

British

R A D I O A N D

TELEVISION

Incorporating "The British Radio Maker and Exporter"

Vol. X No. 8

DECEMBER, 1955

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£1 a year post free

A Grundig Masterpiece



The

**'ARUNDEL' CONCERTGRAM
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RADIOGRAMS &



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GRAMOPHONE RECORDS

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WHAT's this! What's this! I don't get it. Oh *I* see—*wedding* reception! But surely that clot of an artist knew we were talking about radio sets not nuptial celebrations.

At any rate, we *were* talking about radio sets — though we went on to make the point that radio and television sets are only two of the vast range of electrical equipment for which Philips are world-famous.

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Model 7
Universal AVOMETER



AVO VALVE
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AVO
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AVO Wide Range
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Mrs. Chapman's busy day



MRS. CHAPMAN is a housewife. Her husband runs a prosperous and expanding firm of builders' merchants in a town not far from the Surrey-Hampshire border. They live with their two small sons in a large house on a wooded slope a few miles out.

Mrs. Chapman has plenty to do, even though she has her own small car in which to get around and a full-time man to look after the garden. The children want watching and there are the hundred and one chores that have to be done even in a modern labour-saving home. Besides, her husband is president of the local ratepayers' association, which means rather a lot of voluntary secretarial work for her in the evenings.

There was quite a stir in the village when she was chosen to represent Surrey in a national floral decoration contest, and a brand-new enthusiasm for 'Sunday-painting' has aroused great interest among her colleagues in the Women's Institute. Yes, she is indeed a busy woman.

Mrs. Chapman reads *The Listener*—chiefly for its reports of broadcasts on social problems, for the book reviews, and to keep in touch with the London art exhibitions; but she is always intrigued to discover how interested she becomes in an article about a foreign country or some industrial topic. Yet she is but one of thousands* who find that *The Listener* satisfies a need for stimulating and varied reading.

The Listener does have this unique influence among well-informed people, who in their turn enjoy considerable local prestige. Advertisers who wish to appeal directly and economically to a selective market of people of influence and discrimination will find no better medium than the advertisement columns of *The Listener*.

* Certified weekly net sales, January-June 1955, 139,752



The Listener

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four de-luxe instruments from the SUPERB **DECCA** R. & T. RANGE

**RG103**

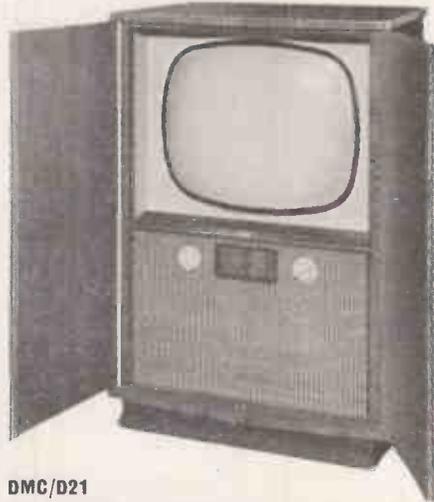
High fidelity 7-valve superheterodyne radiogramophone; VHF-FM tuning unit and Short, Medium and Long wavebands for AM reception; carefully designed amplifier with separate bass and treble controls; two speakers; Garrard RC111 3-speed auto-changer with turnover crystal pick-up; hopper-style storage compartment; walnut finished cabinet; AC only.
£87 (Tax paid)

**RG103**

De-luxe, 9-valve superheterodyne radiogramophone. VHF-FM and Short, Medium and Long wavebands; push-pull amplifier with separate bass and treble controls; two electrostatic and one 10 inch P.M. speakers; Garrard 3-speed auto-changer with Decca ffr interchangeable pick-up heads; elegant, hand-polished walnut-finished console with two record storage compartments; AC only.
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High quality console receiver with 17-inch tinted tube and pre-tuned VHF-FM radio unit; 18-valve superheterodyne circuit; 12-position turret tuning for all B.B.C. and I.T.A. transmissions, and with 5 spare channels; automatic anti-fade control; 10-inch P.M. speaker; cabinet finished in selected walnut and with doors; AC or DC.
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H. P. over 12, 18 or 24 months on all Decca instruments

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Band III Converters

The new commercial programmes are bringing a tremendous demand for Television adaptors, for which the following **OSRAM VALVES** are recommended . . .

Type	Description	Filament or Heater		Impedance ohms	Conductance mA/V	Anode Voltage max.	Screen Voltage max.	Base
		Volts	Amperes					
B319	R.F. double triode ...	7.0	0.3	4,000	6.0	250	—	B9A
LZ319	{ Triode pentode V.H.F. frequency changer } triode section pentode section	9.0	0.3	{ 4,000 — }	{ 5.0 6.0 }	{ 250 250 }	{ — 200 }	B9A
X719	Triode Heptode frequency changer ...	6.3	0.3	1,000,000	0.775	300	125	B9A
*Z77	R.F. sharp cut-off pentode	6.3	0.3	300,000	7.5	250	250	B7G
Z719	R.F. sharp cut-off pentode	6.3	0.3	400,000	7.4	300	300	B9A
*B309	Double triode	{ 6.3 12.6 }	{ 0.3 0.15 }	10,000	5.5	300	—	B9A
B719	R.F. double triode ...	6.3	0.435	9,700	5.9	300	—	B9A

*The popular circuit for the registered UNIVERTER was designed by IKOPATENTS around Osram Valves.

Data Sheets on all these Valves are obtainable from the Osram Valve and Electronics Dept.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, W.C.2

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3 new winners... IN RADIOGRAMS



THE "CHELTENHAM" FM/AM Model RG 357

Frontal controls, 3-speed with turnover pick-up. Fully equipped to receive the new Frequency Modulated sound transmissions and existing long, medium and short wavebands. Walnut-veneered cabinet, record storage space. A.C. mains, 200/250 volts. Size 32in. wide, 30in. high, 16in. deep.

62 gns



THE "WALDORF" Model RG 359

This superb F.M./A.M. Bureau type radiogram incorporates the latest refinements. The 4-wave, 7-valve (including tuning indicator) superheterodyne chassis is suitable for operation on A.C. mains, 200-250 volts, 50 cycles, while the negative feedback audio circuits, and 10in. loudspeaker ensure excellent tone response. The handsome walnut-veneered cabinet is 32in. high, 36in. wide and 15in. deep, and has two large record storage compartments. Latest Garrard type RC.110 3-speed, record changer, and turnover type crystal pick-up. For reception of F.M. V.H.F. band, and long, medium and short wavebands, with magic-eye tuning. Separate tone control, extension loudspeaker terminals, built-in aerial for F.M. reception.

75 1/2 gns



THE "ASTOR" RADIOGRAM Model RG 360

An elegant Bureau type radiogram with 3-wave, 5-valve superheterodyne chassis for operation on A.C. mains, 200-250 volts, 50 cycles. 10in. loudspeaker and negative feedback audio circuit, with separate tone control ensuring really good tone reproduction. Walnut-veneered cabinet 32in. high, 34in. wide and 15 1/2in. deep, with large record storage compartments. Collaro type RC.54 3-speed mixer record changer, with turnover crystal pick-up. For reception of long, medium and short wavebands, with magic-eye tuning indicator. Extension loudspeaker terminals.

62 gns



WILL SELL ON SIGHT AND SOUND

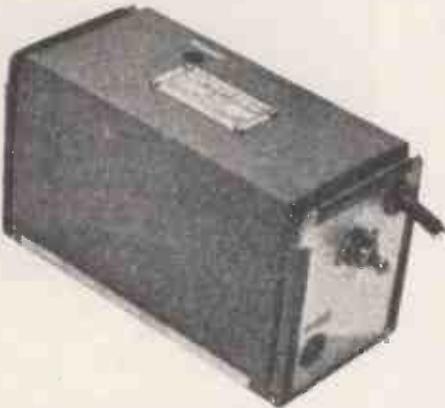
Showrooms and Sales Dept., 319/321 Euston Road, London N.W.1
 Head Office: Fitzroy Place, London, N.W.1
 Midland Depot: 103 Colleshill Street, Birmingham, 4
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BAND III Converters

are enjoying TREMENDOUS POPULARITY



The **Type 33** with switch unit for mounting on the front of or side of receiver providing 2 Band III stations and the usual Band I.

£10. 2. 6.

Price retail complete

The **Type 32**. 3 station selector switch



I.T.A. or B.B.C. reception readily selected and ensuring a neat installation.

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Price retail **£9. 10. 0.** complete

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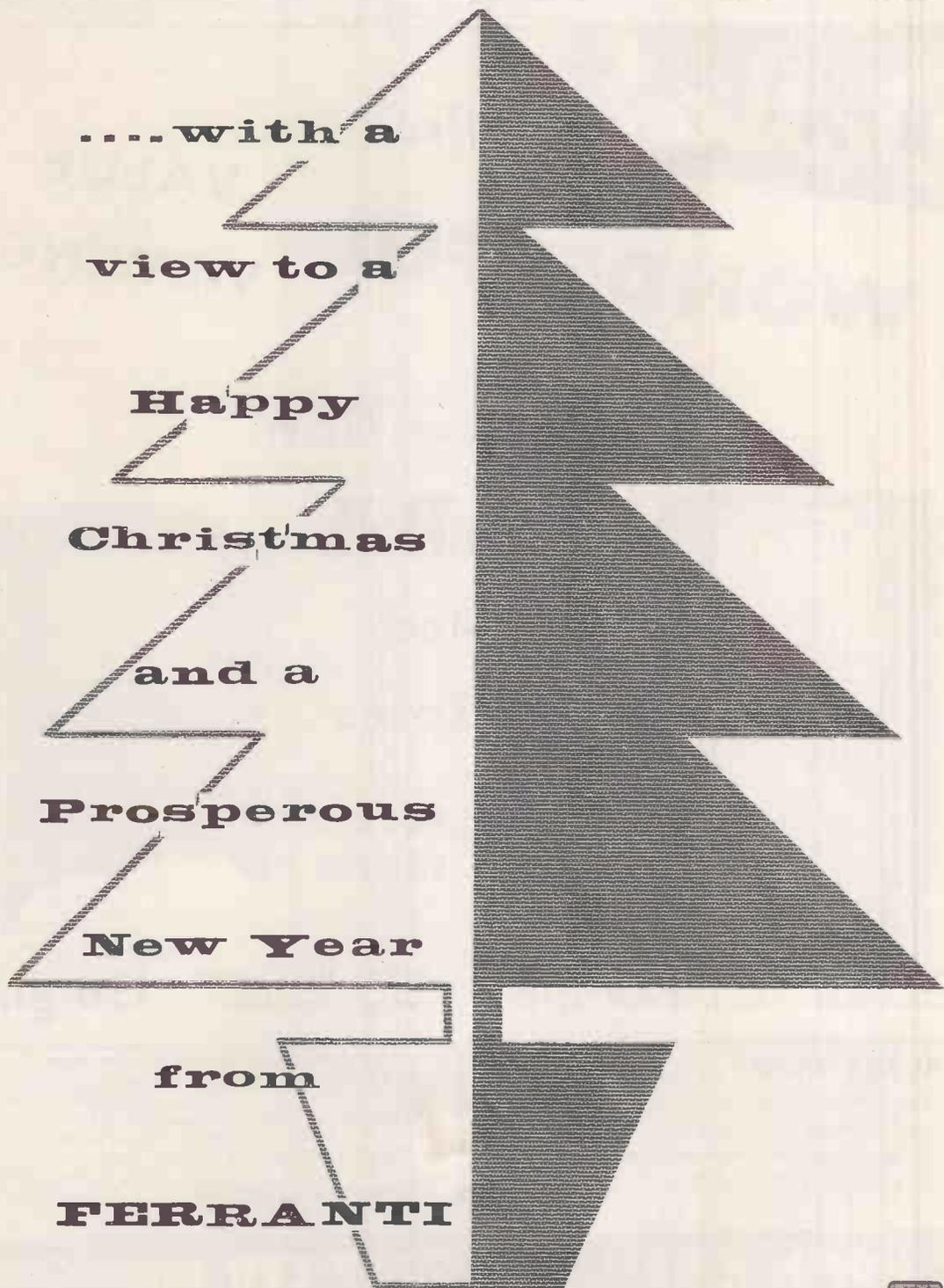
SAMPLE units will be sent on request. Please provide the name and address of your usual Wholesaler.

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QUAY WORKS, GT. YARMOUTH

Phones: 3009 and 4794

Grams: Spencer-West Gt. Yarmouth



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Christmas

and a

Prosperous

New Year

from

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ALBA Model T436
Console without doors.

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ALBA

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FROM STOCK



ALBA Model T536
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- ★ DALLAS B.V.A Valve List

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Phone: Great Yarmouth 2631
LUTON: 15 Stanley Street Phone: Luton 2275

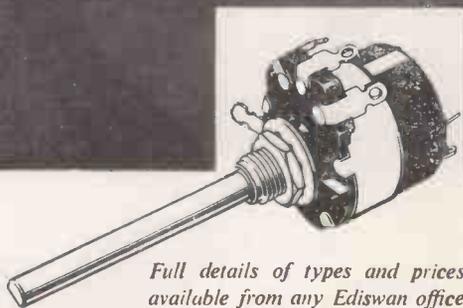
JOHN E. DALLAS & SONS LTD. Bishopsgate 9981
DALLAS BUILDING, CLIFTON ST. LONDON E.C.2.





Silent control

With a Morganite Potentiometer entertainment cannot be ruined by 'noises off' and volume interference—that is why it has the confidence of the entire industry. Its track of hard carbon film bonded to a heat resisting base has special terminations to prevent noise. The all-steel rotor head prevents pick-up from the switch and leads. Double clenched terminals give extra security and durability and a high quality switch completes this top grade, trouble-free radio component.



Full details of types and prices available from any Ediswan office and all reputable Wholesalers.

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Telephone: Gerrard 8660.

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

Telegrams: Ediswan Westcent, London

ADVANCE COMPONENTS LTD., MARLOWE ROAD, WALTHAMSTOW, LONDON, E.17

Telephone: LARKSwood 4366/7/8



The Advance type HI Audio Signal Generator completely covers the unusually wide range of 15 c/s to 50,000 c/s.

It is characterised by its extremely low distortion and level output over the entire range; provides both sine and square wave output. A robust, reliable and accurate instrument for the discriminating service engineer

- Accuracy $\pm 1\%$, ± 1 c/s. ● Distortion less than 1% at 1,000 c/s. ● Output from 200 microvolts to 20 volts with accuracy of ± 2 db. ● Weight 14 lb. ● Size $13\frac{1}{2}'' \times 10\frac{1}{2}'' \times 8''$

Full details in Folder B16 gladly sent on request.

THE ADVANCE TYPE HI

LIST PRICE
IN U.K.

£28

Advance
audio generator

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RECORDER
COMPONENTS
AND
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AMPLIFIER
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●
FOOT CONTROL
●
TELEPHONE ADAPTOR
●
MONOSET AND STETHOSET
HEADPHONES
●
CORNER DIFFUSION SPEAKER

TRUVOX LIMITED

TAPE DECK Mk 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.

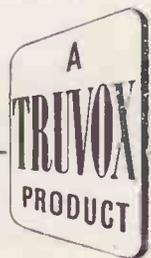
Details of complete recorders incorporating the TRUVOX Tape Deck are available on request.

The full range of Truvox Tape Recorder Components and Accessories is shown alongside—send for fully descriptive leaflets.

Sales Office: 15 Lyon Road, Harrow, Middx. Tel: Harrow 9282

Tech. & Service Dept.: 328 The Broadway, Station Road, Harrow, Middx. Tel: Harrow 4455

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'BELLING-LEE' Mast Adaptor Kits



These additions to our range of band III aerials were introduced to enable erectors to save time in conversion work. They avoid the necessity of taking down the old array, and altering it. They are mounted either directly on to the existing mast, or to the existing chimney bracket, according to the type used. A new low-loss cable is required for the new array.

Remember — every 'Belling-Lee' aerial is guaranteed and insured for three years. Remember, also, that we are the makers of more than half of Britain's aerials.

Band III aerials for fitting the existing 1½" or 2" dia. masts (complete with stacking clamp).

L 923/9/S1½	3-element high gain	...	£1 . 14 . 0
L 923/9/S2	3-element high gain	...	£1 . 14 . 0
L 904/8-9/S1½	6-element array	...	£2 . 10 . 6
L 904/8-9/S2	6-element array	...	£2 . 10 . 6
L 905/8/S2	9-element array	...	£3 . 10 . 6
L 905/9/S2	9-element array	...	£3 . 10 . 6

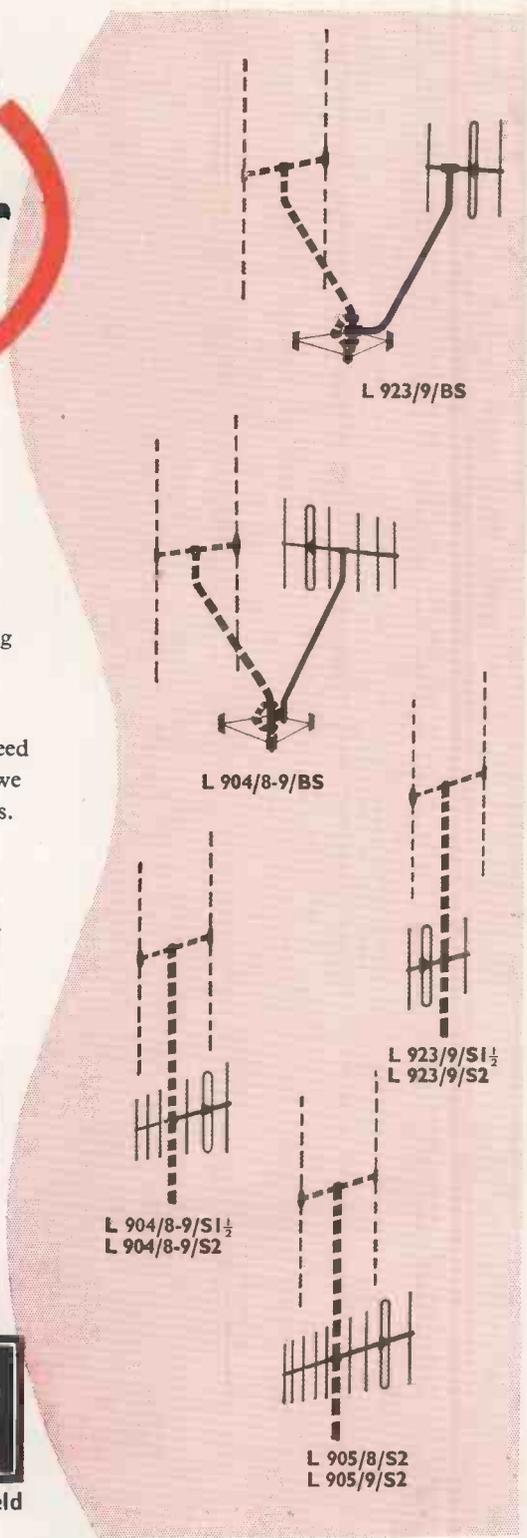
Band III aerials for fitting to existing masts between the jaws of the brackets (supplied with clamp).

L 923/9/BS	3-element high gain	...	£2 . 11 . 0
L 904/8-9/BS	6-element array	...	£3 . 7 . 6

BELLING & LEE LTD

GREAT CAMBRIDGE ROAD, ENFIELD, MIDDX., ENGLAND

Telephone: Enfield 3322 • Telegrams: Radiobel, Enfield



Better Value - Better Viewing

by *Beethoven*



91 GNS.
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B.94c. 16" Console Model.
Size: Width 20",
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Maintaining unassailable standards these three models typify the famous Beethoven reputation for design, construction and mechanical efficiency.



81 GNS.
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B.94. 17" Table Model.
Size: Width 20",
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B.95. 14" Table Model.
Size: Width 17",
Depth 18½",
Height 17".



70 GNS.
inc. P. Tax.

- Band I and III stations reception.
- Fitted 12-Channel Turret Tuner.
- Automatic Anti-fade Control on vision and sound.
- Flywheel synchronisation.
- Automatic Interference suppression.
- Cabinets beautifully finished in High Burnished Veneers.



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"Vision and Sound of Classical Quality"

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"Babygram"

"THE LITTLE CHAP WITH
THE LOUD CLEAR VOICE"



LOW IN PRICE
TOP IN QUALITY

£12 . 2 . 6 Inc. Tax

The Latest Release
Mixer Autochange Model
19 Gns. Inc. Tax

- ★ 2 VALVE HIGH GAIN AMPLIFIER.
- ★ 3 SPEED B.S.R. MOTOR.
- ★ 7" x 4" ELLIPTICAL LOUDSPEAKER.
- ★ TONE AND VOLUME CONTROLS.
- ★ STRONG LAMINATED TWO TONE ASSORTED COLOURS I.C.I. REXINE COVERED CABINET 12" x 10½" x 5½". WEIGHT 8½ lbs.

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MACAULAY 2246/7

British RADIO AND TELEVISION

Incorporating "The British Radio-Maker and Exporter"

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COMMERCIAL

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-there's no alternative

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No fanfares—no trumpets—just a simple truth. By sheer merit of quality, performance and reliability, Pye 13 Channel TV has won its way into the hearts and homes of hundreds of thousands of people throughout the country. Picture for picture—pound for pound—it is still Britain's finest value in TV today. Display it—demonstrate it—give it all you've got—and share its undeniable success.



P Y E L I M I T E D O F C A M B R I D G E

The Season's Greetings . . . to all in or connected with the Radio Trade and Industry from the Directors, Editorial and Advertising Staff of British Radio and Television

Tele-opinion

The First Ten Weeks

TEN WEEKS AGO Commercial Television came to the south of England and changed the pattern of British broadcasting. New programmes, new prospects, new problems—and new pressure on dealer, who is the man fundamentally responsible for getting the new TV into the homes of the viewing public.

Already it seems as if Commercial TV has been with us for a long time—ten months rather than ten weeks, and dealers in the Croydon reception area have done a good job in record time. Although the pressure on London area dealers has not diminished in any way, the spotlight is now turning towards the Midlands, scheduled to receive ITV in February of next year.

Last month the two programme contractors for the Midlands, ABC and ATV, launched an extensive conversion-sales campaign to persuade the public to convert early. The response is expected to be heavy, for Midlands viewers are not buying an unknown quantity. The quality and variety of Commercial TV programmes have received favourable comment everywhere, and this additional factor will act as a spur to viewers to have their sets converted.

Dealers in the Midlands are going to have a very busy Christmas and an even busier New Year. *They should make sure that their sales and service departments are geared to cope with the coming demand.*

Purchase Tax

THE recent increase in purchase tax is not likely to produce much of a dent (if any) in the retail sales graph of radio and television sets. Its influence is swamped by the more effective buying brake applied by the hire purchase credit squeeze. Nevertheless it is good to see that many manufacturers—quite independently and spontaneously—have decided to absorb the tax increase by reducing the list price of their products.

In this era of booming TV and keen competition, every small gesture de-

signed to make the dealers job of selling a little easier is welcome. It demonstrates that the industry is vigorous and flexible—and continually on its toes.

R.I.C. Dinner

SIR EDWARD APPLETON made his first appearance as president of the Radio Industry Council when he presided at the annual dinner at the Dorchester Hotel last month. He introduced the guest of honour, Sir Walter Monckton, Q.C., M.P., the Minister of Labour, who proposed the toast "The

Radio Industry." The reply was by G. Darnley Smith, chairman, R.I.C.

New Look Again

LAST year in December we announced that *B.R.T.* would have a "new look" in the New Year, and, in fact, we introduced several changes in style—notably the introduction of *James Huxley's Service Department*—which were well received by our readers.

This year we are again able to announce a "new look," and the January issue will embody further improvements and ideas designed to give greater service to readers.

So watch out for the next issue of *B.R.T.*—and if your subscription has expired, renew it without delay. *At £1 a year "B.R.T." is the best buy in trade journalism!*



W. F. Howard and Sons, of 10 Boundary Road, Ramsgate, have arranged an attractive display of Ferguson Nine Star Television Receivers in their showroom, each model being linked to a star by a ribbon, the display being completed by Ferguson showcards. The new Ferguson glass window pelmets are also to be seen in the photograph.

ROUND-UP OF THE MONTH'S NEWS AND VIEWS

R.I.C. Premiums for Technical Writing

DETAILS OF THE
1955 CONTEST

NON-PROFESSIONAL writers of technical articles dealing with radio and electronics, including specialised applications to any industry, and the editors responsible, are reminded in a leaflet issued by the Radio Industrial Council of its premium award scheme, now in its fourth year and nearing the time for judging.

Up to six premiums of 25 guineas each are offered yearly in respect of articles which, in the opinion of the Council's panel of judges, are likely to enhance the reputation of Great Britain in radio, television and electronics.

The 19 awards so far made have happened to be mostly for articles in radio and electronic journals, but it is pointed out in the leaflet that many industries are increasingly using electronic methods of control and production and articles in the journals serving a wide variety of industries are eligible provided they can be bought by the public on bookstalls or by subscription. Industries specifically concerned are the motor, aircraft, metal-working, wood-working, and food industries, with wide uses also in hospitals, clinics and research establishments.

An innovation now announced is that one of the six premiums will be open for articles published in manufacturers' own journals with an overseas circulation, provided they also can be bought by the public. Articles in privately published journals of professional bodies are not eligible.

Object of the scheme is to encourage a greater flow of articles from within industry, but any writer is eligible provided he is not paid wholly or

mainly for writing and is not earning more than 25 per cent of his income from fees for articles or book royalties.

The judges, headed by Professor H. E. M. Barlow, Professor of Electrical Engineering, University College, London, believe that an article, to have maximum impact, should have a non-technical introduction setting out the aims and applications of the techniques described, and if possible economic advantages, the object being to interest executives and administrators as well as scientists and engineers. Value of the article in making known British achievement, originality of subject, technical interest and presentation and clarity are the criteria.

To enter, copies of the journal or pages have to be sent before the end of the year to the Secretary, Radio Industry Council, 59 Russell Square, London, W.C.1, with a written declaration that the writer is eligible.

New Company for Plessey Enterprise

DETAILS have just been released by the Plessey Group concerning the formation of a new company which is to control the establishment and development of a number of new Plessey enterprises in Great Britain. It is to be called The Plessey Development Company, Ltd.

In recent years the Plessey Group has played an active part in the field of Anglo-American trade co-operation and a number of agreements with leading American manufacturers are now in operation and further projects are in an advanced stage of negotiation. In many cases, it is planned that the American companies will be engaged in active collaboration with Plessey, particularly on the marketing side.

The Plessey Development Co., Ltd., is being staffed with a number of senior engineering and production personnel specially engaged for the purpose, together with certain Plessey personnel who have been seconded to the new organisation.

The functions of this new company are probably unique in British industry as it is, in fact, an administrative unit designed to provide and blend American abilities in design and production with the Plessey Group's extensive production capacity. It is anticipated that the new company will also operate this technique in reverse and that through its services the Plessey Group will develop its own manufacturing potential in overseas markets.

Directors of The Plessey Development Co., Ltd., are A. G. Clark, who is chairman and managing director, and E. J. Earnshaw and A. E. Underwood.

SHOW DATES — 1956

The Radio Show
Earls Court, London, from August 22 to September 1, with a preview for overseas guests on August 21.

The Components Show
Private exhibition of the R.E.C.M.F. Grosvenor House, London, W.1, from April 10 to 12, with a preview for overseas guests on the afternoon of April 9.

BREMA MONTHLY SURVEY

The Ups and Downs of September Trade

SALES during September appear to have been affected by two opposing forces. During the early part of the month sales in all groups continued to be depressed as the result of the hire-purchase restrictions imposed in July, while towards the end of the month sales of products in the higher price groups (radiograms and television) were stimulated as the result of the rumours of a possible increase in purchase tax.

The depressing effect of the hire purchase regulations was first noted in the August sales figures. Normally sales in September are considerably in excess of August, but in fact the figures for radio (79,000 sets) show that sales were only up 8 per cent on the previous month.

So far as television sets were concerned, the violent public reaction to the purchase tax scare, coupled with the strong interest created in television by the opening of the alternative television service offset the early shortfall, and at the end of the month sales stood at 138,000 in comparison with 64,000 in August, an increase of 116 per cent.

Likewise radiogram sales rose from 11,000 to 19,000—a rise of 73 per cent. Compared with experience in recent years these sales of radiograms and television receivers in September are not abnormally high; television sales were lower than for last September.

For the first nine months (January-September) of 1955, radio receiver sales (at 756,000) are 2 per cent lower than last year, while radiogram sales (179,000) are 2 per cent up. Television sales (744,000) have increased by 12 per cent.



Stage, screen, radio and TV comedian Tommy Trinder opened the new premises of B.B.S. (Radio), Ltd., at Kettering last month. This is the company's fourth branch. To publicise the opening a competition was held for the prize of a £75 TV set—members of the public were asked to guess the number of valves in a box. Picture shows Tommy Trinder with H. Sturgess (centre), director of B.B.S. (Radio), Ltd., Mr. Crabb (manager of the Lyric, Wellingborough), and R. J. Buckby (manager of the Corny branch of B.B.S.) after the official opening of the new premises.

FOR ALL IN THE TRADE AND THE INDUSTRY

Radio Exports Booming!

NEW record export figures of British radio equipment for 1955 are almost assured. September exports of radio equipment of all kinds, provisionally valued at nearly £2,890,000 (£250,000 more than in September, 1954), brought the total for the first nine months of the year to nearly £23,800,000.

If the monthly average value (over £2,600,000) is maintained for the remaining three months of the year, the 1955 exports will be in the region of £31,750,000, compared with nearly £30,000,000 for 1954, itself a record year.

O.K. FOR SOUND

Outstanding feature of the exports this year has been the continued rise in the demand for sound reproducing equipment—including public address amplifiers, microphones, loudspeakers, record players and changers, gramophones with electrical reproduction, tape recorders and tapes.

Exports in September, worth more than £534,000, were the highest yet (exceeding those for May last by £30,000). They brought the total for the year to more than £4,000,000—and to more than the value for the whole of 1954 (£3,700,000, the previous highest level).



MULLARD, LTD., recently held their hundredth dealer film meeting at Caxton Hall, London. Since 1953 the company have been organising film meetings for dealers at the invitation of and in co-operation with trade associations, institutions, and radio and television societies. The chair at this meeting was taken by H. A. Curtis, director and secretary of the R.T.R.A. who, incidentally, addressed the first meeting, which was also held at Caxton Hall. Principal speaker was T. E. Goldup, C.B.E., M.I.E.E., a director of Mullard (pictured above). The Mullard film meetings are designed to provide a means of bridging the gap between the dealer and the manufacturer. From their inception they were acclaimed as a success. By February, 1955, the total attendance had passed the 10,000 mark.



One of the first sales meetings organised by Webcor (Great Britain), Ltd., in the provinces to introduce their forthcoming lines to the British market was held at F. K. Smith, Ltd., Liverpool, recently. Picture shows Webcor's general sales manager H. E. G. Harvey (extreme right) demonstrating one of the models to the F. K. Smith, Ltd.'s salesmen.

Webcor launch big sales campaign

A BIG campaign to herald their "fonographs" on the British market, featuring the use of direct mail, has been launched by Webcor (Great Britain), Ltd. A full colour broadsheet, giving details of the three Webcor models available to the British public, together with an extensive review of Webcor's American background is the spearhead of the attack. Two issues are being sent direct to all retailers, and the second issue will contain the full list of Webcor-appointed wholesalers.

The broadsheets will coincide with extensive trade press advertising. Window bills and descriptive leaflets for each model will be available to retailer stockists, and inside each unit will be a fact card, to enable retailers' staffs to be familiar with the special features, and when placed in a prominent position on the instrument will act as a silent salesman to the public.

National and Provincial Press advertising commences on December 5, and includes a half-page space in the *London Evening News* on December 7 and in the *Daily Express* on December 12. Reprints of this advertisement will be sent out to all retailers before publication, suitably captioned for display purposes. The advertisements will be couponed and enquiries passed on to wholesalers and retailers in the areas concerned.

Webcor's general manager, Noel Mackay, and general sales manager, H. E. G. Harvey, are at present meeting wholesalers' representatives throughout the country and already several wholesalers have arranged dealer demonstrations in their own areas.

New retail prices of the Webcor range of record players are: *Lark*, 19 gns.; *Holiday*, 30 gns.; *Musicale*, 45 gns.

R.C.A. Photophone Expansion

A NEW modern factory and administrative centre has been built at Sunbury-on-Thames, Middlesex, to house the works and head offices of R.C.A. Photophone who were formerly located at Shepherds Bush, London.

The new floor area of 66,000 sq. ft. has been necessitated by R.C.A.'s decision to enter the field of consumer products as typified by their recently announced new Orthophonic high-fidelity reproducing equipment for the home. Increases in R.C.A.'s cinema sound equipment business, important U.S. Navy off-shore procurement contracts, television studio and other equipment and British Government contracts have, likewise, necessitated the acquisition of these new commodious premises.

Commencing with the combination of a pre-amplifier and power amplifier of attractive design, with high quality of sound reproduction, R.C.A. are preparing an extension of this high-

fidelity series to enable music lovers to standardise on complete R.C.A. lines.

Full address of the new premises is: Lincoln Way, Windmill Road, Sunbury-on-Thames, Middlesex. Telephone: Sunbury-on-Thames 3101.

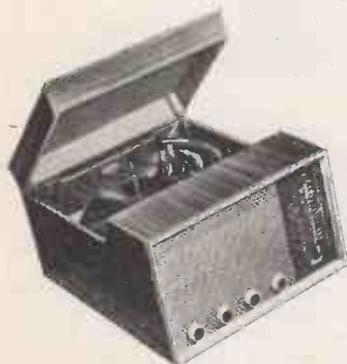
PHENOMENAL!

PHENOMENAL sales figures are reported by the Classic Electrical Co., Ltd., well known radio, TV and hi-fi dealers of Croydon, Surrey. Sales for September and October exceeded £12,000 per month, and for the period July-October were 50 per cent up on last year.

J. H. Kendall, managing director of the company, attributes part of the boom to the advent of Commercial TV and the threat of the Budget, but he believes that November and December sales will be on the same scale, making a record year's trading.

Marconiphone Dealers are having

A CRACKING GOOD SEASON!



AM/FM TABLE RADIOGRAM

Model TARG44A. 3-waveband,
3-speed with auto-change.

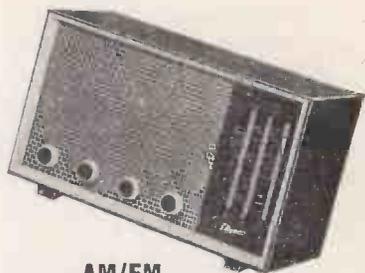
45 gns. (Tax Paid)



MODEL VT68DA

Table Receiver designed for the reception of both BBC/ITA programmes. Incorporating 14" Emiscope aluminised tube. Cabinet finished in walnut veneers.

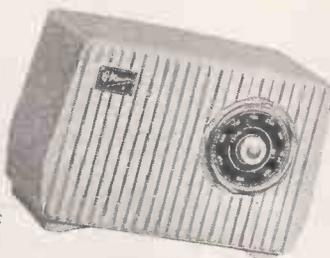
69½ gns. (Tax Paid)



AM/FM

Model T42A 6-valve, 3-waveband table receiver—attractively designed and highly efficient.

£28. 15. 0d. (Tax Paid)



COMPANION

4-valve Model T43DA Trans-portable receiver. Well-styled in cream plastic. For AM reception only.

14 gns. (Tax Paid)



MODEL T36AB

5-valve AC mains/battery portable in grey imitation lizard skin.

£19. 7. 6d (Tax Paid)
(without batteries)

WITH

MARCONIPHONE

The First and Greatest Name in Radio

NEWS ROUND-UP CONTINUED

IMPERIAL PRODUCTS

A NEW company, Continental Radio and Electronics, Ltd., has been set up by the Jason Finance Co., Ltd., of Blenheim House, Blenheim Grove, Peckham, London, S.E.15, for the purpose of dealing with the products of Continental-Rundfunk, G.m.b.H., of Stassfurt, Germany. The products comprise the *Diktat* office dictating machine and the *Imperial* range of radios and radiograms.

The new company are at present negotiating for premises near Ludgate Circus, London, E.C.4. They announce that they are prepared to receive preliminary enquiries from the trade at the temporary address in Peckham. The general manager is D. G. Gow.

Preliminary arrangements have already been made for the manufacture of the *Imperial* range of instruments in the U.K.

PYE in FRANCE

PYE, LTD., announce the formation of a French subsidiary company, to be known as Pye (France) S.A. The French company will be primarily engaged in the active introduction into the French market of the entire range of Pye Telecommunications products.

RONDEN DRG948

RONDEN MANUFACTURING CO., LTD., announce that the Model number of their DRG948 has been changed to ARG490.



The Ever Ready Co. (Great Britain), Ltd., have now taken delivery of the latest addition to their transport fleet. This is the E.R.F. 7/8 ton delivery van, on a 44G chassis, powered by a Gardner Diesel Engine. The floor of the van has been especially adapted for roller conveyors. The motif, *Ever Ready Batteries—For Life*, is displayed on the rear panel. The sides of the van display the Ever Ready sign in black and orange accompanied by the words *Batteries For Life* in bold lettering.



New Components Firm doubles floor space

NOW under construction at Enfield, Middlesex, is a new large extension to the factory of Atlas Process Components, Ltd., a radio components manufacturing company who started business last April and are already reaching capacity on existing production lines. Picture shows the old and new buildings in Alexandra Road, Enfield.

The new premises will be completed and in use by February of next year, giving a total of 11,000 sq. ft. of floor area. Principal products of the company will be components for radio, television, and electronics, and small electrical assemblies.

Managing director of the new company is A. F. Woolsey. Other key personnel include D. D. Mathieson, F.C.A. (director), and Peter J. Garrini (general sales manager). Mr. Garrini is well known in radio industry circles.

The company have applied for membership of the R.E.C.M.F.

Among the products at present being manufactured are a range of low-power wire-wound silicone coated precision resistors, a range of high-power wire-wound silicone coated resistors, a new ceramic insulated coaxial resistor wire-wound on a fibreglass core, and carbon-track potentiometers of the preset type in ranges of 500 ohms to 10 megohms (linear) and 5,000 ohms to 5 megohms (log.).

STOLEN SET

A PORTOGRAM *Junior Eight* record player fitted with a Collaro 3-speed autochanger was stolen from a car parked at The Crescent, Surbiton, Surrey, on Friday evening, October 21. The case was finished in blue rexine, and the serial number is believed to be either 4620 or 4624. Dealers are asked to watch out for this instrument, and, if identified, inform the manufacturers: Portogram Radio Electrical Industries, Ltd., Preil Works, St. Rule Street, London, S.W.8. Telephone: Macaulay 2246-7.

Antiference Lectures

ANTIFERENCE, LTD., are planning to give a series of Band III lectures to the trade during January, 1956. To obviate any possible difficulties of weather and transport, the lectures are to be held in Birmingham, Coventry, Leicester and Stoke-on-Trent, so that dealers and engineers can attend with the minimum of trouble. Further details will be sent to Antiference distributors in the Midlands, and dealers are advised to watch for a further announcement regarding the venue and invitations.

AVO Trade Agreement

A NEW trading arrangement is announced between the Automatic Coil Winder & Electrical Equipment Co., Ltd., and Blume & Redecker of Hanover. The effect of the new agreement is that the Automatic Coil Winder & Electrical Equipment Co., Ltd., have taken over sales of the German manufacturer's laminating, wire stripping and coil winding equipment for the United Kingdom and Commonwealth markets, as well as for China, Japan, Argentina, Russia and Russian satellite countries.

COSSOR IN GUERNSEY

A. C. COSSOR, LTD., recently held a small two-day exhibition on the island of Guernsey. During the morning this was reserved for the trade and from 2.30 p.m. to 9 p.m. the public were admitted.

A full range of Cossor sets was available and also many servicing instruments. The attendance from trade and public was excellent.

MONARCH AUTOMATIC RECORD CHANGER

Such has been the demand for this outstanding changer that leading makers of high fidelity radiograms and players the world over now install it as standard equipment. In quality, value, reliability and performance the Monarch is unsurpassed.

Make the most of B.S.R. national advertising by stocking sets incorporating the Monarch.



First choice of record lovers everywhere

REGENT H.F. 100 SINGLE RECORD PLAYER

Built to the same high standard as the Monarch, the new Regent H.F.100 plays single records of all speeds and sizes. It is essentially a high fidelity unit and has been specially designed to replace older type units in existing modern radiograms.

Display this superb unit and capture a larger share of the increasing sales of replacement gramophone units.



BIRMINGHAM SOUND REPRODUCERS LTD., OLD HILL, STAFFS.



E. K. Cole, chairman and managing director of E. K. Cole Ltd., recently presented long-service awards to 14 members of E. K. Cole Ltd. to commemorate their 25 years with the company. The presentation was made in the Ekco Club-house, Southend-on-Sea, and this photograph shows the recipients with Mr. Cole. Left to right: R. F. J. Lingwood (wireless mechanic), S. E. Parr (pattern and instrument maker), Miss P. M. Durrant (development engineer), A. E. King (production engineer), J. E. Dowson (personnel dept.), R. L. Clarke (executive engineer), R. S. Lamb (radio sales representative), L. J. A. Gibbs (radio sales representative), E. K. Cole (chairman and managing director), A. Tyrer (development engineer), C. E. J. Spraggs (senior progress chaser), M. A. K. Price (typist), L. C. Robinson (millwright), C. J. N. Peters (storekeeper), and H. H. Hill (transport manager).

After 46 years with G.E.C., Ltd., A. E. POTTON has now retired at the age of 64. He joined the head office in 1909 when it was at Queen Victoria Street. For the past 20 years he has been responsible for the section of the radio department which deals with batteries and torches.

S. J. WHITFIELD is now radio and TV representative for Philips Electrical, Ltd., in Kent (excluding the metropolitan area), East Sussex, and part of



★
S. J. Whitfield,
Radio and TV
Representative,
Philips Electrical,
Ltd.

Surrey. He was formerly at head office in the sales and distribution department. His predecessor, R. B. ORMAN, has taken up an appointment with the Philips London and Home Counties regional office.

The telephone number of W. G. ROBERTSON, representative of the Ferguson Radio Division of Thorn Electrical Industries, has been altered to: Lark Lane 5446. His address, 240 Aigburth Road, Liverpool, 17, remains unchanged.

Newly appointed distribution manager of the Ferguson division of Thorn Electrical Industries, Ltd. is GEORGE TYLER, who now assumes full respon-



★
George Tyler,
Distribution
Manager,
Ferguson Radio
Corporation



sibility for national distribution and control of depot stocks. Mr. Tyler has been associated with Ferguson since he joined the Thorn organisation in 1948.

New address of E. H. WILDING, Mullard valve sales department representative for the north-east England area, is: "Longhurst," Leyland Mill Lane, Wigan, Lancs.

Twenty-five members of the staff of Bakelite, Ltd., recently met to pay tribute to H. V. POTTER, their managing director, on his retirement. At the ceremony, which took place at a private luncheon in London, Mr. Foster was presented with a silver salver, paid for by contributions from the company's 3,000 employees, and an illuminated album of signatures. G. W. HODDS, who succeeds as managing director, said that Mr. Potter had been with the company and its predecessors for more than 40 years, and he had been making synthetic resins long before the generic term "plastics" was adopted.



Picture shows H. V. Potter (right) being presented with an illuminated album of signatures by C. C. Last, a director of Bakelite Ltd., at a private luncheon given to mark his retirement as managing director of the company.

As a result of recent expansion, Cleminson's Agencies, Ltd., who represent manufacturers throughout the country, have taken on two representatives. A. V. LAKE will cover a territory comprising Hampshire, Kent, London,



A. V. Lake D. I. Wiggans

Oxford, Surrey and Sussex, and in addition will call on wholesalers in certain parts of North London. D. I. WIGGANS will act as area manager in the Midland counties of Derbyshire, Leicestershire, Northants, Notts, Staffs., Warwickshire and Worcestershire.

★
W. A. Maynard,
Assistant Sales
Manager,
Grundig (G.B.)
Ltd.



★
W. A. MAYNARD, who joined Grundig (Great Britain), Ltd. in 1953, has now been appointed assistant sales manager. Formerly he was with Philips Electrical, Ltd.

R. A. HENDERSON and J. L. E. SMITH have joined the board of The Solartron Electronic Group, Ltd.

P. S. ROBERTS, field representative of Berec (Great Britain), Ltd. (Ever Ready's export organisation), left London a few weeks ago on a tour covering Aden, Ethiopia, Eritrea and the Sudan and is expected to return to the U.K. on December 6.

STOCK THIS

Stella

A CHRISTMAS SELLER

THE NEW AM/FM RADIOGRAM (ST 308A)

7 valves; internal ferroceptor for AM; dipole for FM; 10" dual cone loudspeaker; AC mains 200/250v.
Retail price: 83 guineas (tax paid)

You've only to display it to get people interested. To bring them to the brink of a sale, demonstrate it: let them hear its magnificent tone and interference-free reception. Then, to clinch the sale, point out such features as the Philips 3-speed automatic record-changer with press-button operation; the two Philips sapphire stylus pick-up heads; and round off your sales story with Stella's wonderful value — 83 guineas can't buy many sets like this nowadays! In view of the popular demand for this set — Order from your Wholesaler right away!

Stella**THE IDEAL COMPANION**

STELLA RADIO & TELEVISION CO. LTD.,
OXFORD HOUSE, 9-15 OXFORD STREET, W.1.

GERRARD 2655
(SR148A)

Transatlantic View ★ by Michael Lorant

World's First "Solar" Radio

SUN-POWERED RADIO (PICTURED AT RIGHT) IS THE LATEST NOVELTY IN THE U.S.A.

THE American Admiral Corporation has recently developed an experimental transistor radio that derives its power from the sun, requires no tubes or replaceable batteries, and which conceivably could last a lifetime without repair.

The new solar receiver resembles a conventional table radio, contains volume and station selector knobs, and a loudspeaker. On one end is a control knob for turning the radio on or off and changing it from solar operation to a flashlight-size standby battery which can be re-charged by the sun's rays. The standby cell is capable of continuous operation for 50 hours without re-charging.

The seven-cell solar power source is contained in a plastic strip mounted on top of the cabinet. The solar battery can also be activated equally well by a heat lamp or by an ordinary 100-watt household bulb.

Using eight transistors in place of tubes, the new radio has the same sensitivity as an average home radio. Cloudy days would create no problem in providing power. The turn of a knob cuts in the set's standby battery, which can be re-charged by the solar cells merely by turning the same knob to "Charge Battery" and exposing the radio to the sun.

An improved type of "solar cell," which should be available within a year, will automatically cut in the standby battery when voltage from sun power drops to a predetermined level.

Eventually, using trouble-free printed circuits, the chassis of the solar-powered transistor radio could be sealed in a one-piece plastic cabinet and conceivably be given a lifetime guarantee.

Monaural Delay

MONAURAL delay, a system in which a sound is received by one ear 0.06 second before it reaches the other ear, is claimed to produce better hearing. Tests conducted by Ohio State University's Speech and Hearing Clinic showed that radio messages received under noisy conditions were 22 per cent clearer when they were heard by one ear before the other.



The delayed signal sounded "louder, fuller and farther away." The delay was produced with a tape recording device that split the signal fed to headphones.

The reason monaural delay produces better hearing is not clearly understood. However, Ohio State University scientists state that the 0.06-second delay, which gives the best results, corresponds with estimates of the time required for the discharge of a signal from the auditory nerve.

New Colour Tube

A NEW colour TV tube now in the U.S. General Electric laboratories combines advantages and eliminates disadvantages of existing types. The tube has vertical colour stripes on the screen, ahead of a vertical grill which

acts as an electron-optical mask or lens and permits 90 per cent of the beam to reach the screen (a shadow-mask tube passes only 15 per cent of the beam).

An in-line three-gun assembly halves the number of convergence controls and eliminates switching and gating difficulties of the one-gun tube. G-E hope to get the tube into production in about a year.

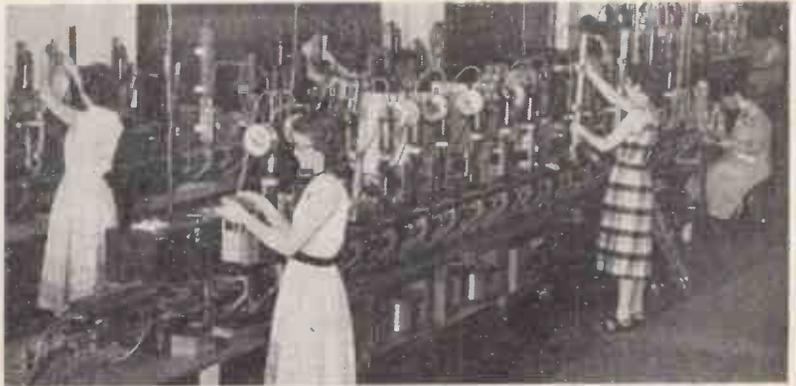
Automation TV

THE American Admiral Corporation in their latest 1956 television receivers have eliminated over 400 hand-soldered connections by the use of printed circuits and automation.

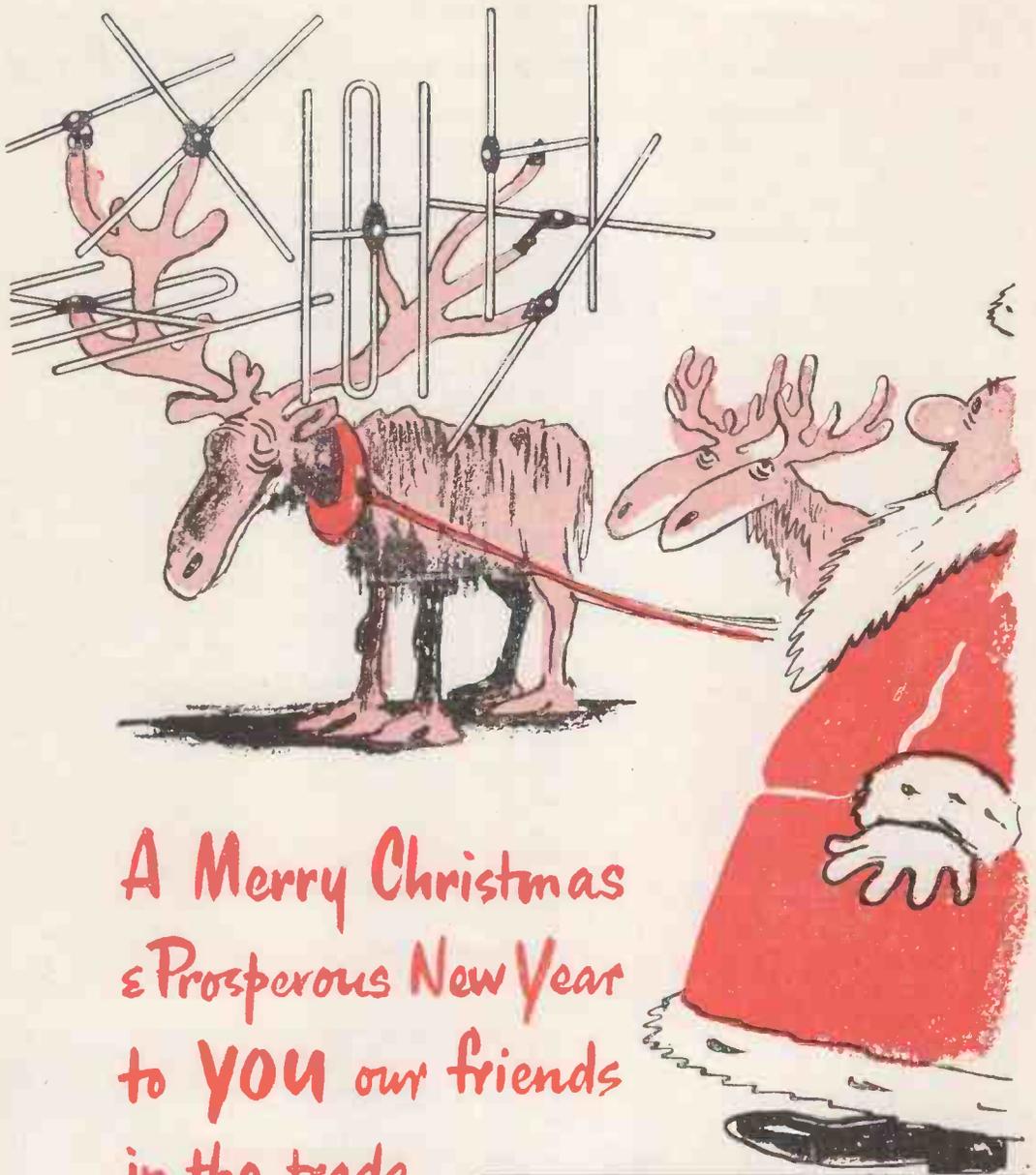
The "super-cascade" chassis of the new receivers contains three printed circuit sections. After assembly by automation, each section is dipped briefly in solder to accomplish in a split second what formerly required several hundred individual connections with hand soldering irons.

A total of 231 electrical components are mounted on the printed circuit sections. Over 70 per cent of these components are inserted by automation on the automatic assembly machines. The three printed panels contain 13 tubes and represent from 75 to 80 per cent of all the circuitry.

Increased use of printed circuitry and automatic assembly machines assures uniform quality in television production. Circuits are simple and trouble-free, with greater resistance to vibration and jarring, as well as to extremes of temperature and humidity.



This is part of the automation line for television assembly now being used by the Admiral Corporation in the U.S.A. Seventy per cent of the components on printed circuit sub-assemblies are mounted by automation devices.



A Merry Christmas
& Prosperous New Year
to YOU our friends
in the trade

ANTIFERRENCE
LIMITED

RADIO AND TELEVISION AERIALS

BICESTER ROAD, AYLESBURY, BUCKS

Tel: AYLESBURY 1467/8/9

and

ANTIFERRENCE, TORONTO, CANADA · ANTIFERRENCE, SYDNEY, AUSTRALIA

display topics

"Point of Sale" Displays

MANUFACTURERS' ADVERTISING CAN BE A VITAL FACTOR IN THE RETAIL SHOP

THE most valuable site at which a product can be advertised is the "point-of-sale." A customer can be tempted by press advertising, enticed by cinema and television films, but it is in the shop that he actually makes up his mind. For sales a manufacturer must back up other publicity with adequate "point-of-sale" displays.

There are many firms, including of course my own company, who specialise in the design and manufacture of "point-of-sale" work.

This is not as simple as it sounds. The variety of the work is so wide that we are equipped to use cardboard, papers, metallic foils, plastics, glass, wood, steel, aluminium—almost anything that one cares to name.

One object with a successful display is to outshine the competitor; but while a 10ft. display with flashing lights and rotating panels will certainly catch a customer's eye and help sales, it is necessary to be practical about design. Remember that a shopkeeper is normally under no obligation to display advertising material in his shop. A display which detracts from other lines he is trying to sell will not qualify for the valuable space in his shop.

The showcard

The most popular display is the showcard, and this has progressed a long way from the simple card of the 1900's. Showcards now appear embossed, in 3-D, with high-gloss washable surfaces—litho, letterpress or silk-screen printed in any number of colours—



CLEARLY . . . this one word gives the essence of this simple but hard-selling showcard produced by Acme Showcard and Sign Co., Ltd., for Ferranti. It measures 9½ in. x 6½ in. and is silk-screened in two colours on a brilliant red background. The replaceable "screen" panel is in fluorescent green on matt black.

by

R. Rainham

(ACME SHOWCARD AND SIGN CO. LTD.)

with a metallic, velvet or fluorescent finish.

As well as the orthodox rectangle they can be cut out to almost any shape and combined with plastic window sheeting for original effect.

Self-service units

With the electrical and radio world, self-service is not gaining such rapid ground as with other retail trades, for obvious reasons. For many years however, torch, battery, and general accessories have been sold by this useful method of counter display.

A self-service unit is, usually, a series of shelves on which the product will neatly stand and can be easily withdrawn by the customer for inspection and purchase. A bright name-plate or sales message should be incorporated. With larger items, such as radio and TV sets, self-service is less obvious, but the same principle is involved with new millboard plinths on which a set can stand at a good height to allow a potential customer to examine it at his leisure.

Gramophone records—delicate items which no shopkeeper likes customers to browse through recklessly—are a natural for self-service, and most companies are now packing them well enough to avoid damage.

Dozens of display types

There are literally dozens of other types of "point-of-sale" material which can be used: posters, cash-mats, door mats, window transfers, pelmets, banners, metal wall plaques, plastic models, paper bags—and so on *ad infinitum*.



ESSENTIALLY SIMPLE . . . this large display card (2ft. high by 19in. wide) produced by the Acme Showcard and Sign Co., Ltd., for Pye is silk-screened in four colours and has a high-gloss porcelain finish for maximum eye-appeal.

Most of them are simple—but there is often a breakout to try and discover something new and original. Perhaps it is because of this that the full potentialities of light and movement are being exploited.

Illuminated signs

Light attracts: It brings emphasis and beauty which help a display achieve its object. In its many different applications the light can be of any type—incandescent, fluorescent, or ultra violet.

The simplest type of illuminated sign is the box sign made of cardboard. The front face carries the sales message, part of which is cut out and a thin plastic window inserted. This adds emphasis and also diffuses direct light. Current consumption is low with normally about 25 watts.

More complicated signs, for outside or permanent positions, can be made of metal and glass. The design is fired into the glass with ceramic paints eliminating damage by scratching. The light needed will naturally depend on the size of the unit and its site. Further additions can be made with "flashers" or revolving drums, worked by hot air rising, or simple motors.

Ultra violet lights are the most fascinating type of night window display. When shone on fluorescent paint the display takes on an intriguing glow that is sure to attract.

CHRISTMAS DISPLAY NOTES

by Victor Sutton

WHAT makes us look into a shop window? Invariably it is the display idea that happens to catch the eye. At this time of the year a wide range of eye-catching novelties designed to tie in with topical Christmas appeal are available. They should be used, but not over-used. Too much Christmas atmosphere can be as bad as too little. Christmas display novelties should be points of attraction which lead the eye to the articles of merchandise on show. They should not steal all the attention.

Here are some Christmas display items available from Church and Co. Ltd. A picturesque and colourful clown in papier mache, with movable base, 32in. high and arms spread out to 26in. so that he can hold a sales promotion card or unit. A Father Christmas on skis, 30in. high, who can be suspended, if desired, on nylon thread. A range of grotesque clown's heads in flexible latex measuring 12in x 12in.—again suitable for suspension. A latex "Snow Family" in sizes from 8in. upwards, including the snowman, his wife, and snow children.

How often do we see a good window, and one containing several hundreds of pounds worth of radio and television receivers, spoiled because the window base is unattractive? A modern idea which is gaining ground is to use a felt base. A suitable material is "Meadowfelt," available in 50 colours in rolls 54in. wide. This can be fitted as ordinary carpet and will last for years.

Point of Sale Displays—continued

Movement

The same fascination of movement found when watching a stream is also present with displays. A simple motor—run at a cost of a few coppers a week from a torch battery—can give vital animation to a display. Even simpler is the use of hot air rising from a bulb, sufficient to turn a small fan or rotating drum.

Apart from these electrical powers there are natural sources such as wind. The mobile showcard, made of light card and delicately balanced with cotton to hang from the ceiling, and also the

Christmas display demands a good background. It may well be, however, that the shop has some out-of-date fittings and other structures which are difficult to move. The best idea is to blot it all out with corrugated cardboard which can be obtained in 12-yard rolls 6ft. 6in. wide. Display firms can supply suitable corrugated cardboard in a wide variety of colours with as many as five different kinds of flutes and ribs. And, of course, the material can be used in other ways, for pillars, pelmets, etc.

Dignity combined with gaiety (the two are not incompatible) should be the keynote of the Christmas window. An ideal background drape material is "Milano Drape." This is available in 36in.-wide rolls, white only, and is, incidentally, widely used in TV studios.

Another attractive material particularly suitable for the window background is "Satinglow"—a fluorescent material in magenta, green, blue or yellow, costing 12s. 6d. per yard. But plan the background so that it doesn't compete with the goods on show!

Special Christmas window pelmets are available from display firms, some embodying a traditional red and robust town crier theme instead of the rather overworked Father Christmas.

Finally—try white and green as a background colour scheme for your window. It can be very attractive, and the Christmas display novelties, which usually embody a large amount of red, show up to advantage.

weathercock type of outside display both operate in the breeze.

They must be good

The great variety in types of "point of-sale" display is illustrated by the many assorted materials used in their manufacture. But no matter how much is spent on the displays and how well they are distributed, they will be of no avail unless the initial design and execution pleases both the customer—and the shopkeeper!

The design of "point-of-sale" is no amateur's business, but a highly-skilled job which needs years of experience.

Transatlantic View

continued

Tube Saver

A NEW device, called "Tube-Saver" that prolongs life of tubes by protecting filaments and cathodes from destructive high-power surges, has been developed by the American "Wuerth Enterprises." The unit is designed to operate with any television or electronic equipment drawing between 150 and 400 watts.

The deterioration of tube filaments and cathodes is claimed to be slowed by use of the new device to an average of 26.8 per cent of normal.

Meltback Process

RESEARCH scientists of the American General Electric Research Laboratory have recently developed an improved transistor that can be used in television, radar, shortwave radio, and other electronic devices where high-frequency requirements have previously required bulkier vacuum tubes.

Transistors made by the new method, called "Meltback" process, can operate efficiently at frequencies five times higher than ordinary transistors, and at these high frequencies the new transistors show improved power-amplification characteristics.

In previous processes, crystals were formed from a pool of molten metal, and the layers created by cycling the rate of growth. Scientists have been faced with the problem of keeping materials in different layers from contaminating each other during the 20 minutes it takes the molten mass to solidify and cool to room temperature. This has meant thicker separating layers than are desirable for high-frequency use.

In the new process, the cooling time is greatly shortened, there is less intermixing between layers, and the layers therefore can be thinner.

"Meltback" transistors are claimed to have improved "gain" characteristics. Amplification of current with ordinary transistors usually is about 50 times. With the new technique, current gains of several hundred are typical.

The Electronics Division of the American General Electric Company at Syracuse, N.Y., revealed late last year that it was tooling up for mass production of low-cost transistors. Productions of "millions of units per year" is expected before the end of 1956.

Pye Telecommunications announce a NEW TWO-WAY RADIO EQUIPMENT

Demonstrations of a new equipment, designed in Cambridge, have been given in London recently to representatives of Police and Fire Services, Local Authorities and Industrial Organisations. This equipment has been designed to defeat the chronic shortage of two-way radio channels.

Known as the Pye "Ranger", it is the solution to the frequency shortage which is ham-stringing mobile radio users in Great Britain!

The new equipment operates on a channel spacing of only 25 Kc/s—a quarter of the customary spacing—thus potentially quadrupling the number of mobile radio channels. Robust construction, excellent performance and carefully selected components make it capable of operating under arduous conditions and in any weather.

This mobile radio is designed for fitting in the dashboard of ordinary cars and vehicles. The price of the equipment, notwithstanding its many-times improved specification, is approximately the same as that of earlier equipments which it now replaces.

Please write for full details



Telecommunications

CAMBRIDGE

ENGLAND



PYE TELECOMMUNICATIONS LTD., NEWMARKET ROAD, CAMBRIDGE · TELEPHONE: TEVERSHAM 8131



An A-R TV television camera focuses on one of the Mullard ultrasonic demonstrations during rehearsals for *The Scientist Replies* programme on Commercial TV last month. The machine is drilling a square hole in a piece of glass.

RADIO AND TELEVISION DIGEST

★ *Topicalities from Everywhere* ★

A "flat" TV picture tube, only a few inches thick, is being developed by Hoffman Electronics in America. An experimental model uses two guns and a special screen having red and green phosphors. A three-gun tube is in preparation.

Australia's first TV company, known as the Television Corporation, Ltd., are shortly to issue shares. The company is backed by Consolidated Press, Sydney, in which Associated Newspapers of London have an interest.

Figures quoted by the Radio Industry Council show that the Lichfield (I.T.A.) coverage is 85 per cent. of the Sutton Coldfield (B.B.C.) coverage in terms of licences, and 88 per cent in terms of population.

Radio Luxembourg are spending £150,000 on a plan to operate three powerful transmitters as one, operating from Marnach, to guarantee perfect reception throughout Britain and Ireland. This is part of Luxembourg's answer to the threat of I.T.V.

A demonstration of improved reception by v.h.f. techniques was staged in the Music Hall, Aberdeen, to show the prospects for this area early next year when a v.h.f. f.m. service will start.

On sale in time for Christmas in the U.S.A.—the first wrist-radio powered by three transistors. Price, £8 18s.

A recommendation that free TV versus fee-TV be made an issue by candidates in the 1956 U.S. presidential election was presented by General Sarnoff, chairman of R.C.A., recently.

Large new premises have been opened in Sauchiehall Street, Glasgow, by Harvie and Henderson, Ltd., the south-side radio and TV retailers.

The South-Western Gas Board at Bristol is equipping 27 of its vans with radio-telephone equipment to speed up the emergency repairs service. The system will enable headquarters to keep in touch with repair vans and direct them to districts where urgent work is called for.

A contract worth more than a quarter million pounds has been awarded to Marconi's Wireless Telegraph Co., Ltd., for the complete radar and communications equipment for two new Chilean destroyers, now building.

A Philips "Music Maid" clock radio was one of the prizes presented by Michael Miles in the commercial TV quiz programme "Take Your Pick" last month.

Voters in a recent *London Evening Standard* competition showed unpopularity in this order: Wilfred Pickles, Richard Dimbleby, Philip Harben, Gilbert Harding, "Gran" of the Grove Family, and Malcolm Muggeridge.

Representatives of manufacturers, the G.P.O. and the Central Electricity Board are said to be investigating the problem of certain types of television sets which cause street lights to black out.

The London County Council have provided a £120 TV set at Cumberland Lodge remand home to replace film shows. This saves them £230 a year.

Sir Robert Fraser, director-general of the I.T.A., recently stated that Independent Television would have upwards of 20 stations in the hands of 20 different programme companies by 1958.



At the Mullard Service Department, Waddon, Surrey, a new system has been devised for handling valve returns from the trade for replacement. Centred on the moving belt shown in the picture, the system has resulted in increased efficiency and improved service.

The Americans are using a system called "Datavision" to send still pictures of, say, cheque signatures from bank head offices to branches. A flying spot scanner is employed, and the range is 15 miles over phone wires. Camera and receiver cost £750.

The South of Scotland Electricity Board is staging an Electronics Conference in Glasgow and then in Edinburgh in February next year to bring data on electronic engineering applications to the smaller industrial firms in those areas.

Cossor held an exhibition of their radio and TV models at St. Peter Port, Guernsey, following the opening of the Les Platons TV transmitter in the Channel Islands.

Jays Furnishing Stores in Glasgow have opened a new premises in Argyle street covering radio and television. It was opened by TV celebrity Eunice Gayson.

Winter favourite in Dublin bookie's shops are television sets. A number have installed sets unobtrusively so that their clientele can view big races. Hundreds of others are waiting for possible police reaction.

Transatlantic TV is now possible. A cable giving simultaneous reception of programmes on both sides of the Atlantic could be laid, but it would be ten years before it was economic.

A voice believed to belong to a TV studio technician was clearly heard to say, "I don't know what the b..... hell he wants me to do," during a recent commercial TV breakdown.

During the first three weeks of Commercial TV, advertisers spent £400,000 in return for 700 advertisements lasting 440 minutes. At that rate £7 million will be spent annually in London alone.

British Insulated Calender's Cables are negotiating for a licence for the U.K. for a Swedish soil treatment process which, it is claimed, improves the conductivity of an earth electrode to earth.

Hawick, in Scotland, is to get a wired TV service this month. Relay Systems (Hawick), Ltd., will provide a 14in. wired set at 8s. 9d. per week. Owners of existing sets can have their pictures wired at a cost of 2s. per week.



James Huxley's SERVICE DEPARTMENT

No. 12

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Servicing Modern Autochangers

Part I.

by V. D. CAPEL

THE advent of the multi-play stylus, and microgroove and extended play records, has brought increasing popularity to the gramophone record as a means of home entertainment. This is demonstrated by the fact that more than 300,000 radiograms were sold last year apart from hundreds of thousands of playing decks and similar units. The majority of this equipment has included an automatic record changer, which means that an ever-increasing flow of autochangers will be passing through the service department for repair in time to come.

Autochangers, being mainly mechanical, are a vastly different proposition from radio and television receivers when it comes to servicing. They have their own faults and peculiarities and because of the complexity of modern changers and the many functions they are required to perform, troubleshooting can be a considerable headache.

With electronic equipment, voltage, current and resistance readings can be taken and compared and circuits isolated and analysed; with autochangers, however, at the end of the record everything springs rapidly into action at the same time, leaving the engineer scratching his head and wondering which part was responsible for the fault.

An important thing to remember is that just as with a TV² receiver, there are certain separate and distinct functions or operations which are performed, each being carried out by certain components. One would not look for a fault in the speed-changing mechanism if the pick-up did not drop in the right place, just as one would not look in the sound i.f. circuits for an e.h.t. fault.

It is necessary then, to have a clear idea of the various functions of the autochanger, how they are carried out in the particular make under inspection, and the particular components which are responsible for those functions. It is thus possible to narrow down the fault to just three or four basic parts.

Changer Functions

The various functions of a modern autochanger may be summarised as follows: First, the pick-up must be made to move from its rest onto the record. Second, the pick-up must be made to lift from the run-out grooves of the record and move back on to its rest. To do this, movement in two

planes is necessary—vertical and lateral.

Third, there must be some way of starting the cycle of operations at the beginning, stopping them while the record is actually playing, and starting the changing cycle at the conclusion of the record.

Fourth, the changer must switch itself off after the last record has been played.

In addition to the above, which relate to starting, stopping and pick-up movement, there are certain other essential functions.

Fifth, the dropping position of the pick-up must be automatically altered to accommodate the particular size of record to be played.

Sixth, the next record must be deposited on the turntable ready for playing.

A seventh operation is the selecting of the appropriate speed, but this is normally accomplished by a manual control, as is the selection of the correct stylus.

We will therefore proceed to analyse each of these essential functions, and see exactly how they are accomplished in some of the more popular models of well-known manufacturers.

The Cam-Gear

In any automechanism, the various movements are originated and synchronised by what may be termed the "brain" of the equipment. This usually takes the form of a gear wheel with cams, grooves with irregular contours, hills and dales, actuating rods and other means for producing the necessary movement.

These varied devices are made to strike, push, trip or otherwise move levers and links mounted in such a position to engage with their appropriate actuating part on the gear wheel or associated cams. Although all part of the one gear wheel (which

henceforth we will term the cam-gear), each of these actuating devices controls one of the separate essential functions.

Normally, the cam-gear is made to revolve once for each set of movements (the starting and setting down of the pick-up, or, the finishing and returning of the pick-up to its rest); but some, like the E.M.I. changer, revolve only once for a complete cycle (from the start of one record to the start of the next). The cam gears of several models are shown in the diagram, indicating the purpose of the various actuating devices.

Pick-up Motion

Referring to our list of essential functions, the first two were vertical and lateral movement of the pick-up. This is produced in many and varied ways by different makers.

In the B.S.R. Monarch autochanger both movements are produced by circular projection on the cam gear. This is offset from the centre of the cam gear, and when it rotates eccentrically, moves a sliding carriage along its carriageway. This carriage is linked to the pick-up base assembly thereby imparting lateral motion. Additionally the carriage operates a U-shaped wire crank which pushes a vertical rod in the pick-up mounting lifting the pick-up from its normal position.

The lateral and vertical movements in the Garrard RC111 are produced separately. There are two separate cams on the cam-gear; the smallest (at the front) is the vertical movement cam. This moves a boomerang shaped lever pivoted in the centre, the other end of which pulls a long connecting link which pushes the vertical rod in the pick-up mounting via a pivoted "L" lever.

Lateral movement is controlled by the larger cam behind the smaller. This moves a lever which is engaged against the pick-up base assembly, moving both it and the pick-up horizontally. The lateral movement cam is situated behind the gear wheel itself in the RC75.

The Collaro 3RC511 uses an irregular groove in the cam gear to provide both vertical and lateral movement. This groove actuates a sliding arm which has two sloping raised edges at its other end. These edges ride over two fixed rollers, thereby causing the

end of the arm to rise as it is pulled by the cam-gear groove.

This in turn pushes up the vertical pick-up rod, giving the necessary vertical movement. A small lever is pivoted on to the sliding arm and imparts lateral movement to the pick-up base assembly via a crank arrangement.

The pick-up moving system in the Plessey autochanger is extremely simple but none the less effective. The cam-gear is so mounted that its edge travels directly beneath the pick-up base. The necessary movements are imparted to the pick-up as directly as possible, cutting out the use of many connecting links.

The vertical movement is brought about by a circular groove in the cam gear of varying depth. The pick-up vertical push rod engages directly into this groove, movement being produced by the varying depressions. The irregular inner cam engages directly to the pick-up base assembly, thereby bringing about the horizontal motion.

The E.M.I. autochanger uses a rather more complicated system. The means of producing the vertical movement is fairly straightforward. A lever pivoted in the middle has a roller at one end. This bears against the face of the cam-gear (in this case not a

gear-wheel as the drive is via a rubber-tyred edge), and the other end is engaged against the pick-up vertical rod.

The vertical movement is produced by the roller following a depression in the cam-gear face. The lateral motion is controlled by two actuating bars on the cam-gear, one controlling the moving in at the start of the record, and the other controlling the return movement at the finish. For the moving in, a bar at the rear of the cam moves a first lever, pivoted at its extreme end, outwards.

A second lever fixed to the pick-up base assembly is pulled in by the first lever, thereby moving the pick-up in.

The return movement after the record is played, is operated by a rod at the front of the cam. This same rod also controls the spindle record dropping mechanism. The rod pushes against a third lever, the other end of which engages to the second lever.

As this third lever is pivoted in the middle instead of at the end as was the case with the first lever, the direction of motion is the reverse of that produced by the first lever, hence the pick-up is moved outward to its rest.

Changing Cycle

The third essential function listed was starting the changer cycle, stopping

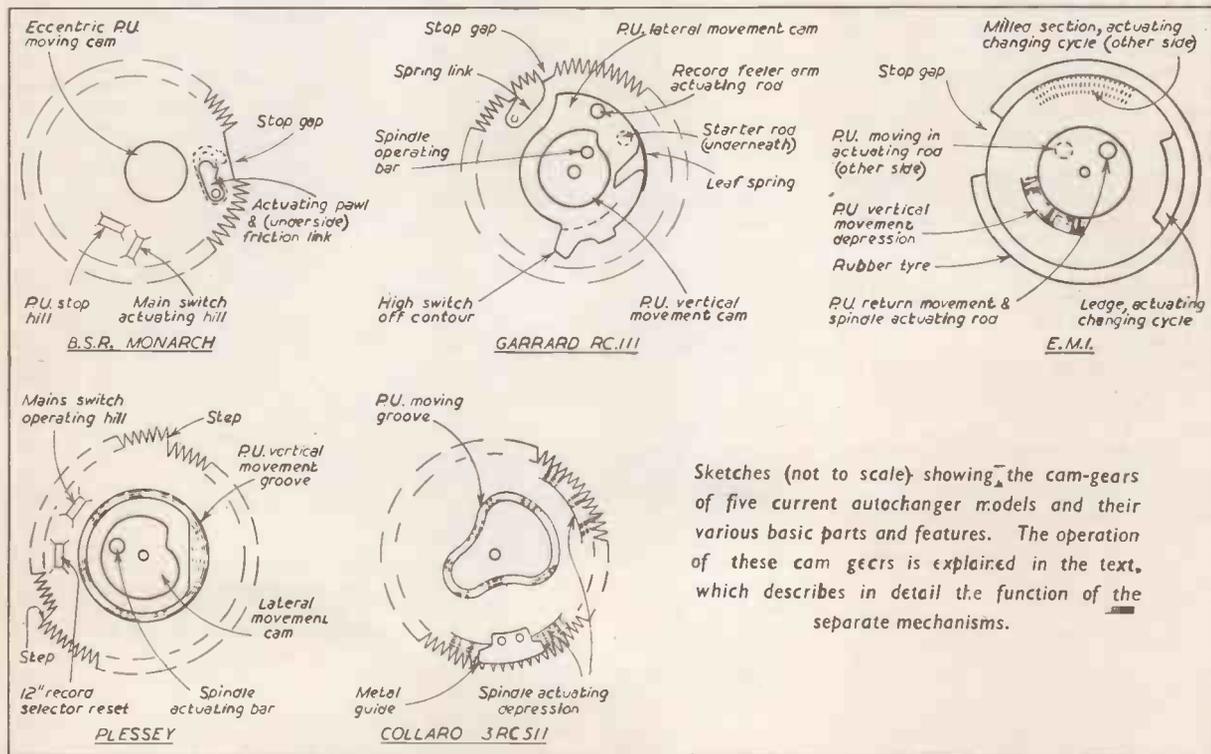
it while the record is being played, and recommencing it to effect a change at the end of the record.

Many different means are employed by various makers. The Monarch cam-gear is driven by the cogged turntable hub. It stops after one complete revolution owing to a gap in the engaging teeth train. An engaging pawl with a friction link is pivoted on the cam gear near the gap.

To start the cycle, this pawl and link is pushed outward to engage with spline on turntable hub, by a lever engaged with the starting control (which also operates the mains switch to the motor). This turns the cam-gear sufficiently to start the tooth train in the turntable cogs. The lever is also actuated by the pick-up base assembly, so that at the end of the record, the run-out grooves cause the pawl to engage, starting the changing operation.

Movement of the pick-up in the record playing grooves is absorbed by the friction link, thereby preventing changing before the record is finished. When the cam-gear revolves, the pawl and link are pushed back to their original position by a stationary flat spring.

The Garrard RC111 also utilises a gap in the engaging teeth train to prevent more than one revolution. Starting and changing is accomplished by the cam-gear being pushed around



Sketches (not to scale) showing the cam-gears of five current autochanger models and their various basic parts and features. The operation of these cam gears is explained in the text, which describes in detail the function of the separate mechanisms.

to enable its teeth chain to engage, by a sprung lever pushing against a bar situated behind the larger cam. This lever is normally held off by a catch lever, but when this is moved by the starting control, the sprung lever is released, and starts the cam-gear moving.

The changing operation is initiated by a device similar to an ordinary auto-brake. A lever is moved toward the turntable hub by the pick-up movement across the record, and via a friction clutch to prevent premature changing. This lever (which is situated on top of the motor plate), when it reaches the hub is jerked upward by a small cam. The impulse is communicated to the catch lever by a bent trip rod, through the motor plate.

The drive on the Collaro 3RC511 reaches the cam-gear by a rather devious route. It proceeds from the motor to the turntable rim, to an intermediate rubber tyred wheel, to intermediate gears, to cam-gear. The intermediate wheel is mounted on a lever sprung against the turntable rim.

When playing a record, or at rest, the lever is held away by a catch lever. This is disengaged by the starting control, releasing the wheel to engage with the rim. A similar system engages an intermediate wheel between the turntable rim and the motor, the lever supporting which also operating the mains switch.

The changing cycle is triggered by a trip lever which is moved toward the turntable hub via a friction clutch by movement of the pick-up arm. When tripped by the turntable, it pushes away the catch lever releasing the intermediate wheel to engage with the turntable rim.

The Plessey cam-gear has a tooth chain which is stepped in two places. The drive is from a cogged turntable hub via an intermediate gear-wheel. This is mounted on a lever which is sprung to engage against the hub. This lever is held away by a catch lever while at rest, thereby disengaging the intermediate wheel. Pressing the starting button moves the catch lever, freeing the sprung lever and allowing the intermediate wheel to engage.

When a step is reached the intermediate gear has been pushed out by the increasing diameter of the cam-gear, so that the sprung lever again locks with the catch lever. This prevents the intermediate running down over the step, hence the cam-gear becomes disengaged.

The first step is reached when a record has started, the second, when the pick-up has returned to its rest. The changing cycle is initiated by a ratchet. The pick-up base assembly plate has a milled edge which is in contact with a

ratchet on the catch lever.

Movement of the pick-up to the centre of the record has no effect, as the ratchet only engages on outward movement. Hence it is on the backward motion of the run-out groove that the ratchet engages, moving the catch lever and disengaging the intermediate wheel. This system ensures that premature changing cannot happen while the pick-up is in the playing grooves.

Drive from a milled brass turntable bush to a rubber-tyred cam-wheel with a stop gap in the tyre is a feature of the E.M.I. changer. The starting control causes a lever with an end pawl to engage with a ledge on the cam-wheel, pushing it around until the start of the tyre engages with the milled bush.

The mains switch consists of two leaf contacts mounted beneath the pick-up rest. The weight of the pick-up depresses a spring loaded spindle in the rest and holds the contacts apart. The starting control lifts the spindle and pick-up, allowing the contacts to close.

As the pick-up moves inward, a lever fixed to the pick-up base assembly engages with a ledge on the cam-wheel, moving it around slightly and bringing the start of the tyre nearer the driving bush. Another lever also fixed to the pick-up base assembly, moves a ratchet over a milled section at the rear of the cam-wheel.

When the pick-up is moved outwards, the ratchet engages, and moves the cam-wheel around. Thus inward or outward movement of the pick-up produces movement of the cam-wheel. Hence after a few oscillations in the run out grooves, the cam-wheel is moved sufficiently to enable the tyre to engage.

The fourth essential function is to switch off after the last record has been played.

This is controlled in the Monarch by the record steadying arm. While there are records on the spindle the arm is held up, but it drops with the last record. The arm spindle pushes a pivoted L-shaped lever, which pulls a steel wire connecting link, which in turn pulls one arm of a T-shaped lever.

Another arm of this lever is pivoted to allow it to be raised vertically by another lever which is actuated by an elevation on the cam-gear. Normally this arm just rises and falls during changing, but when the last record has fallen and the "T" lever is moved laterally, this arm engages with a spring-loaded vertical rod, and pushes it into the path of the pick-up base plate assembly, preventing the pick-up from moving in on the record again.

The third arm of the "T" lever pulls

a sliding trip bar into the path of another elevation on the cam-gear. When it is struck by this, it operates the toggle mechanism of the mains switch, switching off the supply current.

With the Garrard RC111, a record feeler arm is made to swing across the top of the turntable, via a connecting lever and crank by an actuating rod on the cam-gear. If no obstruction is encountered (when the last record has fallen) the connecting lever pushes a catch lever forward to engage with the lever controlling the pick-up lateral movement.

This prevents it following the deep contours of its cam, thus preventing the pick-up from moving in on the record again. Instead, it follows the high contours, which cause it to move a trip link that operates the mains switch. An actuating rod on the cam; disengages the catch lever to free the horizontal control lever on the next cycle.

Behind the main cam on the cam-gear of the Collaro 3RC511 is a small cam which actuates a rod that projects up through the motor plate. This rod is fixed to a sprung sliding lever under the turntable, which, by a system of catch levers, can release both motor and cam-gear drive intermediate wheels, also the mains switch.

The sliding lever is normally held by a rod projecting back through the motor plate and a slotted catch lever. When the final record has dropped, the record steadying arm drops, operating a pivoted lever which holds off the slotted catch lever thereby allowing the sprung sliding lever to switch off and disengage the intermediate wheels.

When the last record has dropped on the Plessey autochanger, the record steadying arm is released and swings away. A flat on the bottom end of the arm spindle pulls a sliding lever back as it turns. This pulls a pivoted lever into the path of an elevation on the cam, which, when it is struck by it, switches off the mains switch and prevents the intermediate wheel from riding over the step in the cam-gear tooth chain.

The E.M.I. changer has a flap which steadies the unplayed records. When the last record drops, so does the flap, which then rests its weight on a vertical spindle in the flap mounting. After this record has been played and the pick-up moved away, an actuating rod on the rear of the cam-gear moves a sliding lever which releases the vertical rod.

This is pushed down under the weight of the flap and lifts the lever controlling the pick-up inward movement away from the cam-gear. Thus the pick-up is prevented from moving in and drops on its rest, which breaks the mains switch contacts.

Band III Aerials

by S. R. Kharbanda,
A.M.Brit.I.R.E., Assoc. I.E.E

Part I—Design of two-band aerials

THE desirability of using a well designed television receiving aerial cannot be over-emphasised except in those instances where the set is operated under saturation signal conditions. No matter how well designed the receiver may be, the entertainment value will be low if an inadequate signal is fed into it. The problem becomes more acute than ever on Band III because at frequencies as high as 200 Mc/s the signal may well suffer more attenuation over the transmission path, and a stronger input to the receiver will be needed to yield the same signal to interference ratio as that obtained on Band I.

A great number of high-gain directional arrays have been developed over the past 30 years but, unfortunately, only a selected few are suitable for TV reception mainly due to reasons of cost, size, weight, appearance, etc. Most of the successful designs suitable for the general public is based on the Yagi array or combinations of Yagi arrays.

Basic Design

The Yagi is so well known that a description is superfluous. Nevertheless there is a good deal of "know-how" in its design and the dimensions of some Yagi aerials would seem to suggest that not all designers are fully informed on the subject.

For example, carefully controlled experiments show that for a given boom length there is an optimum number of elements for maximum gain. Increasing the number of elements beyond this optimum does not yield improved performance; indeed, the radiation resistance falls to such a low value that impedance matching by simple and inexpensive means becomes particularly elusive and consequently, feeder losses increase substantially.



Fig. 1: A cross-over network box, to couple two aerial inputs together to provide a common input to the receiver

In the first of two articles the author, who is a member of the Television Society and Technical Director of Labgear (Cambridge), Ltd., discusses design aspects relating to problems arising from Band III transmissions.

It is the writer's opinion that a well designed 4-element wide-spaced Yagi with a folded dipole to match the impedance of the co-axial feeder represents the most satisfactory cheap commercial basic unit (Fig. 2). If one requires more gain, then two or more 4-element units may be stacked (*i.e.*, placed parallel to one another with a spacing of between a half and one wavelength).

However, it must be remembered that the radiation coupling between the sections may necessitate altered dimensions and matching arrangements for optimum results, especially when an effort is made to limit the magnitude of minor lobes. There are various methods of co-phasing the Yagis and considerable scope for design ingenuity exists here. Lack of proper attention to this point frequently yields a most disappointing performance and in such circumstances it may very well be found that the results obtained by two co-phased Yagis may be no better than using a single one.

Realistic figures for aerial gain are: (a) 4-element Yagi—9db; (b) Twin 4 × 4 side-by-side Yagis—12db. These are peak values for one channel on Band III. Useful results can be achieved over three adjacent channels but a loss

of gain of at least 3-4db may be expected at the extremities.

Two-band Reception

The majority of viewers who use Band III will also, of course, want to receive programmes on Band I. Therefore, one must either use a separate Band III aerial in conjunction with a Band I aerial or use a special aerial designed to operate on both bands.

In the former case, it is usual to couple the two aerials together into a common input to the receiver via a device known variously as a cross-over network, combiner unit or diplexer. The basic purpose of such a unit is to allow each aerial to be correctly matched to the line but avoiding mutual loading of one aerial by the other. In practice, the output of the Band I aerial is coupled to the line via a low-pass filter and the Band III aerial via a high-pass filter (Fig. 1). The small magnitude of the circuit parameters make printed circuit technique ideal for this application.

An alternative scheme is to place a parallel-tuned circuit resonated at Band I in series with the Band III output and a parallel tuned circuit resonated at Band III in series with the Band I aerial. Clearly the insertion loss is an important factor and in a well designed cross-over network, this should not exceed about 1db on either hand.

The use of a cross-over network in its normal form may be avoided in a combined Band I/Band III aerial, but to understand why this is so, it is necessary to examine the principles of operation on which such aerials are based.

Method I—dipoles directly paralleled

This system will work only when the longer dipole is in approximate, even-harmonic, resonance, at the higher frequency. The lower frequency dipole puts a very high impedance across the shorter dipole and mutual loading can be neglected.

Fortunately, allowing for various correction factors, a channel 1/channel 2 dipole is in approximate fourth harmonic resonance over the band 180-200 Mc/s and for all practical purposes will not seriously load a Band III dipole designed to operate within this band. In the London and Lancashire areas, where channels 1/9 and 2/9 have been allocated respectively, the system works excellently.

A wide-spaced Band III reflector may be used in conjunction with the Band III dipole without seriously affecting the impedance match. A diagram of such an aerial is shown in Fig. 3.

Method 2—use of phasing stubs on Band I dipole

When the Band I dipole is in odd harmonic relationship with the Band III dipole, a serious loss of Band III signals results due to the low impedance placed across the Band III dipole by the Band I dipole. Moreover, an unsatisfactory polar diagram exists on Band III and the aerial is highly susceptible to interference pick-up.

The difficulty is obviated by placing quarter-wave stubs along the length of the Band I dipole as illustrated (Fig. 4). The Band I dipole then operates satisfactorily on Band III with a polar diagram very similar to that of a standard dipole. Again a Band III reflector may be used to obtain more gain.

This method is particularly applicable to aerials for the Midlands as a channel 4 dipole is approximately in third harmonic resonance at channel 8.

In practice, using Methods 1 or 2 the length of the Band I dipole is adjusted to be in harmonic resonance at the appropriate Band III channel and the small discrepancy of length from the optimum for the Band I channel is of no serious consequences.

Method 3—use of a critical length stub between Band I and Band III dipoles

The principle of this method is to bring the Band III dipole into parallel resonance at Band I by adding to it a 75-ohm stub of critical length. Clearly, at the free end of this stub there is a very high impedance at Band I and a Band I dipole may be connected to this point without fear of loss of signal. The Band I dipole is cut exactly to fourth harmonic resonance at the Band III channel and any residual reactance on Band I is tuned out by altering the stub length by an appropriate amount.

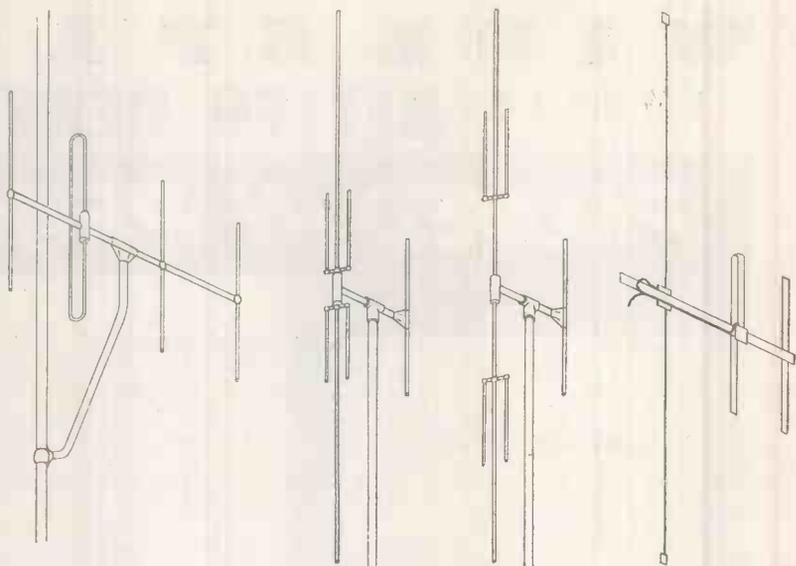


Fig. 2

Fig. 3

Fig. 4

Fig. 5

Four types of aerials used to provide two-band television reception, as described in the text

For example, the length of the Band I dipole to be in fourth harmonic resonance at channel 8 is too long for channel 4. At channel 4 it therefore presents an inductive reactance which would normally yield an unacceptable standing wave ratio. If the length of stub added to the Band III dipole is just long enough to bring it into resonance at channel 4, no correction takes place. But if the stub is increased in length slightly, it presents a capacitive reactance at its end which should be made equal

in magnitude to the residual inductance reactance of the Band I dipole.

Accordingly, both dipoles can be properly matched to the line without fear of one loading the other. An example of an indoor aerial designed on this principle is shown diagrammatically in Fig. 5.

The foregoing is but a very brief review of some of the design techniques which are used among many others for this class of aerial. A future article will deal with the design of cross-over devices for Band I/Band III aerials.

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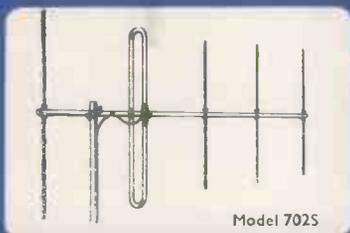
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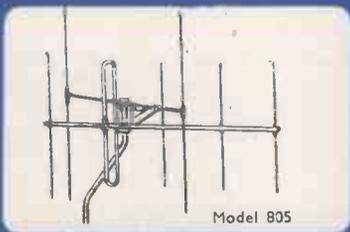
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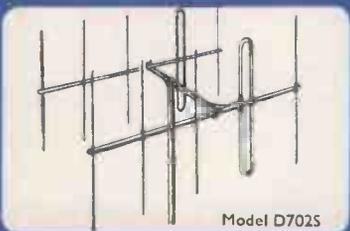
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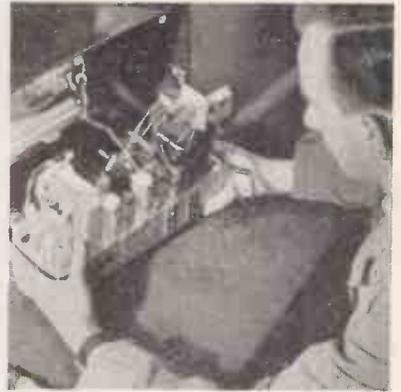
to all the technical gen in this feature, which is your feature, presenting details of faults encountered by engineers in current radio and television sets, and explaining how those faults were diagnosed and overcome. The aim of this feature is to guide

AND HELP

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OTHER ENGINEERS



H.M.V. 1360

Unstable I.F. Stage
With reference to V.D.C., Bristol (page 625, November B.R.T.), the following explanation may be of interest: His pentode i.f. amplifier most probably had the internal connection to the suppressor grid open-circuited so that the valve was operating as a tetrode instead of a pentode. This being so, the operating point between stations may be just off the negatively sloping portion on its characteristic curve. However, on tuning in a station, the a.g.c. would alter the grid bias and could bring the operating point on to the negative slope. The valve would then operate as a Dynatron oscillator and would therefore give rise to the instability experienced.

Tuning away from a station reduces the a.g.c. bias and takes the operating point off the negative slope—and the oscillations would cease. That this is the probable explanation is shown by the fact that when V.D.C. replaced the valve the trouble stopped.

Most valve testers would not reveal this fault unless numerous readings were taken to plot a characteristic curve, when the "kink" peculiar to a tetrode would be noted.—U.S., Darlington.

Pye VT4

Loss of Contrast
The customer complained that sometimes after about half-an-hour the picture level would fall, necessitating adjustment of the contrast control. Upon being tested in the

workshop, the receiver operated satisfactorily for three days before showing a fault.

While in fault condition all voltages were normal, but systematic injection of the video i.f. revealed that C16, a 220pF capacitor (maker's manual) was passing very little. On the bridge this capacitor seemed o.k. but a small movement of one end wire produced almost an open circuit.—R.E.J., Llanrwst.

Ekco T216

Faulty Sync Diode
The complaint was: picture-roll, accompanied by several slanting black bands. When switched on the set operated correctly, but soon developed frame-roll and line-slip,

critical setting of the hold controls (particularly the frame hold) being required to steady the picture.

The sync separator circuit was suspected, and valve and voltage checks were made. No fault was found. Study of the type of circuit revealed the presence of a small crystal diode. This was tested out of circuit and appeared to have a satisfactory "back-to-front" ratio, but was changed and the set re-tested.

This check quickly proved that the original crystal was faulty, as frame-and line-hold was now available over a wide range of setting of the hold controls. Different models have subsequently been quickly serviced by replacement of the sync separator crystal diode when the symptoms indicated critical settings of the hold controls, especially the frame-hold.

The crystal is situated at the rear-centre of the chassis, and connected between the frame transformer and a tag on the chassis.

Other models which employ a similar circuit are late models of type 161, the 164 series and the 217 series.—K.L.C., Birmingham, 19.

Ferguson 992T

Patterns on Picture
The picture was weak, and patterning was also observed together with instability when the contrast control was turned to maximum. After a few seconds at maximum position the instability would drive the tube to

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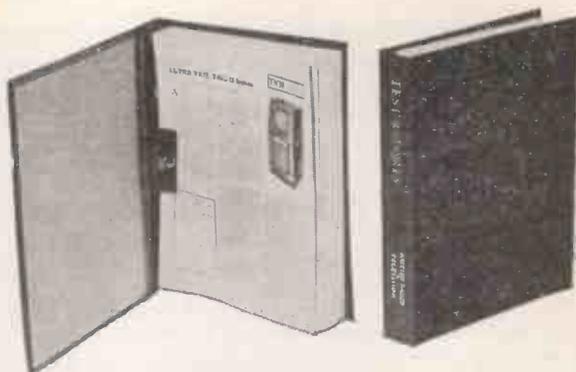
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grid current. Attention was paid to the r.f. stage. In due course the screen decoupling capacitor—a .002 μ F tubular—was found o/c. Replacement cured the trouble.

Slight frame non-linearity in these receivers is usually traced to a 150k Ω resistor going high. It is situated on top of the frame output transformer and can be replaced without disturbing the chassis.—K.M., Leeds, 9.

Ekco T141

Frame Amp. Failed On this receiver, after about half-an-hour, frame amplitude deteriorated and finally collapsed completely. The usual fault-finding sequence was followed, valves, condensers, etc., with no results. After considerable checking, the fault was traced to the screened lead on the grid top-cap of the frame output valve. When the ambient temperature increased the lead gradually developed a high resistance leak between conductor and braiding, this finally developing into a short circuit.

This is a fairly common but initially baffling fault. Nowadays, whenever frame trouble is experienced on these models this lead is replaced as a matter of course—thus eliminating any possibility of doubt.—C.B., Wellingborough.

Pye V2

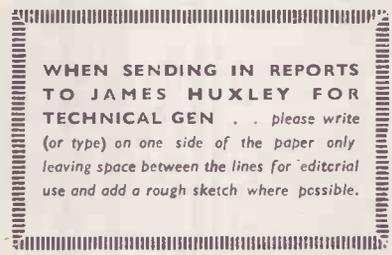
Fading Sound & Vision One of these receivers came in with the complaint that sound and vision faded after about five minutes. Examination showed this was true and attention was centred on the r.f. and oscillator stages. After the chassis had been removed it was noticed that a 100pF silvered mica

capacitor coupling the r.f. to mixer grid was slightly bent, due to heating from the EF80 mixer valve.

It was found on test that after five minutes running the heat from the valve caused the capacitor to go o/c. The fault could be speeded up by holding the tip of a heated soldering iron near the capacitor. When cool, the component appeared to be normal. A replacement proved satisfactory.—H.F., Belfast.

G.E.C. BT5147

TV Snow Storm The screen of this set was obliterated by brilliant dots flashing over the whole screen. This effect began when line oscillations commenced, and corona discharge or an e.h.t. short circuit was expected. With the set operating, careful application of a screwdriver blade to high voltage points gave only slight sparks, and there was no visible evidence of corona.



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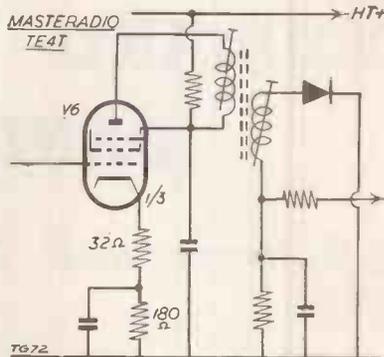
The e.h.t. voltage was well below normal, so the e.h.t. rectifier was suspected and changed. Still there was no improvement. Wiring was re-made and joints covered with silicone grease, but without success.

The only other possible cause was a faulty capacitor in the line stage, so each was meggered. None broke down. There was, however, a 50pF capacitor rated at 5kV working for which a megger test was not satisfactory, so in lieu of a substitute it was removed.

On further testing without the capacitor in circuit, the corona effect had disappeared. The faulty capacitor was discarded and a new one fitted. The capacitor (about 2in. \times 1in. \times 1/2in.) is connected between the top cap of the line output valve and chassis. Other models which employ a similar component are types 4544 and 4643.—K.L.C., Birmingham, 19.

Masteradio TE4T and TE7T

Improving Sound Instability and intermittent sound can often be traced to overloading of the 2nd sound i.f. stage on these models. It may be overcome by increasing the bias and lightly detuning the primary of the 2nd sound i.f. transformer. A 32 Ω resistor can also be



inserted between the existing cathode-bias resistor and the cathode pin of V6, some measure of negative feedback being introduced by leaving the by-pass capacitor across the original 180 Ω resistor.

Further improvement in the sound stages of these models can be effected by the insertion of a 47 Ω grid stopper at the grid of the pentode section of V8, the ECL80 sound output valve.—H.W.H., Bargoed.

Ferranti 20T4

Frame Scan Failure The fault on this new projection set was "no picture." After allowing time to warm up the set was switched off and the screen observed. It was noticed that a horizontal line appeared momentarily, thus indicating a frame time-base fault. On replacing the frame time-base valve, a ECL80, the picture appeared but lasted for only 3 minutes.

Voltage checks revealed low frame oscillator anode volts. Following the circuit through the height control and associated wiring to two tags mounted on an insulated strip on top of the mains transformer revealed the culprit, a broken Varite frame stabilising feed resistor (R64) cunningly concealed beneath the insulating strip.

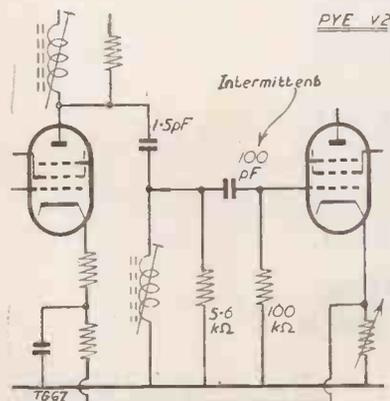
This may save other engineers time as it is not clear at first sight where this resistor is located.—B.A., Oxford.

Cossor 916

Jagged Vertical Band This table model required service for a fault which appeared only when the contrast control was turned up, when the picture blacked out and a jagged wide band appeared vertically in the centre of the screen.

Further experimenting showed that this occurred when the brilliance was set excessively high, with contrast at minimum, and this seemed to rule out the possibility of a fault in the r.f. side.

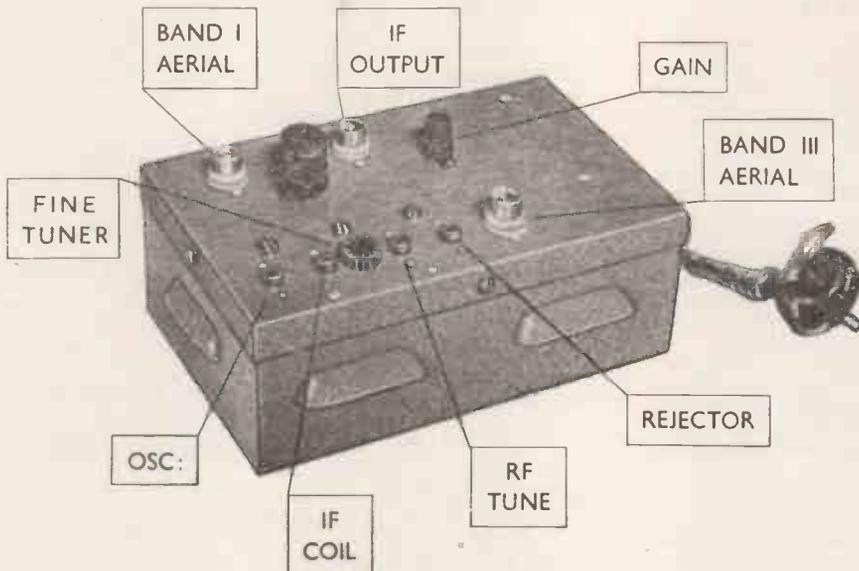
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At the same time the tube would "ring" violently as if resonating.

A new tube was fitted, but on further testing, the fault persisted. Testing was continued with the new tube in position. After various voltage checks were made, the line transformer was removed and a new one fitted. This effected a cure and the picture was found to be free from flashing.

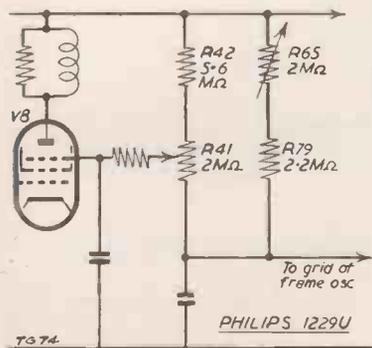
It was assumed that excessive beam current had overloaded the e.h.t. circuit and revealed the fault in the line transformer. The old tube was then replaced, and the set given a final check. Although the jagged bands were no longer present, the resonant effect remained, for if the picture was turned up with either brightness or contrast, ringing and corona discharge began.

However, a good picture could be obtained with careful setting of these controls, and this was explained to the customer. He decided against a new tube at the moment, and thoughtfully accepted a handful of brochures about the newest makes of multi-channel TV.—K.J.C., Birmingham, 19.

Philips 1229U

Low Contrast Level The complaint on this receiver was very poor contrast, insufficient for daylight viewing, together with unstable frame hold. On checking it was found that on adjusting the frame hold control R65, the picture brilliance varied considerably. It was also found that there was a negative voltage on the suppressor grid of the video output valve V8 which could not be returned to zero in respect to chassis even with the vision interference suppressor at zero.

It was found that the limiter h.t. feed resistor R42 had risen in value from 5.6MΩ to around 10MΩ. Re-



SERVICE BRIEFS

Philips 1800A: No brightness due to lack of e.h.t.; anode of e.h.t. oscillator V3 glowing red. Anode voltage of V3 found to be 150V instead of 350V. Checking showed that C8 (0.0027Fμ) had leak of 1.5kΩ. Replacement restored e.h.t. to normal.—R.H.L., Newcastle.

Philips 1726U: Boost anode red-hot, line o.p. stage inoperative. Due to cored linearity coil, which is biased by nearby permanent magnet. Insulation tape round magnet faulty and arcing occurring between the coil and magnet; new tape cured trouble. This is second receiver with this fault.—W.P., Belfast.

English Electric T40: Poor picture with insufficient contrast, line hold critical and line slip frequent. Sync separator suspect, but shown o.k. Fault traced to crystal diode X4 in the spotter circuit, which is in the grid circuit of the PL83 video amplifier valve.—R.H.L., Newcastle.

Ultra V8-17: Sound o.k., picture just visible with full contrast; increasing sensitivity produced negative picture. Trouble was due to R29, detector load, going down from 4.7kΩ to 200Ω.—E.E., Pontypridd.

Philips 492U: Weak sound and normal picture accompanied by what seemed like sound-on-vision. Both conditions due to C16 (65μF) smoothing capacitor on h.t. line to sound detector and sound output valves. The focus coil and c.r.t. first anode are on same line which accounts for the strange sound-on-vision effect.—R.H.L., Newcastle.

placement returned the contrast range to normal and the frame hold was again stable. It appears that the negative voltage at the grid of the frame oscillator V12 was sufficient to overcome the positive potential at the top of R41, the interference limiter control, and the fact that R42 and R41 in series are in parallel with R65 and R79 (the frame hold resistors) apparently accounted for the unstable frame hold.—R.M., Biggar, Lanarks.

C.R.T. Trouble

Internal Corona Effect A minor case of "snow" was accompanied by vertical flashing bands of an intermittent nature, and ragged edges of the picture. An exhaustive series of tests began with cleaning and adjusting the contacts to the outer coating of the c.r.t. and continued with changing the line output valve, the booster valve, e.h.t. rectifier, line transformer and included complete voltage checks of these circuits, but to no avail.

Judicious tapping of valves, tube, etc., produced no conclusive results, so finally the c.r.t. was removed and sent away for testing by the company insuring the set. A report on the tube indicated no fault, but a further test was requested as a new tube had meanwhile been fitted to the set which had since performed satisfactorily.

This avoided an impossible situation, for the tube was again passed as serviceable, and only the knowledge that the set was o.k. prompted the insistence of more testing. Finally, flashing was observed on the tube after a prolonged test. The c.r.t. was carefully opened and inspected.

The Aquadag coating had begun to

flake from the inner surface, resulting in corona discharge inside the tube and the condition referred to as "brushing." Probably the packing and transport of the tube had disturbed the condition, which would explain why no fault was indicated on first tests.—K.L.C., Birmingham, 19.

English Electric 16T18

Mains Dropper Mod. Referring to your September issue (page 437) on barretter failure in this model—after checks on the circuit and consultation with the manufacturers, it was decided that the barretter failure was due to magnetic fields from the tube and/or the focus magnet. The shape of the barretter filament after some use will confirm this decision.

One cure is to mount a screening can around the barretter, but as this is a rather tricky operation, English Electric have decided to issue a modification kit for all receivers. This consists of a 185-ohm mains dropper and accessories to replace the barretter, and can be obtained free of charge on application to the company.—D.R.F., Newport, Mon.

Invicta 120T

Scan Coil Fault The set was received and tested for the intermittent appearance of a jagged vertical band which split up the picture. The fault did not occur until the chassis was tapped sharply. Further tapping of the line valves, line transformer, etc., did not localise the fault, but it was found that the trouble

(Continued on page 729)

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C	Bands 1 & 3 I.F.	NO	Unmodulated C.W.	One Composite Pattern	None	Sound OR Vision	—
D	Bands 1 & 3	YES	Unmodulated C.W. Video Output	Five Patterns	1.5/3 Mc/s	Sound OR Vision	—
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TECHNICAL GEN

Continued

was far more severe when the set was on its side.

Recalling a previous case of "brushing" the tube was suspected. It was isolated from its mountings and suspended, and testing began again. This time tapping the chassis had no effect, but when the tube was gently tapped the flashes appeared. This seemed to indicate that the tube was faulty, so it was re-assembled on the chassis to await a substitute c.r.t.

As a cross-check the set was switched on again and re-tested. The picture had become off-centred, and was set up on the test card. During the process of rotating the scan coils, the flashing re-appeared and was more pronounced.

The securing screw was loosened, and the coil assembly moved by means of the plastic connection leads. The flashing was in sympathy with this movement, and it was assumed that the coil connections were either frayed

or shorting. This would explain why the fault was present when the tube was suspended away from chassis; the deflection coils were still in position.

The coil assembly was dismantled and inspected, and the connecting leads individually insulated. As these bunch through a small hole in the former, transparent tape was used. The coil assembly was re-assembled and the set tested, but the flashing persisted when the set was tapped or the scan coils moved.

A new set of coils was obtained and fitted, and this finally did the trick. No more trouble was experienced from flashing. This is yet another item to add to the long list of faults that can cause flashing.—K.L.C., Birmingham, 19.

Pye VT4

Poor Line Sync. Another "intermittent" brought in for repair proved to have unreliable line lock, the sync losing control suddenly and remaining thus for a long period when it would right itself again.

Catching the set in fault condition was difficult since any disturbance by

the meter brought things back to normal. While checking waveforms with the 'scope, the "hot" lead touched the h.t. line, disclosing a 10kc/s sawtooth on it.

Decoupling was investigated and sure enough the 200 μ F section of the twin electrolytic C35, C36, was found o/c. The fault was misleading since there was no trace of residual hum on the raster.—R.E.J., Llanrwst.

Ferranti 14T4

Loss of Sync The fault was intermittent loss of sync. The most unusual thing about this fault was that while the sync pulses were absent, the contrast control remained operative—which act cording to the circuit it should not have done. The culprit was finally traced to C74, a 0.05 μ F sync coupler.

No amount of bridge testing found any fault with the capacitor, yet replacement cured the trouble. The only solution we can offer is that the capacitor altered the time constants of the circuit in such a way as to cut off the sync pulses without affecting the contrast circuit.—D.J.D., Sevenoaks.

Testing Television Valves

A NEW MARCONI-OSRAM TABLE

A NEW table specially designed for conditioning and testing Osram N339 and U329 valves has been developed by the Marconi-Osram Valve Co., Ltd. Both types are used in domestic television receivers, the N339 as a line output-valve and the U329 as a booster diode with exceptionally high heater-cathode insulation. The new table subjects them to the same high peak voltage and currents as they encounter in service, and ensures a uniform high standard of performance.

Two of the new tables are shown in the accompanying illustration. Each of them incorporates twelve test positions which will accommodate either type of valve. The valve is inserted and a Perspex window is drawn down over them.

The peak voltages developed on the valves can then be increased from zero to maximum either manually or automatically to a preset sequence. Each valve is monitored by pressing the button located immediately below it, the peak output voltage being indicated on a meter let into the front of the table.

Circuit Details

The test circuit for each valve is very similar to the line time-base circuit used in television receivers. The line transformer is loaded with a dummy coil to simulate the effect of the deflection coils. All twelve test positions are driven by a negative 10kc/s pulse at

the grid of the N339 from a common driver unit, the output of which is kept at a constant amplitude.

The peak voltage developed on the anode of the N339 is dependent on the rate of change of current through the valve at cut-off. The current flowing through the valve is controlled by a variable screen grid supply which, therefore, controls the peak voltage output.

The automatic conditioning is achieved by providing a stepped input voltage to the screen grid power supply from a thyatron operated timer unit. The number of switched steps available

is 24 and the duration of each step is variable over a considerable range by adjustment of the thyatron circuit. The maximum screen grid voltage may be preset by a control on the front of the desk.

After the conditioning process is completed the equipment may be set up for testing the valves. The valves are switched on cold and the peak voltages are allowed to build up quickly to the maximum rating. This is the treatment the valves receive in a television receiver and the conditioning process ensures that no flashing will take place during testing and use.



SERVICE WITH A GRIN ——— by H. W. HELLYER

Once a Year

CHRISTMAS won't be the same without George. He was the leading light of our little "outside" gang, a specialist on aerials, as familiar on a rooftop as Father Christmas' reindeer. Up and down the valleys of Glamorgan his handiwork is plainly to be seen, gracing the chimney of many a miner's cottage, perched on a pole in the shadow of a slag-heap or propped in some inconspicuous corner where its presence will not offend the more sensitive members of reactionary town councils.

George is on speaking terms with most of the "ghosts" that haunt the steep hillsides of South Wales.

But this Christmas he will be laying ghosts in a less rugged area; the lure of I.T.A. and almost unlimited business has attracted him to London.

He told me, "It's money for jam. Dinky little dipoles like toffee apple sticks and a multi-array not much bigger than a toasting fork. You could almost push the whole lot in your pocket. After this stuff, it's a walkover."

"This stuff" is the Channel 5 antennae that has kept George and the gang busy for several years.

And no time is busier than Christmas. Complaints are like holly, evergreen and prickly but much more pronounced when the Yuletide approaches.

It seems curious that the Christmas spirit so moves people to complain of faults that for 11 months of the year are overlooked. Quite placid customers, content in their viewing, develop an anxiety neurosis when the first frosts of December are felt.

"It's probably nothing much," they say, "But I'd like you to come and have a look."

Often their fears are completely



"Is Mrs. Smith's so-and-so ready?"

every Sunday morning in the little general store around the corner. I was caught by one of them last year, almost before cockcrow.

The present he had bought little Johnny, it seemed, was lacking a vital part. It was an elaborate, intricate railway system that would have been electrically operated if he'd remembered to buy a transformer.

Fortunately the part was in stock and we relocked the shop and rushed to the rescue, fully expecting a flood of tears.

We need not have hurried. Young Johnny had seen electric railways before. He was too busy with his new Space-Travel outfit to bother with anything so antediluvian as a train!

I reminded myself it was the season of goodwill and left them. Young Johnny was busily trying to disintegrate the cat with a Super-Atomic Ray gun while the fond parent, his worries forgotten, was happily shunting the Flying Scot from Snow Hill to Penzance.

George told me later he fared little better, but the aerial that annoyed him was his own! He had to stand helplessly watching it veer in the teeth of a gale—"Like a blooming weathercock"—while the ladders were locked in the garage.

"I didn't come down for the keys," he explained, "because I knew that the doorbell would be disconnected and the knocker muffled." George had met the Christmas rush before.

And now, as I mentioned, he has left us. Christmas won't seem quite so real without him. We shall miss the gay cards that temporarily oust the pin-ups from position, the holly that twines insidiously among the jumper leads, the tinsel on the mirror, the mistletoe at the door, the gaudy paper hat upon the hood of the 'scope and George's infectious air of goodwill.

Ah well, perhaps when the higher frequencies come to the valleys of South Wales we shall see George again. How many Christmases hence, I wonder?

unfounded, but there is always the odd occasion when something has really gone wrong. Then woe to the poor engineer who cannot complete his repair before the holiday.

The bench is full, the racks are loaded, the irons are running red hot. Poor



"... happily shunting the Flying Scot ..."

George wheezes in at infrequent intervals to thaw out the rime from his chilblains. The telephone rings, incessantly, and somebody calls up the workshop stairs—

"Is Mrs. Smith's so-and-so ready?"

Mrs. Smith's so-and-so is probably dissected on the bench, refusing to yield up its guilty secret or, what is worse, refusing to go wrong at all!

George used to say there was one certain method of making those annoying intermittent faults recur.

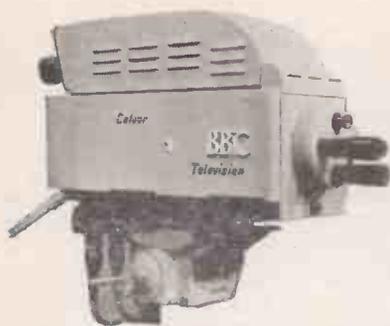
"Take it back to the customer's house."

Yet somehow the Christmas spirit wins: the bench becomes cleared; George and his mates have suppressed the last "flasher" on the tinsel-laden trees; the cashier has reluctantly taken down her dying sprig of mistletoe; only the lights in the window remain to declare that we provide a 24-hour service. We relax.

But not for long: there is always the client who wants something done when the shop has been locked, barred and bolted; the sort of customer you see



"... on speaking terms with most of the ghosts ..."



Colour TV Topics

by

W. J. CLARKE, B.Sc.

IN THIS ARTICLE THE AUTHOR DESCRIBES THE EQUIPMENT AT PRESENT BEING USED BY THE B.B.C. FOR THEIR COLOUR TELEVISION EXPERIMENTS. HE ALSO EXPLAINS THE BASIC CHARACTERISTIC OF THE N.T.S.C. SIGNAL AND SHOWS WHY IT IS A "COMPATIBLE" SYSTEM.

DURING the month the B.B.C. released some technical details about the equipment they are using for the series of experimental colour television tests which began on October 10, and also gave details of the nature of the signal being transmitted at present. The signal is a modified version of that used in the U.S.A., and recommended by the National Television Systems Committee. For this reason it is known as the N.T.S.C. signal.

The principle features of the N.T.S.C. colour signal are: (i) the colour signal is radiated by the same transmitters and in the same frequency channel as carry the monochrome signal; (ii) the system is claimed to be compatible in that the colour signals can be accepted by a standard TV set to produce a black-and-white version of the colour picture; (iii) the system is flexible enough to allow for considerable future development to improve the quality of the colour picture.

Since the British and American television standards differ considerably (e.g., U.S.A.—525 lines, 60 frames/sec. interlaced, negative modulation; Britain—405 lines, 50 frames/sec. interlaced, positive modulation), there is no good reason why the N.T.S.C. system should be adopted in this country without first examining whether it would show the same advantage when modified to suit British TV standards, and without first investigating the possibilities of other colour systems.

This is, in fact, precisely what the B.B.C. are now doing, and the present tests, which are expected to cover a wide field of investigation, will provide information for the Television Advisory Committee which has been asked by the Postmaster General to report on the whole field of colour television.

THE N.T.S.C. SIGNAL

Last month we saw that all the colours of the spectrum normally encountered in real life can be produced by suitably mixing or adding together red, green and blue lights. These three additive primary colours correspond to a theoretical colour sensitivity of the human eye. A colour scene can, therefore, be broken down into these three primaries by the camera

and transmission equipment, and re-assembled additively at the receiving end to form a full colour image.

In the N.T.S.C. system these three signals are transmitted as: (i) a luminance or brightness component, and (ii) a chrominance or colour component having two separate parts.

The luminance component is the same as that which would be produced by a monochrome television camera looking at the same scene, and this signal therefore produces a normal black-and-white representation of the coloured scene on a standard receiver.

The chrominance component consists of two colour-difference signals which, in the simplest terms, may be said to convey the hue and degree of saturation of the colour information.

In the colour receiver, these three signals representing brightness, hue and saturation are combined to produce the required intensity from each of the red, green and blue lights.

The fact that a monochrome receiver and a colour receiver can simultaneously produce each its own version of the scene from the same signal gives the N.T.S.C. system its valuable feature of "compatibility."

BANDWIDTH ECONOMY

It would be possible to transmit the chrominance signal quite independently of the luminance signal and in this case the compatibility would be virtually perfect. However, the second unique feature of the N.T.S.C. signal is that the two components have been combined in such a way that they occupy the same total bandwidth as that used by the equivalent monochrome signal.

Due to the manner in which the human eye perceives colour, the separation of luminance and chrominance enables the bandwidth of the chrominance signal to be reduced to about one-third of that of the luminance.



A view of the B.B.C. experimental colour television studio at Alexandra Palace. In the centre is the control console with three-tube colour picture monitor. On extreme right is a radio check colour receiver.

Further saving of bandwidth is achieved by placing this reduced bandwidth information at the upper end of the luminance band in such a way that the inevitable interference (cross-talk) between the two signals has a minimum effect on the compatible picture on the monochrome receiver.

THE COLOUR SUB-CARRIER

The actual mechanism, by which this band sharing takes place, employs a colour sub-carrier (in the British version 2.66 Mc/s) which is simultaneously modulated in amplitude and phase by the two colour difference signals, the carrier itself being suppressed so that the chrominance signal exists only when colour is present in the scene being transmitted.

The colour sub-carrier is an odd multiple of half the line scanning frequency, and, under these circumstances the visibility of the best pattern produced between it and the scanning lines is a minimum.

This ingenious combination of band saving, band sharing, suppressed carrier modulation and "frequency interleaving," is claimed in the U.S.A. to produce an adequately compatible signal.

COLOUR EQUIPMENT

The main items of colour TV equipment installed at Alexandra Palace comprise a colour slide and film scanner (designed and made by the Research Department of the B.B.C. Engineering Division), and a colour camera, signal coding equipment, colour picture monitors, and colour test equipment (designed and made by Marconi's Wireless Telegraph Co. Ltd.).

THE CAMERA

Coloured light entering the lens of the camera is split into three colour separation images by a colour analyser similar in principle to that used in the slide and film scanner.

In place of the three photo-multiplier cells are three image orthicon camera

tubes of a type developed specifically for colour work. These tubes produce the three colour separation signals in electrical form. Each of the tubes is supplied with the necessary scanning waveforms and electrode potentials just as in the case of the single-tube monochrome camera.

It will be realised that the output of each tube is a separate picture of which not only the transfer-characteristic between light input and voltage output must be maintained in a precise manner for the three signals, but the geometry of the three pictures must be the same within very close limits so that any particular detail of the picture occurs at the same point in the scanning cycle of all three.

The signals from the tubes are amplified in the camera and transmitted to the control room over three identical cables. In the control room, each signal is gamma corrected and equalised in a manner very similar to that used in monochrome equipments employing the same type of camera tube, and finally emerges as a colour separation signal of the same form as that produced by the slide and film scanner, which, of course, uses the flying-spot principle.

SIGNAL CODING

The signal coding equipment includes the special colour waveform generating equipment and the "encoder" in which the luminance and chrominance signals are formed from the incoming three-colour information.

The "master" frequency, from which all the other scanning and pulse waveforms are derived, is obtained from a temperature controlled crystal oscillator whose frequency is 2.6578125 Mc/s ± 8 c/s. This frequency is multiplied and divided to produce the usual double line frequency of 20,250 c/s from which the standard 405 line interlaced waveform is generated.

The input to the encoder consists of the three gamma-corrected colour separation signals (red, green and blue) which are produced by either the slide and film scanner or by the camera.

The colour sub-carrier is then modulated by the I and Q signals in such a way that the amplitude of the resultant signal conveys the saturation information and the phase conveys the hue. In the absence of colour information the sub-carrier is suppressed.

The complete chrominance signal is added to the luminance which is, of course, in video form. Finally, the synchronising waveform is added to produce the complete waveform.

The synchronising waveform is of the normal type except that a "burst" of nine cycles of the colour sub-carrier is added in the suppression period following every line synchronising pulse. This "burst" is used at the receiver to synchronise a sub-carrier generator which is needed for detection of the quadrature modulated chrominance signal.

COLOUR PICTURE MONITORS

There are two colour picture monitors. One employs three separate tubes, the phosphors of which emit respectively red, blue and green light. The application of the colour separation signals to the grids of these tubes produces three colour separation images which are combined optically by dichroic mirrors to produce a direct viewed colour picture.

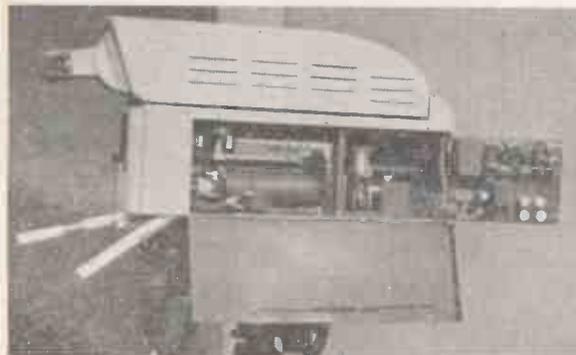
The other monitor uses a 15in. R.C.A. shadow-mask tri-colour tube. Since the monitor incorporates its own decoder, the input signal is of the N.T.S.C. type and the unit is therefore used for general checking and monitoring of the transmitted signal.

COLOUR TEST EQUIPMENT

The complicated nature of the N.T.S.C. signal requires special test signals and measuring apparatus to ensure that its specification is met. The main signal for this purpose, "colour bars," is generated electronically and produces on the picture monitor seven vertical strips which, from left to right, are white, yellow, cyan (blue-green), green, magenta (purple), red and blue.

These signals represent saturated colours for which the amplitude and phase of the colour sub-carrier are known. The amplitude is measured in the usual way with a waveform monitor; the phase is measured by a special piece of test equipment known as a Colour Signal Analyser. Distortion occurring in the transmission of the signal after it has left the encoder can, of course, be measured similarly.

Other electronically generated signals such as "dots" and a grid pattern of lines covering the whole picture are provided for the purpose of adjusting the picture monitors. The camera and slide and film scanner have a series of special test cards for the alignment of the apparatus.



A side view of the three-tube colour camera, showing one of the camera tubes in its yoke and its associated amplifiers.

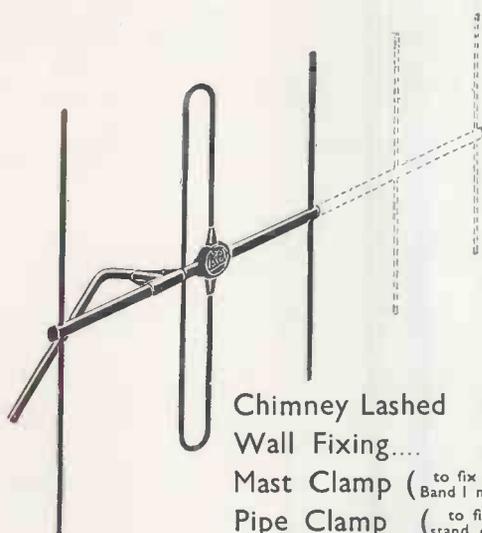
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WOLSEY TV CROSSOVER UNIT

Wolsey Television, Ltd., 43-45 Knight's Hill, West Norwood, London, S.E.27. Telephone: GIPsy Hill 2207.

THE new Wolsey crossover unit uses a printed circuit to provide efficient coupling of a Band I and Band III aerial into a common download. The unit, which is housed in a die-cast rubber sealed box, is available for mast mounting or wall mounting, under eaves, or any convenient location either inside or outside.

No insertion loss occurs on London, Lancashire and Birmingham channels in Band III, with a maximum of 1db at the extreme ends of Band III and not greater than 0.5db on any frequency on Band I.

Rejection between the two bands varies from 40db to a definite minimum of 25db in the working range of Band I and Band III.

Prices are: for wall or wainscoat mounting, 15s.; for arm and mast mounting, with adjustable clamp, 17s. 6d.

FERRANTI TV FRINGE MODELS

Ferranti, Ltd., Moston, Manchester, 10. Telephone: Fallsworth 2271-2071.

FRINGE versions of four of Ferranti's current range of TV models have been released. They are: Model 14T5F (71 gns.); Model 17T5F (84 gns.); Model 17SK5F (91 gns.); Model 17K5F (106 gns.). All prices include tax.

Ferranti are now offering credit sale facilities to their dealers in addition to the normal hire purchase facilities; in addition, records to the value of £5 may be included on hire purchase and credit sale proposals for Ferranti radiograms.

NEW FALCON RADIOGRAMS

John Street Manufacturers, Ltd., 88 Springbank Road, London, E.S.13. Telephone: HITHer Green 5558.

TWO new Falcon radiograms are announced. The bureau model incorporates an 8-valve chassis, covering the long, medium, short and v.h.f. f.m. bands. Output is via a 10in. speaker. The gram side uses a 3-speed

The latest in Radio and TV Receivers and Accessories

autochanger. The cabinet provides ample storage space for some 200 records. Price of this model is 53 gns (tax paid).

The other model is a console radiogram with a similar chassis (including the v.h.f. f.m. band) and 3-speed autochanger. This sells at 48 gns. (tax paid).

INVICTA TABLE TV

Invicta Radio, Ltd., 100 Great Portland Street, London, W.1. Telephone: LANgham 5742-3.

LATEST addition to the Invicta television range is Model 122 (illustrated), a 14in. table model housed in a brown rexine-covered cabinet. This set sells at 61 gns. tax paid (£45 12s. 3d. list plus £18 8s. 9d. tax).

WEBMORE BAND III TV AERIAL RANGE

Webmore (1948) & Co., Camp Lane Works, Kings Norton, Birmingham, 30. Telephone: Kings Norton 2870.

A NEW range of Band III television aerials is released by the company. Loft mounting types include a 3-element array (type 3/L111, £1 1s.) and a 5-element array (type 5/L111, £1 9s. 6d.). Outside aerials include 3-element and 5-element arrays, available with mast adaptor for fitting to existing masts ($\frac{3}{8}$ in. to 2in. diam.), or with wallplate and 3ft. stand-off arm, or with chimney lashing gear and 4ft. 6in. mast. Prices



Invicta 122 14in. table TV

are: type 3/O111 (3-element with mast adaptor) £1 15s.; type 3/OW111 (with wall-plate and stand-off arm) £2 2s.; type 3/OC111 (with chimney lashing, etc.) £2 15s.; type 5/O111 (5-element with mast adaptor) £2 4s.; type 5/OW111 (with wall-plate and stand-off arm) £2 11s.; type 5/OC111 (with chimney lashing, etc.) £3 4s. 6d.

There is also a portable loop aerial type P/111 designed to fit the Webmore TV9 Band I loop aerial to convert it for two-band operation. Alternatively, the adaptor may be used as a separate Band III portable aerial if desired. Price, £1 7s. 6d.

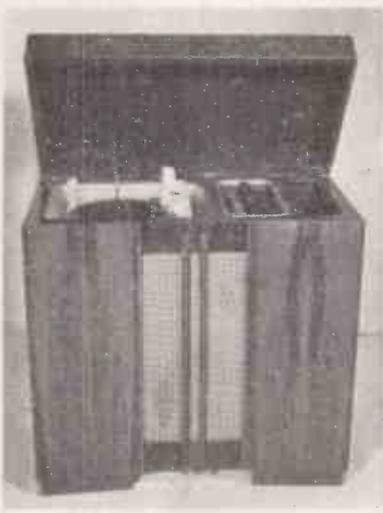
Two f.m. aerials complete the range. Type FM/P is a portable f.m. aerial (£1 7s. 6d.) and type FM/R is an f.m. ribbon aerial (17s. 6d.).

A useful aerial accessory is the type SOA/111 stand-off arm, 18in. long, for fitting to loft or outside Band III arrays where existing clearance is not sufficient. Price 6s. 6d.

NEW DULCI PRODUCTS

The Dulci Co., Ltd., Dulci Works, 97-99 Villiers Road, Willesden, London, N.W.2. Tel.: WILesden 6678-9.

SEVEN new products are announced by the company, ranging from a Band III converter to a tape recorder. The Band III converter is for use on a.c. mains and has fine tuning and contrast controls. Price £9 15s. There is also a self-powered f.m. tuner designed for use in conjunction with radiograms, amplifiers, tape recorder, etc. The tuner uses six valves and covers the frequency band 87-100 Mc/s. For operation on a.c. mains 200-250V. Price £17 10s. 3d. (tax paid). Another tuner unit is the crystal receiver-tuner, for reception of long and medium



The new Falcon console radiogram

(Continued on page 737)

This tape means business!

EMITAPE

AND ITS RANGE OF ACCESSORIES

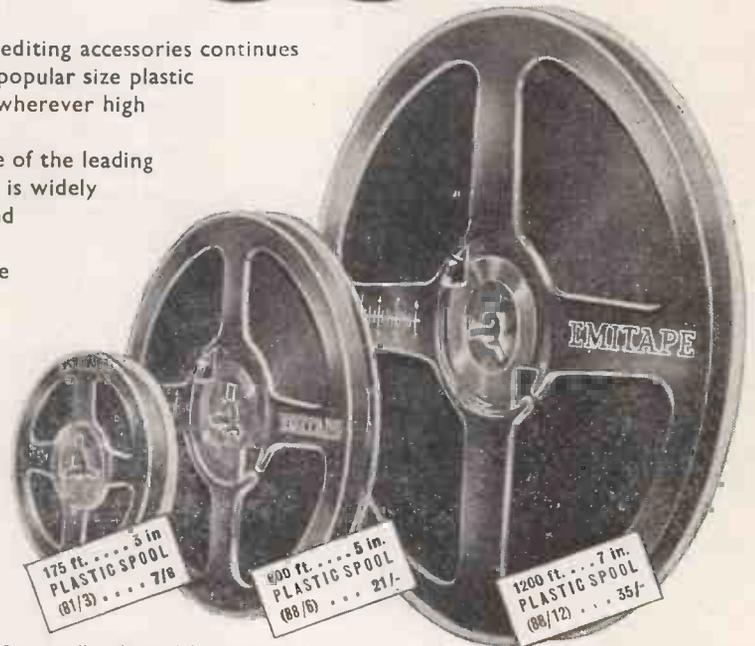
" 88 "

The demand for Emitape and its range of editing accessories continues to grow. The introduction of Emitape in popular size plastic spools has been enthusiastically received wherever high quality recording is required.

The Emitape range has become the choice of the leading broadcasting recording organisations, and is widely used in industry, scientific laboratories and also for domestic recording of all types.

Make sure that your stocks of Emitape are kept up to meet the constant and ever-increasing demand.

- HIGH SENSITIVITY
- ANTI-STATIC
- P.V.C. BASE
- HIGH TENSILE STRENGTH
- FREEDOM FROM CURL
- EDITING LEADER AND TRAILER STRIPS



Used by the leading Broadcasting Organisations and for recording the world's greatest artists on

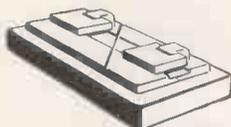
'HIS MASTER'S VOICE', COLUMBIA AND PARLOPHONE RECORDS

T A P E A C C E S S O R I E S

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 16s.



Magnetic Tape Jointing Block
AP.46 Price 8s.



P.V.C. Tape Jointing
Compound AP.77
Price 4s. 6d.



Gummed Jointing Tape AP.37
Price 6s. 6d.
White P.V.C. Editing Tape
150 ft. Roll AP.38 Price 4s. 6d.



Full particulars of Emitape, accessories and customer literature are obtainable from our wholesale distributors.

E.M.I. SALES & SERVICE LTD., Recording Equipment Division
Hayes, Middlesex, England Telephone: Southall 2468

Export enquiries for products mentioned in this advertisement should be addressed to:—

E.M.I. INTERNATIONAL LTD. (also at Hayes)



Continued

wavebands with outlet for tape recorder or hi-fi amplifier. The unit, which embodies a germanium diode detector circuit, measures 6in. × 4in. × 3½in. and costs £2 8s. 8d. (tax paid).

Complete radio chassis are available in either a.m.-f.m. versions. Model F3 is a 5-valve 3-waveband receiver giving 4 watts output (£14 11s. 11d. tax paid). A push-pull version is available giving an output of 6 watts (£18 15s. 4d. tax paid). Model H4 is a 7-valve 4-waveband (including v.h.f.-f.m.) receiver giving 4 watts output to any 15-ohm or 3-ohm speaker. Price, £27 16s. (tax paid).

The Dulci tape recorder incorporates a Truvox tape deck and a 5-valve amplifier. There are two tape speeds, the frequency response being 40-11,000 c/s at 7½in./sec., and 40-8,000 c/s at 3½in./sec. A magic-eye recording level indicator is included. Price (including microphone and one reel of tape) is £55 2s. 6d.

Also available is a tape recorder amplifier designed for use with the Truvox tape deck. Frequency response is 50-11,000 c/s. There are five valves, including magic-eye, and output is 4 watts. For operation on a.c. mains, 110-120 and 200-250V. Price £14 14s.

BUREAU TAPE RECORDER

Elon Tape Development Co., Ltd., 377 Milkwood Road, Herne Hill, S.E.24. Tel.: BR1xton 3417.

ELON have introduced a 7-valve tape recording chassis with separate power supply housed in a bureau-type cabinet, for operation on 200-



Above—Elon bureau tape recorder. Below (at foot of previous column)—900T tape recorder on console amplifier

250V a.c. mains. Provision is made for recording from high-impedance microphone, pick-up or radio tuning unit. Ample storage space is provided for tapes, etc., and provision is made for a portable record player in the attractive high-gloss cabinet. Standard finish is in walnut veneer with contrasting white sycamore internal finish; alternative finishes can be supplied.

Although the bureau is sold primarily as a recording instrument, a radio tuning unit is available as an accessory. The radio incorporates the v.h.f.-f.m. band, and operates additionally on l.w., m.w., and s.w.

Price of the bureau recorder is 75 gns. retail (no tax), and the radio tuner unit costs 20 gns. retail (tax paid).

The company are also producing a tape recorder Type 900T, incorporating a Truvox tape mechanism. Among the interesting features is a link which when removed (as when using pre-recorded tapes) prevents accidental erasure. Hum level, at 4 watts output and maximum bass boost, is negligible. The units are on separate chassis, with quick-release clips for easy servicing. It sells at 62 gns.

Also available is a console amplifier, balanced for use with the 900T, which uses twin 8in. speakers, a 5-valve 12-watt amplifier, separate bass and treble controls. Fitted with ball-bearing castors, it contains a rear cupboard for storing tapes and accessories. Retail price is 33 gns.

MULTICORE GIFT PACK

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

MULTICORE have supplemented their Bib lines with a new 5s. gift pack containing a Bib wire stripper, electrician's insulated screwdriver and a card of Ersin Multicore match melting tape solder. The three items are mounted attractively on a gift card and packed in a cellophane envelope.

Designed primarily as a permanent gift line, it will have particular appeal for home electricians and handymen at Christmas time, although due to the prevailing steel shortage, supplies for this year are limited.

The new 5s. Bib gift pack is being distributed through the usual wholesalers and is available at 3s. 4d. net trade.

SOBELL 707 RADIOGRAM

Radio and Allied Industries, Ltd., Langley Park, Slough, Bucks. Slough 22201.

THE new Sobell Model 707 is an a.m.-f.m. autoradiogram housed in a fixed-top console cabinet finished in selected walnut veneers. The 5-valve (plus rectifier) chassis covers the long, medium and short wavebands and the v.h.f. f.m. band. Built-in aerials are



The new Sobell 707 radiogram

incorporated, with sockets for external a.m. and f.m. aerials if required. Output is 5 watts to a 10in. × 6in. elliptical speaker.

The gram section uses a B.S.R. Monarch autochanger with turnover pick-up cartridge. Separate doors conceal the gram. unit and radio controls and provide access to storage for more than 200 records. The instrument is designed for operation on a.c. mains, 200-250V. Price, 65 gns. (tax paid).

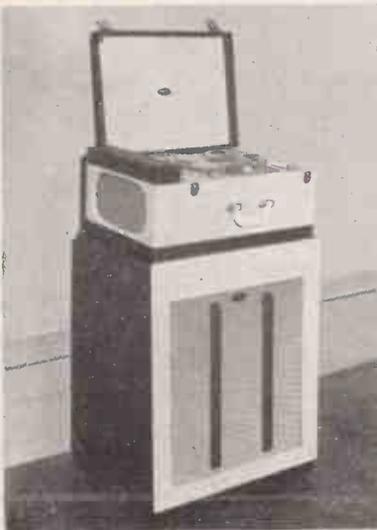
The Model 707 is being supported by large-space advertising in the national dailies, Sundays, and London evening press.

NEW RADIOSPARES COMPONENTS

Radiospares, Ltd., 4-8 Maple Street, London, W.1. Telephone: EUSton 7232-7.

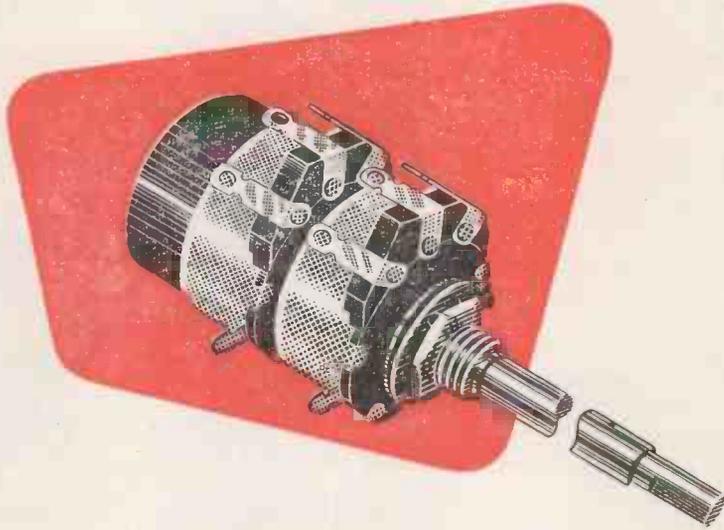
FURTHER additions to the large Radiospares component range are announced in the November catalogue which is now available to bona-fide traders on application to the company. "Prong-fitting" electrolytics, housed in negative cans provided with prongs which twist into suitable sockets and

(Continued on page 739)



THE MORGANITE TYPE A

Multi-unit POTENTIOMETER



The multi-unit version of the most popular control for radio and television.

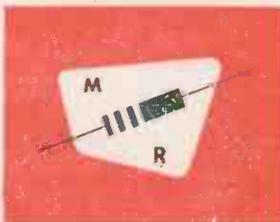
Proved in use by all the leading manufacturers.

Renowned MORGANITE resistance track for minimum noise and maximum hard-wearing qualities.

Fitted with concentric spindle.

Available with or without the famous MORGANITE D.P. Switch—approved by all leading Test Authorities

—meets the most stringent trade requirements.



Manufacturers' and export enquiries direct to
Morganite Resistors Ltd.

Bede Trading Estate, Jarrow, County Durham.

Wholesale and retail distributors' enquiries to
Edison Swan Electric Co. Ltd.

155 Charing Cross Road, London, W.C.2.



Continued

positive contacts brought out to soldering tags, are available in the following values: 32-32 μ F, 350V (3in. long \times 1in. diam.) at 5s. 9d. each; 50-50 μ F, 350V (3in. long \times 1 $\frac{1}{2}$ in. diam.) at 7s.; 100-200 μ F, 25V (2in. long \times 1in. diam.) at 4s.

In the range of "Exact Replacement" volume controls is a new Philips type having a 0.5M Ω track tapped at 50k Ω , fitted with a d.p. switch, designed for use in Philips and equivalent receivers which feature tone compensation. This control (type V62) costs 8s.

Other new items include sprite-nut kits (2s. 6d.) containing a variety of different sized nuts totalling 72; "outer-clamp" kits (2s. 6d.) containing spring retainers to fit "necked" control knobs; and "circlip" kits (2s. 3d.) containing "compression ring" type control knob retainers.

Due to the rising cost of raw materials and labour, the price of certain lines listed in the catalogue have been increased.

PRIMAXA SPOTLIGHT SOLDERING GUN

S. Kempner, Ltd., 29 Paddington Street, London, W.1. Telephone: HUNter 0755.

THIS new soldering gun, known as the Primaxa (type 100) incorporates an internal "Spotlight" with two magnifying lenses to provide uniform and shadow-free illumination of the soldering area. This is a companion to the Primaxa type 60 soldering gun described in the June, 1954, issue of B.R.T.

The Primaxa is a heavy-duty soldering gun (100 watts consumption) and is ready for action in six seconds. It can be used intermittently without overheating. Design of the gun provides a handle with trigger switch and a loop element suitable for work on deep radio and TV chassis.

The gun, which is supplied with 6ft. of cable, costs £4 12s. 6d., post free. Price of Model 60 (60 watts) is £3 12s. 6d. as before.

CONICAL VEE BAND III AERIAL

S.E. Opperman, Ltd., Boreham Wood, Herts. Telephone: Elstree 2021.

THE Conical Vee aerial (illustrated) is a Band III television aerial for indoor or outdoor use within a range of some 10 miles from the transmitter. It sells at the low price of 10s. 6d. retail, subject to the usual trade discounts. Design is compact and robust,



Left—the Conical Vee Band III television aerial, and (right)—the Stirling Band III converter, both manufactured by S. E. Opperman, Ltd.



the dipole elements forming a virtually continuous rod. The aerial has useful directional properties.

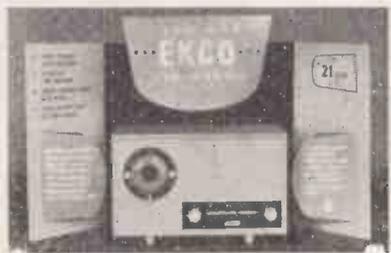
The company are also marketing a new Band III converter, known as the Stirling. This is a self-contained unit with built-in power supply incorporating fine tuning and gain controls. The aerial input sockets will cater for either separate or combined Band I and Band III aerials.

The converter may be fitted to the back of the receiver, or it may stand in a convenient position nearby. It is for a.c. mains operation only, a mains on-off switch being provided. Dimensions are 4in. \times 2 $\frac{1}{2}$ in. \times 6 $\frac{1}{2}$ in. Retail price is 6 gns.

NEW MULLARD PRODUCTS

Mullard, Ltd., Century House, Shaftesbury Avenue, London, W.C.2. Telephone: GERRard 7777.

THE inductance and h.f. resistance of a straight wire can be increased appreciably by threading it through a small bead of "Ferroxcube." This fact is made use of in a variety of h.f. decoupling applications, including simple "grid stoppers" to prevent parasitic oscillation, and decoupling circuits in heater leads.



NOW AVAILABLE TO EKCO DEALERS IS THIS NEW SALES AID FOR THE EKCO RADIOTIME. THIS ATTRACTIVE COLOURED UNIT, SEEN HERE COMPLETE WITH RECEIVER, PIN-POINTS SOME OF THE SALES FEATURES OF THE EKCO MODEL A244

The use of Ferroxcube beads for decoupling heater wiring is particularly attractive in that there is no increase in resistance at d.c. or supply frequencies, though the h.f. resistance may be increased by an appreciable amount by the addition of a single 3mm. bead. This large resistive component also reduces the risk of the decoupling elements themselves causing parasitic oscillation, since any tuned circuit formed by them will be heavily damped.

Two types of Ferroxcube bead are available from the Component Division of Mullard, Ltd.—type FX1666, which is suitable for applications involving relatively low radio frequencies, and type FX1667, for high frequency circuits. Both types take the form of short tubes (length, 33mm, inside diameter, 1.2mm, outside diameter, 3.5mm). The beads are put into circuit simply by slipping them over the relevant leads. They can be held in place if necessary by pieces of sleeving. More than one bead can be used to obtain increased inductance and loss resistance.

New Valves

PCL82.—This is a noval-based triode-pentode with separate cathodes. It is suitable for use in the frame time-base circuits of transformerless television receivers employing 90 degrees scanning tubes such as the Mullard MW53-80. The triode section then functions as a blocking oscillator and the pentode section as a frame output valve.

The Mullard PCL82 has a 16V, 300mA heater, and will operate satisfactorily from a high tension line of 170V. The triode section has an amplification factor of 70 and a mutual conductance of 2.2mA/V. The pentode section has a maximum rated anode dissipation of 7W, and a mutual conductance of 7.5mA/V.

A.M.-F.M. Valves.—The Mullard series of noval-based valves for use in a.c. mains-operated f.m.-a.m. receivers has now been supplemented by an equivalent range having a common heater current rating of 100mA. These valves enable the design of efficient f.m.-a.m. receivers for operation from both a.c. and d.c. mains.

This new Mullard range comprises the UCC85 r.f. double triode, the UCH81 triode-heptode, the high-slope variable- μ pentodes types UF85 and UF89, the UABC80 triple-diode-triode, and the UL84 high-slope 12W output pentode. The associated half-wave rectifier is the UY85.

EZ81.—This is a new all-glass full-wave rectifier valve on the noval base. It has a maximum output current of 150mA, and is suitable

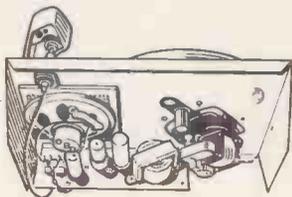
(Continued on page 741)

**Cash in
on the
record
boom!!**



with the *Champion Teenager*

**3 SPEED PORTABLE RECORD PLAYER
WITH H.F. AMPLIFIER AND SPEAKER**



NOTE THIS SPECIAL FEATURE

Compact construction, on heavy gauge pressed steel one-piece chassis, ensures rigidity and strength without loss of efficiency and portability.

Record manufacturers all over the world are reporting rapidly increasing demands for records of all types. You should share in this "boom" with the Champion TEEN-AGER (Model 843), a most attractive, self-contained, portable 3-speed record player for A.C. mains 200/250 volts. Plays standard and long-playing records (33 $\frac{1}{3}$, 45 and 78 r.p.m.). Specially designed H.F. amplifier, 5in. fidelity speaker. Turnover type crystal pick-up. Very appealing light-weight air-luggage type carrying case.

12 $\frac{1}{2}$ gns.

(£9 9s. 6d. plus £3 13s. P.T. new rate.)

(TAX PAID.)

Now is the time to stock Champion AM and AM/FM/VHF Radio Receivers and Radiograms and Record Reproducers.

Champion ELECTRIC CORPORATION

Head Office and Works: NEWHAVEN, SUSSEX. (Newhaven 500) London Office: 8 Eccleston Street, London, S.W.1 (Sloane 9838)



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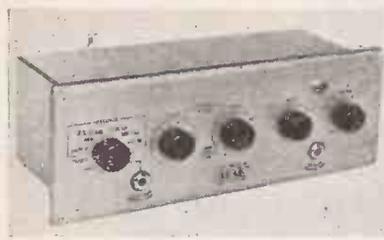
for use with a.c. inputs of up to 350V r.m.s. in capacitor input circuits.

The EZ81 has heater ratings of 6.3V, 1.0A, and the peak heater-to-cathode voltage rating is 500V. Filter input capacitors of up to 50 microfarads may be employed. This valve is recommended for use in the Mullard 5-valve 10-watt high quality amplifier circuit.

NEW LEAK PRE-AMPLIFIER

H. J. Leak & Co., Ltd., Brunel Road, London, W.3. Tel.: SHEpherds Bush 1173.

THE new Leak *Varislope* Mark II pre-amplifier has been designed to give flexible and accurate control over the quality of sound reproduction from records, broadcasts, or tape recordings. It is essentially a low noise, low distortion, two-stage feedback tone control pre-amplifier. The first stage gives record-compensation by means of a frequency selective negative feedback. Negative feedback is also used in the "Tuner," "Tape," and "Auxiliary" input circuits and is partially released in the "Microphone" input circuit to give high gain and a flat frequency response.



The Leak *Varislope* Mk. II pre-amplifier

In the second stage, negative feedback tone control circuits give bass and treble lift and a resistor-capacitor circuit gives bass cut. In the treble cut positions twin-T resistor-capacitor networks in the negative feedback loops form an integral part of the circuit to give continuously variable control of the rate of attenuation above the selected turnover frequency from 5db to 50db per octave.

Pre-set volume controls are fitted at the rear of the pre-amplifier, which also carries the various input sockets, and the socket providing power from any Leak power amplifier.

VIDOR TABLE TV

Vidor, Ltd., Erith, Kent. Tel.: Erith 3080.

THE price of the new Vidor 14in. television set, Model CN4230, has now been fixed at 70 gns. (£52 6s. 10d., list, plus £21 3s. 2d. tax). This receiver has now been released for sale.



The Impresario Mk. III tape recorder

NEW IMPRESARIO TAPE RECORDER

Lee Products (International), Ltd., Elpico Works, Olive Road, Hove 3, Sussex. Tel.: Hove 46044.

A NEW version of the *Impresario* tape recorder, known as the Mark III, is now available. It has provision for fitting the Elpico RF720 radio tuner unit. Two spools of tape can be accommodated at the rear of the tape deck and a compartment is provided for microphone storage, etc.

Three tape speeds are available (15, 7½ and 3¾ in./sec.), and the record head, which is of the high-impedance type, has an adjustable azimuth enabling minute adjustment to be made

for optimum reproduction of commercial music tapes. The Elpico tape deck is used, which has three drive motors and mechanically inter-locked controls.

Power output is 4 watts into a 6in. speaker. Independent bass and treble controls are fitted. For operation on 200-250V a.c. mains (110-125V to special order).

The Model RF720 radio tuner is a 3-valve 4-waveband unit with cathode-follower output stage. Price of the Mark III recorder is 56 gns. (excluding microphone, tape and radio). The Elpico M411 crystal microphone with lead and plug costs 3 gns. The RF720 radio tuner is priced at 15 gns. (tax paid).

SPRING-LOADED CASTOR

Hudson Patents, Ltd., Seyman Road, Leyton, E.10. Telephone: LEYtonstone 5678.

THE company have introduced a spring-loaded castor which, because of its "shock-absorber" action, would seem to be particularly suitable for television sets, radiograms, etc. containing valves and other delicate parts. The spring, fully compressed at 26-28 lb., takes an overall load of more than 100 lb. Movement is ¾ in. Stronger springs can be fitted if desired.

The castor has a ball-point bearing, so that the swivel action can not be upset by dust, dirt or rust. Further details and samples can be obtained by bona-fide enquirers from the manufacturers.

RECENT REFERENCE BOOKS

THE Mullard Maintenance Manual has been prepared with the aim of providing the service engineer with valve and tube information most useful to him in repairing and maintaining radio and television receivers and amplifying equipment.

The manual is divided into two main sections—receiving valves and television tubes. Each section carries an index of Mullard and other manufacturers' types, with indications of the recommended Mullard replacements. A special feature is the inclusion of obsolete valves that may still be encountered by the service engineer, together with their replacements from the list of currently available types.

The manual contains 291 pages of comprehensive information and is intended rather to supplement the Mullard Wall-Chart for service engineers, than to be a text book for constructors.

The cover is attractively designed and printed in seven-colour litho. The manual is currently available through trade channels or direct from Mullard Ltd., Valve Sales Department, Century House, Shaftesbury Avenue, London, W.C.2. The price is 10s. 6d., plus postage.

INTERESTING facts and statistics about sound radio and television are set out in the *B.B.C. Handbook, 1956*, published last month. The B.B.C. Television Drama Department, for instance, produced an average of three new productions a week—more than all the theatres in the West End of London, and Television Outside Broadcasts Department provided one-fifth of the total television programme output. The number of contracts issued to outside performers by the B.B.C. as a whole amounted to 140,000.

An article on plans for the extension of v.h.f. broadcasting shows that v.h.f. transmitting stations will cover 83 per cent of the population by the end of 1956.

Broadcasts in the B.B.C.'s external services, in 44 languages, totalled more than 30,000 hours in the year—half as many again as in the Home, Light and Third programmes combined.

In a reference to the creation of the I.T.A. the Handbook says: "There will be no departure from the B.B.C.'s purposes nor from the standards which it has set itself. But the existence of an alternative broadcasting system is bound to affect the Corporation's work in many ways. The B.B.C. recognises that, while competition in programmes must be met when it comes, there might be other matters affecting both bodies in which co-operation would be desirable in the public interest."



A NEW name for a PROVED process

*Radiant
screen*



There are a hundred-and-one convincing reasons for the consistent quality and long life of Mullard Picture Tubes. But to describe them all would take a book or a full length film.* One feature, however, is all important—the fluorescent screen. This has been the subject of years of research by Mullard scientists.

This screen—in many respects unique—is a major distinguishing feature, and so that it may be recognised as such, Mullard have adopted a new

distinguishing term—RADIANT SCREEN. In future all Mullard TV Picture Tubes will be known as Mullard Radiant Screen Long Life Picture Tubes.

For details of the big Radiant Screen Advertising Campaign see the August issue of the Mullard Outlook.

**There is a film. Full details about it were given in the July issue of the Mullard Outlook. If you haven't seen it yet write at once to find out when it will be shown in your district.*

Mullard

Radiant screen



TELEVISION TUBES
for Picture Quality and Life

MULLARD LIMITED, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

MVE 128B

BAND III TOPICS

I.T.A. and B.B.C. to share masts

THE Television Advisory Committee has informed the Postmaster-General that the best technical solution to the problem of siting television stations in the London area is a single tower to carry the aerials for all the television services of the B.B.C. and the I.T.A. The B.B.C. have accordingly agreed to make provision for the I.T.A.'s requirements on the tower now in course of erection by the B.B.C. at its new television station at Crystal Palace.

The B.B.C.'s offer has been welcomed by the G.P.O., which is responsible for approving the sites of all B.B.C. and I.T.A. stations, and by the I.T.A. itself.

The I.T.A. is at present negotiating with the London County Council to acquire land near the base of the tower for the erection of a building to house a new television station which will replace the temporary station now in service at Croydon.

The new arrangements will involve halving the size of the B.B.C.'s Band I aerial. The top 250ft. of the tower will have to be redesigned, and this will delay its completion by 18 months. It will not, therefore, be possible for the new tower to be brought into service early next year as had been planned.

However, in order that the new high power transmitter which is being installed at Crystal Palace may be put to use as soon as possible, the B.B.C. will erect a temporary mast

and aerial, 250ft. high. This temporary mast and aerial system will be capable of a radiated power of 60 kilowatts instead of the 200 kilowatts which the B.B.C. had hoped to be able to radiate initially from Crystal Palace.

The B.B.C. have decided to make this arrangement in order to achieve co-siting of the B.B.C. and I.T.A. stations in London which has been recommended by the Television Advisory Committee as a means of giving the best reception to viewers of both services.

When the tower and aerial system in its new form come into service about May, 1957, the B.B.C. will be able to raise the power to 125 kilowatts. Later on, a further increase to nearly 500 kilowatts, the maximum permitted by international regulations, is planned.

The I.T.A. hope to begin transmitting from the new tower at the Crystal Palace during 1957.

ITV in SCOTLAND

DURING December the I.T.A. are expected to start advertising for applications from organisations wishing to become programme contractors in Scotland.

Some of the present contractors are known to be interested in taking over the running of the Scottish station, but two things are likely to guide the I.T.A. in making the final choice:

(i) *A desire to grant the contract to an organisation which has considerable Scottish connections.*

(ii) *The duty of the Authority, as laid down in the Television Act, to do all it can "to secure adequate competition to supply programmes between a number of contractors independent of each other both as to finance and control."*

There are hopes that a decision will be reached within the next three or four months.

Members of the Authority feel that a contractor should be given at least 12 months in which to get fully organised and present plans are for the Scottish station to start transmissions in the spring of 1957.

BELLING-LEE BAND III AERIAL CONVENTION

FIVE HUNDRED dealers and engineers attended the Belling-Lee Band III aerial convention held at the Birmingham Town Hall on November 30. Main speaker at the meeting, which was arranged for the discussion of purely technical matters, was G. L. Stephens, chief engineer of the company, supported by F. R. W. Trafford, M.I.E.E. (technical manager), N. Dundas Bryce (executive director) and S. B. Begley and L. D. Taylor, sales engineers.

The new times of working from the "Belling-Lee" Band III television transmitter at Lichfield are:

Monday to Friday

9.30 a.m. to 12.30 p.m.

2. p.m. to 5.30 p.m.

7.30 p.m. to 8.30 p.m.

Saturdays

10 a.m. to 1 p.m.

Midlands ITV Publicity

AN extensive TV conversion-sales campaign was launched in the Midlands on November 25 by the two programme contractors—A.B.C. Television, Ltd., and A.T.V.

Utilising press advertisements, posters, bus sides and exhibitions and a wealth of material for radio dealers throughout the anticipated primary and secondary areas of the new television service from Lichfield, it emphasises the urgency of the consumer to contact his dealer for advice "now" if he is to receive the new programmes when transmissions commence in February.

A public relations department is also being set up by the programme contractors in Birmingham to service the press and to render all possible assistance to dealers in arranging additional displays, etc.

BREMA Band III Dealer Conference Postponed

THE meeting with dealers which the B.R.E.M.A. Television Promotion Committee had organised in co-operation with R.T.R.A. in Birmingham on last month to discuss Band III reception met with such a limited response that it was decided to postpone it.

The small demand for tickets is not taken to indicate any lack of interest in Band III problems or in meeting to discuss them, but rather as a sign that dealers are fully extended in meeting present demands partly caused by the pre-Budget uncertainty and spurt of buying which arose from it.

Birmingham TV Theatre

THE Astoria cinema, Aston, Birmingham, has been taken over by the two Midlands programme contractors, ABC and ATV, and will re-open as Birmingham's TV Theatre in February, 1956. At least two studios will be housed in the building. The balcony will be retained for TV audiences.

TESTED AT EVERY STAGE

EMITRON

REG. TRADE MARK

**Valves and
Cathode Ray Tubes**

10"
12" & 15"
ROUND



14" & 17"
RECTANGULAR

You can rely on **EMITRON**

REG. TRADE MARK

REPLACEMENTS

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New Books and Trade Literature

Radio Servicing Pocket Book

IN June, 1954, we reviewed a reference book entitled *Television Engineers' Pocket Book*. Now the same publisher has brought out a *Radio Servicing Pocket Book* as a companion volume of similar format and style, intended for radio engineers, dealers and servicing men.

Those who already possess a copy of the earlier volume will know exactly what to expect in this new book. It is essentially a compact work of reference embracing the whole field of radio servicing. Of special interest is a topical section dealing with servicing problems in v.h.f. f.m. receivers.

Chapter headings include: *Workshop Organisation and Practice; Servicing Equipment; Modern Circuitry; Fault Finding and Replacements; Receiver Alignment; Principles and Servicing of F.M. Receivers; Electrical Interference; Gramophone Record Reproduction, etc.* In addition there are several chapters of statistical data, formulae, colour codes, valve data, broadcast wavelengths, etc. There are numerous illustrations.

The size of the book, 6½ in. × 4 in. makes it handy for slipping into the pocket, and it will be welcomed by engineers as a handy source of reference data.—P.P.H.

Radio Servicing Pocket Book, edited by E. Molloy and J. P. Hawker. Published by George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Size, 6½ in. × 4 in.; 212 pages; well illustrated. Price, 10s. 6d.

Repairing Record Changers

MOST dealers and servicing men will agree that for a long time there has been a need for a comprehensive book dealing with the general servicing of automatic record changers. Admittedly manufacturers provide service manuals for their individual changer models, but they are specific in approach, as are manufacturers' radio and television service manuals. What is required is a reference book covering the principles and design of auto-changers as a group—a mechanical parallel to the many books available on radio and TV design and servicing.

Such a book is necessary if an engineer is to understand fully how and why changers function, and it would

also illuminate the more concise and utilitarian information contained in the service manual, which is concerned with the application of theory to one particular model.

From this point of view, *Servicing Record Changers* might have been written to specification, for it certainly fills an important gap in available technical literature. Although an American book, it is equally applicable to British equipment, as it deals with mechanisms of widely differing types, many of which have their equivalents in this country.

A step-by-step treatment is employed. The first few chapters cover the general principles of changer mechanics, service bench requirements, pick-ups, styli, records, etc. Then the various mechanical motions involved in the functioning of changers are explained one by one. Next, the author discusses the levers, cams, gears and other devices that produce these motions.

It is emphasised that these basic motions are employed in all auto-changers, though each manufacturer may use a different arrangement of mechanical parts reflecting the taste of the designer. Once the fundamental motions are known and understood, the engineer can then work out the mode of operation of any particular changer.

Chapter headings include: *Service Bench Set-up; Motor Drives; Tripping Mechanisms; Record-dropping Mechanisms; Cycling the Pick-up Arm; Shut-off Mechanisms; Special 45 r.p.m. Changers and Spindles; Fault Location and Tests.* There is also a chapter dealing with the servicing of magnetic tape recorders.

The book is extremely well illustrated by pictures and diagrams showing in great detail the many mechanisms and motions employed. The text is easy to read and assimilate. Recommended

for the technical library of every dealer and engineer handling autochanger service.—K.R.

Repairing Record Changers, by E. Eugene Eckland. Published by the McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon Street, London, E.C.4. Size, 9 in. × 6 in.; 278 pages; profusely illustrated. Price, £2 4s. 6d.

Mullard Ferroxcube

REMARKABLE advances in magnetic materials have been made since the war. In particular, the introduction of ferrites for use as magnetic cores has led to more efficient and compact components, such as transformers for single frequency, wide band and pulse operation, TV line transformers and deflection yokes, etc. Such ferrites are marketed by Mullard, Ltd., under the name of "Ferroxcube."

Mullard Ferroxcube, intended as a reference book for designers of components and equipment deals comprehensively with the properties and applications of Ferroxcube.

Exhaustive data is given on all Mullard Ferroxcube components, including pot-cores, transformer-cores for communications and television, aerial rods and special components, with descriptions of the design procedure necessary to make use of them.

Mullard Ferroxcube, published by Mullard, Ltd., Components Division, Century House, Shaftesbury Avenue, London, W.C.2. Size, 10 in. × 8 in.; 130 pages; illustrated by line and half-tone. Price, 7s. 6d.

TRADE LITERATURE

Measuring Instruments (Pullin), Ltd., Electric Works, Winchester Street, Acton, London, W.3. The latest edition of the Pullin catalogue, section "A," is now available. It covers the range of Pullin miniature panel-mounting instruments and incorporates a number of improvements in layout designed to assist the reader.

Wolf Electric Tools, Ltd., Hanger Lane, London, W.5. The autumn edition of *The Electric Tool User* has now been published. This is a quarterly illustrated magazine covering the applications of electric tools, and this issue contains details of the Wolf radio and television suppressors. It is available to bona-fide members of the trade on application to the manufacturers:

E.S.D. sold out!

James Huxley's **ESSENTIAL SERVICING DATA** is now out of stock and we are therefore unable to accept any further orders for this popular pocket reference book. A new edition is in the course of preparation, however, and when ready will be announced in the pages of *B.R.T.* Meanwhile . . .

DO NOT ORDER UNTIL THE NEW EDITION IS ANNOUNCED

COLOUR TV TRAINING ?

Dear Sir,—Why should D.F.F. (*Points of View*, November) be worried about colour TV training for engineers when there isn't likely to be a colour TV service in this country for many years, if at all? For the next few years Band III is going to be the problem not colour. In any case, it's debatable whether the money to be spent on starting colour TV couldn't be put to better use in improving black-and-white TV. A good programme is good in black-and-white or colour, and a bad programme certainly won't be improved by using colour. Programmes sell sets. Too much talk about colour will build up a sales resistance.—W.F., Liverpool, 8.

H.P. AND RENTALS

Dear Sir,—We were told before the Budget that people were spending too much and that further restrictive measures would have to be taken to prevent this.

In our trade we prepared for "the blow" but we smaller retailers hoped that at least some attempt would be made by the Chancellor to restrict the growth of rental business.

"The blow" has fallen but the rental companies have got away scott free and it is quite obvious that their

points of view

Letters to the Editor

The Editor welcomes letters on subjects of general, technical or trade interest, but does not necessarily endorse the views or opinions expressed by correspondents.

business can only be increased as a result of this Budget. Where, then, is the reduction of spending to be achieved?

The obvious solution, we felt, was to have brought about some control of rental business. We all know that, nowadays, TV rental methods are simply legal ways of side-tracking h.p. regulations, making the Government look silly and forcing more and more dealers to take up a form of business which they do not like and which adds yet more worry to an already very worried profession.

Our own sales have been reduced by about one third since the increased h.p. deposit was enforced some months ago but the rental concerns have been

more busy than ever. The moral should be obvious, Mr. Butler.—J.G.S., Leigh, Lancs.

BACK NUMBERS

Dear Sir,—Would it be possible to publish details of the more important articles which have appeared in *B.R.T.* during the past few years, as I am sure many readers would like to order back numbers on that basis.—F.J., Chingford, London. E.4.
(See page 748 in this issue.—Editor.)

THE LIGHTER TOUCH

Dear Sir,—I like the lighter touch to be seen in recent issues of *B.R.T.*—I mean, of course, the cartoons and the touches of humour here and there. More of them, please. There are lots of laughs in day-to-day trading and servicing, and I don't see why a trade paper shouldn't reflect some of them.—B.B., Nottingham.

Dear Sir,—I don't care much for the idea of having cartoons and humorous articles, although they are well done. I think the space would be better devoted to more technical articles or "Tech. Gen" which have a practical value.—S.T.R., Hayes, Middlesex.

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	0.197"	0.197"	0.5	1.2	1.5	2.5	3.8
	0.158"	0.197"	0.6	1.4	1.7	3.1	4.6
	0.138"	0.197"	0.7	1.6	2.0	3.8	5.4
	0.118"	0.197"	0.8	1.8	2.3	4.5	6.3
	0.106"	0.197"	0.9	2.0	2.5	5.0	7.2
Tolerance			±0.3	±0.5	±0.5	±0.5	±0.5

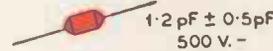
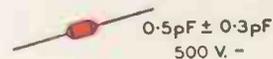
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Of all the different bases that are used for magnetic recording tapes, none can match the precise uniformity of cast cellulose acetate. 'Scotch Boy III', with its cellulose acetate base, offers recordists the most exact uniformity of response that any tape can provide. 'Scotch Boy III' is the best of all tapes for high-precision recording, whether of voice, instrument, or mechanical sound.

For laboratory experiments that require the utmost uniformity of response 'Scotch Boy III' is the natural choice: at 1000 c/s its output variation within each reel is less than

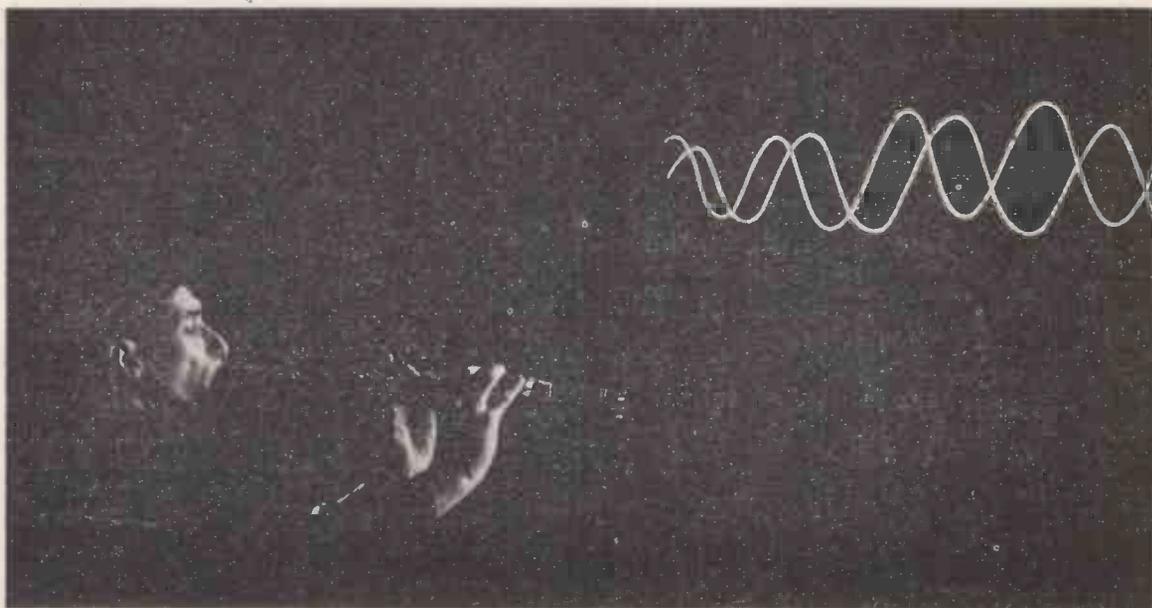


Photo and oscillograph of Cy Laurie playing a characteristically agile embroary of a phrase from "King of the Zulus"

$\pm \frac{1}{4}$ db., and the variation from reel to reel is less than $\frac{1}{2}$ db. 'Scotch Boy III' is used by the services for experiments that involve the precise measurement of mechanical and other sounds, and by sound technicians and expert recordists all over the world.

'Scotch Boy III' is supplied in 1200-ft. lengths on easily-threaded, 7" plastic spools, and also in 600-ft. and 2400-ft. lengths. All these lengths are free from splices.



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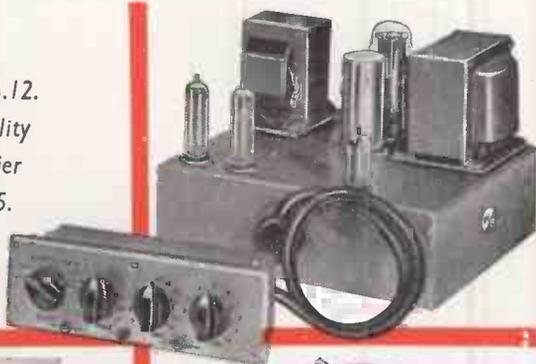
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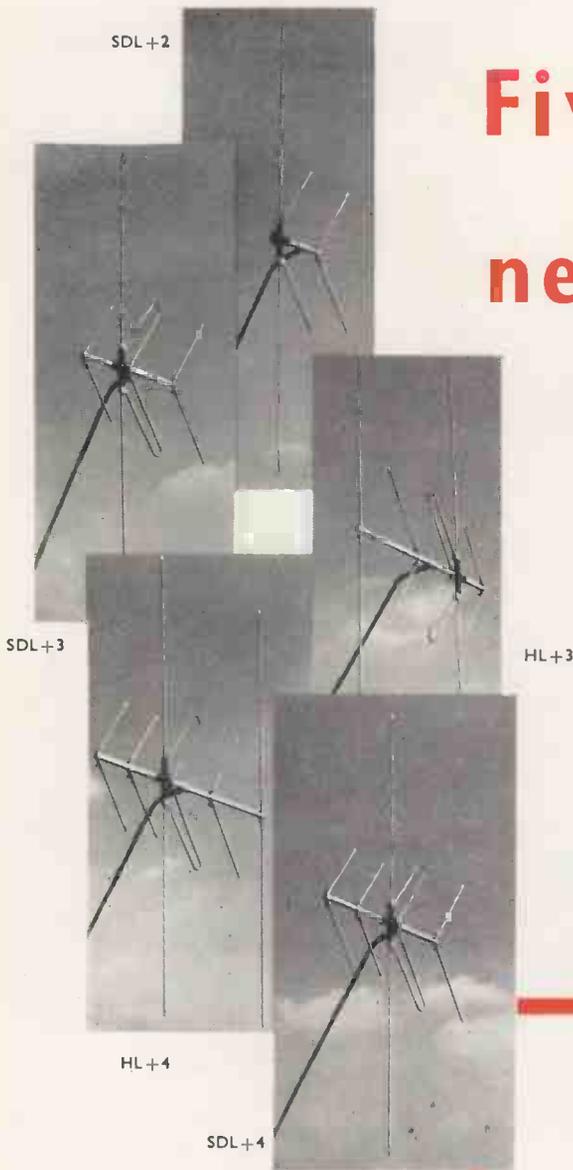


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SDL+2	For chimney lashing complete ...	3	7	6
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SDL+4	For chimney lashing complete ...	4	15	0
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Financial News

It is pointed out that winding-up proceedings and liquidations are frequently rendered necessary for the purpose of reconstruction, extension of capital, transfer of business, etc., quite unconnected with any financial embarrassment, and the fact that companies appear in this list, therefore, must not be taken as necessarily indicating any want of solvency.

BANKRUPTCY PROCEEDINGS

Kenneth Frederick Ponting-Baker, carrying on business in the name of P. B. Radio Services (K. F. Ponting-Baker), at the Metropole Showrooms, North Road, Minchard, Somerset, radio and television contractors. Order of Adjudication September 22. Public examination November 22, at 1A, Wood Street, Taunton.

Julius Hiller, 76 Whitechapel Road, and 52 Whitechapel Road, London, E.1, radio dealer, etc. Application for discharge November 16 at Bankruptcy Buildings, Carey Street, London, W.C.2.

CHANGES OF NAME

Bedfont Radio, Ltd., 6a George Street, Richmond, Surrey. Name changed to Bedfont Radio and Television, Ltd.

Butler & Littman, Ltd., 21 Denmark Street, W.C.2. Name changed to Star Records, Ltd.

Epsylon Sound Accessories, Ltd., Twickenham Studios, St. Margarets, Middlesex. Name changed to Epsylon Sales and Service, Ltd.

James Sawle, Ltd., 56 Liverpool Road, Great Crosby, Liverpool, 23. Name changed to Norman Green (Electrical), Ltd.

Lincoln Radio Relay Service, Ltd., 107 Cricchade Road, Swindon. Name changed to Westcott Holdings, Ltd.

Mallor Radio & Television Co., Ltd., 15 Buckingham Palace Gardens, S.W.1. Name changed to Mallor Radio & Electronics, Ltd.

DISSOLUTION OF PARTNERSHIP

Harry Myers and John Barnett, carrying on business under the style of North West Television Company, 117 Portobello Road, Kensington, London, television insurance specialists, August 31, 1955 (dated September 12, 1955) so far as concerns John Barnett, who retires.

Albert Charles Sidney Wells and Kenneth Harold Edgar Dawson, carrying on business under the style of Express Services, 65 Bells Road, Gorleston, Suffolk, and 33 Church Road, Gorleston, Suffolk radio dealers, etc., September 30, 1955. All debts in respect of the business at 65 Bells Road, Gorleston, by Albert Charles Sidney Wells who will continue the business, and all debts in respect of the business at 33 Church Road, Gorleston, by Kenneth Harold Edgar Dawson who will continue the business.

INCREASES OF CAPITAL

All-Power Transformers, Ltd., 8a Gladstone Road, S.W.19. Registered capital of £20,000 increased by £30,000.

Associated-Rediffusion, Ltd., Stratton House, Piccadilly, W.1. Registered capital of £100 increased by £499,900.

Beaumont (Television), Ltd., 2 St. Peter's Street, Huddersfield. Registered capital of £1,000 increased by £9,000.

Bowmaker, Ltd., Bowmaker House, Lansdowne, Bournemouth. Registered capital of £1,250,000 increased by £750,000.

B.P.L. (Instruments), Ltd., The Houseboat, Radlett, Herts. Registered capital of £5,000 increased by £5,000.

Brentford Transformers, Ltd., Kidbrooke Park Road, S.E.3. Registered capital of £30,000 increased by £120,000.

Eastern Counties Hire Purchase Company, Ltd., 82 Victoria Road, Chelmsford. Registered capital of £7,000 increased by £8,000.

Edison Swan Electric Company, Ltd., 155 Charing Cross Road, W.C.2. Registered capital of £1,250,000 increased by £500,000.

Electronic Developments (Surrey), Ltd., 78 Victoria Road, Surbiton, Surrey. Registered capital of £7,500 increased by £2,500.

English Electric Valve Company, Ltd., Queens House, Kingsway, W.C.2. Registered capital of £250,000 increased by £250,000.

Gresham Transformers, Ltd., 50 Gresham House, Old Broad Street, E.C.3. Registered capital of £50,000 increased by £25,000.

Grundig (Great Britain), Ltd., 103 Cannon Street, E.C.4. Registered capital of £10,000 increased by £29. The additional twenty-nine shares are to be issued to Herbert S. Melly and Beatrice L. Melly with the right to renounce such shares in favour of Gas Purification and Chemical Company, Ltd.

Harry Carr, Ltd., 16 West St. Mary's Gate, Grimsby. Registered capital of £5,000 increased by £5,000.

Hartley Baird, Ltd., 37/9 Thurloe Street, S.W.7. Registered capital of £800,000 increased by £200,000.

Howitt (Wholesale), Ltd., Britannia House, High Street, Holywell, North Wales. Registered capital of £1,000 increased by £9,000.

Kingsland Finance Company, Ltd., 1/2 Sandringham Mansions, Exeter Road, Bournemouth. Registered capital of £50,000 increased by £50,000.

Loughton Radio & Electrical Company, Ltd., 204 High Road, Loughton, Essex. Registered capital of £1,500 increased by £3,500.

Marconi International Marine Communication Company, Ltd., Marconi House, Strand, W.C.2. Registered capital of £1,500,000 increased by £1,000,000.

Multi-Broadcast (Engineering), Ltd., 92 Lower Millmorton Road, Rugby. Registered capital of £94,000 increased by £56,000. Part of the above increase is for the purpose of acquiring not less than 90 per cent of the issued share capital of Multi-Broadcast (Rugby), Ltd.

Rental Collections, Ltd., 109 Maybank Road, E.18. Registered capital of £900 increased by £12,100.

Sarum Electric, Ltd., 30 Milford Street, Salisbury, Wilts. Registered capital of £1,000 increased by £1,000.

Servit Electric, Ltd., 319 Wimborne Road, Bournemouth. Registered capital of £1,000 increased by £9,000.

Southern TV Distributors, Ltd., 146 White-ladies Road, Bristol, 8. Registered capital of £50,000 increased by £50,000.

Stanwood Radio, Ltd., 144 High Road, E.15. Registered capital of £20,000 increased by £30,000.

Sydney S. Bird & Sons, Ltd., Cydon Works, Fleets Lane, Poole, Dorset. Registered capital of £65,000 increased by £235,000.

Telecommunication Instruments, Ltd., 244a Southtown Road, Gt. Yarmouth. Registered capital of £4,000 increased by £2,000.

Transformer and Electrical Company, Ltd., Eastern Works, Eastern Road, E.17. Registered capital of £500 increased by £4,500.

Trix Electrical Company, Ltd., 1/5 Maple Place, Tottenham Court Road, W.1. Registered capital of £6,000 increased by £14,000.

Universal Injection Plastics, Ltd., Brook Road, Wood Green, N.22. Registered capital of £10,000 increased by £30,000.

Whitehead Electrical Radio Company, Ltd., Victoria Street, Mansfield, Notts. Registered capital of £1,000 increased by £49,000.

Wolsey Television, Ltd., 103 Cannon Street, E.C.4. Registered capital of £100 increased by £35,000.

NOTICE OF DIVIDEND

William Holdsworth, trading as "Meadow Melody Stores," 65A Meadow Road, Leeds, wireless dealer. No. 49 of 1932. Supplemental of 7d. in the £ payable at the Official Receiver's Office, 29 East Parade, Leeds.

NEW COMPANIES

Abrams & Wright (Electronics), Ltd. Capital £500. Objects: To carry on the business of manufacturers and dealers in electrical, electronic, wireless, telephone and telegraph apparatus, etc. Directors: Gordon A. Abrams, Mrs. Mary E. Abrams, Frank W. Wright and Mrs. Margaret J. Wright. Secretary: Mary E. Abrams. Solicitors: Parkers & Groome, Rushden. Registered office: Victoria Road, Rushden, Northants.

A.D. Television Services, Ltd. Capital £100. Objects: To carry on the business of owners, managers and operators of television and sound broadcasting stations and studios, etc. Subscribers: C. B. Rossiter, secretary and P. M. Rudge, article clerk. The first directors are not named. Solicitors: Rubinstein Nash & Co., 5/6 Raymonds Buildings, W.C.1.

A. Howarth & Co., Ltd. Capital £2,500. Objects: To acquire the business of "A. Howarth & Co." carried on by Alfred Howarth and Alice M. Howarth at Upway, Wotton Lane, Lymington, Devon, and to carry on the business of manufacturers of and dealers in radio and television aerials, etc. Directors: Alfred Howarth and Mrs. Alice M. Howarth. Secretary: Mrs. A. M. Howarth. Solicitors: Linsley-Thomas & Co., W.1. and Brighton. Registered office: Aqua House, 24/5 Old Steine, Brighton, 1.

Alston Capacitors, Ltd. Capital £100. Objects: To carry on the business of manufacturers of and dealers in capacitors, electrical accumulators, batteries, acids and containers, dynamos, motors, transformers, magnetos and all electrical plant, etc. Directors: Bernard Alston and Leonard C. Harman. Registered office: 104 Gt. Russell Street, W.C.1.

Alberta Electric Co., Ltd. Capital £1,000. Objects: To carry on the business of designers and manufacturers of and dealers in electrical, electronic, radio, television and telephone apparatus, etc. Directors: Albert E. Smith, Mrs. Mary E. Smith, Edward C. Smith and Joyce Smith. Secretary: Joyce Smith. Solicitors: Whittingham, Bradwell & Mack, Nottingham. Registered office: 34 Radford Road, Nottingham.

Argee Radio and Television (Retail), Ltd. Capital £2,000. Directors: Reuben Gold and Betty Gold. Solicitors: Peters & Peters, 70 Wimpole Street, W.1. Registered office: 68 Queens Crescent, Kentish Town, N.W.5.

Arthur Moore (Electrical), Ltd. Capital £1,000. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: Arthur Moore and Mrs. Evelyn C. Moore. Solicitors: S. J. Green, Cambridge. Registered office: Fair Street, Cambridge.

Bentley & Son, Ltd. Capital £20,000. Objects: To carry on the business of hire purchase financiers, etc. Subscribers: J. Ransome Bentley, Joan Stewart and John Ransome Bentley. Secretary: J. R. Bentley. Registered office: 17 Dorset Square, N.W.1.

Betavue (Birmingham), Ltd. Capital £100. Objects: To carry on the business of manufacturers of and dealers in radio and television, radio and television engineers, etc., aerials. Directors: Samuel A. Salter, Colin J. Salter and Harry D. V. Gould. Secretary: Harry D. V. Gould. Registered office: Bank Chambers, 512/514 Brixton Road, S.W.9.

Bradnick & Co., Ltd. Capital £2,000. Objects: To carry on the business of manufacturers of, agents for and wholesale and retail dealers in electrical goods of all kinds, wireless and television sets, etc. Directors: Denis C. Bradnick and Mrs. Beryl M. Bradnick. Secretary: Albert B. Howard. Registered office: National Provincial Bank Chambers, Five Ways, Birmingham.

Brayhead Products, Ltd. Capital £5,000. Objects: To carry on the business of manufacturers of and dealers in electronic equipment, assembled and un-assembled accessories of all kinds, radio and television equipment, etc. Directors: Wm. Murphy and Harold T. Mote. Registered office: The Gower House, Headstone Lane, Harrow, Middx.

Browns (Sparkbrook), Lt. Capital £5,000. Objects: To carry on the business of dealers in wireless and television sets and components, etc. Directors: Harold Brown, Betty M. Brown and Peter H. Robinson. Secretary: Ernest B. West-

(Continued on page 756)

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14" C.R.T
13 Channel
Receiver

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Effective Area	1/64 sq. in.
Weight	34 ounces
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Financial News

—continued

wood. Registered office: Lombard House, Great Charles Street, Birmingham, 3.

Cheb, Ltd. Capital £500. Objects: To carry on the business of electrical equipment specialists manufacturers of and dealers in batteries, accumulators, magnetos, dynamos, etc. Directors: Douglas E. Cowling, Alfred V. Holdsworth and E. Bertin. Registered office: 34 Thameshill Avenue, Romford, Essex.

C.C.L., Ltd. Capital £6,000. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of components for radio, television and electronic industries, etc. Subscribers: Menry E. Goodrich and Ethel R. Cornell. The first directors are not named. Solicitors: Henry E. Goodrich, 3 Field Court, Grays Inn, W.C.1.

C. C. Shackleton & Sons, Ltd. Capital £15,000. Objects: To acquire the business of "C. C. Shackleton" carried on by Chas. C. Shackleton at Kingswood, Glos. and to carry on the business of electricians, radio, television and refrigeration plant manufacturers, dealers in electrical apparatus, etc. Subscribers: Chas. C. Shackleton and Chas. L. Shackleton. Chas. C. Shackleton is the first director. Solicitors: Lawrence Williams & Co., Bristol. Registered office: 101 Regent Street, Kingswood, Glos.

Cofox, Ltd. Capital £500. Objects: To carry on the business of manufacturers of and dealers in radio and television apparatus and appliances, etc. Subscribers: Geo. A. Crook and Henry C. Hayman. The first directors are Kenneth Cooper, Arthur Fox and Cedric G. McCrossan. Secretary: G. A. Crook. Registered office: 168 Corporation Street, Manchester, 4.

G. D. Fly (Maintenance), Ltd. Capital £500. Objects: To carry on the business of manufacturers of and dealers in wireless and television apparatus, gramophone and electrical equip-

ment, etc. Directors: Jean V. Fly and John O. W. Hutchins. Secretary: Jean V. Fly. Solicitors: Burgess & Parsons, 60/62 High Street, N.W.10. Registered office: 111 Church Road, Willesden, N.W.10.

General Television Co., Ltd. Capital £100. Objects: To acquire the business of General Television Co., carried on by Stanley Pollock at 9a Princes Parade, N.W.11. Subscribers: Marie C. Lyne and Stanley Pollock. Stanley Pollock is the first director. Registered office: 9a Princes Parade, N.W.11.

Harold E. Ayscough, Ltd. Capital £500. Objects: To carry on the business of manufacturers, repairers of and wholesale and retail dealers in wireless and television sets, etc. Directors: Harold E. Ayscough and James Webster.

H. Harding (Telradio), Ltd. Capital £12,000. Objects: To carry on the business of designers and manufacturers of and dealers in radio, television and telephone apparatus, etc. Directors: Herbt. Harding and Keith G. Harding. Secretary: E. W. H. Webb. Registered office: 61 Clarence Road, Bristol, 5.

Howard's (Exeter), Ltd. Capital £20,000. Objects: To acquire the business of radio, electrical, television and refrigeration engineers carried on by Robert Howard, John Aplin and Lewis A. G. Satterley at 90 Sidwell Street, Exeter, and 5 Exeter Road, Exmouth, as "Howards." Directors: Robert Howard, Lewis A. G. Satterley, and John Aplin. Solicitors: Theodore Goddard & Co., 5 New Court, W.C.2; and Crosse & Crosse, Exeter.

Jack Bamford, Ltd. Capital £6,000. Capital £6,000. Objects: To acquire the business of a dealer in cycles, wireless and television apparatus, perambulators and toys now carried on by Jack Bamford at Urmston. Directors: Jack Bamford, Mrs. May Bamford and Mrs. Vera M. Cox. Secretary: Vera M. Cox. Solicitors: J. H. & J. A. Bowden, Manchester. Registered office: 114 Plinton Road, Urmston, Lancs.

J. Leithes, Ltd. Capital £10,000. Objects: To carry on the business of radio and television

engineers, etc. Directors: Joseph Leithes, Lilian B. M. Leithes, and Gordon Fawell, 10 May Street, Durham. Secretary: Lilian B. M. Leithes. Registered office: Seaside Lane, Easington Colliery, Co. Durham.

Ketay, Ltd. Capital £50,000. Objects: To carry on the business of manufacturers of and dealers in mechanical, electrical and electronic instruments, appliances, components and equipment, etc. Subscribers: Percy O. Ansell & Andrew Matthews. The first directors are to be appointed by the subscribers.

K. Howe & Son, Ltd. Capital £1,000. Objects: To carry on the business of manufacturers of and dealers in electronic apparatus, wireless and television sets, etc. Directors: Albert E. Howe, and Kenneth Howe. Secretary: Mary E. Howe. Registered office: 583 Selby Road, Leeds, 15.

Kingsway of London, Ltd. Capital £100. Objects: To carry on the business of mechanical, electrical and general engineers and contractors, radio and television engineers, etc. Subscribers: F. L. Giles and C. F. T. Wiggington. The first directors are not named. Solicitors: Theodore Goddard & Co., 5 New Court, W.C.2.

Mitchell's Home Services, Ltd. Capital £150. Objects: To carry on the business of electrical wireless, radio and television contractors and engineers, etc. The directors are: Dennis W. Mitchell, John H. Munn, and Albert E. Hall. Secretary: A. E. Hall. Registered office: 16 Grange Road, Southwick, Sussex.

Munns & Co. (Leicester), Ltd. Capital £2,000. Objects: To carry on the business of electrical and electronic engineers and contractors, etc. Directors: Wm. C. C. Munns and Geo. W. Mitchison. Secretary: W. C. C. Munns. Registered office: 91 Harrison Road, Leicester.

Norman Thomas (Television), Ltd. Capital £1,000. Objects: To carry on the business of manufacturers and distributors of, agents for and dealers in electrical goods, wireless and television sets, etc. Directors: Jas. N. Vinall and Fdk. T. Williams. Secretary: Pamela N. Vinall. Solicitors: Sidney L. Samson, 151 Strand, W.C.2. Registered office: 151 Strand, W.C.2.

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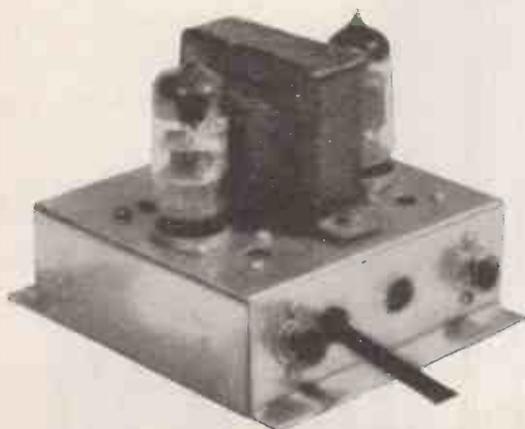
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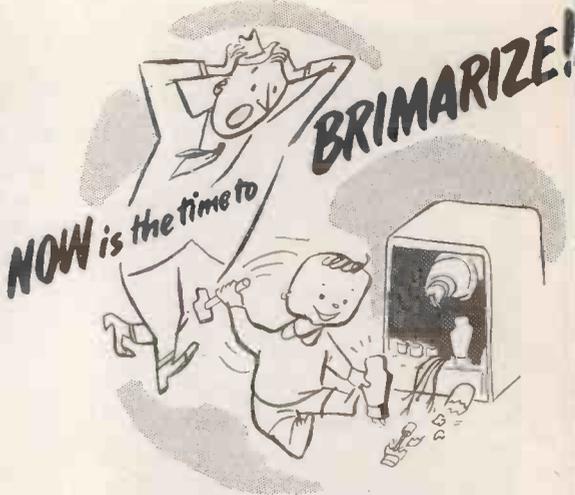
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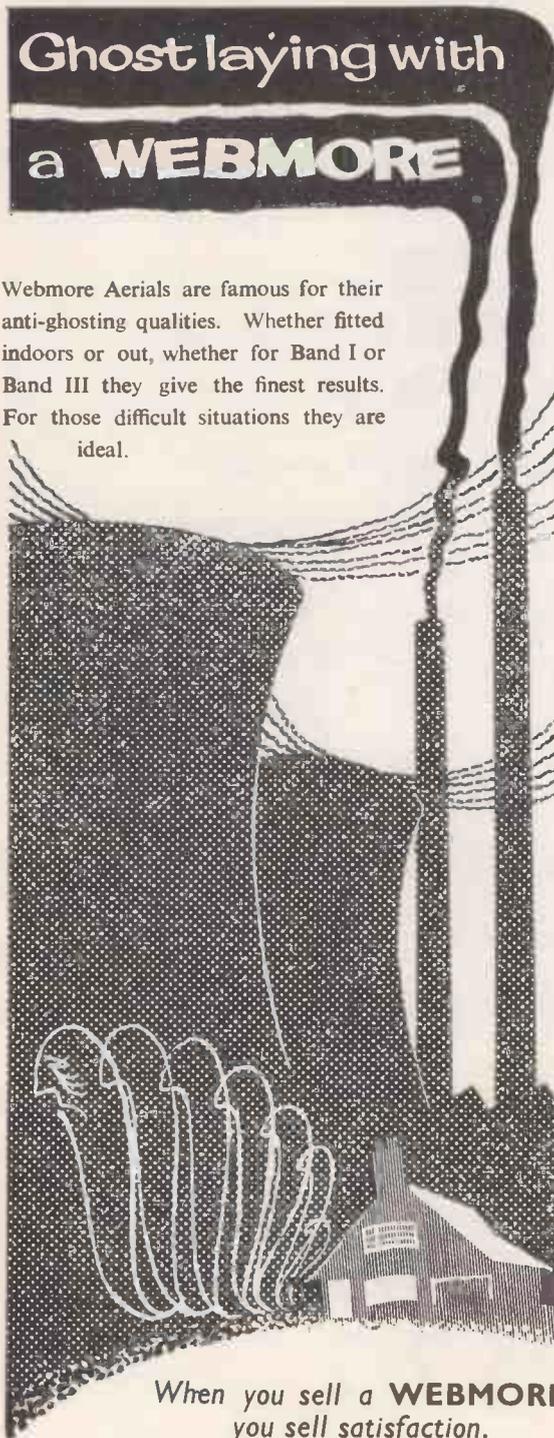
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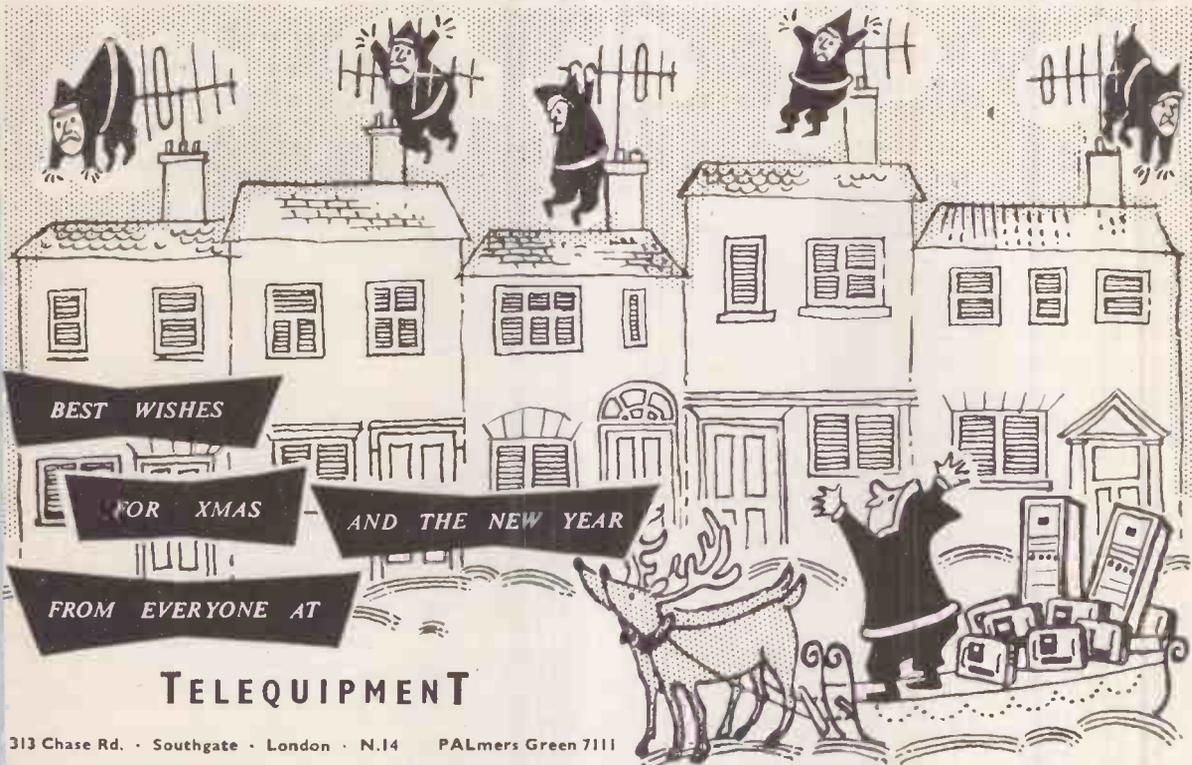
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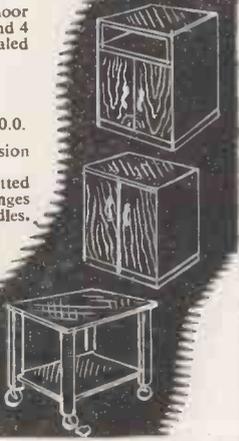
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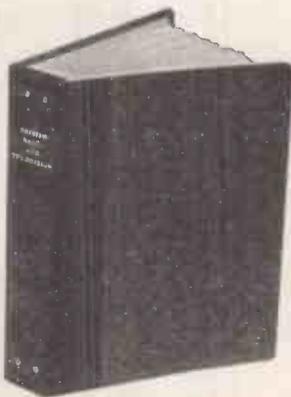
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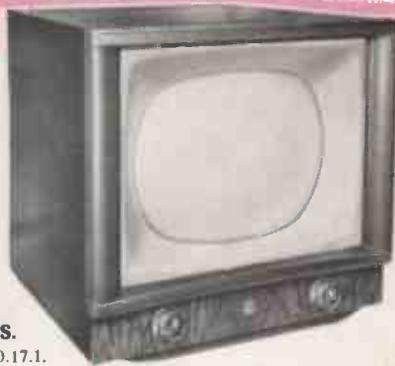
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