new, 12/6; used 9/6; I.F. Filters, 2/6. CLOCKWORK Contactors, 2 impulses per sec., 8/6. TR1196 with all valves, less xtals, 45/. (carr. 8/6). R1355, new improved type, 37/6 (carr. 7/6). TR1145A, Tr. 50, 6 valves, 17/6; Ex. 74, 8 valves, 27/6; Mod/amp. 185, 5 valves, 15/. (post 2/6 each). R1392A 100/150 mca., 13 valves, used, good cond., 27/10/. (carr. 10/-. PCR Vibrator Pack 12 v. D.C. to 250 v. 80 mA., smoothed, filtered, 17/6, spare vibrator, 5/. (carr. 6/-. Eddytone 6 pin plug and socket, on lead, 5/-. RA-10/DB/DA Bendix 7 valve 8'het. Long. Meq., 2-5, 5-10 Meq. bands remotely controlled. 28 v. New, grey crackle, 90/. (carr. 10/-. FREQUENCY METERS 40-60 c. 7in. dia. 230 v. Ironclad, 30/-. Pots. w/k 25 k 4 w., 2 ohms 4 w., 3/6. Vit Resistors, 10 k 120 w., 1/6.

METERS - BRAND NEW - BOXED

Table with columns: FSD, Scale, Size, Type, Ft, Price. Rows include 500mA, 2mA, 10mA, 10mA, 20mA, 25mA, 30mA, 40 & 120mA, 100mA, 100mA, 200mA.

List and enquiries. S.A.E. please! Terms: Cash with order. Postage extra. Immediate despatch.

Callers and Post Callers. W A BENSON (WV) 308 Rathbone Rd., Liverpool 13. S T O 1604. SUPER RADIO (Whapel) LTD., 118 Whitechapel, Liverpool 1. ROY 1130.

PAINTS. CELLULOSE, ETC. PAINT spraying handbook, 3/6 post free. Cellulose and synthetic paints and all spraying requisites supplied; catalogues free.—Leonard Brooks, 55, Harold Wood, Romford. [0207]

BUSINESS OPPORTUNITIES. FINANCE available for television/radio, or take shares.—Box 5463. [5061]

MISCELLANEOUS. AUTOMATIC dual coil winding machines, range from 22 to 44 S.W.G.—Hawkins 170, Wotton Rd., Aston, Birmingham, 6. [5019]

COPPER winding wires ex stock, competitive prices, 17 to 48 swgs, plain enamel, tinned, synthetic, silk, rayon, cotton covered and Litiz types.—Box 4414.

METALWORK, all types cabinets, chassis racks, etc., to your own specification; capacity available for small milling and capstan work up to 1in bar.

PHILPOT'S METAL WORKS, Ltd. (G4B1)—Chapman St., Loughborough. [0208]

YOUR own tapes recording transferred to Y disc.—Write, call or phone Queensway Private Recording Studios, 123, Queensway, W.2. Tel. Bay. 4992. Studio recordings, tape recording service. [4957]

BUILD your own TV and learn about its operation, maintenance and servicing; qualified engineer-tutor available whilst you are learning and building.—Free brochure from E.M.I. Institutes, Dept. WW.58, London, W.4. (Associated with H.M.V.) [0180]

LET professionals transfer your tape recordings to LP records; record your broadcasts; supply your requirements. D.s. 10in disk 15/6; 12in 18/6. Also LP-S disk vouchers with tapes purchased from Sound News Productions, 59, Bryanston St., London, W.1. Amb. 0091. [4976]

FOR sale, complete public address equipment; suit small factory; consisting of a Tannoy rack-mounted 120w amplifier, pre amplifier, two wave band radio, input and output switch panels, full monitoring and metering facilities; 6 horn loudspeakers 6 double wall or Ceiling mounting loudspeakers, 3 microphones (2 ribbon, moving coil).—Box 5363.

COPPER wires enamelled, tinned, Litiz, cotton, silk covered, all gauges; B.A. screws, nuts, washers, soldering tags, eyelets, ebonite and laminated bakelite panels, tubes, coil formers; Tinned rod, headpieces, flexes, etc.; latest radio publications, full range available; list, s.a.e.; trade supplied.—Post Radio Supplies, 33, Bourne Gdns., London, E.4. [0138]

BUILD your own highly efficient aerial for F.M. commercial, etc.; we supply an ex-radar antenna display consisting of moulded Bakelite insulator, stand-off mounting bracket, dipole elements, and director easily adjusted to suit whatever band required; these aerials have cost several pounds to manufacture, our special price only 15/- plus 1/6 packing and postage.

WALTON'S WIRELESS STORES, 48, Stafford St., Wolverhampton. [0145]

NOTICES

BRITISH SOUND RECORDING ASSOCIATION. Details of membership, open to the professional sound recording engineer and all others interested in recording high quality reproduction and other branches of audio engineering, together with details of the London lecture programme and the Manchester, Portsmouth and Cardiff Centres, may be obtained from the Hon. Membership Secretary, H. J. Houlgate, A.M.I.E.E., 12, Strongbow Rd., Etham, S.E.9. [0031]

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 person is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is exempt from the provisions of The Notification of Vacancies Order 1952.

MULLARD, Ltd.

AN opportunity occurs for an Engineer, 25-30 years of age, to enter an expanding commercial engineering office handling magnetic materials and electrical and radio components. The post would suit a man educated to Grad. I.E.E. standard with good technical background who wishes to enter the commercial side of engineering. Starting salary will be not less than £20 p.a. with full employee benefits and scope for advancement in an expanding field.—Applications in writing should be addressed to: Personnel Officer, Century House, Shaftesbury Avenue, London, W.C.2. [5000]

PYE, Ltd., Cambridge.

The above company has vacancies in its Engineering and Research Laboratories for Design and Detail Draughtsmen, mechanical and electrical, also Engineering Tracers, for interesting work on a variety of projects. Applicants must have had drawing office experience, but experience in the electronics industry is not in every case essential. SALARIES will be on a generous scale in accordance with qualifications and experience and there are good prospects of advancement for persons of suitable ability.

PLEASE write in confidence to Chief Engineer, Pye, Ltd., St. Andrew's Rd., Cambridge, giving brief details of attainments to date and stating which type of work interests you most. [4983]

RADIO and television engineer (fully experienced) required; house available for right man.—Box 5510. [5079]

TELEVISION engineer, fully qualified, able to drive; good wages for the right man.—Radio & Electrical Services, 35, Westbury Ave., Wood Green, N.22. Bowes Park 2068. [5030]

"AUTOMAT" CHARGERS and POWER PACKS

as supplied to Ministries, Airline Co.s, etc., up to 600 watts. Correct design, best materials and workmanship. Selenium rectifier stacks, 40 ma. to 10 amp., with or without transformers.



"AUTOMAT" SELF REGULATING CHARGERS

"Export" model as illustrated for 6 v./12 v. 5 amp., using B.T.C. selenium rectifier, damp-proof, ultra reliable, wt. 16lb., for 215/245 v. A.C. £65/-. Carr. 4/6 extra. 12 months. Also our well known 12 v. 3 amp. charger with protective ballast and glow indicator, 69/6, ditto, 6 v. 2 amp./12 v. 2 amp., 69/6.

ditto, 12 v. 1 amp. 42/6, postage 1/10, wt. 8lb.

FOOLPROOF CHARGER KITS. Genuinely trouble free and ultra reliable. As sold for 11 years through "W.W." with full data sheet and instructions. No. 1 Kit. Westalite 3 amp. rectifier, 65 watt tapped, impregnated trans., ballast bulb, for 2 v. 6 v., 12 v. charger, all rectifier troubles eliminated, 46/-, p.p. 1/10. Handsome steel case, ready punched, louvered, enamelled, 12/6. No. 1A Kit. 3 a. rectifier, 65 watt trans., ballast, res., ammeter for 2 v., 6 v., 12 v., 3 a., 52/6, p.p. 1/10. No. 2 Kit. 12 v. 2 amp. rect., 45 watt trans., ballast/indicator bulb for 2 v., 6 v., 12 v. charger, 36/6. Case 12/6, p.p. 1/10. Wt. 8lb. with case. Minor Kit, 6 v. 2 amp., 33/-, p.p. 1/10. case 12/6 extra. Senior Model, for 6 v./12 v. at 4 to 5 amp., 12 v. 5 amp. B.T.C. rect., 85 watt trans., ballast bulb, 64/-, p.p. 2/-. Slider Kit, 120 watts trans., 14 v. 6 amp., large finned type rect., slider res., high grade ammeter, wt. 17lb., for 6 v./12 v. charger, 24/13/-. carr. 4/-.

SELENIUM RECTIFIERS, new stock not surplus, 6 v. 1 a., 4/-, 2 a., 7/6, 4 a., 15/-, 12 v. 0.5 a., 5/-, 1 a., 7/6, 2 a., 9/6, all p.p. 6d. 12 v./14 v. 3 a. to 3.4 a., 15/6, 6 a., 27/-. Large finned 6 a., 32/-. 10d. 24 v. 50 mA., 2/9. 24 v. 0.3 a., 9/-. 1.5 a., 15/-. 3 a., 27/-. 5 a., 42/-. 8 a., 62/-. all p.p. 10d. 60 v. 1 a., 24/-, 2 a., 47/-. 230 v. 1 a., 97/-. p.p. 1/6. H.T. rectifiers, 120 v. 60 mA. R.M.2, 3/4, 135 v. 30 mA. e.m.t., 5/6, 250 v. 60 mA., 7/-. 250 v. 100 mA. bridge, 14/8. All p.p. 6d. Many other L.T. and H.T. types in stock.

CHAMPION PRODUCTS

43, Uplands Way, LONDON, N.E1. Phone LAB 4457

Wireless Fundamentals

By E. Armitage, M.A. (Cantab.), B.Sc. (Lond.). This important book develops the theory of radio from the fundamentals to an explanation of the superheterodyne principle. The physical and experimental side is kept to the fore throughout the book, while purely mathematical treatment of the more theoretical parts of the subject is provided in the Appendices. 335 illustrations. 20s.

The Principles of Television Reception

By A. W. Keen, M.I.R.E., A.M. Brit. I.R.E. An important book by a practising electronic research engineer. The entire receiving system is examined stage by stage, complete circuits are given of four up-to-date commercial receivers, and the problems of colour television are fully discussed. With over 200 illustrations. 30s. net.

PITMAN

Parker St · Kingsway · London · W.C.2

EARLS COURT VISITORS

Armstrong

Specialists in High Quality
Reproduction for over 20 years.

Invite you to complete your tour of inspection with a visit to their DEMONSTRATION ROOM at WALTERS ROAD, HOLLOWAY.

We are quite near to Nags Head Corner and the Piccadilly Line will bring you direct from EARLS COURT to HOLLOWAY ROAD Station, which is only a few minutes walk from our premises.

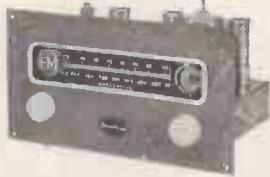
BUS No. 43 from the City or BUS No. 29 from the West End pass the door.

TROLLEY BUSES from Moorgate Holborn Circus and Tottenham Court Road all come to Nags Head Corner.

OUR DEMONSTRATION ROOM OPEN DAILY FROM 9 a.m. to 6 p.m. (Saturdays until 5 p.m.) AND WE SHALL BE DELIGHTED TO DEMONSTRATE OUR CHASSIS, RADIOGRAMS AND AMPLIFIER AS DESCRIBED ON PAGES 66 AND 72.

Special High Fidelity Demonstrations of the A.10 Amplifier and FM 56 Tuner are given every Thursday evening from 7 p.m. If you are unable to visit us please write for descriptive literature mentioning W.W.

F. M. 56 TUNER



Price
£21 (inc. tax)

- PERMEABILITY TUNING
- FREEDOM FROM DRIFT
- AUTOMATIC LIMITING
- MAGIC EYE TUNING

COVERAGE: 85-95 Mc/s. IMAGE REJECTION: 26 dB. I.F. REJECTION: 60 dB. CIRCUIT: A low noise triode R.F. Stage is coupled to a high stability frequency changer. This is followed by two I.F. Stages and a triple diode triode ratio detector and A.F. Stage. VALVES: Mullard ECC85, EF85, EF85, EABC80, EM34.

GUARANTEE: All our models are sold under full and unconditional money-back guarantee of satisfaction, and we will refund your money if for ANY reason you are not satisfied after 7 DAYS TRIAL IN YOUR HOME.

HIRE PURCHASE terms of ONE-THIRD deposit and balance payable over 12 months are available for all models.

ARMSTRONG WIRELESS & TELEVISION CO. LTD.
WALTERS ROAD, HOLLOWAY, LONDON, N.7

Telephone: North 3213/4

SITUATIONS VACANT
ELECTRONIC Engineer.

INTERESTING post in new and expanding division of a large Co. for an energetic engineer to lead a small team on design and development of pulse generators, wide band amplifiers, oscilloscopes and other instruments: West London suburb, commencing salary £1,000 per annum.—Box 5113. [4990]

MICROWAVE Engineers

ARE required by Decca Radar, Ltd., for work on advanced microwave and millimetric aerial design in a rapidly expanding Aerial Group. Applications are invited from Electrical Engineers and Physicists of H.N.C. standard or above, having practical experience in microwave components; the prospects for men of ability are considerable. There is a pension scheme in operation. British Nationality essential.—Please write, quoting reference RLA 108, to Decca Radar, Ltd., 2, Tolworth Rise, Surbiton, Surrey. [0168]

ENGINEERS & Physicists.

FERRANTI, Ltd., in their new Laboratories are engaged in a programme of electronic development of great industrial importance. The work involves the use of digital computers to control machines and industrial processes and covers a wide and expanding field of application, offering long-term interest to those engaged in it.

DEVELOPMENT activity for these projects is taking place in the field of electronic circuitry (including pulse technique), digital computers, magnetic recording and servomechanisms; engineers and physicists having experience as well as interest in one or more of these subjects are invited to apply.

THE appointments are permanent and offer full scope for initiative in an expanding organization; a salary commensurate with the qualifications required will be paid; staff pension scheme; application form will be sent on request (quoting Ref./EP/AL) to—The Personnel Officer, Ferranti, Ltd., Ferry Rd., Edinburgh, 5. [4718]

TECHNICAL ASSISTANTS.

ELECTRONIC, to undertake development work of a varied and interesting nature, in a Missile Guidance laboratory now undergoing expansion. Types of work include micro-wave and pulse circuitry, field work on aerials, test gear and power supplies. Applicants should have electronic experience, preferably of radar, communication or telemetry work and hold, or be studying for, H.N.C. or equivalent. Service experience may be a qualification. Excellent salary with bonus. Pension Scheme. Pre-arranged holiday may be taken.—Apply, quoting Ref. WW/15, with full details of experience, to the Assistant Manager.

THE FAIRX AVIATION Co., Ltd., Weapon Division, Heston Aerodrome, Hounslow, Middx. [4985]

CINEMA TELEVISION, Ltd.

HAVE vacancies in the VACUUM Tube Development Laboratory at Lower Sydenham.

FOR personnel in several fields of work, including cathode ray tubes, photocells and signal generating tubes; previous experience of similar vacuum work an advantage, but not essential; applications for interview giving details of age, qualifications and previous experience, are invited from suitable men and women; men applicants should be free from National Service obligations.

1. CHEMIST or Physical-Chemist.
2. GRADUATE to work on cathode ray tube phosphor screening processes and investigation of phosphor characteristics.
3. LABORATORY Assistants.
4. QUALIFICATIONS to 3 G.E. advanced level in general science or with ordinary national certificate; successful applicants will be expected to continue studies at evening classes.
5. LABORATORY Technicians.
6. QUALIFICATIONS to G.O.E. ordinary level in science and mathematics; must have capacity for careful and detailed work and have considerable general mechanical aptitude.
7. VALVE Mechanics.

FOR experimental and pre-production electrode assembly; basic training in workshop practice, experience on small bench work and good manual dexterity essential.

WITH at least 2 years experience of branch and lathe work and the preparation of small metal to glass vacuum seals.

6. FINISHED Tube Inspector. TO carry out performance checks on a wide range of vacuum tubes, manufactured on a laboratory scale; education approaching G.C.E. advanced level in general science essential.

ITEM 1. 39 hour week; items 2-6, 44 hour week.

PENSION scheme, canteen facilities, 25 minutes Charing Cross.

APPLY to Personnel Department.

CINEMA-TELEVISION, Ltd., WORSLEY Bridge Road, Lower Sydenham, S.E.26. [5026]

RADIO and/or television engineer required for bench and outside repairs, driver; references, age, experience, salary expected.—Field's Radio, Ltd., 52, Hall Gate, Doncaster. [5542]

ELECTRICAL SERVICE (EDGWARE) Ltd., require good service engineer, bench and outside; clear licence; top salary; permanent; congenial.—93, Edgware Rd., W.2. Pad. 2342 [4797]

GOOD SOUND DIVIDENDS



Whatever may happen to the stock market this autumn, and whether bulls or bears fare best, one thing is absolutely certain—all who invest in Duode Units will have a grand season of appreciation with ample assured interest for years to come. As we have often said, a Duode is the finest long term sound investment you can get.

You may see and hear much at the Radio Show if you are fortunate enough to be within reach of it, but those of us who are even more fortunate in owning Duodes already—and we are many, spanning the World from Australia and Hong Kong through Malaya, India and Africa to Europe and across to the Americas; then beyond to the Pacific Isles—we know that our evenings will definitely go on being the best time of every day.

So the best advice we can give, or you can possibly take, is to—

INVEST IN A DUODE

DUODE 12A

A full 12 inch unit with the famous dual drive, built-in crossover, feed back and individual care which have made the Barker and Duode names so world known for NATURAL sound. Fitted with a magnet system giving about 11,000 gauss. List price £10. Full value—no tax.

DUODE 12B

The same cone and drive assembly with a better magnet giving about 14,000 gauss and similar performance to that of the standard Duode of the past two years. List price £14. Full value—no tax.

DUODE 12C

A very special unit, similar to the well-known 150 but now fitted with a cloth outer suspension and selected cone. Its bass range extends well down to 25 cps., almost sub-sonic, and the extreme top, to over 16,000 cps.—almost ultra-sonic. The large magnet gives about 17,000 gauss, which, with the Duode built-in damping, holds all transients and the bass register in the firmest grip. Definition throughout the entire range is superb. We believe the Duode 12C is the finest high quality Sound Unit available at any price to-day. List price £20. Full value—no tax.

Any recognised music or radio dealer can, if he wishes, buy Duode Units from us for his stock and demonstration. If yours will not do this for you, we will help by offering you the facility of trying a Duode at home, under very fair and reasonable conditions.

Write for details today.

Duode Sound Reproducers
3, Newman Yd., London, W.1

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
3886 COLLEGE HOUSE,
29-31, WIGHT'S LANE,
LONDON, W.3.



CAPACITY AVAILABLE

Due to further expansion of our works and facilities manufacturers are advised that immediate capacity is available

FOR THE MANUFACTURE OF
Transformers, Chokes and

Inductances,
including wave winding
of all types.

HADFIELD'S solventless varnish vacuum impregnation and enveloping processes to approved specifications.

MACHINE ENGRAVING on
metal and plastics.

Enquiries to:—

MELTON ELECTRONICS, LTD.

387, ASHLEY RD., PARKSTONE, DORSET.

Telephone: Parkstone 230.

SITUATIONS VACANT Design Engineers

ARE required by Decca Radar for positions created by the continued expansion of their Research Laboratories. These cover work in a wide field, embracing high and low power pulse, receiver, A.F.C., radar display, and test equipment design in standard and sub-miniature form. Applicants should preferably be of degree or H.N.C. standard, and have had previous experience in this field. A pension scheme is in operation. British Nationality essential.—Please write to Decca Radar, Ltd., 2 Tolworth Rise, Surbiton, Surrey, quoting Reference RL4.103. [1617]

GUIDED MISSILES IN CANADA.

A MAJOR company and leaders in the field of guided missiles development in Canada REQUIRES immediately a highly qualified SENIOR Electronics Engineer FOR A Top Level Supervisory Position. ESSENTIAL qualifications include wide experience in the telecommunications and/or electronics field, together with recent supervisory experience in a modern and currently active missile project; specialised knowledge in guidance and control, servo mechanisms, telemetry and test equipment is preferred. THE candidate should also hold a Degree or H.N.C. in electrical, electronics or telecommunications or the equivalent A.M.I.E.E., etc. THE appointment will be on a contract basis and carries an excellent salary. COMPLETE first-class family transportation and moving allowances will be paid, which, together with the generous salary, will provide a very desirable transition to the new life. THIS is an exceptional opportunity to take up a position as one of the leaders in the profession. ALL applications will be treated in strictest confidence unless permission is given otherwise.

WRIT: to Box No. C.M., c/o Canadian Dept. of Labour, 61, Green St., London, W.I. [5066] FEDERATION OF MALAYA.

ASSISTANT CONTROLLERS OF TELECOMMUNICATIONS (ENGINEERING). Duties include staff management and responsibility for the maintenance, installation and operation of telecommunications equipment, including exchanges, carrier equipment, telegraph and railway signalling equipment and minor radio stations.

Appointments on contract/gratuity terms with salary according to qualifications and experience in the range \$743 to \$1,645 (£1,001 to £2,303 per annum). Variable cost of living allowance also payable. Substantial gratuity; free passages; quarters provided, if available, at low rental or rent allowance in lieu; generous leave. Candidates, under 40 years of age, should be corporate or graduate members of the Institution of Electrical Engineers or hold a degree or diploma acceptable by the Institution for corporate membership and have at least two years practical experience in telecommunications work.

Further details on application to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1. in writing give brief details of age, qualifications and experience and quoting reference number BCD 133/23/037. Closing date for receipt of initial inquiries Sept. 17, 1955. [4999]

V.H.F. radio link engineer required FOR the maintenance of Multi-Channel Links. Previous telephone and radio experience essential.

APPLY giving full details of experience to Personnel Manager, Pye Telecommunications, Ltd., Ditton Works, Cambridge. [4891]

RADIO technician required by the

GOVERNMENT OF KENYA for service as Inspector of Police, Grade I (Supernumerary) for one tour of three years with possibility of permanency. Commencing salary (including present temporary allowance of 35% of salary) according to previous experience in scale 2796 rising to £1,134 a year. Gratuity (at least £247 after three years service). Outfit allowance £30. Uniform allowance £10. Separation allowance payable to married men under certain conditions. Free passages. Liberal leave on full salary. Candidates, preferably unmarried, aged 20-35, should be at least 5ft 7in without footwear and be of good education. Vision—good standard required but men who wear spectacles are eligible provided that they are not greatly incapacitated without them. Candidates must hold City & Guilds Certificates in Radio and/or Telecommunications or have had at least four years experience with the Technical Radio Branches of the Services or with a reputable firm or a Government Department. Married men should note that it is unlikely that accommodation could be found for their families during the first tour.—Write to the Crown Agents, 4, Milbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M1/36753/WF. [4994]

SERVICE engineer required for duties in Singapore. A young single man would be preferred, but good experience with radar and echo sounding equipment is essential.

AN initial two-year term of duty would be renewable by arrangement. There are generous leave and salary provisions for competent engineers and a training period covering the company's products would be given before taking up duties abroad. WRITE, giving full particulars of age, experience and salary required, to Box 4800. [4919]



THE "FLUXITE QUINS" AT WORK

"Quick! Turn off our fountain!" cried EH "We've a big job for FLUXITE today Niagara's not in it We'll be swamped in a minute!"

And there's ructions three gardens away!

Make a quick success of that soldering job—use Fluxite Paste. Suitable for all metals, except aluminium. Even solders and "tins" dirty metals!

And, remember, Fluxite "wipes" joints that other methods won't touch.

Used for generations in Government Works and by leading Engineers and Manufacturers. Of all Ironmongers in tins from 1/- upwards.

FLUXITE

SOLDERING PASTE

A STAINCH COMPANION, TO FLUXITE SOLDERING FLUID

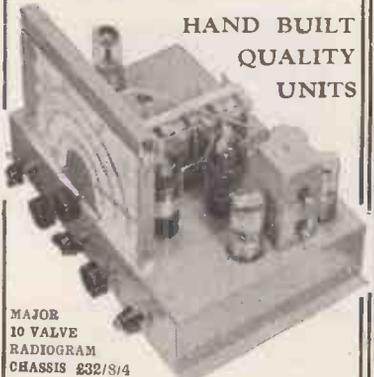
Simplifies ALL Soldering

FLUXITE LTD BERMONDSEY ST. LONDON S.E. 1

GM.14

Fidelia

HAND BUILT
QUALITY
UNITS



MAJOR
10 VALVE
RADIOGRAM
CHASSIS £32/8/4

F.M./A.M. Reception. New 1955/56 Season Models. Fidelia announce three new models of their real high-quality hand-built chassis. These give reception of V.H.F./F.M. transmissions as well as the normal wavebands and gramophone reproduction. Our range now includes:—

Fidelia F.M./A.M. Standard 9-valve chassis	£28 10 0
Fidelia F.M./A.M. de Luxe 11-valve chassis	£32 0 0
Fidelia F.M./A.M. Major, 13-valve chassis	£42 0 0
Fidelia F.M. Tuner units, from	£13 10 0
Fidelia 7-valve Standard model	£21 12 0
Fidelia 9-valve de Luxe model	£25 5 0



ELECTRO
Acoustic
DEVELOPMENTS

2 AMHURST ROAD,
TELSCOMBE CLIFFS,
Nr. Brighton,
SUSSEX

Tel: Peasehaven 3158

SOUTHERN RADIO'S WIRELESS BARGAINS

TRANSCEIVERS. Type "38" (Walkie-Talkie). Complete with 5 valves. In metal carrying case. Ready for use. Less external attachments. 30/- per set.

ATTACHMENTS for use with "38" **TRANS-RECEIVER: HEADPHONES 15/6; THROAT MICROPHONE** with lead and plug. 4/6; **JUNCTION BOX 2/6; AERIAL 2/6; SPECIAL OFFER** of used "38" **TRANS-RECEIVERS** less valves but complete with ALL COMPONENTS. Excellent for SPARES. 11/6 per set. P. & P. 2/-.

TRANSCEIVERS. Type "18" Mark III. TWO UNITS (receiver and sender) contained in metal case. Complete with six valves, microammeter, etc. LESS EXTERNAL ATTACHMENTS. 4/10/-.

RECEIVERS. Type "109." 8 Valve S.W. receiver with VIBRATOR PACK for 6 V.A. Built-in speaker. METAL CASE. 45.

BOMBIGHT COMPUTERS. Ex R.A.F. BRAND NEW. A wealth of components. GYRO MOTORS; REV. COUNTERS; GEAR WHEELS; etc., etc. Ideal for model makers, experimenters, etc. 45.

LUBRICA HOLE CUTTERS. Adjustable 3in. to 3 1/2in. For metal, wood, plastic, etc. 6/6.

RESISTANCES. 100 ASSORTED USEFUL VALUES. Wire ended. 12/6 per 100.

CONDENSERS. 100 ASSORTED. Mica, metal tubular, etc. 15/- per 100.

PLASTIC CASES. 14 x 10 1/2in. Transparent. Ideal for maps, display, etc. 5/6.

STAR IDENTIFIERS. Type I A-N. Covers both hemispheres. In case. 5/6.

CONTACTOR TIME SWITCHES. In sound-proof case. Clockwork movement, 2 impulses per sec., thermostatic control. 11/6.

REMOTE CONTACTORS for use with above. 7/6.

MORSE TAPPERS. Standard 3/6. Midget 2/9. Postage or carriage extra. Full list of RADIO BOOKS 2/4.

SOUTHERN RADIO SUPPLY LTD.
11 LITTLE NEWPORT STREET
LONDON, W.C.2. Gerrard 6653

SIEMENS SITUATIONS VACANT BROTHERS & Co., Ltd.

DEVELOPMENT & Research Laboratories. There are vacancies for:—

SENIOR Engineers to take charge of long-term development in:—

- (a) New types of Mercantile Marine radio communication equipment.
- (b) Multi-channel carrier current telephone and telegraph equipment.
- (c) Carrier current terminal equipment for radio links, and submarine cable systems employing submerged repeaters.
- (d) Transistor applications.
- (e) Electronic switching and computing.
- (f) Electro-acoustics.
- (g) Design of new components including miniaturization.

ASSISTANT Engineers and **Laboratory Technicians** to carry out the detailed development for the above.

TECHNICAL Sales Engineers for Carrier Equipment to undertake preparation of tenders, editing and writing technical publications, and training customers' engineers.

APPLICANTS with any of the following qualifications will be considered:—

- (i) Degree in Physics or Electrical Engineering with some previous industrial experience.
- (ii) Recent and prospective Science Graduates.
- (iii) H.N.C. Electrical or Telecom Engineering or A.M.I.E.E.
- (iv) O.N.C. or equivalent City and Guilds Certificates with practical industrial experience.

ALL are pensionable staff posts with good prospects of advancement.

SALARY according to qualifications and experience.

APPLY in writing to Siemens Brothers & Co., Ltd., Ref. 744/21, Woolwich, S.E.18, stating age, educational qualifications, experience, and any special requirements. (5018)

E. K. COLE Ltd. (Malmesbury Division).

The Malmesbury Division of E. K. Cole is engaged in the development and production of radar and communication equipment associated with military defence projects. Vacancies exist in the Development Department for Project Engineers, Engineers and Assistant Engineers with training and experience in the following fields.

PULSE Circuits.
PULSE Modulators.
STROBE Systems.
VIDEO Amplifiers.
TIME Base Generators, etc.
H.F. AND V.H.F. Communication—airborne and ground receivers, transmitters and aerial systems.

APPLICANTS should have had technical training to Degree or Higher National Certificate standard, and in the case of project engineers and engineers appropriate technical design experience is necessary.

COMMENCING salaries will be dependent on qualifications and experience and will compare favourably with scales prevailing in the radio industry. A superannuation scheme is in operation. Applicants should apply in the first instance for technical staff application form to Personnel Manager, E. K. Cole, Ltd., Malmesbury, Wilts. (4702)

HER MAJESTY'S OVERSEA CIVIL SERVICE.

APPLICATIONS are invited for the following post:—

RADIO Engineer,
SOCIAL Development Department,
TANGANYIKA.

DUTIES are to be responsible for the operation and maintenance of the 20kw and 1.25kw transmitters, and two 250watts R.C.A. transmitters of the Dar-es-Salaam Broadcasting Service.

APPOINTMENT is pensionable on probation in the salary scale £912 to £1,164 p.a. plus a non-pensionable cost of living allowance of 10% of salary. Quarters, if available, provided at moderate rent. Free passages up to the cost of three adult fares. Leave at the rate of five days for each month of service.

CANDIDATES, preferably under 35 years, should have had at least 2 years' experience of the operation and maintenance of E.F. transmitters. Experience of installation an advantage. Grade C or B.C. examination of an engineering degree or other engineering qualification is desirable.

APPLY in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD 178/8/05. (5052)

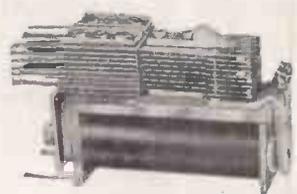
SYLVANIA THORN COLOUR TELEVISION LABORATORIES, Ltd., require **CIRCUIT Engineers** for research work on colour television systems, especially receiver display devices.

1. SENIOR Engineers. Must have had a number of years' experience of actual design work on electronic circuits, but not necessarily for television. Academic qualifications to degree standard preferred. Men of inventive character capable of making their ideas work are required.

2. ASSISTANTS to above senior men. Some experience of circuit work and at least H.N.C. or the equivalent essential. Salaries in line with present-day standard. Pension and Life Assurance scheme.

APPLY in writing to (quote B2710):—
SYLVANIA THORN COLOUR TELEVISION LABORATORIES, Ltd., Gt. Cambridge Rd., Enfield. (5057)

RELAYS TYPE 3000



BUILT TO YOUR SPECIFICATION—EARLY DELIVERY—QUOTATION BY RETURN—PLEASE STATE RESISTANCE OF COIL REQUIRED AND CONTACT BUILD UP.

TEST METER FSD 1M/A. Scaled 0/100. Resistance 75 ohms 2 1/2in. Flush Round. Fitted in metal case 7 1/2 x 5 1/2 x 2 1/2in. Ideal for making a universal Test Meter. 35/- Post 2/-.

GENALEX EXTRACTION FANS. 230/250 volt, 50 cy. Induction motor 1,350 r.p.m., 85 watts, 9in. blades, silent running. 26/15/- Carriage 7/6.

CELL TESTING VOLTMETERS. 3-0-3 volts. In leather case with prods. 25/- Post 2/-.

RAYO ARM UNITS by H. W. Sullivan. Brand new. 600 ohms + 600 ohms. 50/- Post 2/-.

WHEATSTONE RESISTANCE BRIDGE. Manganin. 1 to 10,000 ohms. 25.

GALVANOMETER. Mirror type, 5 Microamps FSD. Table Model in case 8 x 5 1/2 x 5 1/2in, scaled 0/5, 0/25, 0/125 microamps. 21/0.

MICROPHONE. A most attractive professional crystal mike with beautiful friction slide, adjustable heavy floor stand and 12ft. screened cable. 26/6/- Post 2/6.

MICROMETERS. 250 FSD 3in. FLUSH MODEL S37. Specially scaled for test meters. Knife edge pointers, magnetic shield. Brand new. 55/-.

BLOWER MOTORS. Dual voltage 12-24 volts. Recommended for car cooling or heating. 25/- Post 2/-.

RECEIVER B1155. BRAND NEW. AERIAL TESTED. In maker's original transit case. Now is the chance to get one from the best. 20/- Post 2/-.

Ministry, Car. 10/6. £11/19/6. Send S.A.E. for further details or 1/3 for publication giving circuit diagrams etc.

45 Meis PYE IF STRIP. These vision units are brand new and complete with 6 EF50 valves and EA50. Our price only 65/- Post 2/6.

TELEPHONE SETS

FOR PERFECT COMMUNICATION BETWEEN 2 OR MORE POSITIONS

WALL TYPE. One pair of units. 25. Batteries 5/6. Twin wire 5d. yd. Post 2/6.

DESK TYPE now available, latest modern style. Two complete units with battery, ready for use. 25/17/6. 5 score flex required at 6d. per yd.

BASKS P.O. STANDARD for 19in. p.a.u.s. Steel channel sides, correctly drilled. Heavy angle base Height. 4ft. 10in. or 6ft.

VACUUM PUMPS or Rotary Blowers. Ex-R.A.F. Brand new. 7 cu. ft. per min. 10lb. per sq. in. at 1,200 r.p.m. Ideal for a brazing torch. Size 6in. x 4in. shaft 2 x 1in. 22/6 each. Post 2/6.

ROTARY MOTION DIALS. 6in. Scaled 0-10 reduction 200 to 1 or direct. 5/6 each. Post 1/6.

VOLTMETERS. 0/300 for A.C. Mains 50 cy. Clear 5in. dial. 60/-; 0/15 volts A.C./D.C. 2 1/2in. flush. 15/6.

VOLTMETERS. 0/500 D.C. 2in. flush square with external resistance. 10/6; post 1/-. Easily connected to read A.C. by using a 5 Milliamp meter rectifier. at 7/6. Post 6d.

VOLTMETERS. 0-20 M.O.C. Flush 10/6 ea. Post 1/-.

AMMETERS. 2in. Flush 0/20, 10/6 each. 20-0-20, 12/6 each. 0/30 10/6 each. Moving Coil D.C.

INSTRUMENT RECTIFIERS. Full Wave Bridge. 1m/A. 8/6 each. 5m/A. 7/6 ea., 50 m/A. 5/- ea.



ELECTRO MAGNETIC COUNTERS. Post Office type 11A, counting up to 9,999, 2 to 6 volts D.C. 3 ohm coil, 12/6 each. Post 1/-. Many other types in stock. Lists sent with order or send S.A.E.

HEADPHONES. HIGH RESISTANCE. 4,000 ohms. Type C.R. New. 12/6 pair. Post 1/6.

ACPL PUMPS. These pumps enable you to fill all accumulators on the bench with the carboy at floor level. Brand new. only 30/- Post 2/-.

ROTARY CONVERTERS. Input 24 volts D.C., output 230 volts A.C. 50 cycles. 100 watt. 92/6 each car. 7/6.

LISTS AVAILABLE. Meters, Potentiometers, Resistances. All types including High Stability Carbon and Wire wound. Send large S.A.E.

L. WILKINSON (CROYDON) LTD. DEPT. W.W.W.
19, LANSDOWNE ROAD, CROYDON

NEW S.T.C. AND "WESTALITE" SELENIUM RECTIFIERS. Largest L.T. range in Great Britain. Latest Current Products NOT Surplus.

CURRENT PRICE LIST

DEDUCT 15% FROM S.T. & C. PRICES

S.T. & C. E.H.T. K3/15, 4/5; K3/45, 8/2; K3/50, 8/8; K3/100, 14/8; all post 4d. extra

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 6d.
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/-; 7.2 v. 1 a., 49/-; 1.5 a., 78/-; 2 a., 81/-; 3 a., 92/-; 5 a., 128/-; 100 v. 1 a., 70/-; 1.5 a., 112/-; 2 a., 128/-; 5 a., 174/-; all post 1/4.

BRIDGE CONNECTED HEAVY DUTY FUNNEL COOLED, or 7 1/2in. SQUARE COOLING FINNS. 17 v. 6 a., 49/6; 10 a., 56/-; post 1/10.

BRIDGE CONNECTED HEAVY DUTY FUNNEL COOLED, or 7 1/2in. SQUARE COOLING FINNS. Both types, same price.
17 v. 12 a., 102/-; 20 a., 118/-; 30 a., 164/-; 50 a., 112/15/-; 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., 111/-; 10 a., 112/15/-; all post 2/-.

"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., 235/-; 24 v. 1.2 a., 15/10; 2.5 a., 27/8; 5 a., 51/-; 10 a., 92/8; 20 a., 176/2; 36 v. 1.2 a., 27/8; 2.5 a., 51/-; 5 a., 69/10; 10 a., 130/9; 100 v. 2.5 a., 104/10; 5 a., 178/-; 10 a., 350/-.

E.H.T. RECTS., 14D, 134, 22/-; 36 E.H.T.-50, 31/10, 18A, 1-1-16-1 11/- All Post extra.

Wholesale and Retail.
Special Price for Export and Quantity.

T. W. PEARCE
66 GREAT PERCY STREET, LONDON, W.C.1
88 Pentonville Rd. Between King's Cross and Angel

AUTOMATIC TELEPHONE & ELECTRIC COMPANY LTD. LIVERPOOL, 7.

COMMUNICATION ENGINEERS AND DRAUGHTSMEN

The Transmission Department invite applications in senior, and junior, categories for **LINE TRANSMISSION LABORATORY ENGINEERS, and APPARATUS DESIGN ENGINEERS,** and also **DRAUGHTSMEN** with experience in telecommunication and light current engineering. Expanding programmes offer progressive opportunities in interesting work.

Specialist experience in any branch of line transmission engineering is desirable for some of the posts.

The positions offered are on the Company staff, with contributory Pension Fund, and usual staff conditions. Assistance in establishment in the Liverpool area will be given in approved cases.

Applicants should write to the Personnel Manager, Automatic Telephone & Electric Co., Ltd., Strowger Works, Edge Lane, Liverpool, 7, giving full details of age, experience and qualifications.

SITUATIONS VACANT E.M.I. ENGINEERING DEVELOPMENT, Ltd.

TRANSFORMER design. A VACANCY has arisen at the Feltham laboratories of this active company for an engineer to work on transformer design and development; the person we are looking for will have at least Ordinary National and preferably have had some experience in the field, but this is not a pre-requisite for consideration; the post is pensionable, and prospects are excellent.—Please send your first reply to Personnel Dept. (ED/235), E.M.I. Eng. Dev., Ltd., Blyth Rd., Hayes, Middx. [5083]

ELECTRONIC Wiremen and Radar Mechanics ARE required by Decca Radar to fill positions as Technical Assistants in their Research Division. These positions carry excellent rates of pay and the possibility of promotion to staff appointments. The work is of a varied and interesting nature, concerned with the development of modern navigational aids. There are good canteen facilities. British Nationality essential.—Write, quoting reference RLA101, to Decca Radar, Ltd., 2, Tolworth Rise, Wotton, Surrey. [0166]

HER MAJESTY'S OVERSEA CIVIL SERVICE

APPLICATIONS are invited for the following post:—**TELECOMMUNICATIONS Engineer.** POSTS and Telegraphs Department, Sierra Leone.

DUTIES cover all general branches of tele-communications engineering, maintenance and construction of overhead and underground line plant, all types of telephone exchanges, telegraph apparatus, and point-to-point radio networks.

APPOINTMENT is either pensionable in the salary range £822—£1,562 p.a. gross or on contract for two tours of 15-24 months each, in the salary range £886—£1,758 p.a. gross, plus a gratuity of £25 to £37 10s for each completed 3 months satisfactory service. Free first class passages for the officer, his wife, and up to two children under 10 years of age. Government quarters are provided, if available, at low rentals. Leave is granted at the rate of 7 days for each month of resident service.

CANDIDATES should be A.M.I.E.E. or have passed or be exempt from Parts A and B of the Institution's examination. A sound knowledge of the theory of telecommunications engineering is necessary and extensive experience of its application. APPLY in writing to the Director of Recruitment, Colonial Office, Great Smith St., London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number (BCD 108/15/03). Closing date for the receipt of initial applications 17th September, 1955. [4998]

JUNIOR Wireless Operators required by the

FALKLAND ISLANDS DEPENDENCIES ADMINISTRATION for service in South Georgia for one tour of 30 or 36 months. Commencing salary in the scale £330 rising to £420 a year. Free board and accommodation. Free passages. Leave on full salary. Candidates, unmarried, must possess a P.M.G. Certificate of Proficiency in Wireless Telegraphy and should have some knowledge of postal telegraphs and ships W/T services.—Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/41076/WF. [5034]

BRITISH RAILWAYS—modernisation plan;

signal engineering. APPLICATIONS are invited from suitably qualified men for a vacancy for **TELECOMMUNICATIONS Assistant** in the Headquarters of the Signal Engineer's Department, Eastern Region, at King's Cross. The post is mainly concerned with telecommunications development work under the Railway Modernisation Plan and offers an interesting career to a suitable man. Applicants must have a sound knowledge of electronics, also thorough knowledge and experience of multi-channel carrier-telephony, radio AM and FM, VF telegraphy, public address equipment, all types of repeaters and automatic telephony. Some knowledge of radar and computers desirable. Academic qualifications essential. The commencing salary will be £1,050 per annum. Certain residential and other travel concessions given. Applications should be addressed to the Signal Engineer, British Railways, Eastern Region, King's Cross Station, London, N.1, giving full details of experience and qualifications. Letters should be marked "D.4." [5009]

SALES Engineer required with a good knowledge of the application of components and materials to the following:—**ULTRASONIC equipment.** **RADAR equipment.** **GUIDED missiles.**

PREFERABLY with commercial background in addition; salary in accordance with experience; excellent opportunity for progress in a rapidly expanding organisation.—Box 5514, [5082]

ELECTRONIC Engineer required who can undertake part or full time development of low frequency tuned circuits.—In first instance apply Box 511. [4991]

RADIO Testers and Mechanics required for commercial and Government equipment. Permanent positions for right men.—Apply Britamer, Ltd., 48-56, Bayham Place, London, N.W.1. Tel. Eus. 7941/6. [4988]

Excellence in design..

Specialists in Sub miniature Telecommunication Components.



STAND OFF INSULATOR

For 1,500 volt working. Overall height 1.1". Over chassis .86". Silver plated spill .35". 6BA hexagon stud chromium plated.

These are reproduced (approx.) actual size

MINITRIMMER

Standard maximum capacities up to 13pF. Voltage 500 DC. Base 1/2" square with fixing centres for 10 BA 1/2" apart.



Details from—

OXLEY DEVELOPMENTS CO. LTD. ULVERSTON, NORTH LANC'S
Tel: ULVERSTON 3306

WAFER SWITCHES

for the **OSRAM 912-PLUS**

S1 (14061/B1)	} 14/6 pair
S2 (14062/B1)	
S4 (SS/556/1)	11/6
S5 (SS/556/2)	10/6

Prices include postage

Truvox Tape Deck Switch
12119/B3 14/6
inc. postage

SPECIALIST SWITCHES

(Wafer Switches to Specification)
23 RADNOR MEWS · LONDON W.2
AMBassador 2308
Enquiries by post or phone only



A.I.D. Approved

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 Contactors, E.M. Brakes, Air Valves, etc., and Coil WINDINGS for all purposes.

SOLENOIDS

for A.C. and D.C. Operation.

W. F. PARSONAGE & Co., Ltd.
INDUCTA WORKS · Park Rd · Bloxwich · Walsall
Telephone: BLOX 66464

QUARTZ CRYSTAL UNITS



Type B7

The type B7 unit is mounted in the standard B7G valve envelope and is hermetically sealed and fully evacuated.

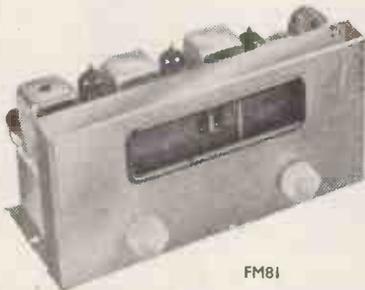
Available for the frequency ranges from 100 kc/s. to 500 kc/s. and from 3 Mc/s. to 16 Mc/s. Gold electrodes applied by cathodic sputtering give permanence of calibration. Normal adjustment. accuracy 0.01% Max. adjustment accuracy 0.003%

Early delivery can be given of some 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 NEW MALDEN

TUNERS

AM and FM



FM81

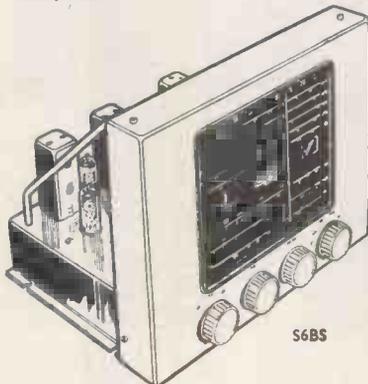
Our FM tuners provide excellent reproduction with absence of background noise and are tunable between 87.5 Mc/s-100 Mc/s and will receive the proposed National B.B.C. Frequency Modulated V.H.F. transmissions as and when installed within approximately 60 miles of the transmitter.

Using the latest valves and techniques they are available in three forms:

FM81 illustrated above, £21 tax paid.

FM82 with pre-set station selection, output 1-2 volts, self-powered 200-250 volts, £24 tax paid.

S5/FM all waves AM and FM tuner, £32/10 tax paid.



S6BS

S6BS 9 Band (6 Electrical band spread) with R.F. F.C. 2 I.F. Delayed Amplified A.V.C. Variable Selectivity. Fly Wheel Tuning. Tropicalised. Suitable for use with any High Quality Amplifier. £44. Tax paid.

S6 A new model similar to the well-known S6BS but only 3 Wave Bands; 16m-50m, 195m-550m, 800m-2,000m. £30. Tax paid

S6E As S6 but 4 Wave Bands: 12.5m-37m, 35m-100m, 90m-250m, 190m-550m. £30. Tax paid.

S5 3 Wave Bands. 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, Acoustical and other High Quality Amplifiers.

C. T. CHAPMAN (Reproducers) LTD.

RILEY WKS., RILEY ST., CHELSEA, S.W.10

FLAxman 4577/8

Export Enquiries Invited

SITUATIONS VACANT

THE GENERAL ELECTRIC Co., Ltd., has vacancies for:

1. **TRANSFORMER Designers** for a number of development projects including guided missiles. The work involves design of a wide range of types including small power transformers—at mains or audio frequencies—and pulse transformers.

2. **ENGINEERS** for work on magnetic amplifier transformers.

APPLICANTS should have experience of the design and development of the above types of electronic components and possess H.N.C. & G. certificates or equivalent qualifications.

APPLICATIONS will also be considered from ex-Naval R.E.A.s, R.E.s and R.A.F. radar fitters who have reached the required technical standard.

APPLY stating age and experience to the Personnel Manager, The General Electric Co., Ltd., Brown's Lane, Allesley, Coventry, Ref. RG. [4994

GOLD COAST GOVERNMENT. Broadcasting Engineers

APPLICATIONS invited for one vacancy in each post of:—

A. HEAD of Engineering Training.

B. ASSISTANT in Engineering Training (Radio Frequency).

C. ASSISTANT in Engineering Training (Audio Frequency).

DUTIES: Post A. Responsible for formulating and carrying through a training scheme in audio engineering for new entrants to the service courses of training "on the job" for existing staff, and a course and examination approximately equal to the B.B.C.'s Grade C examination for Technical Assistants who wish to qualify for promotion into the Senior Technician Assistant Grade.

POST B. Responsible under the Head of Engineering Training for the training of pupils scattered in small groups over wide areas by lectures and postal courses up to approximately the standard of the B.B.C.'s Grade C examination with emphasis on radio frequency subjects and on the theory and operation of radio frequency equipment. Will also be required to carry out some operational duties.

POST C. Responsible under Head of Engineering Training for the training of pupils scattered in small groups over wide areas by lectures and postal courses up to approximately the standard of the B.B.C.'s Grade C examination with emphasis on audio frequency and power frequency subjects; also for specialized courses on the theory and operation of audio frequency and wired broadcasting equipment used in a broadcasting organization. Will also be required to carry out some operational duties.

QUALIFICATIONS: All posts. Candidates should have passed or have been exempted from Sections A and B of the Associateship examination of the Institution of Electrical Engineers or hold equivalent qualifications. Additionally as follows:—

POST A. Have had previous teaching experience. Must be able to organize the training scheme in all its aspects, including postal courses, for its inception, and must have a thorough knowledge of the requirements for the engineering division of a broadcasting service.

POST B. Candidates with exceptional experience but not so qualified may be considered for appointment. Candidates should have a thorough knowledge of transmitter, aerial and feeder systems, receivers, etc., and should also have a sound knowledge of the fundamental theory of audio frequency power frequency equipment and be capable of lecturing on these subjects. Previous teaching experience is desirable.

POST C. Have had appropriate experience in radio engineering. Candidates not so qualified but of exceptional experience may be considered for appointment. Candidates should have a thorough knowledge of studio apparatus and acoustics, tape and disc recording and power equipment and should also have a sound knowledge of the fundamental theory of radio frequency equipment and be capable of lecturing in this subject. Previous teaching experience is desirable.

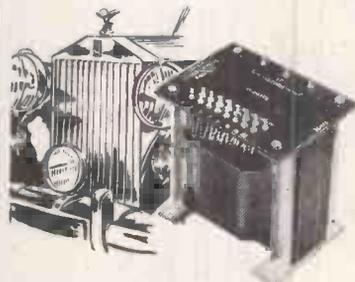
TERMS of Service: The appointment will be on contract/gratuity terms for one tour of 18 to 24 months with extension provision to two tours. Salary in range £1 600-£2 050 according to age, qualifications and experience. Gratuity at rate of £37/10 for each three months' completed satisfactory service. Free passages appointment and on leave for officer, once each way for wife and up to three children under 13 years each tour. Vacation leave with pay 7 days for each month's service. Kit allowance £30 may be payable. Basically furnished accommodation at £90 p.a. rental. Income tax at low rates.

CANDIDATES in the United Kingdom should apply to the Adviser on Recruitment, Gold Coast Office, 13, Belgrave Square, London, S.W.1. for a form of application. Other candidates should send full personal details and statement of qualifications, experience, employments, etc., with approximate dates, to that address. [5065

ELECTRONIC Development Engineers required by well-known North London company, including specialist vacancy for test engineering department. Above average salaries for experienced qualified engineers.—Write Box 5114. [4989

TELEVISION: leading and progressive Murphy dealers need men with good theory background and able to drive, even if little practical experience. Good Salary, conditions and prospects.—Singer's, Pad. 7915. [5023

IT'S THE ROLLS-ROYCE PERFECTION THAT COUNTS



Dear Sirs,

I am a customer, having two of your Transformers, which I believe are the best in the world. . . .

G. L. A. B., Washington, U.S.A.

Savage "Massicore" Transformers are meeting more exacting electronic needs than ever before—including those of Rolls-Royce, makers of the best car in the world.



NURSTEED ROAD,
DEVIZES WILTS.

Telephone: DEVIZES 932

LONDON CENTRAL RADIO STORES

EVERETT AND EDGUMBE METROHM BRIDGE. A resistance box to work in conjunction with Megger. All ranges. £2/10/-, carr. paid.

AC/DC VOLTMETER by G.E.C. 0-150, 0-300 volt, moving iron. 6in. scale. In perfect condition. In case with carrying handle. Size 7 1/4 x 7 1/4. £3/5/-, carr. paid.

HEAVY DUTY WIREWOUND POTS. 190 ohms at 24 volts. 4/6. p.p.

HAND GENERATORS. For telephone bell ringing etc. Brand new condition. 9/6. p.p.

HAND MIKES. Carbon Type No. 7 or Moving Coil Type No. 4. 7/6 each.

NIFE CELLS. 1.5 volt, 6 amp. hour. Size 7 x 1 1/2 x 1 1/2. 5/6. p.p. 2.5 volt, 16 amp. hour. Size 9 x 2 1/2 x 2 1/2. 10/6. p.p.

5-CORE RUBBER COVERED CABLE. 4 amp. Suitable for all purposes. 9/6 per dozen yards. F & P. 1/6.

GOODMAN'S P.M. SPEAKERS. 8in., 11/6. P & P. 1/6.

PHILCO RADIO SETS. 3-wave 5-valve. Fully reconditioned and tested. Incorporating 2 speed tuning. In walnut cabinet. A.C. or Universal Mains. Approx. size: 18 x 14 x 9 1/2. £5/10/-, carr. paid.

23 LISLE ST. (GER. 2969) LONDON, W.C.2
Closed Thursday 1 p.m. Open all day Saturday

YOUR METER DAMAGED?



Leading Electrical Instrument Repairers to the Industry

Contractors to the Ministry of Supply and General Post Office. Repairs by skilled craftsmen of all makes and types of Voltmeters, Ammeters, Microammeters, Multi-range Test meters, Electrical Thermometers, Recording Instruments, etc. Quick deliveries—for speedy estimate send defective instruments by registered post to—

L. GLASER & CO. LTD.

Electrical Instrument Repairers
96-100 ALDERSGATE STREET, E.C.1
(Tel.: MONarch 6822)



FIVE STAR

HIGH-FIDELITY PROGRAMME

★ **F.M. and A.M. RADIO UNITS** by Chapman, Armstrong, Lowther Sound Sales and Jason. Prices from £15/17/-.

★ **AMPLIFIERS:** Quad, Leak, Rogers, Sound Sales, Pamphonic Cape. From £20.

★ **AUDIO FURNITURE** to house all types of equipment. Prices from £3/10/-.
Also Speaker Cabinets to take 12in. units ready polished from £9/19/6. Call or send S.A.E. for details.

★ **SPEAKERS.** New Models by Goodmans, Wharfedale, W.B., Tannoy, G.E.C., Pamphonic, Sound Sales.

★ **TRANSCRIPTION GRAM UNITS.** By Garrard, Collaro, Jason, Connoisseur Goldring, Decca. Prices from 13 gns.

Demonstrations Daily at:

HOLLEY'S RADIO

285 Camberwell Road, London, S.E.5.
Phone: RODney 4988.

Hire Purchase terms arranged. Open all day Saturday.

SITUATIONS VACANT
A DRAUGHTSMAN with mechanical design experience is required for the ELECTRONICS Division of Saunders-Roe, Ltd. Applications are invited from suitably qualified men, especially those with a basic knowledge of the principles of electronics plus experience in the design of electromechanical transducers servomechanisms and electronic assemblies.

HOUSING assistance, pension and assurance schemes and other amenities can be offered. **THOSE** interested should write, quoting ref. WW/56, and giving details of age, experience, etc., to the **PERSONNEL Officer, Saunders-Roe, Ltd.,** East Cowes, I.O.W.

EX-NAVAL R.E.A.S. R.E.s or R.A.F. air or ground radar filters. **APPLICATIONS** are invited for employment on development and prototype testing of radar and guided weapon equipments; there is plenty of scope for enthusiastic men with initiative and ability; the work is interesting and working conditions are good; the positions offered are permanent and are covered by a contributory pension scheme; salary according to age and experience.

APPLICATIONS should be made to the Personnel Manager, The General Electric Co., Ltd., Brown's Lane, Allesley, Coventry. Ref. Ref. 14710

TECHNICAL writer (radar) required by manufacturer in the London area to compile literature on radar equipment.

A GOOD general educational and engineering background is necessary, with H.N.C. (including electronics) as the minimum technical standard.

THE principal requirement, however, is the ability to assimilate information supplied by laboratory technicians and to prepare this in a clear logical sequence suitable for publication as a handbook.

SALARY will be commensurate with experience and ability, but a minimum of £750 per annum is offered and, for a qualified radar engineer who is able to meet the requirements described above, there is scope beyond the position now vacant.

WRITE, in confidence, giving full particulars of past experience, qualifications, age and salary required, to Box 4624, [4882

TECHNICAL writers required by large television instrument manufacturers in the following fields:—

BOILER house and process control gear. Aviation instruments. Radar and other electronic navigation equipment.

AN engineering background is desirable but not essential, and applicants should be familiar with at least one of the fields mentioned above, and be able to write technical service literature.

SALARIES are in accordance with experience and qualifications but are based on a generous scale. The positions are permanent and favourable pension and payment during illness arrangements, etc., are in operation.

APPLICATIONS, which can be made in the strictest confidence, should be addressed to The Personnel Manager, Kelvin & Hughes, Ltd., New North Rd., Barkingside Essex. [4883

R. B. PULLIN & Co., Ltd. invite applications for the following vacancies in their recently formed and expanding Electronic Development Division:—

(a) **SENIOR** Development Engineers: Applicants should possess an Honours Degree or equivalent qualifications, and should have had several years' experience of the development of electronic circuits, preferably including work on electrical servos and magnetic amplifiers.

(b) **DEVELOPMENT** Engineers: Qualifications to O.N.C. or H.M.C. standard, together with some previous experience of valve circuit design.

THE positions are of a permanent nature: they offer excellent prospects and the opportunity to work in a newly equipped Laboratory on a variety of projects requiring considerable individual technical responsibility and initiative.

A COMMENSURATE salary will be paid. Contributory pension scheme, canteen and recreational facilities.—Applications will be treated as confidential, and should be made to the Superintendent, Electronic Development Division, R. B. Pullin & Co., Ltd., Phoenix Works, Great West Rd., Brentford, Middlesex. [0209

ENGINEER, experienced radio and L.F. amplifiers for factory installation service, preferably own transport.—Apply Gensign, 73, Great Peter Street, London S.W.1. [5037

DRAUGHTSMAN required for detail work on Radio Components. Apply in writing to Personnel Manager, A. H. Hurt (Capacitors), Ltd., Bendon Valley, Garratt Lane, S.W.18. [0059

EXPERIENCED fault finders and testers required for work in London on radio and TV. Good positions for right men with one of the most progressive firms in the industry.

APPLY, Works Director, Pye, Ltd., Cambridge. [5012

A VACANCY exists for an engineer to take charge of an expanding department engaged on the testing of a wide range of electronic equipment. Applicants should have the following qualifications:—

(a) **ABILITY** to organize and control staff.
(b) **A SOUND** technical background, with preferably a H.N.C.
(c) **EXPERIENCE** of V.H.F. and pulse techniques.

(d) **EXPERIENCE** of A.I.D. and I.S.M.E. procedure an advantage.
Apply Airmec, Ltd., High Wycombe, Bucks. [5035

Some Bargains

for YOU!

PRECISION TEMPERATURE CONTROL OVENS. 230 volts 50 cy. for quartz Crystals will give stability with suitable Crystals of better than two parts in one million. Fitted precision thermostat and thermometer. Temperature adjustable 40/60 degrees cent., £9/10/-.

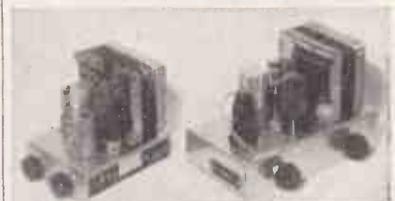
MOTOR ALTERNATORS. 110 volts D.C. input 68/125 volts S.P. 500 cycles 1.25 kVA., £30. 28 volts D.C. input 115 volts, .9 kVA. 800 cycles output, £10. 24 volts D.C. input 115 volts .5 kVA. 1,200 cycles output, £15. 28 volts input 115 volts 2.4 kVA. 400 cycles output with control panel £25. 24 volts D.C. input 115 volts 115 V.A. 3 ph. 400 cycles output £11/5/-, crg. extra. Write for list giving full details.

NIFE BATTERIES. 1.2 volts 45 A.H. single cell, 30/-, post 2/-, Wood crate containing 10 cells for 12 volts 45 A.H. New and uncharged. £12/10/-, Crg. 10/-.

Leslie Dixon & Co.

Dept. A, 214 Queenston Road, London S.W.8

Telephone: MACaulay 2159



3-VALVE QUALITY AMPLIFIERS

3-4 wt. 16 S.W.G. al. chass.; neg. fdbk.; vol. and tone controls; A.C. 200-250 v.; voltage panel; 2-4Ω spkr. socket; new comp. and PLAYING TESTED; 87g 6 1/2 x 5 x 4 1/2 in., £4/2/6.

INT. OCT. 9 x 6 x 4 1/2 in., £3/19/6.
Carr. 2/6 either model and state type P.U. E.K.E., 47, Arksey Lane, Bentley, Doncaster.

This UNIQUE BENDER



Quickly and Accurately Forms Angles, Channels, Sections, Boxes, Lids, Trays, Tanks, Chassis Brackets, Clamps, Clips, Shrouds. Chemical, Electronic and Electro Medical apparatus. Used by leading Radio Manufacturers. Invaluable to Servicing Engineers, Hospitals, Universities and Research Workers.

For 6 page folder write to:—



A. A. TOOLS (W)

197a Whiteacre Rd., Ashton-u-Lyne

Every genuine A.A. tool bears this mark.

MARCONI'S WIRELESS TELEGRAPH CO. LIMITED, invite applications from **MECHANICAL DESIGNERS** and **DRAUGHTSMEN** with experience in the Electronics field.

Permanent, pensionable and progressive careers are available to suitable applicants both at Chelmsford and London.

Social and Athletic Club.

Modern Canteen.

Write, stating age, experience, qualifications and salary required, to Dept. C.P.S., 336/7, Strand, W.C.2., quoting Ref. 142M.

MARINE Radar and Communication equipment. Marconi's Wireless Telegraph Company Limited, Chelmsford, have vacancies in their Development laboratories for both **Junior and Senior Engineers** and **Physicists** for interesting work in the above field. The appointments are permanent and pensionable and offer excellent prospects for promotion in this world famous organisation. Please apply, quoting ref. no. 2140A, to Dept. C.P.S., 336/7 Strand, W.C.2.

ELECTRONIC ENGINEERS
Marconi's Wireless Telegraph Company Limited,
Chelmsford

are expanding their activities in the field of black, white and colour television.

There are openings for both **Junior and Senior Engineers** and **Physicists** for work in connection with the development of cameras, transmitters, teletext and associated equipment.

These appointments offer excellent opportunities for promotion to suitable applicants. Please apply, quoting Ref. 2220B to Dept. C.P.S., 336/7, Strand, W.C.2.

SITUATIONS VACANT
CHIEF Designer required by company manufacturing electronic and mechanical measuring instruments for industrial and aircraft use: salary £1,000-£1,200, housing allowance, pension scheme.—Full particulars to Box 5485, [5067]

RADIO and TV testing offers scope for an interesting career; young men keen on electronics will be trained and given every opportunity to become lift testers.—Reply to Pye, Ltd., Personnel Dept., Cambridge. [5014]

RADIO service mechanics required by Smiths (Radomobile), Ltd., for many parts of the country.—Write details of experience and qualifications to Personnel Officer, Goodwood Works, North Circular Rd., London, N.W.2. [0342]

SENIOR technician and technician for construction of prototype electro-mechanical apparatus in department of medical electronics.—Apply Personnel Officer, St. Thomas' Hospital, London, S.E.1. [5031]

RADIO Luxembourg require recording engineer for West End studios, comprehensive knowledge of tape and disc recording essential; send full details of experience and salary to—Mr. F. Belcher, Radio Luxembourg (London) Ltd., 38 Hertford St., London, W. [5059]

RADIO and TV testers and fault finders, Pye, Ltd., Cambridge, have vacancies in London and Cambridge for men with factory production experience; attractive rates of pay and prospects of promotion.—Reply to Ref. 124, Pye, Ltd., Personnel Dept., Cambridge. [4968]

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]

MURPHY RADIO, Ltd., have vacancies in their electronics division laboratories for engineers and assistants on design and development work, and also on associated electro-mechanical problems; applicants will be considered in the following categories:
1. CANDIDATES with engineering or science degrees or equivalent who have experience in industrial design.
2. GRADUATES who have completed military service but have no experience in design work.
3. CANDIDATES with lesser qualifications but who have considerable experience in industrial design.
4. CANDIDATES under 21 who are at present engaged upon H.N.C. time courses.

THE range of work involved is part of an interesting long-term programme in an expanding field and includes:
1. NAVIGATIONAL aids.
2. V.H.F. and U.H.F. transmitters and receivers.
3. PULSE systems.
4. MAGNETIC information recording systems.

THESE posts are permanent and pensionable, and offer good scope to men of ability; applications, giving full details of qualifications, age, experience, should be addressed to Personnel Department (EDL), Murphy Radio, Ltd., Welwyn Garden City, Herts. [5032]

MICHAEL RADIO, Ltd., Slough, Bucks, have vacancies from time to time for electronic engineers to be engaged on Government projects; those wishing to be considered are invited to write fully to the Chief Engineer, Equipment Division. [0198]

SALES Representative.—Airmec, Ltd., High Wycombe, have a vacancy for a Technical Sales Representative: Able to drive and willing to travel abroad if necessary.—Apply, giving full details of experience and salary required to Personnel Officer. [5003]

SENIOR Transformer Designer required to take charge of design office dealing with small transformers, power, audio, pulse, etc. Excellent prospects for an engineer with practical experience as well as academic knowledge: London area.—Box 3026 [4528]

TRAINEE Television Service Engineer required by old-established London retail radio and electrical business. Good opportunity for keen man with aptitude for this work. Driving experience essential. State age and full details of career.—Box 5439. [5053]

SENIOR and junior design engineers required for high fidelity sound reproduction projects.—Applicants should give full details of qualifications and experience by letter to Chief Engineer, Pye, Ltd., St. Andrew's Rd., Cambridge. [4917]

REQUIRED to fill immediate vacancies, radar mechanics with experience of Army A.A. Mark 3, for employment as testers; write fully stating experience and qualifications.—Airtech, Ltd., Aylesbury & Thame Airport, Haddenham Bucks, Tel. Aylesbury 1163. [5039]

RADIO Inspector required to cover the overhaul and testing of modern aircraft radar and radar equipment, the post is both permanent and pensionable; free transport to local towns, canteen facilities; write fully stating experience and qualifications.—Airtech, Ltd., Aylesbury & Thame Airport, Haddenham Bucks, Tel. Aylesbury 1163. [5038]

ADMIRALTY—Royal Naval Scientific Service. Engineers and Physicists (particularly with electronics) required in Experimental Officer and Assistant Experimental Officer grades in Experimental Establishments in London, Portsmouth, Weymouth areas, Gloucestershire and Scotland. Qualifications—British subjects, minimum of H.S.C. (Pass degree, H.N.C. or near equivalent an advantage. London only (over) E.O. £750-£920. A.E.O. £302/10-£670 (according to age). Appointments unestablished, but opportunities to compete for established posts. Application form from M.L.N.S., Technical and Scientific Register (K), 26, King St., London, S.W.1, quoting A214/5A. [4980]

GALPIN'S
ELECTRICAL STORES

408 HIGH STREET, 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

Notice: Owing to increases in Freight and Copper Wire prices we have no alternative but to increase our prices accordingly, all prices quoted are carriage paid unless otherwise stated.

MAINS TRANSFORMERS. Input 200/230 Volts OUTPUT 0/9/18 Volts at 3/4 amps., 25/- each; another output 12 1/2/0/12 1/2 volts 2 amps., 25/- each; another suitable for soil heating, garage lighting, etc., 0/14/17 1/2 volts, 20/25 amps., 52/6 each; another 4 volts 20 amps. twice, 35/- each. I only 500 WATT TRANSMITTER complete with Valves, Crystals, etc., 13 meters 3/2k.W. Variacs Range 6.25 to 12.5 M/cys. 12.5 to 25 M/cys. In very good condition, all fitted into rack approx. weight 5/6 cwt. £100 to clear, buyer collects.

EX-GOVT ROTARY CONVERTERS 24 volts D.C. Input 50 volts 50 cycles, 1 phase at 450 Watts. OUTPUT (complete with Step Up Transformer) from 50 volts to 230 volts, £13/10/- each or CONVERTER only £9/10/- each.

EX-NAVAL ROTARY CONVERTORS 110 volts D.C. Input, Output 230 volts 50 cycles 1 phase 250 watts capable of 50 per cent. overload; in good condition, guaranteed weight approx. 110 lb. £13/10/- each.

MAINS TRANSFORMERS all 200/250 volts primaries (New) Heavy duty Output combination of 0/6/12/18/24/30/36 volts 4/5 amps., 38/6 each. Ditto 6/8 amps., 5/1/6 each. Ditto 15 amps. Output 75/- each. Another with combination of 0/6/12/18/24 volts 6/8 amps., 5/1/6 each. Ditto 10/12 amps., 5/8/6 each. Ditto 25/30 amps. Output 85/- each.

MEDIUM SPOT WELDER TRANSFORMERS. Input 200/250 volts, OUTPUT combination of 0/2/4/6/8/10/12 volts at 50/70 amps. £7/7/6 each. Ditto 120/150 amps. Output, £7/10/- each.

PRE-PAYMENT I/- SLOT METERS 200/250 volts A.C. 10 amp size only, 100 per cent. overload set at 2d. per unit (guaranteed 12 months), £3/17/6 each. Ditto credit type 10 amps. only, 25/- each.

RECTIFIERS FOR CHARGERS 6 or 12 volts Output 2 amps., 9/6 each, 4 amps., 22/6 each, 6 amps., 36/- each. **MAINS TRANSFORMERS** to suit, 25/-, 30/- and 46/6 each respectively.

EX-CANADIAN EX-GOVT. ROTARY TRANSFORMERS for No. 19 receiver, Input 12 volts D.C. OUTPUTS 275 volts 110 M/amps.; also another output of 500 volts 50 M/amps. completely smoothed, 30/- each.

AUTO WOUND Voltage changer TRANSFORMERS. Tapped 0/110/200/230/250 volts 200 Watts, 48/6 each; 350 watts, 57/6 each; 500 watts, 76/6 each; 1,000 watts, £6/5/- each; 1,500 watts, £8/5/- each; 3,000 watts, £17/10/- each.

EX-R.A.F. ROTARY TRANSFORMERS. Input 24/28 Volts D.C. OUTPUT. 1,200 volts 70 M/amps. 4 hour rating, 10/- each. Ditto 18/24 volts D.C. Input 450 volts 50 M/amps. Output constant, 25/- each. These latter ones can be used as motors off A.C. mains with a little alteration.

LARGE RECTIFIERS output 50 volts 1 amp. with an input of 70/75 volts A.C. 10/- each. **EX-R.A.F. MORSE TAPPING KEYS,** 5/- each. **SINGLE EARPHONE** with carbon microphone 40 Ohms, 8/6 each.

ROTARY CONVERTORS. Input 24 volts D.C. Output 50 or 100 volts A.C. 500 cycles 1 phase at 300 Watts. £8/10/- each.

DESK-TYPE TELEPHONES for office intercom. with numbered dials, 55/- each. Moving Coil **VOLTMETERS** Switchboard type, 6 inch scale 0 to 200 volts, 25/- each. Ditto 0 to 100 volts, 25/- each.

EX-R.A.F. 1154 TRANSMITTERS complete with valves. Complete in TRANSIT CASE. AS NEW. 45/-

EX-GOVT. E.H.T. TRANSFORMERS. Large type. Two transformers in one case in Oil Input 230 volts OUTPUTS 4 or 5.5 K.V. at 30 M/amps., 6.3 volts 2 amps., 4 volts 3 amps., 2 volts 2 amps. These transformers can be used separately out of the case size dismantled, approx. 3 1/2 in. x 3 in. x 3 in. and 5 1/2 in. x 5 in. x 4 1/2 in. £4/5/ each.

ANY TRANSFORMERS made to order within 7 days from date of order. Please ask for quote. Numerous other items in stock. Please ask for quotation.

Clients in Eire & Northern Ireland, please ask for quotation as to carriage charges. The above charges only apply to England.

SMITH'S

of EDGWARE ROAD

Component Specialists since Broadcasting started offer the following, which are surplus to normal stock requirements:—

1. 100,000 Ω Green Vitreous Enamel Resistors, clip-in type, 9½ x 1in. Also 800 Ω..... per doz. £1 0 0
2. 1 μf Mica Capacitors, moulded upright case, 2½ x 1½ x 1in., 1,500V. D.C. wkg..... per 100 £5 0 0
3. 0.005 μf ditto 2 x 2½ x 11/16in per 100 £4 0 0
4. 1 μf Mansbridge type Capacitors, inverted mounting, 6½ x 3½ x 2½in., 5,000V. D.C. wkg..... per doz. £1 10 0
5. Durawire "SC5" 14/36 Black Coaxial Cable, wall .6, O.D. 4.5, grade S1012.....per 500 yards. £8 10 0
6. Glass Tuning Scales, 16-50, 180-550, 1,000-2,000 metres, current wave-lengths..... per 100 £2 0 0
7. 4in. Drums suitable for above per 100 £2 10 0

Quotations for smaller quantities on request.

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

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.

(555) 52b ABINGDON ROAD, LONDON, W.8
Candler System Co., Denver, Colorado, U.S.A.

Rowridge & Norwich



CONVERTOR TYPE 26. For conversion from channel 3 to channel 1, complete with self-contained power supply unit and totally enclosed in a handsome, well finished steel case. Price complete, £11/17/-.

Also available in chassis form less HT supply but including mains operated heater supply for inclusion in receivers. Price complete, £8.

CONVERTOR TYPE AC/4. For weak signal areas. Price complete, £15/15/-.
(Leaflets on request.)

SPENCER - WEST,

Quay Works, Gt. Yarmouth.

Telephone: 3009.

'Grams: Spencer-West, Gt. Yarmouth.

SITUATIONS VACANT

A TECHNICAL Assistant is required for secretarial staff of a radio manufacturers' Association in London. Good technical qualifications desirable plus the ability to record accurately and dictate reports, etc. Commencing salary £550 to £600. Apply to Box 5451. [5049]

ELECTRONIC engineer, degree or equivalent, practical design experience of V.H.F. transmitters and receivers essential; small but rapidly expanding organization on South Coast (near Southampton).—Write full details, age, experience and salary expected to Box 5359. [0263]

OLD-ESTABLISHED radio and electrical business, London, requires (a) Television Service Engineer; (b) Electrician; (c) Trainee for television or electrical work. Driving experience essential. Good prospects for capable men. State age and details of career.—Box 5440. [5054]

ELECTRONIC test engineers required to work on a number of interesting projects, ex radar or wireless filters would be suitable; must be capable of working with a minimum of supervision.—Apply in writing to the Chief Engineer, stating age and full details of experience, Messrs. J. Langham Thompson, Ltd., 88, High Rd., Bushey Heath. [5058]

RESearch investigation to work on development of new batteries and allied projects; starting salary in the range £600-£800, according to experience: F.S.S.U. superannuation scheme.—Applications to The Director, Tin Research Institute, Fraser Rd., Greenford, Middlesex. [5096]

ELECTRONICS Engineer, B.Sc., or H.N.C. for laboratory development work on miniature equipment using transistors. Work in Slough/Marlow area. 5-day week, canteen, pension scheme. Wide scope for energetic, versatile man with progressive ideas. Full details of age, experience, salary required to Box 5430. [5050]

A. H. HUNT (Capacitors), Ltd., require Draughtsmen, preferably with mechanical and electrical experience, for work on special purpose machines. Write giving age and previous experience to Personnel Manager, A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, S.W.13. [0057]

LABORATORY Assistant required in the research laboratory of a group working on a missile system, some experience of electronics and circuit construction is required; the post would suit an applicant with N.C. or C. & G. who wishes to improve his technical and practical knowledge.

WRITE giving full details of qualifications and past experience quoting Ref. 71, to The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [5047]

ELECTRONIC Laboratory Assistant required for experimental work and measurements; superannuation scheme; write, stating age, qualifications and/or experience and salary required to—Personnel Manager, The Telegraph Condenser Co. Ltd., (North Acton, W.3). [4718]

A GRADUATE wishing to enter the field of guided missiles is offered a post in the system research laboratory of an advanced guided weapon project, theoretical knowledge of general electronics, transistors, or servo mechanism is required; some practical knowledge would be an advantage.

WRITE in detail, quoting Ref. 70 to—The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [5044]

EDISON SWAN ELECTRIC Co., Ltd., require a Technical Salesman to operate from the address below. The work will include liaison with customers of the Company's industrial valves. Send particulars of age, experience and salary required to—155, Clifton Cross Rd., London, W.C.2. Reference K.S.P. [4979]

SENIOR Engineers required for development of television with large manufacturing company in N. London area. excellent prospects for promotion in a large research and development establishment, four-figure salary, pensionable position.—Write in confidence giving details of experience to Box 5423. [5043]

ELECTRONIC/Electrical engineer required by London component manufacturers for test year development and supervision of maintenance; minimum age 30; a good salary can be offered to engineer with definite practical ability; write full details, experience and present remuneration.—Box 4568. [4961]

SENIOR and junior electrical and mechanical draughtsmen required for the electronics drawing office of the British Thomson-Houston Company, Blackbird Road, Leicester. Please apply in writing to Manager, Drawing Offices, British Thomson-Houston Company, Ltd., Rugby, giving details of age, experience, etc. [4990]

SOUND recording equipment maintenance and operating staff required; essential qualifications: Higher National Certificate or equivalent, plus experience servicing amplifiers and allied equipment; 5-day week, pension scheme, permanent employment, generous salary.

APLICATIONS are invited from senior project engineers with a specialised knowledge of the manufacture of electrical and mechanical products; applicants should have a good practical engineering background and a sound technical experience of tool design and planning and be capable of putting new projects on a sound production basis; these vacancies offer excellent opportunities to men seeking permanent and progressive positions; London area.—Applications, which will be treated in confidence, should give full details of experience and salary required and be addressed to Box 4395. [4927]

NEW BOOKS ON RADIO & TELEVISION

- Practical T.V. Aerial Manuals for Bands 1 and III, by E. Laidlaw..... 4/9
- Radio Amateurs Handbook A.R.R.L. 1955..... 3/1-
- An Introduction to Colour Television, by G. G. Gouriet, 62 pages, 12 diagrams, etc..... 9/6
- World Radio Handbook, by Lund Johansen..... 10/-
- Practical F.M. circuits for the home constructor, by R. Deschepper..... 5/3
- Valve and T.V. Tube Equivalents, by Babani British, U.S.A., European and Service Types..... 5/4
- Simple Electronic Musical Instruments for the constructor, by Alan Douglas New Brimar Valve and Teletube Manual No. 6..... 5/3
- Radio Controlled Models for Amateurs, by J. M. Kerney, Bernards Series No. 133..... 5/3
- T.V. Engineers Pocket Book, by E. Molloy..... 10/10
- Fundamentals of Transistors, by L. Krugman..... 2/16

ALL POST FREE. Write for New List of ENGLISH AND AMERICAN BOOKS AND PERIODICALS

UNIVERSAL BOOK CO.
12 LITTLE NEWPORT STREET,
LONDON, W.C.2 (adjoining Lisle St.)

WEBB'S SERVICE DEPARTMENT

for complete renovation of complex communications receivers of any make

Test report issued showing sensitivity, selectivity, signal/noise equal to, or better than, makers' original figures.

WEBB'S RADIO,

14, SOHO STREET, LONDON, W.1

EUREKA & CONSTANTAN RESISTANCE WIRES

Prices per ounce			
SWG	Enam.	DASC.	SWG Enam. DASC.
16	1/6	1/6	28 2/1 2/6
17	1/6	1/6	29 2/2 2/6
18	1/6	1/6	30 2/2 2/6
19	1/6	1/6	31 2/3 2/8
20	1/6	1/6	32 2/3 2/9
21	1/6	1/6	33 2/4 3/-
22	1/6	1/8	34 2/6 3/-
23	1/6	1/10	35 2/8 3/3
24	1/8	2/-	36 2/9 3/6
25	1/10	2/2	37 3/- 3/9
26	2/-	2/4	38 3/3 4/3
27	2/-	2/4	40 3/6 4/9

Wires to 50 swg available

COPPER INSTRUMENT WIRE ENAMELLED, TINNED, LITZ, COTTON AND SILK COVERED.

All gauges available.
B.A. SCREWS, NUTS, WASHERS, soldering tags, eyelets and rivets.
EBONITE AND BAKELITE PANELS, TUFONOL ROD, PAXOLIN TYPE COIL FORMERS AND TUBES.
ALL DIAMETERS.

SEND STAMP FOR LIST. TRADE SUPPLIED.

POST RADIO SUPPLIES
33 Bourne Gardens, London, E.4

**FERRANTI LTD.
LONDON COMPUTER
LABORATORY**

The Company invites applications for important positions in a new and rapidly expanding DEVELOPMENT ESTABLISHMENT IN THE LONDON AREA from ENGINEERING DESIGN DRAUGHTSMEN (Mechanical and Electrical) (age 25-40) for work on commercial and Government projects. The positions offer ample scope for initiative and eventual advancement to

ENGINEER STATUS
in the Engineering Design Group.
The work is in the following fields:—

1. Process and Manufacturing Automatic Control Equipment, involving servo-mechanisms, gear systems, clutches, etc.
2. Experimental and Production Machines for automatic and semi-automatic circuit assembly.
3. Analogue and Digital Computers.
4. Computer Construction techniques.
5. Magnetic Recording Equipment.
6. Digital Conversion Mechanisms.
7. Circuit Design and Layout Engineering.
8. Information Storage Mechanisms

Desirable qualifications are possession of Higher or Ordinary National Certificate, or equivalent, some practical workshop experience and experience or interest in one or more of the above fields. A staff Pension Scheme is in operation.

Salaries will depend on age, qualifications and experience but will in general be based on excellent scales.

Application forms from Mr. T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs.

Please quote reference WSE/10/3.

SITUATIONS VACANT
JUNIOR Engineers required for development of television with large manufacturing company in N. London area, excellent prospects for promotion in a large research and development establishment, salary according to experience, pensionable position.—Write in confidence giving details of experience to Box 5421.

SENIOR Engineers required for development of electronic instruments with large manufacturing company in N. London area, excellent prospects for promotion in a large research and development establishment, four-figure salary, pensionable position.—Write in confidence giving details of experience to Box 5421.

ELECTRONIC engineers are wanted in Midlands engineering plant, the positions are progressive and interesting requiring qualified and experienced electronic engineers, senior and junior for rapidly expanding laboratory engaged upon measurement and control problems.—State age, qualifications and experience fully in confidence to Box 3686. [4678]

JUNIOR engineers required for development of electronic instruments with large manufacturing company in N. London area, excellent prospects for promotion in a large research and development establishment, salary according to experience, pensionable position.—Write in confidence giving details of experience to Box 5402.

ELECTRONIC valve engineer required for new research laboratory in north London area. Keen Junior Graduate of Higher National Certificate and first year to be spent undertaking full time post-graduate course in applied electron physics at Imperial College, with full pay.—Reply, giving full particulars, to Box 5194.

DEVELOPMENT engineers: a leading music manufacturer of domestic radio and television equipment invites applications from qualified men with experience in this field for responsible positions in the laboratories.—Those interested should write, giving brief details of qualifications and experience, to the Personnel Manager (Ref. D.E.), Box 4594. [4872]

ASSISTANT for technical service department of leading radio valve manufacturers in Central London. Would suit Nat. Cert. or C. & G. examinations student who has completed National Service. Salary according to age and experience, good prospects, pension scheme.—Box 864, Dorland Advertising, Ltd., 18-20, Regent St., London, S.W.1. [5071]

TRANSFORMER design engineer, with experience in mass production of small transformers for electronic industry required by progressive firm in West Country; applicant must have initiative, ability to control staff, and ambition to take departmental responsibility; write, with full details of age, experience and salary required, to—Box 5461. [5063]

VACANCIES exist for engineers in radio and radar field at our various depots. Applicants should possess First Class P.M.G. Wireless Certificate or Ministry of Transport Radar Certificate. Applications from long-service Naval personnel welcomed.—Reply to W. H. Smith & Co., Electrical Engineers, Ltd., 68, Grosvenor St., Manchester, 1. [5072]

ELECTRONIC engineers and physicists read. For rapidly expanding research department; candidates should have experience of electronic instrument development; experience in pulse circuits or ultrasonics desirable but not essential; B.Sc. or H.N.C. standard.—Write full particulars to Glass Developments, Ltd., Brixton, S.W.2. [5073]

CHIEF inspector required by radio component manufacturers to take charge of mechanical inspection of piece parts and final electrical testing; knowledge of loudspeakers an advantage.—Write giving details of past experience and salary required to Electro Acoustic Industries, Ltd., Stamford Works, Broad Lane, Tottenham, N.15. [5021]

VACANCY occurs for a chief inspector; applications are invited from candidates with engineering qualifications and experience in the radio and television industry; salary range from £800-£1,000.—Apply giving full particulars of experience to Personnel Manager, Radio & Allied Industries, Ltd., Hirwaun Industrial Estate, Nr. Aberdare, Glam. [5022]

ENGINEERS required for climatic testing of components and complete equipments. Work involves electrical testing measurement. Commercial or Services experience of electrical or telecommunications equipments desirable. Possession of H.N.C. or O.N.C. an advantage.—Reply in writing, stating age, qualifications and experience, to The General Electric Co., Ltd., Brown's Lane, Allesley, Coventry. [4878]

TRANSISTORS—an engineer is required for the design and analysis of transistor circuits with application to a guided missile, some experience of transistor circuit design is required, together with academic qualifications, consisting of a degree, N.C. or C. & G.; this is an opportunity to enter a small but expanding team working on these problems, where initiative and ability will be recognised.

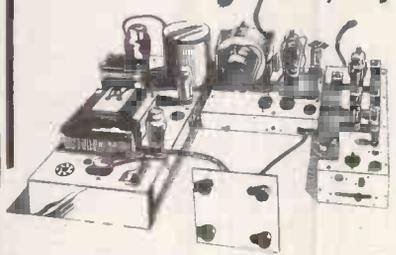
WRITE in detail, quoting Ref. 69, to The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [5045]

A SENIOR mechanical designer is required by a Midlands manufacturer engaged in the complete engineering and production of a variety of electronic products.—First-class men with experience of design work in the light engineering field are invited to write, giving brief details of career and qualifications, to the Personnel Manager (Ref. S.M.D.), Box 4595. [4871]

TV Tubes
guaranteed 6 months

12in. MULLARD TUBES. £5. 6-month guarantee, 3 months on other makes. As we have been selling for the past 4 years. 15/6 ins. carr. on all tubes.
14in. WIDE ANGLE. £7/10/-. Picture shown to callers, 6-month guarantee.
17in. WIDE ANGLE. £12/10/-. Guaranteed 6 months. Picture shown to callers.

TV CHASSIS 97/6



T.V. 12in. CHASSIS. 97/6. Complete chassis by famous manufacturer. R.F. E.H.T. Unit included. Drawing FREE. Easily fitted to Table or Console model. Owing to this chassis being in three separate units (Power, Sound and Vision, Timebase) inter-connected THIS CHASSIS IS LESS VALVES AND TUBE, but see our catalogue for cheap valves. Our £5 Tube fits this Chassis. List of valves by request. Carr. 5/- London. 10/- Provinces.

T.V. TIME BASES. 10/6. Containing scanning coil, focus unit, line trans., 10 controls, etc.; famous mfr. Drawing FREE. Post 2/6.
POWER PACK. 29/6. 5KV. EHT. 325V. 250 m.a. smoothed H.T. heaters 6V, 5amp., 4V, 5 amp., 4V, 5 amp., with extra winding for 2- or 4-volt tubes. Carr. 4/6.

T.V. SOUND AND VISION. 27/6. 5/het, complete sound and vision strip, 10-valve holders. Post 1/6.

V.H.F. 1125 RECEIVER. 7/9. Complete with valves. New X.W.D. Post 2/3.
V.H.F. 24 RECEIVER. 10/6. New X.W.D. Complete with valves. Post 2/3.

"DENCO" RADIOGRAM CHASSIS. £5/17/6. 5/het. Famous turret coil pack. Modern international octal valves included. Front controls. 5 valve 4 w/band. 8in. P.M. speaker with O.P. trans to match 12.6 extra. Post 4/6.

RADIOGRAM CHASSIS. 29/9. Including 8in. speaker. 5-valve 5/het, 3 w/band, A.C. mains. Complete less valves. Tested, guaranteed. FREE drawing with order. Post 4/6. Set of knobs 1/6 extra.

RADIOGRAM CHASSIS. 14/9. A.C. or universal 5/het, 3 band, 465, I.F.S. Less dial, electrolytics and valves. Otherwise believed to be in working order. Post 3/6.

SPEAKERS. 10/9. 8in. P.M. standard 2-5 ohms. Post 1/9.

TRANSFORMERS. E.H.T. 5 K.V. 2V. Heater. 29/6. Post 2/6.

MAINS POWER TRANS. 325-0-325V. 250 m.a. 6V. heater, 5 amp., 4V., 5 amp., 4V., 5 amp., with extra winding for 2- or 4-volt tubes. 29/6. Post 2/6.

TRANS. 350-0-350V. 80 m.a. 9/9. 6v. + 5V. heaters. Post 2/3.

TRANS. 5/9. 350-0-350V. 12v. + 4v. heaters. Post 2/3.

TRANS. 3/9. 350-0-350V. 4V. + 4V. heaters. Post 2/3.

O.P. TRANS. 1/9. Standard 2-5 ohms. Post 9d. Salvage, guaranteed.

2 GANG CONDENSERS. Standard size. 2/9. Salvage, guaranteed. Post 9d.

COIL PACKS. 9/9. 3 band, including 465, I.F.S. Post 9d.



**DECCA
RECORD
PLAYERS**
Standard or L.P.
List Price £12/1/6
OUR PRICE
6 GNS.

Packing, carriage, insurance, etc., 10/6.

Decca 78 r.p.m. variable speed record players, fitted centre drive Garrard motors, (17r plug-in heads, sapphire styl, Revline case. List price £12/18/6. Our price £6/19/6. Packing, carriage, insurance, etc., 10/6.

Send stamp for bargain list of record players.

RONALD WILSON & Co.
12, BRIDGE ST., WORCESTER

MONEY BACK GUARANTEE DUKE & CO
621 ROMFORD ROAD, LONDON. E.12
CWO. or COD • TEL: GRA 6677

VACANCIES FOR SKILLED CRAFTSMEN IN GOVERNMENT DEPARTMENT AT CHELTENHAM

Applicants required with experience of:—

- (a) Maintenance and Installation of Teletypewriters, Auto-transmitters, Perforators, Re-perforators or experienced in
- (b) Cabling, Wiring, Distribution Frames, Jack fields or a knowledge of
- (c) Long distance radio communication systems, Line telegraph systems (e.g. V.F.) Multiplex and five-unit telegraph code.

BASIC PAY: £7/18/10 plus merit pay up to £2/10/-, assessed at interview, based on ability and experience. Opportunities for permanent and pensionable posts.

5-day week—good working conditions—single accommodation available.

Apply to: Personnel Officer, G.C.H.Q. (Foreign Office), 53 Clarence Street, Cheltenham.

The "BANDIT" IS the Answer to BAND III

Send for Lists

TELECRAFT LTD.

Quadrant Works, Wortley Rd. West Croydon, Surrey
THORnton Heath 1191-2-3

VACANCIES IN GOVERNMENT SERVICE AT CHELTENHAM

1. Instrument Makers with fitting and machine shop experience in light engineering.
2. Radio and Electronic Mechanics and Assembler Testers with experience of telecommunications equipment.

BASIC PAY

£7/18/10 plus merit pay up to £2/10/-, assessed at interview, based on ability and experience.

Opportunities for permanent and pensionable posts.

Apply to: Personnel Officer, G.C.H.Q. (Foreign Office), 53, Clarence Street, Cheltenham.

BASS REFLEX CABINETS

Walnut, Mahogany or Oak, veneered, 30-in. high. For 8-in. Speakers, 10-in. Speakers, 12-in. Speakers. £9-0-0d., £9-10-0d., £10-0-0d. carriage paid.

FOR BUYERS ABROAD

We now have a collapsible Tropic Proof Model of our Standard Bass Reflex Cabinet. (Patent Pending)

GOODMANS & G.E.C.

Full range of cabinets for these speakers.

You can see your cabinet being made in our cabinet-making workshop.

Cabinets made to order.

Armstrong Chassis and Amplifiers.

The Leak TL/10 Amplifier.

LOUDSPEAKERS.

Open till 5.30 Saturdays

A. DAVIES & CO. (Cabinet Makers)

3 Parkhill Place, off Parkhill Road, London N.W.3. GULLIVER 5775.

SITUATIONS VACANT

ELECTRONIC Engineer with good knowledge of H.F. measurements and interference suppression required for work in connection with measurement of radio and television interference; superannuation scheme; write giving full details of age, qualifications, experience and salary required to—Personnel Manager, The Telegraph Condenser Co., Ltd., North Acton, W.3. [4722]

X-SERVICE radar and radio technicians are invited to apply for posts as test engineers for work on radar and other electronic products of a large Midland manufacturing organization; further training will be given where necessary; 5-day week; excellent prospects.—Apply, giving details of experience to date, to the Personnel Manager (Ref. E.S.R.), Box 4592. [4870]

DEVELOPMENT Engineer.—Muirhead & Co., Ltd., Beckenham, Kent, have a vacancy for Physicist or Electronic Engineer (with degree or similar qualifications) on the development of data transmission devices, miniature motors and instrument servo mechanisms, salary according to experience, pension scheme.—Apply in writing to Personnel Manager, Box 102. [5022]

X-RAY Development; young man required to assist in the design and development of X-ray apparatus; higher national or equivalent qualification essential, and test room experience in X-ray or similar industry desirable; an unusual opportunity offering scope to an engineer of imagination.—Write to Watson & Sons (Electro-Medical), Ltd., G.E.C. Estate, North Wembley, Middlesex. [5025]

JUNIOR Electronic Engineers/Radio Mechanics, unless wanted for installation, maintenance and operation small radio transmitting stations in U.K. and abroad; candidates must have good basic training in radio and some industrial experience; must be single and medically fit and prepared to travel abroad; excellent prospects; U.K. salary up to £500 after 3 years and very much more abroad.—Write Box 4017. [5025]

TV and radio chief of test; progressive position offered in a North London factory for a man with experience of production testing TV and radio sets; qualifications to include G. & G. Telecom. III or equivalent, substantial practical experience and established ability to control staff, experience of test equipment design or maintenance desirable; substantial salary and prospects of promotion. REPLY to Ref. 246 Pye, Ltd., Personnel Dept., Cambridge. [4969]

EXPERIENCED senior and junior engineers, technicians, mechanics and wiremen at all levels required urgently for a rapidly expanding Telecommunications Dept. of a factory situated in the Oxford Circus Area; exceptionally interesting work on new types of telecommunications equipment; excellent working conditions and possibility of rapid advancement; apply in writing to—Box 5524. [5085]

SENIOR radio engineers required for the development of domestic radio receivers, including portables; applicants should have had at least 5 years' previous experience and be capable of progressing designs up to production stage; knowledge of AM, FM technique advantageous; write, giving full particulars of age, qualifications and salary expected to—Personnel Manager, Vidor/Burndep, Ltd., West St., Erith, Kent. [5056]

ELECTRONIC engineer.—An electronic engineer is required for a development laboratory on a guided weapon project. Degree or H.N.C. preferable. The applicant should be capable of working on his own initiative with a minimum of supervision. Experience of pulse circuitry an advantage.—Write in detail, quoting Ref. 65, to The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [5153]

RADIO technicians required by International Aeradio, Ltd., for overseas service; permanent and pensionable positions, inclusive salary from £894 per annum to £1,373 per annum, tax free, according to marital status; free accommodation; kit allowance; free air fares; generous U.K. leave.—Qualified candidates to whom replies only will be sent please write quoting RT to Personnel Officer, 40, Park St., W.1. [0262]

DRAUGHTSMAN.—Vacancies occur for two intermediate grade young draughtsmen in medium-sized Drawing Office in established electronic manufacturing concern in West Middlesex area. Applicants with general basic experience in light electro-mechanical devices or instruments can be considered provided they have some knowledge in electronics. Good salaries and prospects in an expanding organization. Canteen and pension scheme. Please state age, training and experience.—Box 5171. [5001]

TECHNICAL Sales/Service Managers required for British West African branches of large British company distributing domestic radio receivers, V.H.F. radiotelephone equipment, intercommunication telephones, domestic and commercial refrigerators, air conditioners, and office equipment. Good technical radio background essential. Refrigeration experience desirable. Familiarization course arranged with U.K. manufacturers prior to departure for Africa. First class passage, sea/air, free furnished quarters, full pay on leave after approximately 18 months tours, pension scheme. Apply in own handwriting stating age (preferably between 21 and 30), whether married or single, full details education, qualifications, National Service and business experience. Original references should not be sent.—Apply T.S.D., Box 5489. [5069]

ELECTRONIC ENGINEERS

The British Tabulating Machine Co., Ltd., Letchworth, Herts, manufacturers of "HOLLERITH" high-speed punched card accounting and statistical machinery, offer excellent prospects to men wishing to find employment on the application of Electronics to CALCULATING and COMPUTING MACHINES.

This is an expanding and progressive organisation, employing over 5,000 personnel under congenial working conditions.

Qualifications required include a University Degree in Electrical Engineering, Physics or Mathematics, Higher National Certificate or equivalent.

Salaries will be commensurate with experience and qualifications. Housing assistance may be given. Pension Fund. Write giving personal history to the Personnel Superintendent, quoting Ref. WW/19.

Cape Electrophonics LTD.

Manufacturers of highest quality reproducing equipment including the new, outstanding, high fidelity amplifier, the

Cape VL2

Write for leaflets:

CAPE ELECTROPHONICS LTD.

43-45, Shirley High Street, Southampton

THE OSRAM NINE-ONE-TWO

AMPLIFIER INSTRUCTION BOOK

and

HIGHEST QUALITY COMPONENTS

Available from

COVENTRY RADIO

189, DUNSTABLE ROAD, LUTON.

Phone: 2677.

Price 3/6, plus 3d. postage

also

Our 1954-5 Component Catalogue at 1/-



METER REPAIR SERVICE



ALL TYPES and MAKES Single and Multi-Range

METERS SUPPLIED FROM STOCK OR CONVERTED TO ANY RANGE

Phone for immediate service

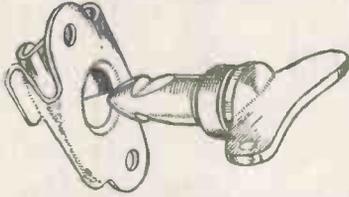
THE ELECTRICAL INSTRUMENT REPAIR SERVICE

329 Kilburn Lane, London, W.9

Tel: LADbroke 4168

ODDIE FASTENERS

Pat. 507249



THIS 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 brochure and other information will be gladly sent on request.

DEPT. "W.W."

Oddie, Bradbury & Cull Ltd., Southampton
Tel.: 55883 Cables: Fasteners, Southampton

MALVYN ENGINEERING WORKS

Precision Engineers

Manufacturers of: Chassis, Small Pressings, Machined Components, Wiring and Mechanical Assemblies, to specification.

Single and Production Quantities. Enquiries Invited.

100 PARK ROAD, WARE, HERTS.

Telephone: Ware 465

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 "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 College House, 29-31, Wright's Lane, London, W.8.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

FERRANTI LTD. LONDON COMPUTER LABORATORY RADIO MECHANICS & WIREMEN

are urgently required for interesting work on the development and assembly of prototype Electronic Computers and Allied Equipment.

Good rates of pay and excellent working conditions. Lunch voucher scheme. Write for application form to 21, Portland Place, London, W.1.

SITUATIONS VACANT

SALES correspondent required by The Telegraph Condenser Co., Ltd., North Acton, W.3. Applicants must be experienced in conducting semi-technical correspondence, submitting quotations and generally dealing with customers. Knowledge of electrical/radio industry an advantage but not essential. Superannuation scheme up to 55 years of age. Write, giving full details of experience and salary required, to Personnel Manager, T.C.C. Ltd., North Acton, W.3. [4887]

SCIENTIFIC Information. A research laboratory on the outskirts of London is setting up a section for the collection of information on a wide variety of subjects. Applications are required from Graduates in Science (physics and mathematics for this post, which offers great scope for the man or woman in charge of the work.) Housing accommodation could be made available to the successful applicant. Write Box W.0209, A.K. Advs., 212a, Shaftesbury Ave., London, W.C.2. [4852]

THE MITCHAM WORKS, Ltd., have a vacancy for a male Radio and Television Progress Engineer in their production control department. The successful candidate will be responsible for co-ordinating activities and progressing materials required for new designs, and therefore a reasonable knowledge of radio engineering is essential.—Please apply in writing to Mr. G. B. King, Personnel Officer, The Mitcham Works, Ltd., New Rd., Mitcham Junction, Surrey, quoting Ref. D.I. [5070]

RADAR, television and radio testers; practical men with a sound basic knowledge of electronics and preferably some experience in one of the above categories are required by the test department of a leading Midlands manufacturer; the work is of considerable interest and offers scope for technical advancement; ex-Service technicians are particularly suitable.—Applicants should write, giving details of experience, to the Personnel Manager (Ref. R.T.R.), Box 4591, [4865]

DESIGNER draughtsman required for interesting development work on the design of small electro-mechanical mechanisms for use in switches, thermostats and similar devices; salary up to £225 per annum according to experience and qualifications; canteen, holiday pension scheme, canteen, holiday arrangements honoured with pay.—Write, call or telephone for an appointment to Chief Draughtsman, Diamond H Switches, Ltd., Gunnersbury Ave., W.4. Chiswick 6444. [4874]

COMPONENTS Liaison engineer. A vacancy has arisen at our Feltham branch for a man, preferably with a H.N.C. or Inter-B.Sc., and without N.S. commitments, who will be prepared to attend, after a suitable training period to discuss components for radio and electronic equipment with Senior Engineers and outside suppliers. The salary and opportunities in this pensionable post are good. Apply in the first instance to Personnel Dept. (ED/260), E.M.I. Engineering Development, Ltd., Blyth Rd., Hayes, Middx. [5037]

THE General Post Office has vacancies for Radio Operators at its coast radio stations and applications are invited from men between 21 and 35 years of age who hold the Postmaster General's First Class Certificate of Proficiency in Radiotelegraphy. Selected candidates will be considered later for permanent pensionable posts. Applications should be made to The Inspector of Wireless Telegraphy, Radio and Accommodation Department, Wireless Telegraph Section, Union House, St. Martins le Grand, London, E.C.1. [5078]

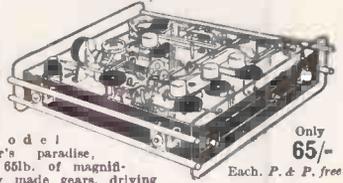
TECHNICAL Publications, vacancies exist in this department for suitably qualified radio and radar technicians. The work consists of preparing servicing, installations and operation manuals for radar equipment. Applicants should have a sound basic knowledge of radio and radar theory, and be able to express themselves in good clear English. Similar experience would be an advantage, but is not essential. Apply in writing to address below, giving full details of experience and education, and stating salary required. The starting salary would be in the range of £500 to £650 per annum.—Ref. RWD/TW, Decca Radar, Ltd., 1-3, Brixton Rd., London, S.W.1. [4987]

ELECTRONIC engineer.—An opportunity exists in the Guided Missile Section for an electronic engineer to take control of small design group dealing with power production and utilisation; sound electronic knowledge essential and good background of electro-mechanical and mechanical experience an undoubted advantage. Candidates should have extensive practical experience of commercial electronic design and manufacture. A degree is not essential. Work is interesting and varied, working conditions good and prospects excellent. Write in detail, quoting Ref. 66, to The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [5017]

MINISTRY of Transport and Civil Aviation. Radio Technicians (mer. only) required at aerodromes and radio stations in various parts of U.K. Special training courses for keen technicians with basic qualifications. Interesting work providing and maintaining aeronautical telecommunications and electronic navigational aids. Prospects of permanent pensionable posts and advancement. Rates of pay (London) from £342/10 at age 19, to £467/10 at 25, rising (subject to qualifying test) to £565. Rates slightly lower in provinces. Shift and night duty allowances from 2/- to 5/- also payable. Candidates aged 19 or over with practical experience in maintenance of radio or radar equipment should apply to any Employment Exchange quoting Westminster 6627. [4981]

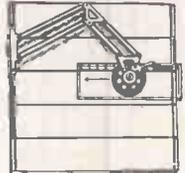
SSC Bargains from SHERMAN'S

Money-Back Guarantee! BOMB SIGHT COMPUTER



A model maker's paradise, over 65lb. of magnificently made gears, driving shafts, bearings, miniature motor, repeater motor, gyroscopes, etc. All supplied in a strong wooden transit case 34in. x 22in. x 11in. high, which itself is ideal as a tool box. Only 65/- Each. P. & P. free

CHART BOARD



Ideal as a drawing board, 17in. sq. Complete with pantograph arm, protractor head and Perspex scale. P. & P. free Each 30/-



ROLLING RULE All metal, three pairs of built-in rubber rollers. Ideal for draughtmen, book-keepers, etc. P. & P. free 2/9
UNIQUE 10in. SLIDE RULE Universal model, brand new, Ex-B.A.F. free 7/9



EX RAF HEADSET

Comprising Lightweight Headphones and Breast Microphones, Complete with cond. 25/- PER SET

Packing and Postage 1/6.

FRANKLYN SPRAY GUN

Works direct from vacuum cleaner or any air supply. Will spray Cellulose, Paint, Disinfectant, Insecticide, etc. Precision built and fully guaranteed. P. & P. 2/- 33/-



IMPELLER PUMP

Approx. 30in long by 2in. dia., 2 amp. at 24 v. D.C. 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, boxed. P. & P. free. Each 39/6

PRECISION DRILL CHUCK

1/2in. capacity, self-centring by H. D. Murray. Complete with 1/2in. parallel shank. At third list price. 10/- Postage and Packing 1/-

NEW CATALOGUE

Send 1/- for latest edition packed with Bargains. Refunded on first purchase.

TERMS—CASH WITH ORDER. C.O.D. 1/- EXTRA. Phone Orders Accepted. (Dep. W.18) 359, KILBURN HIGH ROAD, N.W.8. 479, HARROW ROAD LONDON W.10. ELGar 5852 HIGH STREET HARLESDEN N.W.10.

SHERMAN'S SSC SUPPLY COMPANY

★

'Radiospares'

Quality Parts

The
Service Engineer's
First Choice

★

ARC 1 VHF Transmitter/Receivers installations.
R89B/ARN5 Glide Slope Receivers.
ARN7 Radio Compass Installations.

The above and many other American radio equipments in stock at Croydon Airport.

PHONE, WRITE OR CALL:

AVIONICS LIMITED,

CROYDON AIRPORT, SURREY

Telephone: CROYdon 8396/7/8.
Grams: Aeradio, Croydon.

CABLE CHEAPER IN SMALL COILS

All coils 20-49 yds. in length, unless requested shorter. All prices per 100 yd. lot, less supplied, add 5%. Full 100 yd. coils are available add 5% to any price.

	3/029	7/029
TWIN FLAT	1/044	3/029
Rubber or Plastic	50/-	64 8
Single V.I.R.	23/-	28 6
EARTH WIRE 7/029 tinned copper 10 - a 100-ft. lot. Send for lists of other cables, flexes, wiring accessories and surplus switch and fuse gear. (We buy surplus electrical items, send details.) Add part carriage to small orders please.		48 6

BRITISH DISTRIBUTING Co. (Desk W), 561, Green Lanes, London N.8.

PRECISION SHEET METALWORK

We specialise in manufacturing of Chassis in all metals, large or small quantities to your own specifications.

V. W. BEAMISH

Shardeloes Garage, Shardeloes Rd., New Cross, London, S.E.14.

Telephone: TIDeway 4795.

Purchase or hire your

'VORTEXION TAPE RECORDER'

& ASSOC. EQUIPMENT FROM

GRIFFITHS HANSEN (Recordings) LTD.

32/33 GOSFIELD ST., LONDON, W.1.
MUSEum 0642/2771.

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. S/Oanc 3463
ALSO AT LIVERPOOL, BIRMINGHAM, MANCHESTER, LEEDS

Vitavox Public Address Multicellular Horns S/hand complete with new 15 Ohm Pressure Unit, £12/10/-. Secondhand 8ln. Speakers in Cabinet 5 Ohm, 21/-, New Fluorescent Quick Start Ballast Units to operate 2 40w. Tubes, state voltage, 19/5 each. 100 yd. coils, Twin Plastic Cable, 35/- coil.

Please add postage.

HAROLD MORRIS LTD.

423 Green Lanes, London, N.4. MOU. 5241/2

SITUATIONS VACANT

SERVO-MECHANISMS

applied to guided missiles, an experienced engineer is required to work on the research and design of a complex servo forming part of a missile system, a sound theoretical knowledge, coupled with practical experience is required. The work is of great interest and requires the use of advanced analysis and computing techniques. WRITE giving full details of qualifications and past experience quoting Ref. 72, to The Personnel Manager (Technical Employment) de Havilland Propellers, Ltd., Hatfield, Herts. [5048]

DESIGN engineer

for electronic instruments capable of designing complete instruments to production stage; experience necessary and a knowledge of production problems desirable. Academic qualifications degree, national diploma, or equivalent. Permanent situation covered by company's pension scheme.—Apply to Technical Director, Advance Components, Ltd., Marlowe Rd., Welthamstow, London, E.17. [5015]

ELECTRONIC Engineer

required by a large food concern in London for the development and application of various forms of process control; must have the ability to plan the layout, draw up specifications and supervise the installation; experience in the design of electronic control and measuring equipment is desirable together with some workshop experience; salary dependent on age and qualifications; contributory pension scheme. Apply stating age, qualifications and experience to Box 5513. [5081]

THE GENERAL ELECTRIC Co., Ltd.

Brown's Lane, Allesley, Coventry, requires mechanical development engineers, designer draughtsmen and draughtsmen and electrical experience of radar-type equipments for work on guided weapons and like projects; also required, senior and junior electronic development engineers, particularly in the field of microwave and pulse applications; salary according to age, qualifications and experience. Apply by letter, stating age and experience, to the Personnel Manager, Ref. R.G. [0259]

HONOURS graduate in Physics or Electrical Engineering

is required to work in a laboratory engaged in research and development on frequency control problems relating to communication systems. The position, which is in the South of England, is open to men and women and affords excellent opportunities for detailed study of the theoretical and practical aspects of the subjects. Living accommodation, for single or married persons, could be made available.—Write to Box 12341, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. [4855]

ELECTRONIC engineer

—an experienced engineer is required for the research and design of circuits with application to a guided missile system, he should have at least two years experience and preferably be of degree standard, although applicants with H.N.C. or C. & G. will be considered; the work is of great interest and importance, offering responsibility and good opportunities for promotion. Write in detail, quoting Ref. 68, to The Personnel Manager (Technical Employment) de Havilland Propellers, Ltd., Hatfield, Herts. [5046]

DRAUGHTSMAN

required for interesting work on electrical layouts and installations in connection with heavy works plant test schemes; the successful applicant will be required, in the first instance, to devote his efforts to the electrical test equipment of a new large turboalternator factory, where a good deal of personal initiative and drive will be expected; National Certificate or equivalent essential; salary in accordance with age and experience.—Apply in writing to Box A58, T. & G., 167, High Holborn, London, W.C.1. [5016]

PHYSICISTS and Electrical Engineers

are required for advanced work in a research laboratory on the outskirts of London dealing with ultrasonic vibrations in elastic media. Men or women applying for the posts must have an Honours Degree, and preferably should have studied mathematics to a post-graduate stage. The work involved is of great interest, and ready promotion is available to the person having the necessary ability. Housing accommodation could be made available to the successful applicant.—Write to Box W2127, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. [4851]

HONOURS graduates in Physics or Electrical Engineering

are required for advanced work in a Quartz Crystal Laboratory situated in the South of England. The positions offered afford excellent opportunities for men and women to specialize in the study of piezoelectric materials from both the theoretical and practical viewpoints. An interest in mathematics and electronics would be an advantage for this work. Living accommodation, for single or married persons, could be made available.—Write Box W2127, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. [4851]

TECHNICAL Liaison Officers.

A leading electronics company has vacancies in London for senior and junior staff to participate in the development and marketing of radar equipment, computing devices and industrial electronic apparatus. Salary range £500-£1,000 per annum. Applicants should have technical qualifications, preferably to degree standard, and should have experience in dealing with Government establishments or senior staff in industry. The company is expanding rapidly in the electronics field and offers progressive careers and excellent staff conditions to capable men.—Applications, in writing, stating age, experience and salary desired, should be addressed to Box No. 4541. [4850]



PULLIN
SERIES 100
TEST METER
A.C./D.C. 10,000 A/V
21 RANGES
100µA to 1,000 V
COMPLETE IN DIE-CAST CASE WITH TEST LEADS CLIPS AND PRODS FULLY GUARANTEED

SENT POST FREE FOR **£2.10s.**
deposit & eleven further monthly payments of **£1.** Cash Price **£12.7.6.**

Frith
RADIOCRAFT Ltd
PHONE 58927
69-71 CHURCH GATE LEICESTER

"DE LUXE" OUTPUT TRANSFORMERS £2/15/-

Fully shrouded potted construction, all windings fully impregnated, main primary and secondary connection by flexible leads. Selection of required primary and secondary loads effected by inserting plugs in shock-proof adjusting panel. Dimensions: W. 3 1/2in., H. 3 1/2in., D. 3 1/2in., FC. 3 1/2in. x 3 1/2in. WT: 4 lbs. 6 ozs. Supplied in individual boxes, complete with data sheet.

Primary: To suit single or push-pull FX4, 6L6 or 6V6 valves, C.T. (Optimum loads from 4KΩ to 10KΩ) rated 50 mA; D.C. each half. Secondary: Rated 50 volts. To match 2Q, 4Q, 8Q, or 15Q Speech Coils. This Transformer provides 11 alternative ratios from 15Ω : 1 to 78 : 1.

CROYDON TRANSFORMERS,
2 PAWSONS RD., WEST CROYDON. THO. 1665.

RADIO & TELEVISION COMPONENTS

WE OPERATE A PROMPT & EFFICIENT MAIL ORDER SERVICE

"VIEWMASTER" & "TELE-KING" specialists

Easy terms available. Stamp (only) for lists

JAMES H. MARTIN & CO.,

FIRSTHWAITE NEWBY BRIDGE, ULVERSTON, LANCs.

FM and HI-FI COMPONENTS

In stock for home

WIRELESS WORLD FM TUNER UNIT	
DENCO FM TUNER	circuits 1s. 6d.
RADIO CONSTRUCTOR FM	" 2s. 0d.
MULLARD AMPLIFIER	" 2s. 6d.
OSRAM 912 AMPLIFIER	" 3s. 6d.

Separate price lists on request to

J. T. FILMER MAYPOLE ESTATE
BEXLEY, KENT
Tel.: Bexleyheath 7267

LOCKWOOD

makers of
Fine Cabinets
and woodwork of every description for the Radio and allied trades

LOCKWOOD & COMPANY

Lowland Rd., Harrow, Middlesex. Byron 3704

THE "Dust Bug"

AUTOMATIC GRAMOPHONE RECORD CLEANER

PATENT APPLIED FOR

From **CECIL E. WATTS**
Consultant and Engineer (Sound Recording and Reproduction), Oakleigh Grange, High Cross, nr. Uckfield, Sussex.
Or your local dealer.

Price 18/6, plus 6/2 purchase tax.

OUR NEW

GOVERNMENT SURPLUS CATALOGUE No. 12

containing over 400 items price 1/6d. post free. 2/6d. overseas seamount.

ARTHUR T. SALLIS (w.w.)
93 NORTH ROAD, BRIGHTON, SUSSEX.
Tel.: BRIGHTON 25806



★★★★★★★★★★★★

Our wide experience in fitting converters to all types of sets throughout the London area enables us to offer a reliable converter that you can easily fit yourself.

Suitable for any set, including old non-superhets. Includes own power supply and wave-change switch. Only necessary to connect mains and aerials. Will accept common aerial lead-in or separate leads. Price complete £5/15/6 post paid.

KIT. All components supplied, with drilled chassis and detailed assembly instructions. Easily aligned on station. 4 gns. post paid.

We can supply a light soldering iron, with sufficient solder, for 19/6.

To avoid disappointment order NOW stating voltage.

Band 3 aerial information supplied. Installations at usual rates if required.

COMMERCIAL TELEVISION CONVERSIONS
20, CONDUIT STREET, LONDON, W.1
MAYfair 6043

ARKAY WORLD'S FINEST
KITS

RADIOS PHONOGRAPHS TV
TEST EQUIPMENT HI-FI
Write for FREE Brochure

Radio Kits, Inc. • 120 CEDAR STREET
NEW YORK 6, NEW YORK • U.S.A.

AUTOMATIC (TIME) SWITCHES

New and reconditioned 15 day clockwork and electric switches

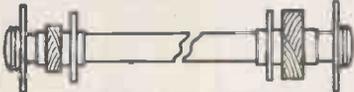
from 35/-

Send S.A.E. for illustrated details to:—
DONOHUE (TIMERS) GEORGE STREET
NORTH SHIELDS, NORTHUMBERLAND

WORKSHOP BENCHES
BY SPECIALISTS

POWNALL MAL 4464
Blagdon Road, New Malden.

TELETRON SUPER INDUCTOR COILS



FERRITE ROD AERIALS

Wound on high permeability Ferroxcube rod. Medium wave 8/9 Dual wave 12/9.

Type HAX. Selective crystal diode coil for tape and Quality amplifiers.

● High Q ● Litz wound

● Dust cored 3/- ea.

HAX.L. (LW), 3/6 ea.

Dual wave TRF. coils, matched pairs (as illustrated) 7/- pr. Transistor coils—L.F.T.'s, etc., etc.

BAND III Converter Coil Set 15/- Circuit and Wiring Diagram 3d. Available from leading stockists.

Stamp for complete data and circuit.

THE TELETRON CO. LTD.
266, Nightingale Road, London, N.9. HOW 2527

SITUATIONS VACANT

TECHNICAL radio engineer required to control technical aspect of radio and TV production and liaison between design department and works in a well-known London factory. Good position for a keen person with sense of responsibility. APPLY Works Director, Pye, Ltd., Cambridge. (5011)

SENIOR methods engineer required by a large and progressive engineering company situated in the London area. Applications are invited from men with good engineering qualifications and experience in the manufacture of radio, television and services equipment; the accepted candidate will have extensive experience of this class of work and will be acquainted with the most up-to-date production methods, including work study and standard costs; for a man with the required knowledge, initiative and drive this vacancy provides excellent prospects; salary range from £800 to £1,500 per annum. Please reply, in confidence, giving full details of previous experience to Box 4333. (4928)

WAYNE KERR LABORATORIES have several vacancies for Development Engineers and Assistants to work on the design of electronic test equipment. The company, which has an established reputation for integrity of design and quality of workmanship, is at present working on a wide range of projects including precision audio oscillators, V.H.F. bridges, pulse generators and microwave equipment up to Q Band. The designs involve such techniques as encapsulation, printed circuitry, electro forming and advanced sub-miniature design. Salaries are decided by individual ability rather than by fixed salary scales. Please write for an appointment to The Wayne Kerr Laboratories, Ltd., Sycamore Grove, New Malden, Surrey. (5051)

MINISTRY of Supply requires Senior Examiners at various places in United Kingdom to inspect and supervise the construction in one of the following fields (a) Aircraft and Aero Engines. (b) Radar and Electronics. (c) Instruments and Electrical Equipment or (d) Materials (metallic and non-metallic). Qualifications—British or British equivalents. Recognised engineering apprenticeship or equivalent training in radio industry or (for materials posts) suitable training in chemistry, physics or metallurgy. O.N.C. or City and Guilds or equivalent qualification desirable. Experience A.I.D. procedure advantageous. Salary within £660 (age 30)—£810, according to age and location. Not established but opportunities to compete for establishment may arise. State preference for duties and location when applying. Application forms from A.B.971, Ministry of Labour and National Service, London Appointments Office, 1-8, Tavistock Square, W.C.1. (4986)

ADMIRALTY.—Temporary Production Inspectors required with experience in either mechanical, electrical, electronic or marine engineering for various places in the U.K. Duties involve work in connection with the manufacture, inspection, test and installation of equipment in H.M. Ships. Inspectors with radar and/or radio experience particularly needed. Candidates, at least 25, should have recognised apprenticeship or equivalent training, plus additional relevant experience with industry or Government Department. They should preferably possess H.N.C. or O.N.C. in mechanical or electrical engineering, or have reached at least an equivalent standard of technical education with qualifications in appropriate subjects. Appointments unestablished, but opportunities may occur later to compete for permanent posts. Inclusive salary scales £690 to £810 per annum; entry at minimum of scale less about £20 for each year by which age falls short of 30. Salaries outside London somewhat lower. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King St., London, S.W.1. quoting D 355/5A. Closing date 9 September, 1955. (5077)

MINISTRY of Supply requires (a) Chief Examiners; (b) Engineers in London area and provinces for technical direction of inspection from F.Q., or supervision of inspection at works engaged in development and production of guided weapons. Qualifications: British or British parents. Recognised engineering apprenticeship or equivalent in electronics, H.M.C. or appropriate City and Guilds or A.P.R.Ae.S., A.M.I.C.E. or Mech.E. or E.E. or exempting qualifications. For posts (a) manufacturing/inspection experience light mechanical engineering, preferably with knowledge of instruments, gyroscopes, servo systems, clockwork and related test equipment, for posts (b) manufacturing/inspection experience electronic equipment, knowledge of H.F. techniques and electronic servo systems advantageous. Salaries within (a) £772—£985; (b) £645 (age 25)—£1,035 according to age, qualifications, location of post. Not established but opportunities to compete for establishment may arise. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King St., London, S.W.1. quoting C494/5A. State (a) or (b) and location preferred when completing application. (4978)

SITUATIONS WANTED

RADIO engineer/administrator (age 49) in radio and electronics for the whole of his working life seeks executive appointment with a company of standing where experience is important. A wide radio engineering experience including design and development organization and administration, production methods, government and inspection procedures and close liaison with Ministry departments is offered for a permanent post with a salary in the region of £1,000 per annum.—Please write Box 4436. (4900)

20 CIRCUITS for 2'6 only

Our 1955 Supa-Handbook, "The Home Constructor" (76 pages), now incorporates:—

- ★ 20 CIRCUITS—Superhets, P.F.F. Sets, Amplifiers, Feeder Units, Test Equipment, etc.
- ★ SUPERHETS—Full constructional details, wiring diagrams layout and point-to-point superhets.
- ★ COIL PACK—Full constructional details for building a superhet coil pack.
- ★ CAR RADIO—Full constructional details.
- ★ BATTERY CHARGER—Details for building a CHEAP charger.
- ★ RADIO GEN.—Pages of information, Resistor Colour Code, Formulae, and "know-how".
- ★ RADIO CONTROL—General information and list.
- ★ RADIOGRAM Constructors list.
- ★ CATALOGUE—Profusely illustrated price list of components including:—

SUPACOILS—Variable iron dust cored coils: 10-30, 16-50, 30-75, 75-200, 190-550, 800-2,000 metres. Aerial H.F. or O.N.C. 3—each.

30 SUPACOIL PACK—All wave (L/M/S) superhet pack—single hole fitting—recommended for numerous receivers—ready 47/5.

40 SUPACOIL PACK—Similar to above. Ready aligned. 82/-. (Either of above can be supplied to order to cover any 3 wavebands from our range.)

EQUIPMENT LEAFLET 10 gives full easy instructions for YOU to make both these packs. 1/6.

"The most helpful book in the Trade."

SUPACOILS (DEPT. W.9)
21, Markhouse Road, London, E.17
Telephone: KEY 6896

"Easco" INTER-COM & SOUND Advisors

BRIGHTON TERRACE, LONDON, S.W.9
Phone BRixton 4961
(3 lines)

EASCO ELECTRICAL (HOLDINGS) LTD.

LYONS RADIO Ltd.

RADIO EXHIBITION. Once again we are holding our SPECIAL SALE, starting August 24th, to coincide with the commencement of the Radio Exhibition. Our premises are only a little over a mile from Paris Court, so if in town why not pay us a visit and secure some of the many bargains which will be displayed at CLEARANCE PRICES. Examples: T.1154 chassis less meters from 5/8, chassis incorporating A.C. mains Power Packs from 25/-, R.1155 models "A" and "B" chassis for break-down from 2/6, and literally hundreds of others. Despatch of purchases gladly arranged. Please DON'T write of phone for further details as we must restrict this SALE to PERSONAL SHOPPERS.

BAND III CONVERTER. Complete coil kit by Teletron Co. with circuit, point to point wiring diagram, alignment instructions, etc. Provides the basis for an efficient, easy to make, two valve converter for use with TRF or Superhet Band I TV receivers. PRICE 15/- post 6d. Metal chassis ready drilled 3/9 post 6d.

ELECTROSTATIC LOUDSPEAKERS. Designed to reproduce the higher frequencies and when connected across an existing speaker of the moving coil type combine to produce that high quality reproduction essential when receiving FM transmissions or reproducing high quality recordings and TV sound. Type LSH75 size 3 x 3 x 1 1/2 in. for outputs up to 6 watts. PRICE 12/6.

Type LSH100 size 5 x 4 x 1 1/2 in. for outputs up to 20 watts. PRICE 21/-. (Type LSH100 size 5 x 4 x 1 1/2 in. for outputs up to 20 watts. PRICE 21/-)

RESIN CORED SOLDER. A big purchase enables us to offer this 5 cored resin radio solder by famous maker in economical coils of 1lb. for only 3/9 1/2 lb. for only 7/- or 1lb. for only 12/9 post paid.

3 GOLDHAWK ROAD (Dept. M.W.) SHEPHERDS BUSH, LONDON, W.12
Telephone: Shepherds Bush 1729

TECHNICAL TRAINING

LEARN it as you do it—we provide practical equipment combined with instruction in radio, television, electricity, mechanics, chemistry, photography, etc.—Write for full details to E.M.I. Institutes, Dept. WW.47, London, W.4.

CITY and 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), 29, Wright's Lane, London, W.8. [0117]

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 174. [0172]

TUITION

OLDHAM EDUCATION COMMITTEE.

MUNICIPAL Technical College.

THE electrical engineering department proposes to run the following courses in light current engineering during the coming session:

1. PART-TIME day and evening courses in radio service, leading to R.T.E.B. certificate.
2. PART-TIME day and evening courses in television leading to R.T.E.B. certificate.
3. PART-TIME day and evening courses in telecommunications meeting the requirements of the City and Guilds syllabus.
4. PART-TIME day and evening course in radio engineering covering the necessary subjects for Graduateship of the British Institution of Radio Engineers.
5. PART-TIME evening course for radio amateurs, leading to the radio amateurs examination if required.

ENROLMENT dates: September 6th, 7th and 8th; classes commence September 19th, 1955.

MAURICE HARRISON, Director of Education. [5029]

FULL-TIME courses for P.M.G. Certs., G.C.L.I. Telecommunications, Radar Maintenance Cert. and B.Sc.(Eng.); prospectus free.—Technical College, Hull. [0111]

WIRELESS—See the world as a radio officer in the Merchant Navy; short training period; low fees; scholarships, etc., available; boarding and day students; stamp for prospectus.—Wireless College, Colwyn Bay.

A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, etc., on "No Pass—No Fee" terms; over 95% successes.—Details of Exams and courses in all branches of Engineering, Building, etc., write for 144-page Handbook—Free: B.I.E.T. (Dept. 387B), 29, Wright's Lane, London, W.8. [0118]

TV & Radio.—A.M.Brit.I.R.E., City & Guilds, R.T.E.B. Cert., etc., on "No Pass—No Fee" terms; over 95% successes.—Details of Exams and Home Training Courses in all branches of Radio and T.V. write for 144-page Handbook—Free: B.I.E.T. (Dept. 387A), 29, Wright's Lane, London, W.8. [0116]

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]

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, R.T.E.B., and other professional examinations; train with the College operated by Britain's largest electronics organisation; moderate fees.—Write to E.M.I. Institutes, Dept. WW28, London, W.4.

WIRELESS telegraphy.—Merchant Navy offers to youths 16 upwards after qualification, lucrative positions as radio officers.—Apply British School of Telegraphy, 179, Clapham Rd., S.W.9. (Est. 1906). Recognised by Ministry of Education, moderate fees, modern equipment, day and evening tuition; also postal courses in theory of wireless telegraphy for P.M.G. Certs and Amateur Transmitting Licence. [0124]

TUITION

WIRELESS operating; attendance and postal courses.—Stamp for reply to Manager, The Wireless School, Manor Gdns., London, N.7.

BOOKS, INSTRUCTIONS, ETC.

I.P.R.E. technical publications, 5,500 Alignment 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.

BOOKS WANTED

WANTED for binding, "Wireless World," January and February, 1954.—Dawe Instruments, Ltd., 99, Uxbridge Rd., Ealing, London, W.5. Tel. Ealing 6215 (3 lines). [5073]



MANUFACTURERS TO THE RADIO TRADE



CHASSIS for RADIO & RADIOGRAMS

New range of Models with latest features. Ferrite Rod Aerial. Miniature (BVA) Valves. A/C. 200/250 volts 3 wavebands Fully guaranteed.

ASSEMBLED AND READY FOR USE.

5 VALVES chassis, 4 watt output, wide range tone control.	7 VALVES PUSH/PULL chassis, 6-watt output, separate bass and treble controls.
---	---

TELEVISION CONVERTERS and A.M./F.M. BAND III. TUNERS. TAPE RECORDERS. TUNING UNITS/CRYSTAL RECEIVERS. AMPLIFIERS for TAPE RECORDERS. AMPLIFIERS for GRAM. PLAYERS.

HIGHEST QUALITY STANDARDS FULL TRADE FACILITIES.

For Detailed List and Specifications write or phone:

THE DULCI CO. LTD.
97 VILLIERS ROAD, LONDON, N.W.2
Telephone: WILLESDEN 6678.

A SPECIAL OFFER OF AERIAL MASTS

R.A.F. Type 50
36 ft. HIGH

Kits comprise:—
9 2in. dia. Tubular Steel (Copper Plated) Sections of 4ft. length, top-section and base, Pickets, Guys and Fittings.
Canvas Carrying Bags contain all items.
YOU can purchase this normally expensive MAST for a fraction of its cost, i.e.

£8.10.0 ONLY (Carr. 7/6)

The MAST is particularly suitable to take aerials for T.V., E.M. and T.V. (especially COMMERCIAL), and has many other uses.
Extra 4ft. sections can be supplied at 11/6 per section.

HATTER & DAVIS (Relays) LTD. (Dept. WW)
126 Kensal Road, London, W.10.
LADbroke 0666

THE "VESPA" DECK

MODEL 721

THIS CAN BE YOURS FOR 24/2 deposit and 8 monthly payments of 24/2. (Cash Price assembled) £9/17/6.



MODEL 521

is available for a deposit of 21/9 and 8 monthly payments of 21/9. (Cash Price assembled) £8/17/6.

Specifications. Model 521. 7 1/2in. x 11in. 5in. Reels. Model 721. 10 1/2in. x 11in. 7in. Reels. High Impedance Record/Replay heads, 2,800 ohms at I.K.Gap. .004in. at 50 Kcs./60 v. High Impedance Erase head, 10,000 ohms at 50K. Gap. .0025in. Erase Volts at 50K. 80/90. Both heads are latest type, low capacity moulded with Ferrocube core.

Frequency Response: At 3 1/2in. per sec. approx. 50/8,000 c.p.s. and at 7 1/2in. per sec. 30/12000 c.p.s.
Frequency Response: 2 speeds are obtainable. 3 1/2in. and 7 1/2in. per sec.
Rewind. A neat and detachable handle is supplied for hand rewinding, but the use of twin track recording makes this unnecessary when full length recordings are made. Model 721 panel is drilled for a rewind motor should the user wish to fit one at a later date.

Drive. Rubber belt from a constant speed motor to a perfectly balanced fly wheel, giving constant tape speed, without "wow" and "flutter", throughout the full length of tape. The motor is suitable for 100/250 volts 50 cycles mains. Send a S.A.E. for leaflet describing these remarkable decks which are also available in kit form.

Desk 214, "LAFCO," 3 Corbetts Passage, Rotherhithe New Road, London, S.E.16
BER 4341

A MAST PROBLEM?

WRITE TO Skymasts

AERONAUTICAL OPPORTUNITIES GUIDED WEAPONS

A well-known firm in the aircraft industry is starting a new project in a London Office. It is anxious to recruit staff to form an Assessment Group.

Vacancies with unusual opportunities for rapid promotion exist to meet the following approximate requirements:—

Assessment Group.

Group Leader. Age 30/37, Science or Engineering degree standard, experienced in aircraft, or G.W. project or assessment groups, with knowledge of performance and servo-mechanism problems and analysis of flight and laboratory tests. Personality is important.

Section Leaders. Ages 27/35, Science or Engineering degree standard, general experience as for Group Leader but to a lesser extent.

Staff to fill these sections, with various capabilities from Computing to Honours degrees in Science or Engineering.

The age groups specified are given for guidance only and need not deter candidates outside these limits.

Monthly staff appointments carry a compulsory Pension Scheme and Weekly staff a voluntary Superannuation scheme.

Write in confidence, giving full details of age, previous experience, qualifications held, etc.; to:— Box A.C. 09762, Samson Clark, 57/61, Mortimer St., London, W.1.

ELECTRICAL ENGINEERS AND PHYSICISTS FERRANTI LIMITED,

in EDINBURGH, is engaged in a programme of Electronic Development of great industrial importance. The work involves the use of digital computers to control machines and industrial processes, and covers a wide and expanding field of application, offering long-term interest.

Development activity for these projects is taking place in the fields of electronic circuitry (including pulse techniques) digital computers, magnetic recording, magnetic amplifiers and servo-mechanisms.

Electrical Engineers and Physicists having experience as well as interest in one or more of these subjects are invited to apply.

The appointments are permanent and offer full scope for initiative in an expanding organisation.

Salaries paid will be commensurate with experience and qualifications, and there is a Staff Pension Scheme.

Application forms will be sent on request (quoting Ref. 59/EP/AL/2) to the Personnel Officer, Ferranti Limited, Ferry Road, Edinburgh 5.

A. V. ROE & CO., LTD.,

offer interesting vacancies for Technicians in the following fields:—

- Servomechanisms
- Applied Electronics
- Mechanical Engineering
- Hydraulic Engineering

Normal qualification H.N.C. or the equivalent, but young applicants without qualifications in the above fields will be considered. This is an opportunity to join a newly-formed Division whose laboratories are situated in a rural area.

Apply to:—

The Chief Engineer,
Weapons Research Division,
A. V. Roe & Co., Limited,
Woodford,
Cheshire.

CLASSIFIED ADVERTISEMENTS

Use this Form for your Sales and Wants

To "Wireless World" Classified Advertisement Dept., Dorset House, Stamford Street, 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 Illiffe & Sons Ltd., and crossed "& Co."
- Press Day, September 1st for October issue.

NAME

ADDRESS.....

REMITTANCE VALUE..... ENCLOSED

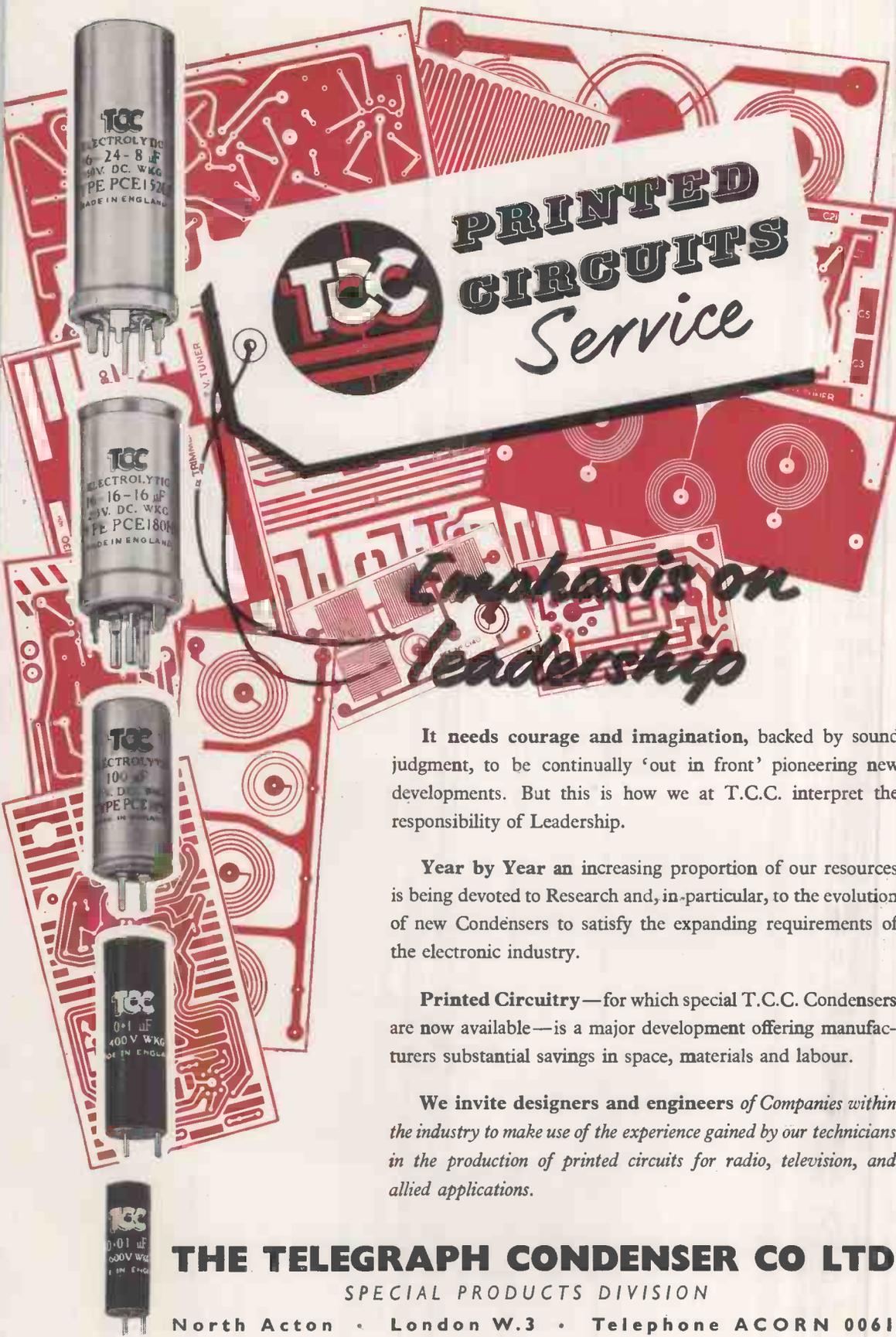
Please write in block letters with ball pen or pencil.

NUMBER OF INSERTIONS.....

INDEX TO ADVERTISERS

Page		Page		Page	
A.A. Tools	184	E.M.I. Institutes	95, 98, 121, 124, 160	Pearce, T. W.	181
Acoustical Mfg. Co. Ltd.	29	English Electric Valve Co., Ltd.	7	Pitman, Sir Isaac, & Son, Ltd.	178
Acu Electric Tool Mfg. Co., Ltd., The	150	Enthoven Solders, Ltd.	19	Point Studios	70
Adcola Products, Ltd.	20	Eta Tool Co. (Leicester), Ltd.	118	Post Radio Supplies	166, 186
A.D.S. Relays, Ltd.	120	E.W.A.	170	Power Controls, Ltd.	34
Advance Components, Ltd.	4, 36	Excel Sound Services, Ltd.	130	Pownall	191
Aerialite, Ltd.	65	Ferranti, Ltd.	17	Premier Radio Co.	84, 85, 86, 87
Aero Research, Ltd.	37	Fisher Electronics Co., Ltd.	33	Proops Bros., Ltd.	159
Airmec, Ltd.	32	Fisher, J. T.	140	Pye, Ltd.	58, 48
Allen Components, Ltd.	75	Fluxite, Ltd.	180	Pye, W. G., Ltd.	35
Alpha Radio Supply Co., The	163	Foyle, W. & G., Ltd.	150	Quartz Crystal Co., Ltd.	182
Altham Radio Co.	156	Fringevison, Ltd.	170	Radio & Electrical Mart, The	156
Ambassador Radio	169	Fritz Radiocraft, Ltd.	190	Radio & T.V. Components (Acton), Ltd.	161
Amplex Appliances (Kent), Ltd.	130	Furzehill Laboratories, Ltd.	133	Radio Corporation of America	165
Anders Electronics, Ltd.	166	Galpins	185	Radio Kits, Inc.	157
Antex	50	Gardners Radio, Ltd.	58	Radio Servicing Co.	131
Antiference, Ltd.	83	Garrard Engineering & Mfg. Co., Ltd.	46	Radiospares, Ltd.	190
Appointments Vacant 164, 167, 168, 169, 170, 171, 172, 173, 185, 187, 188, 189, 192, 193	126	General Electric Co., Ltd.	114, 115	Radio Traders, Ltd.	142, 143
Arcoletric Switches, Ltd.	126	Gilson, R. F., Ltd.	177	Reliance Mfg. Co. (Southwark), Ltd.	176
Ardente Acoustic Laboratories, Ltd.	52, 117	Glaser, L. & Co.	184	Rogers Development Co.	76
Ariel Sound, Ltd.	126	Golding Manufacturing (Gt. Britain), Ltd.	61	Rola Celestion, Ltd.	10
Armstrong Wireless & Television Co., Ltd.	66, 72, 179	Goodmans Industries, Ltd.	15, 54	Rollet, H. & Co., Ltd.	190
Ashworth, H.	158	Goodsell, Ltd.	75	Rudman Darlington (Electronics), Ltd.	27
Associated Rediffusion, Ltd.	71	Gray Arthur, Ltd.	173	Runbaken	168
Audio Transducers, Ltd.	106	Grayshaw Instruments, Ltd.	160	Salford Electrical Instruments, Ltd.	45
Automatic Coil Winder & Electrical Equipment Co., Ltd., The	1	Griffiths Hansen (Recordings), Ltd.	190	Sallis, A. T.	190
Automatic Telephone & Electrical Co., Ltd.	11	Grundig (Gt. Britain), Ltd.	102	Samsons Surplus Stores	162
Autoset (Production), Ltd.	124	Hall Electric, Ltd.	79	Sangamo Weston, Ltd.	102
Avionics, Ltd.	190	Hanney, L. F.	128	Savage Transformers, Ltd.	183
Baker's Selhurst Radio	80	Harris, P.	176	Schock & Co.	169
Beamish, V. W.	190	Hartley, H. A. Co., Ltd.	130	Sherman's Supply Co.	189
Beicher (Radio Services), Ltd.	22	Harvey Electronics, Ltd.	130	Short Brothers & Harland, Ltd.	130
Belling & Lee, Ltd.	93	Hatfield Radio	171	Simmonds, L. E., Ltd.	127
Bell, John, & Croyden	148	Hatter & Davis, Ltd.	192	Simon Sound Service, Ltd.	25
Bel Sound Products, Ltd.	118	Henley's, W. T., Telegraph Works Co., Ltd.	176	Skymasts	192
Benson, W. A.	178	Henry's	155	Smith, G. W. (Radio), Ltd.	251
Berry's (Short Wave), Ltd.	60	Hivac, Ltd.	66	Smith, H. L. & Co., Ltd.	186
Birmingham Sound Reproducers, Ltd.	69	Hobbs, A. B. & Co.	42	Sound Sales, Ltd.	104
B. K. Partners, Ltd.	123	Holleys Radio	184	Southern Radio Supply, Ltd.	181
Blickvac Engineering, Ltd.	126	Home Radio	127	Spectra Ltd.	182
Boulton Paul Aircraft, Ltd.	64	Hope & Waterlow, Ltd.	152	Spencer-West	186
Bradmatic, Ltd.	154	H.P. Radio Services, Ltd.	133	Standard Telephones & Cables, Ltd. 28, 49, 91	132
Brenell Engineering Co., Ltd.	78	Hudson Electronic Devices, Ltd.	9	Stanley Sound & Vision Products, Ltd.	132
Britain, Chas. (Radio), Ltd.	149	Hughes, F.A. & Co., Ltd.	129	Stern Radio, Ltd.	144, 145, 146, 147
British Communications Corp'n., Ltd.	18	Hunt, A. H. (Capacitors), Ltd.	8	Stewart Transformers, Ltd.	112
British Distributing Co.	190	Hunton, Ltd.	120	Suffex, Ltd.	81
British Institute of Engineering Technology	180, 189	Iliffe and Sons Ltd.	68, 77, 87	Surden, A. R., & Co. (Engineers), Ltd.	131
British Insulated Callender's Cables, Ltd.	69	Imhof, Alfred, Ltd.	148	Supacolls	191
British National Radio School	127	International Aeradio, Ltd.	122	Super-Vision, Ltd.	169
British Physical Laboratories	127	International Correspondence Schools	112	Superior Radio Supplies	150
British Sarozal, Ltd.	174	Jason Motor & Electronic Co.	124	Sutton Coldfield Electrical Engineers	150
Brookes Crystals, Ltd.	104	Kaye Electrical Mfg. Co.	164	Tannoy Products, Ltd.	12
Brown, S. G., Ltd.	104	Kenroy, Ltd.	154	Taylor Electrical Instruments, Ltd.	14
Bulgin, A. F., & Co., Ltd.	Edit. 465	Keyswitch Co., The	78	Taylor Tunnelliff (Refractories), Ltd.	41
Bullers, Ltd.	90	Kolectric, Ltd.	122	Technical Suppliers, Ltd.	172
Bull, J., & Sons	128	Koskie, B.	148	Tektronix, Inc.	188
Burne-Jones & Co., Ltd.	128	Labgear (Cambridge), Ltd.	60	Telecraft, Ltd.	188
Candler System Co.	186	Lancaster Hi-Fidelity, Ltd.	171	Telegraph Condenser Co., Ltd.	Cover III
Cape Electronics, Ltd.	188	Lafco Compounds, Ltd.	192	Telegraph Construction & Maintenance Co., Ltd.	120
Cementation (Muffelte), Ltd.	74	Lasky's Radio	136, 137, 138, 139	Telegram, Ltd.	177
Chaffey Cabinet Co.	134	Leak, H. J., & Co., Ltd.	107	Tele-Radio (1943), Ltd.	191
Champion Products	178	Leavers-Rich Equipment, Ltd.	176	Teleton Co., The	191
Chapman, C. T. (Reproducers), Ltd.	183	Lewis Radio Co.	176	Thermionic Products, Ltd.	170
Cinema Television, Ltd.	47	Light Soldering Developments, Ltd.	150	Trionon Electric, Ltd.	54, 116
City Sale & Exchange, Ltd.	68	Lockwood & Co.	190	Try Electrical Co., Ltd.	Edit. 463
Classic Electrical Co., Ltd.	55	London Central Radio Stores	184	T.S.S.	158
Commercial Television Conversions	131	Lowther Mfg. Co., Ltd.	115	Truvox, Ltd.	65
Clyne Radio, Ltd.	140, 141	L. R. Supply Co., Ltd.	115	Uncles, Bilis & Co., Ltd.	116
Cosmocord, Ltd.	92	Lyons Radio, Ltd.	191	Universal Book Co.	186
Cossor, A. C., Ltd.	24, 25	Magneto Devices, Ltd.	53	Universal Electrical Instruments Corp'n.	152, 153
Coventry Radio	188	Mail Order Supply Co.	21	Universal Electronics	135
Croydon Transformers, Ltd.	190	Malvyn Eng. Co.	189	Valradio, Ltd.	122
Daly (Condensers), Ltd.	52	Marconi Instruments, Ltd.	67	Verdik Sales, Ltd.	74
Davies, A. & Co.	188	Marconi's Wireless Telegraph Co., Ltd.	94, 97, 101	V.E.S. Wholesale Services, Ltd.	164
Denco (Clacton), Ltd.	58	Martin, J. H.	190	Vitality Bulbs	154
Dependable Radio Supplies	134	McMurdo Instruments Co., Ltd.	118	Vortexion, Ltd.	103
Direct T.V. Replacements	6	Melton Laboratories	180	Watts, Cecil E.	190
Dixon, L., & Co.	184	Midland Instrument Co.	168	Wayne Kerr Laboratories, Ltd., The	59
Domestic Sales, Ltd.	152	Minnesota Mining & Manufacturing Co., Ltd.	99, 105	Webcor (Great Britain), Ltd.	134
Donohoe's (Timers)	191	Modern Book Co.	178	Webber, R. A., Ltd.	156
Drayton Regulator & Instrument Co., Ltd.	82	Modern Electrics, Ltd.	76	Webb's Radio	72, 186
Duke & Co.	187	Modern Techniques	129	Weir Electrical Co.	116
Duicd Co., Ltd., The	192	Morris, H.	190	Werninghouse Brake & Signal Co., Ltd.	113
Duode Natural Reproducers	179	M.R. Supplies, Ltd.	82	Weymouth Radio Mfg. Co., Ltd., The	82
Easco Electrical Holdings, Ltd.	191	Mullard, Ltd.	3, 43, 57, 90	Wharfedale Wireless Works	70
Edison Swan Electric Co., Ltd.	Cover II, 40, 96, 100	Multicore Solders, Ltd.	Cover IV	Wharton Instruments	156
Edwards (High Vacuum), Ltd.	123	Multitone Electric Co., Ltd.	56	Whitaker, H.	156
Egen Electric, Ltd.	50	Murex, Ltd.	132	White, S. S., Co. of Gt. Britain, Ltd., The	64
E.K.E.	184	Murray Hill Co.	62	Whiteley Electrical Radio Co., Ltd.	30, 31
Electrical Instrument Repair Service, The	138	Northern Radio Services	123	White, L. (Croydon), Ltd.	181
Electrical Remote Control Co., Ltd.	159	Northern Polytechnic	172	Wilson, Ronald	187
Electro-Acoustic Developments	180	Oddie, Bradbury & Cull, Ltd.	189	Woden Transformers, Ltd.	62
Electro-Acoustic Industries, Ltd.	2	Osmer Radio Products, Ltd.	125	Woolleys Radio & Electrical Supplies	119
Electro-Methods, Ltd.	13, 26	Oxley Developments Co., Ltd.	182	Wright & Weaire, Ltd.	5
Electro-Winds, Ltd.	164	Painton & Co., Ltd.	44	Young, C. H.	171
Electronic Instruments (H'tons), Ltd.	164	Parmerko, Ltd.	51	Z. & I. Aero Services, Ltd.	135
Electronic Precision Equipment	108, 109, 110, 111	Parsonage, W. F. & Co., Ltd.	182		
Ellison Transformers, Ltd.	156	Parsons, C. A., & Co., Ltd.	112		
		Partridge Transformers, Ltd.	175		
		P.C.A. Radio	132		

Printed in Great Britain for the Publishers, LIFFE & SONS LTD., Dorset House, Stamford St., London, S.E.1, by CORNWALL PRESS LTD., Paris Garden, London, S.E.1
 Wireless World can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd., William Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co.



T.C.C.
PRINTED
CIRCUITS
Service

Emphasis on Leadership

It needs courage and imagination, backed by sound judgment, to be continually 'out in front' pioneering new developments. But this is how we at T.C.C. interpret the responsibility of Leadership.

Year by Year an increasing proportion of our resources is being devoted to Research and, in particular, to the evolution of new Condensers to satisfy the expanding requirements of the electronic industry.

Printed Circuitry—for which special T.C.C. Condensers are now available—is a major development offering manufacturers substantial savings in space, materials and labour.

We invite designers and engineers of Companies within the industry to make use of the experience gained by our technicians in the production of printed circuits for radio, television, and allied applications.

THE TELEGRAPH CONDENSER CO LTD

SPECIAL PRODUCTS DIVISION

North Acton • London W.3 • Telephone ACORN 0061

Soldering?

MULTICORE SOLDERS LTD.

THE FINEST SOLDERS AND ACCESSORIES

7 lb Reels

Ersin Multicore 5-core Solder is supplied on 7 lb. reels for factory use. It is approved by A.I.D., G.P.O., A.R.B., D.T.D. 599., R.C.S. 1000 and meets all pertinent U.S. Government specifications.



GAUGES

10, 12, 13, 14, 16 and 18 gauges are supplied on 1 lb. and 7 lb. reels. 19, 20 and 22 gauges are supplied on 1 lb. reels only.

ALLOYS

The following alloys are available: 60/40, 50/50, 45/55, 40/60, 30/70 and 20/80. Other alloys are supplied to special order.

FLUXES

The A.I.D. approved type 362 flux is supplied as standard in Ersin Multicore 5-core Solder, but an even faster flux (type 366) can be incorporated if desired. They are both Pentacol derivative fluxes and their residue is completely non-corrosive.

Special Alloys

T.C.L. (Tin / Lead / Cadmium) melting point 145°C.

L.M.P. (with 2% silver content) melting point 179°C.

P.T. (Pure Tin) melting point 232°C.

COMSOL (high melting point solder) melting point 296°C.

ULTRA FINE GAUGES



Ersin Multicore 5-core Solder is supplied on 1 lb. reels in gauges as fine as 22 s.w.g. and on 1/2 lb. reels in even gauges between 24 and 34 s.w.g.



SOLDER RINGS

Butt jointed solder rings 1/2"-2" dia. and 10-22 s.w.g. are made from Ersin and Arax Multicore Solder at no extra cost, for bulk quantities.

Printed Circuits

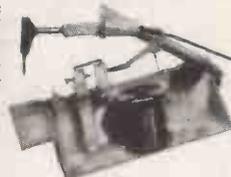
A complete process for the efficient soldering of printed circuits has been developed by Multicore Laboratories. Engineering staffs of electronic equipment manufacturers are invited to write on their firm's notepaper for Publication P.C.101.

SOLDER THERMOMETER

This simple form of pyrometer will enable users to determine quickly the temperature of solder on a soldering iron or in a solder bath. The instrument will measure temperatures up to 400°C. £6.12.6 retail.

AUTOMATIC SOLDERING HEAD

This machine feeds 1/32"-7/8" of 13 to 19 s.w.g. Multicore Solder each time the iron descends. Three models available.



Radio & T/V Service Engineers' 1 lb. Reel

This special economy pack for service engineers contains approximately 167 ft. of 18 s.w.g. 50/50 alloy Ersin Multicore 5-core Solder. 15/- each, retail.



Arax

MULTICORE SOLDER

Specially recommended for metal fabrication, this solder has a non-rosin flux. On 7lb. and 1lb. reels and 5/- cartons.



SIZE 1 CARTON

This handy pack, especially popular among service engineers and radio enthusiasts, contains Ersin Multicore Solder in 4 specifications.

5/- EACH RETAIL



Catalogue Ref. No.	Alloy Tin Lead	S.W.G.	App. length per carton
C 15014	60/40	14	21 feet
C 16018	60/40	18	55 feet
C 14013	40/60	13	19 feet
C 14016	40/60	16	38 feet



Tape SOLDER

Needs no soldering iron; melts with a match. Available on 3 1/2 lb. reels for factory use and on 1/- cards.

Bib WIRE STRIPPER & CUTTER

Strips insulation, cuts wire, splits plastic extruded twin flex. Adjustable to most wire thicknesses. 3/6 each, retail.



Bib RECORDING TAPE SPLICER



This sturdy splicer enables recording tape to be jointed quickly and accurately without breaks or 'clicks'. It incorporates many new detail refinements. 18/6 each, retail.

NEW! Home Constructors' 2/6 Pack

This new pack is just the right size for the home constructor. It contains 20 ft. of 18 s.w.g. 60/40 high tin content alloy Ersin Multicore Solder wound on a reel.



SEE US ON
STAND 63
National Radio Show
EARLS COURT
AUGUST 24 to SEPTEMBER 3