

PROJECTION TV

PRACTICAL TELEVISION

AND TELEVISION TIMES

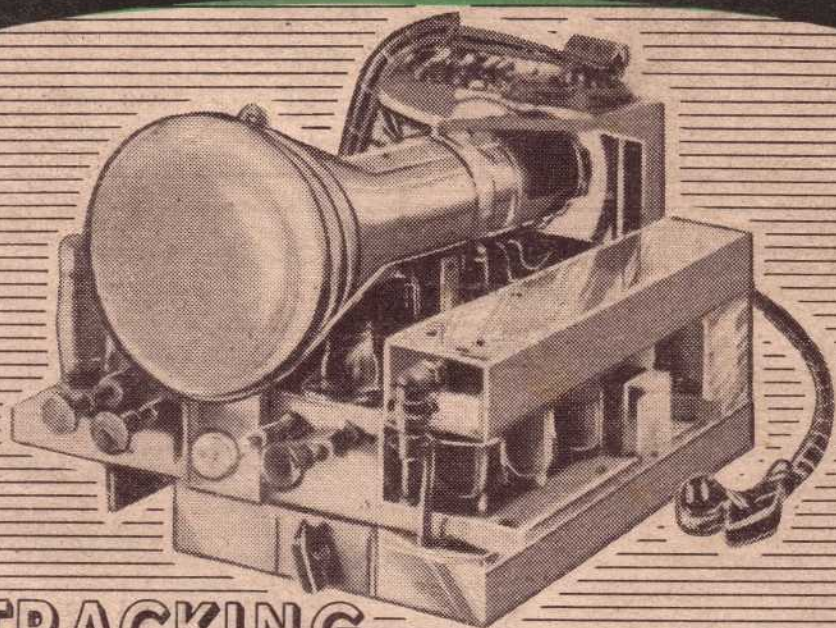
1/-

EDITOR
F. J. CAMM

A NEWNES PUBLICATION

Vol. 4 No. 45

FEBRUARY, 1954



TRACKING
TV FAULTS

FEATURED IN THIS ISSUE

Better Pictures
TV in Eire
Plessey Multivibrator

Telemetry
Phosphors and Colour TV
Problems Solved



Constructors everywhere are amazed!

AT THE EXCELLENCE OF
THE "TELE-VIEWER"

5 CHANNEL TELEVISOR

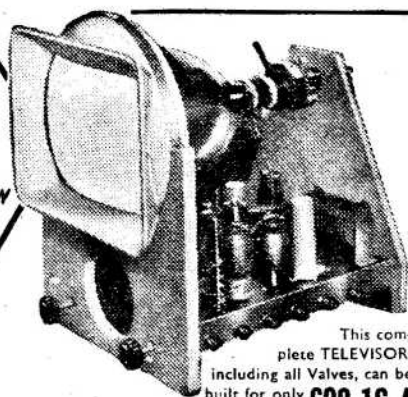
A Design of a Complete 12in. SUPERHET T.V. RECEIVER



HUNDREDS SOLD IN 4 MONTHS
SIMPLE DIAGRAMS MAKE
CONSTRUCTION EASY



PERFECT FRINGE AREA RECEPTION
BETTER RECEPTION AT HALF
COMMERCIAL COST



This complete TELEVISOR, including all Valves, can be built for only £28-16-4 (plus cost of C.R.T.)

We can supply A New 12in. C.R.T. at the specially reduced price of £12/19/6
Cerr. & Ins. 15/- extra.

Complete set of ASSEMBLY INSTRUCTIONS is now available, price 5/-. The instructions include really detailed PRACTICAL LAYOUTS, WIRING DATA AND COMPONENT PRICE LIST. ALL COMPONENTS ARE AVAILABLE FOR INDIVIDUAL PURCHASE. A CABINET WILL ALSO BE AVAILABLE.

STERN RADIO LTD.

109 & 115, FLEET STREET, E.C.4.

Tel.: CENTRAL 5812-3-4

Here are some features which combine to make this such a fine receiver:

- The Superhet circuit easily tuned to any of the five channels, i.e., LONDON, SUTTON COLDFIELD, HOLME MOSS, WENVOE and KIRK-O-SHOTT'S. (The extreme ease of tuning is accomplished by the provision of pre-aligned I.F.T.s.)
 - A lifelike, almost stereoscopic, picture quality made possible by the following factors:
 - (a) Excellent band width of I.F. circuits. (b) A really efficient video amplifier. (c) C.R.T. Grid modulated from low impedance source. (d) High E.H.T. voltage (approx. 10 kV).
 - The picture brilliance is also much above the average and enables comfortable viewing with normal room lighting or daylight.
 - FIRM picture "HOLD" circuits (Frame-Line) ensure a steady picture, free from bounce or flicker even under the most adverse conditions met with in "fringe" areas and excellent "interlace" ensures the absence of "liney effect."
 - Negative feedback is used in the audio frequency circuits which provide 2/3 watts of High Quality Sound.
 - Entire receiver built on two chassis units, each measuring 14 1/2 in. x 6 1/2 in. x 3 1/2 in.
 - Rigid C.R.T. mounting enables entire receiver to be safely handled with tube in position.
 - All pre-set controls are mounted on side of chassis enabling all adjustments to be carried out whilst facing the C.R. Tube.
- As no hire purchase terms are available the receiver can be bought in five separate stages (practical diagrams and circuits are provided for each stage) thus enabling hire purchase interest rates to be avoided.

ARTHURS HAVE IT!

LARGE STOCKS OF VALVES AND C.R.T.s.

| AVO METERS IN STOCK | | |
|---|---------|----------|
| Avo Model 7 | — — — — | £19 10 0 |
| Avo Model 8 | — — — — | 23 10 0 |
| Electronic Test Unit | — — — — | 27 10 0 |
| Electronic Test Meter | — — — — | 40 0 0 |
| Valve Characteristics Meter | — — — — | 60 0 0 |
| * Cossor Oscilloscopes Models | 1052 | 164 0 0 |
| | 1049 | 132 0 0 |
| Full range Taylors Meters. List on request. | | |
| Leak Point One Amplifiers | — — — — | 28 7 0 |
| Leak Pre-amplifiers | — — — — | 9 9 0 |
| Leak Vari-slope Pre-amp. for Leak Point One | — — — — | 12 12 0 |
| Leak Tuning Unit | — — — — | 35 6 3 |
| Chapman Tuning Units | — — — — | 17 6 8 |

LATEST VALVE MANUALS

MULLARD, OSRAM, & BRIMAR No. 5, 5/- each.
MAZDA 2/- each.

ART and SCIENCE in SOUND REPRODUCTION.
By F. H. BRITAIN, D.F.H., 2/6 each.
Postage 6d. each extra.

Terms C.O.D. OR CASH with order and subject to price alterations and being unsold.

Arthur's Est. 1912

PROPS: ARTHUR GRAY, LTD.

OUR ONLY ADDRESS: Gray House,
150-152 Charing Cross Road, London, W.C.2

TELEPHONE: Temple Bar 5833/4 and 4765.

TELEGRAMS: "TELEGRAY, WESTCENT, LONDON."
CABLES: "TELEGRAY, LONDON."

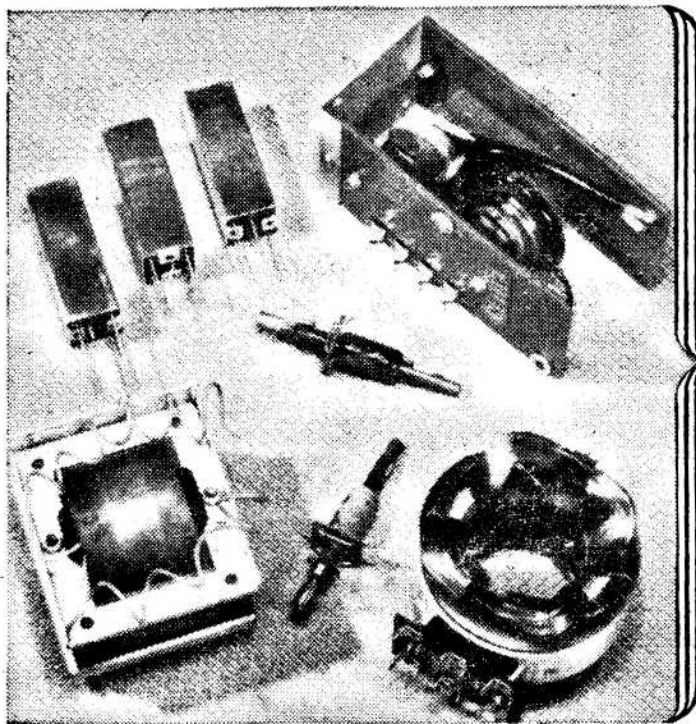
The solder for all
**HOME TELEVISION
CONSTRUCTOR SETS**

Designers of television constructor sets know that the efficiency of their equipment depends on the solder used by the constructor—that's why they recommend Ersin Multicore for trouble-free, waste-free soldering. Ersin Multicore, the only solder containing three cores of extra-active, non-corrosive Ersin Flux, is obtainable from all leading radio shops. Ask for Cat. Ref. C.16018, 18 S.W.G. 60/40 High Tin Television and Radio Alloy. The size 1 Carton contains 55 feet of solder, costs 5/-.



Ersin Multicore Solder

In case of difficulty in obtaining supplies, please write to:
MULTICORE SOLDERS LTD. MULTICORE WORKS, MAYLANDS
AVE., HEMEL HEMPSTEAD, HERTS. • Boxmoor 3636 (3 lines).



**THESE STANDARD
WIDE ANGLE
COMPONENTS ARE
USED IN THE
"TELEKING" AND
"SUPERVISOR"**

*Also for the conversion
to 14" or 17" C/R tubes
of all popular home-built
televisors.*



From all leading Stockists

**ALLEN
COMPONENTS LIMITED**

Crown Works, Lower Richmond
Rd., Richmond, Surrey

Telephone: Prospect 9013

Send 9d. and stamped ad-
dressed envelope for Circuit
Diagram

THE NEW APPROACH . . .

An illustrated brochure "The New Approach" showing our factory premises of approximately 4,000 square feet, and some of the equipment to give you the best radio and T.V. mail order service is available to all sending for our free 60-page illustrated catalogue. We are open to the public and also welcome your visit without obligation to purchase.

VIEWMASTER—

Constructional Manuals 7/6, Pre-amp data 1/-. All components are available immediately from stock. Our Viewmaster price list gives the prices of complete stages—not less certain parts. We do not pretend to save you money by offering doubtful ex-govt. parts. We have available for inspection and test a complete Viewmaster. The benefit of our 28 years' experience is at your disposal free to all clients. Send now for Viewmaster price list.

WE STOCK THOUSANDS OF RADIO & T.V. COMPONENTS.

WE HAVE BEEN ESTABLISHED 20 YEARS AND ARE ONE OF THE ORIGINAL PRE-WAR MAIL ORDER BUSINESSES.

SOUTHERN RADIO & ELECTRICAL SUPPLIES,

Sorad Works, Redlynch, Salisbury, Wilts.

Telephone: Downton 207.

IT'S CHEAPER TO MAKE YOUR OWN TELEVISION AERIAL

We can supply parts enabling you to make an aerial to standard design, or to suit your own ideas. 14ft. 16 S.W.G. 2in. HIGH TENSILE ALUMINIUM POLES. 47/6. C. and P. 3/6 extra.

1/2in. 18 S.W.G. D/H ALLOY TUBING (lengths as required). 10d. per ft.

1in. 18 S.W.G. D/H ALLOY TUBING (lengths as required). 1/4 per ft.

INSULATORS. Unbreakable, waterproof (standard). 6/9 each. For "In Line" Aerials, 8/9 each.

MAST HEAD MOUNTING. 2in. fitting, streamlined casting. 8/6 each.

AS ABOVE. 1in. FITTING. Streamlined casting. 6/- each.

REFLECTOR AND DIRECTOR ROD HOLDERS. High Quality Alloy Casting. 3/9 each.

BRACKETS. HEAVY DUTY, DOUBLE LASHING. Improved type, complete with fittings. 45/-. C. and P. 2/6 extra.

AS ABOVE. SINGLE LASHING, LIGHTWEIGHT. 1in. Pole fitting. 27/6. C. and P. 2/- extra.

C.W.O. Packing and Postage 1/6 extra, except where stated.

Fringevision Ltd.

ANGEL YARD WORKS, MARLBOROUGH,
WILTS.

Phone: Marlborough 605.

Sound advice to home constructors...

1. Build a **GOOD** set
2. Use **MULLARD** Valves & Tubes

If you are devoting many hours of leisure time to building a set, build a *good* set, one that will repay you with first class results.

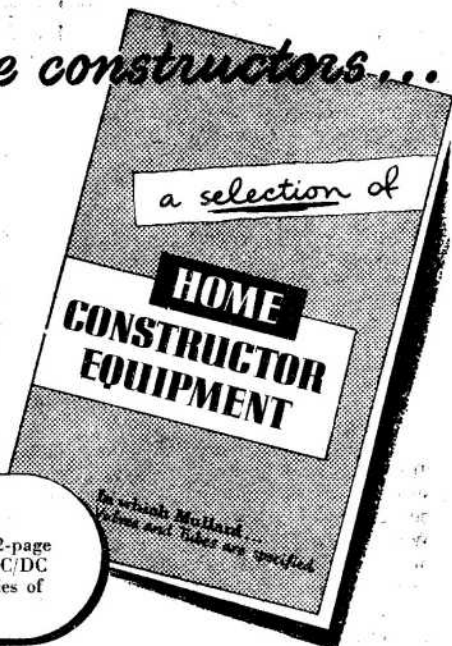
And to be sure of getting first class results choose Mullard Valves and Mullard Long-Life TV Tubes — the best that money can buy.

An interesting list of equipment — it covers TV and sound receivers, L.F. Amplifiers and tape recorders — for which Mullard Valves and Tubes are specified, is available free of charge. Send a stamped addressed envelope to the address below for a copy of "A Selection of Home Constructor Equipment".



FREE! FROM YOUR DEALER

Available from your usual dealer is a free 32-page booklet, "The Universal Large Screen AC/DC Televisor", reprinted by Mullard from a series of articles by A. S. Torrance.



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

MVM 250

COMPLETE VIEW MASTER SERVICE

ALL MODELS ALL AREAS

FULL HIRE PURCHASE FACILITIES

WIDE ANGLE BOOKLET NOW AVAILABLE 3/6d.

PRICES.—We can save you up to £7 on your View Master.

RESISTOR KIT.—Every Resistor labelled with value and position in set. No knowledge of the colour code required.

LONDON KIT, 26/- OTHER MODELS, 24/9.

HIRE PURCHASE.—Full Hire Purchase facilities are available for complete or part kits, including valves and tubes. Our Hire Purchase leaflet gives full details. All H.P. orders are completed within seven days.

PRICE LIST.—Our very detailed Price List is available free. Send for your copy now.

INSTRUCTION BOOKS.—All models, 7/6. Please state model required when ordering.

WIDE ANGLE.—All items for the "Practical Television" conversion are available.

DELIVERY.—All cash and C.O.D. orders are despatched by return.

Prices of individual stages are as follows: Specified or alternative components as detailed in our list:

LONDON MODEL

| | Specified | Alternative |
|---------|-----------|-------------|
| Stage 1 | £2.11.6 | £2. 8.0 |
| Stage 2 | £2. 0.9 | £1.19.3 |
| Stage 3 | £4. 2.6 | £3. 3.6 |

ALL OTHER MODELS

| | | |
|---------|---------|---------|
| Stage 1 | £2.10.6 | £2. 7.6 |
| Stage 2 | £2. 5.9 | £1.18.9 |
| Stage 3 | £4.15.0 | £3.15.0 |

For later stages see our List.

Please Note: Resistors not included in above.

VALVES.—Set of New Valves as specified, £11.9.9.

Special Offer: Set of valves with alternative types. Guaranteed. £7.0.0.

C.R. TUBES

| | | |
|---------------|----------|----------------------|
| Mullard 9in. | £12.10.3 | H.P. Deposit £4.10.3 |
| Mullard 12in. | £16.13.8 | H.P. Deposit £5.13.8 |
| Brimar 14in. | £20.10.1 | H.P. Deposit £6.18.1 |
| Brimar 17in. | £24.13.6 | H.P. Deposit £8.13.6 |

ANY ITEM SUPPLIED SEPARATELY

WATTS RADIO (Weybridge) LTD.

8, BAKER STREET, WEYBRIDGE, SURREY

Telephone: Weybridge 2542

PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor: F. J. CAMM

Editorial and Advertisement Offices: "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Phone: Temple Bar 4363.
Telegrams: Newnes, Rand, London.

Registered at the G.P.O. for transmission by Canadian Magazine Post.

Vol. 4 No. 45

EVERY MONTH

FEBRUARY, 1954

TELEVISIONS

Television on Tape

THE Radio Corporation of America recently gave a demonstration of television from a tape recording—a new technique and a most important contribution to television, for it supplies a link in the electronic chain which has been missing since television was invented. We are aware, of course, that disc recordings of thirty-line transmissions were available over twenty years ago.

The new method is similar in most respects to the tape recording of sound. It is, indeed, a system of electronic photography or video recording. If someone could now devise a means of amplifying light two of the major problems connected with television would be solved. The difficulty with projection television is that as the size of the picture is increased the light is correspondingly reduced. The new system can be employed for the motion picture and theatre industries, for education and for home entertainment. It provides the television industry with a practical and cheap solution to programme recording, immediate playback and rapid distribution. Magnetic tape requires no chemical processing and the recorded pictures can be viewed the moment they are taken. An unlimited number of copies can be made quickly and they can be preserved indefinitely for historic reference; or they can be electronically erased and the tape, of about newsprint thickness and half an inch wide, used again.

As video tape recording technique develops, other possibilities will open up. Small portable television cameras are already in wide use in industry, in stores, in banks, in schools and colleges. Low-cost television cameras that work like satellites off home television receivers are ultimately possible.

It would seem that the cost of recording a colour television programme will be only about 5 per cent. of what it costs to put it on colour film.

In the demonstration a colour television programme originating in NBC Studios in Radio City, New York, was beamed by radio microwave across the 45-mile span to RCA's David Sarnoff Research Centre at Princeton, New Jersey.

This programme was seen as it arrived. At the same instant, RCA's tape recording system recorded the television picture on tape. During part of this transmission, both the live programme from the microwave radio relay and an immediate play-back of the magnetic tape recording were shown.

As soon as the tape reel was rewound it was played back and the recorded television pictures appeared on two RCA colour television receivers which were viewed by a large group of press representatives who witnessed the demonstration.

In the first part of the demonstration, previously recorded magnetic tapes were run through the equipment. This phase included the reproduction of both black-and-white television pictures and colour television pictures that had been beamed over the same New York to Princeton micro-wave link at an earlier date.

Up to the present time television programmes have been recorded on film, a costly and rather bad method in which the pictures pass from the television camera through most of the television system to be reproduced on a small picture tube. A special motion picture camera then photographs the programme on motion-picture film. The film must be chemically processed and, usually, a print made before the pictures can be reproduced.

Super-Visor Blueprints Now Ready

FULL size blueprints of the Super-Visor, recently described in this journal, are now available at 7s. 6d. for the three sheets. A reprint of the constructional data is included with every set.—F. J. C.

---NEXT MONTH!---

FREE BLUEPRINT OF THE "SIMPLEX"

A free blueprint of our latest TV receiver for constructors—the SIMPLEX—will be included with every copy of next month's issue on sale February 22nd. It may be built for about £16.0.0, and is an ideal set for beginners. It makes use of the popular VCR97 6in. tube.

TELEVISION IN EIRE

SOME NOTES ON RECEPTION CONDITIONS
AND HINTS FOR HOME CONSTRUCTORS

By L. B. Moore

ALTHOUGH the Irish Republic has not yet a television service of its own there are quite a few enthusiastic viewers in that country. The majority of these viewers are home constructors, although commercial receivers are used in conjunction with pre-amplifiers and high-gain aerials.

The BBC station at Belfast will provide a usable signal to counties near the border when it is on full power and a serviceable picture should be obtained in the counties of Louth, Monaghan and most of Cavan.

It may be possible to get a serviceable signal in the counties of Meath and Dublin and we have had reports of the sound channel being received in Dublin itself at quite good strength under favourable conditions, from the low-powered temporary transmitter.

In the main, Southern Ireland will depend upon the existing high-powered stations in Britain.

Fig. 1 shows a map of the conditions and gives approximate distances of the main towns from the nearest TV transmitter.

The reports so far received indicate that Holme Moss is the main station received in the Dublin area. It is about 180 miles distant, but much of this is across the sea where attenuation of the signal is at a minimum.

Sutton Coldfield is not received so successfully due, probably, to the Welsh hills.

Waterford is in a difficult situation, as both Holme Moss and Sutton Coldfield are well over 200 miles away. Wenvoe is the most favoured station at this point and good reports have been received.

Cork relies on Wenvoe and although 230 miles separates the two places, good pictures have been received under favourable conditions.

Limerick is in a particularly poor position so far

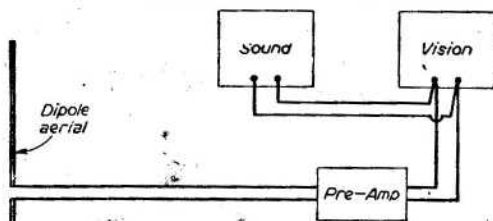


Fig. 3.—Block diagram of two separate receivers with a common pre-amplifier.

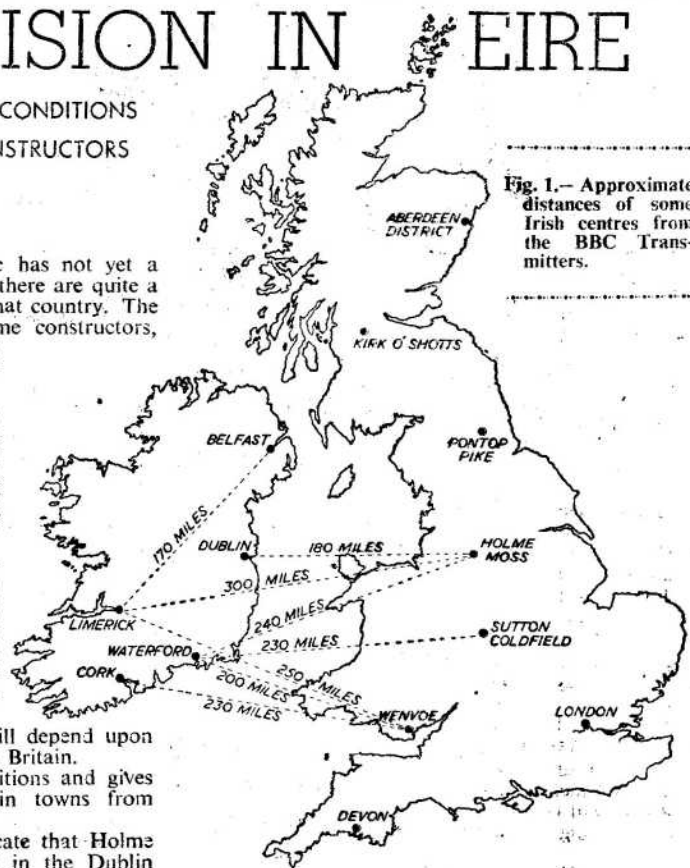


Fig. 1.—Approximate distances of some Irish centres from the BBC Transmitters.

as reception is concerned. We have not received reports from this area to date but it would appear that Wenvoe should provide the best signal.

TV Receivers

For long distance reception such as in Eire it is necessary to use a superhet. It is possible to receive pictures in the localities mentioned by use of R.F. amplification only, under favourable conditions, but a minimum of six stages is required and such an arrangement is difficult to set up.

The amateur constructor relies mainly on the R1355 and this is one of the very best units for the job, if used with an RF26 or RF27. The RF24 or 25 unit does not give anywhere near the same amplification of signal.

Where Holme Moss is received, then the RF26 should be used. The frequency covered by this unit is not low enough for both vision and sound channels, but it can be very easily modified by the insertion of iron dust cores in the coil forms of the R.F. mixer and oscillator stages. The cores should be set level with the tops of the formers and when the station is tuned in on the dial they can be adjusted for maximum response.

A one-valve pre-amplifier can be used in conjunction with the R.F. unit. It is possible to use a two-valve pre-amplifier but the increased gain is offset by the increased noise.

Where a one-valve pre-amp. appears insufficient then a low noise pre-amplifier can be added in front of the existing one. A suitable type which is very easy to set up was described in the November, 1952 issue of PRACTICAL TELEVISION ("Low Noise Pre-Amplifiers,") and the circuit is reproduced in Fig. 2.

For maximum results the video output valve of the R1355 unit can be replaced with an EF50 and the cathode can be decoupled by a 50 μ F 25 v. working condenser.

Separate Sound

It will be found better to use two separate receivers for sound and vision rather than to try to compromise by taking the sound off from some section of the vision receiver.

Two 1355 receivers with RF26's will work quite happily together, one on the vision and one on the sound. The two aerial input sockets can be connected in parallel as shown in Fig. 3.

Under normal conditions it will not be necessary to use all five I.F. stages for the sound channel; generally, four stages will be quite sufficient. The simplest way to modify the receiver is to take out the second I.F. valve and connect its grid cap connection directly to the third I.F. valve.

The R1355 has been mentioned in detail as it has been proved to be one of the most useful units for long-distance reception. Other suitable units are the R3084 and the R3170.

If a straight receiver is preferred, then the 194 strip

is most useful as it possesses six R.F. stages, and a pre-amp can be added.

Where a television is built to a standard superhet circuit, then an improvement in gain can be obtained by restricting the bandwidth to just below 2 Mc/s. It will be found that a satisfactory picture can be obtained under these conditions. It is better to receive

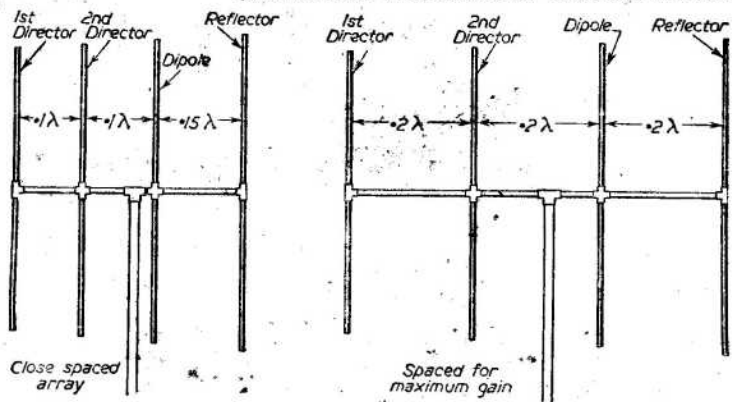


Fig. 4.—Two types of multi-array. Spacing depends on the frequency.

a picture that has lost some of its fine detail than to have one whose fine detail (and, indeed, most of the detail) is obscured with "snow."

One difficulty associated with reception at long ranges is that of arranging a compromise between vision and sound. Most superhets take the sound signal from the first or second vision I.F. stages and the oscillator has to be so adjusted that the picture signal is set 6db down on the carrier. This means an apparent loss of half the power of the vision signal; moreover, the R.F. and mixer inputs have to be adjusted to compromise between vision and sound.

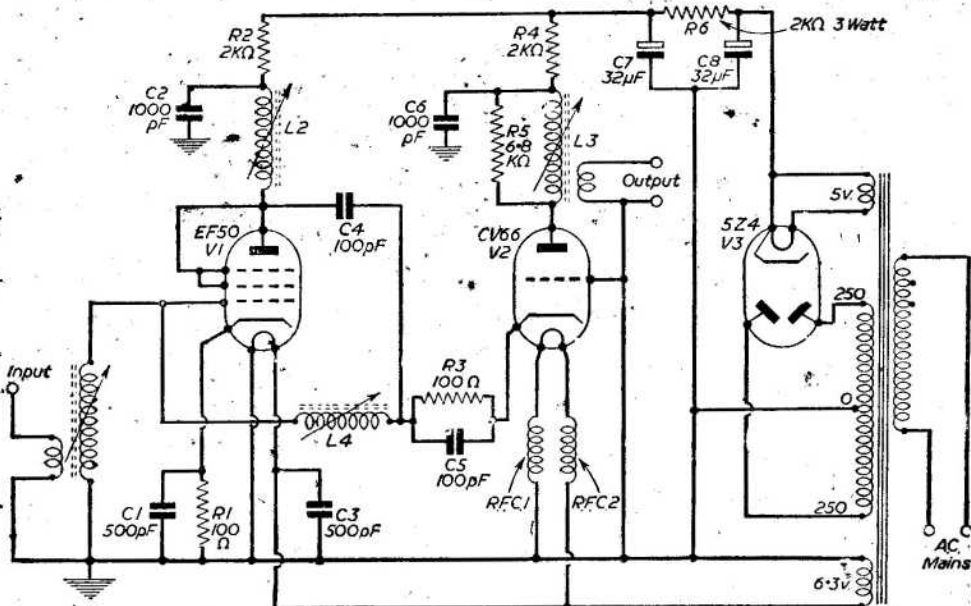
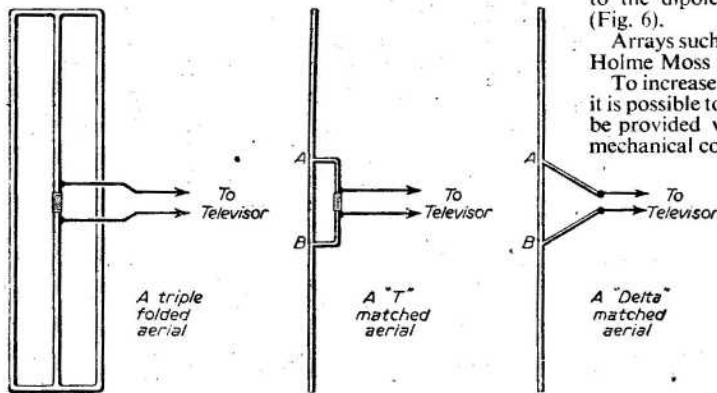


Fig. 2.—A good circuit for a low-noise pre-amplifier with its own power supply.

The difficulty can be overcome by the construction of a separate sound receiver, the existing receiver being peaked up on the vision signal so as to obtain the best quality combined with quantity. The existing sound section of the receiver can be ignored.

Aerials

This is undoubtedly one of the most important parts of the equipment. A high-gain aerial is a *must*



Note: Positions of attachment of matching sections A and B are best found experimentally

Fig. 5.—Folded aerials and methods of matching.

for Eire. The minimum array which will perform satisfactorily is the Yagi array comprised of a dipole, director and reflector.

A better array is the dipole with two directors and reflector. Maximum gain will be obtained with all elements spaced at 0.2λ and such spacing is quite suitable for the reception of Wenvoe. For Holme Moss, however, the array is inclined to be too bulky and spacing of the directors at 0.1λ and the reflector at 0.15λ is recommended (Fig. 4).

The aerial must be matched to the cable and to do this the dipole can be folded (double or triple according to the array) or a Delta or T match employed (Fig. 5.)

Very good results can be obtained by use of a double array comprising two Yagi arrays with 0.1λ , 0.1λ , 0.15λ spacing. This array is about the maximum which can be erected with safety without going to heavy expense in providing a suitable mast, etc. The two sections are spaced at 0.25λ and the coaxial connections from each dipole are connected in parallel to the down feeder, in the centre of the cross-boom. It is important that the two lengths of cables to the dipoles are of *exactly* the same length (Fig. 6).

Arrays such as these have been found to receive Holme Moss quite well in the Dublin area.

To increase the gain of a Yagi array still further it is possible to add more directors. The aerial can be provided with six or more directors, but the mechanical construction of such an array is likely to become rather a problem. Vertical polarisation does not lend itself readily to the stacking of arrays with multi-directors, such as is used in other types of V.H.F. reception.

It is almost unnecessary to remark that the arrays should be erected as high as possible and that the connecting cable to the receiver should be of the fringe type coaxial so as to reduce losses to a minimum.

Fading

Fading is a real nuisance when receiving at long distances. It is a simple matter to fit A.V.C. to the sound section in a similar manner to that employed in the normal broadcast receiver, but the vision receiver presents a more difficult problem.

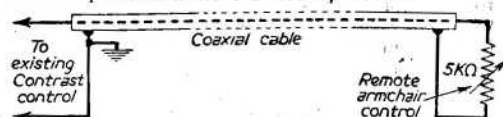


Fig. 7.—Method of fitting a remote or armchair control.

The easiest solution is, perhaps, to rely on a manual control fitted as an armchair contrast control.

Such a control can be fitted very simply. All that is needed is a length of coaxial cable and a $5\text{K}\Omega$ potentiometer; one end of the coaxial is connected across the existing contrast control in the television, the outer braiding going to the earthed terminal on the control. The other end of the coaxial cable is connected to a $5\text{K}\Omega$ potentiometer which is mounted in a small box. The control in the television is set at minimum contrast and picture-fading counteracted by the remote control (Fig. 7).

The measures outlined above should assist in the reception of British TV in Eire until such time as Eire has its own TV system.

When that happy day arrives we shall, perhaps, reverse the process and equip our own televisions for long-distance reception, in order to receive programmes from Eire.

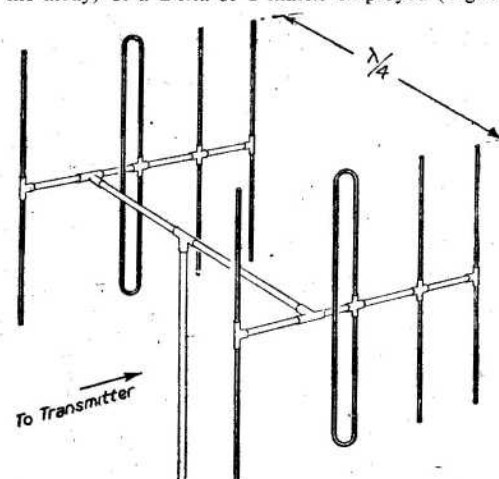
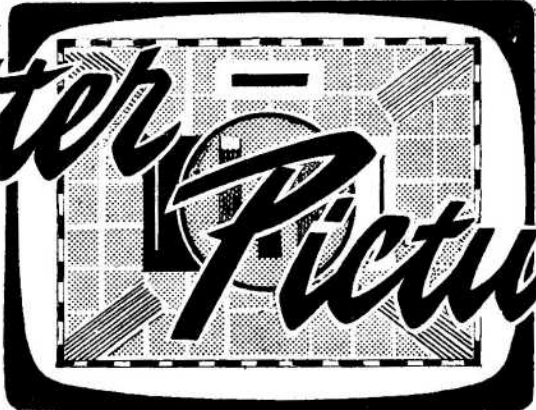


Fig. 6.—For areas of very weak signal strength an elaborate array of this type is not only desirable but, in many cases, essential.

SUPER-VISOR BLUEPRINTS
NOW READY
3 SHEETS, 7/6, by post 7/9, inclusive of
instructions.

Better Pictures



SOME HINTS ON METHODS OF IMPROVING RECEPTION, WITHOUT DRASTIC MODIFICATIONS

By W. J. Delaney (G2FMY)

HAVING built a television receiver, many constructors are content to leave well alone—provided, of course, that there are no important difficulties such as failure to interlace, unstable timebases, etc. As a result, many amateurs are looking at pictures which are by no means the best which could be obtained on their particular receivers and there are several things which may be done to improve matters—without going to the trouble of re-building or making drastic alterations. First of all, what is a good picture? Many viewers, even those with commercial receivers, fail to make properly the necessary adjustments, and regard the picture which they receive as a good one, or perhaps think that, although it is not as good as a picture seen at the cinema, it is the best which can be obtained on a television receiver. If possible, therefore, one should visit a really good demonstration and see just what high quality is really obtainable from the BBC transmissions. Failing this, it may be stated that the picture should range between a really good black and a really bright white, with good fine detail all over. A picture which seems to be slightly "fuzzy"—not exactly out of focus, but without really sharp outlines, and where the blacks are slightly grey, and dirty whites, is by no means necessary. Some of these faults result from bad adjustment of the controls and therefore we will deal first with those faults—assuming that the receiver has been properly lined up and is a good sound design.

Bandwidth

It has already been explained in these pages that for good detail an endeavour should be made to receive the maximum bandwidth, and this will vary according to the type of receiver. If the correct coils are used, and a published design is followed the receiver will, therefore, accept the maximum bandwidth, but this is of little use if the aerial system is unsuitable—either because it is cut for another channel or because it is home-made and lacking in good insulation, or because it is mismatched due to the use of the wrong type of lead. An aerial input circuit in a television receiver may be designed either for a coaxial or a twin-feeder, which may or may not be of the screened

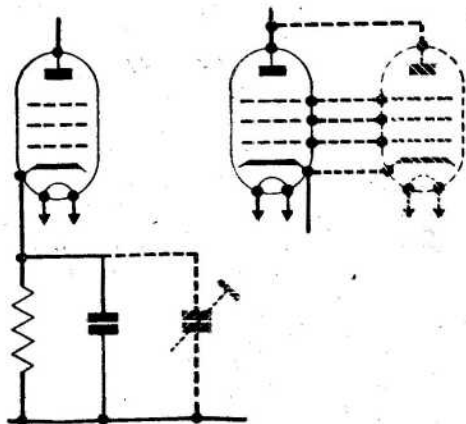
type. It is essential, therefore, to use the type of feeder which is called for, or to alter the input circuit so that the feeder you use is correctly matched. Furthermore, the aerial should be accurately cut to the dimensions which the local channel calls for, and if it is not correct it should be cut down, or lengths of rod added to make it correct. If this is not done then it is useless to expect the receiver to accept a suitable waveband.

Next comes the question of the tuning, and if, due to some faulty wiring or difficulty in trimming, it is not found possible to obtain both maximum sound and vision, an attempt should be made to receive maximum vision and then to try and improve sound by some external means—such, for instance, as using a separate sound receiver. Never compromise in an endeavour to improve the sound. In the same connection, there may be sound traps in the vision circuits and if these are not adjusted correctly they will affect picture quality. In some cases it may be preferable to short-circuit these whilst making the vision adjustments, and then to remove the short-circuits and re-trim slightly if necessary. This will, of course, depend upon the position in the circuit which the sound-traps take up. A similar remark applies to any interference limiter which is fitted. In the majority of cases the limiter merely cuts off above a certain level to prevent the interference spot from becoming large and defocused, but if the values of components used are incorrect, it will cut off at a sufficiently low level to prevent maximum whites from being obtained, giving a dirty effect to the picture. If, therefore, the limiter is of the type having a fixed resistor and condenser associated with a diode, it may be found worth while replacing the fixed resistor by one of half the value, and making up the remainder of the value by either a variable or two or three fixed resistors in series, a plug and socket being used to tap off one or more, so that the whites are improved. In some areas it may be found worth while to cut out the limiter entirely in the interests of better whites.

Contrast

Most receivers have a contrast control, and in some models there is an additional control usually labelled

sensitivity. In the majority of receivers both of these are merely R.F. gain controls, although in one or two commercial models the contrast control may be found to be a normal L.F. control preceding the video stage. This control, no matter where it is situated, must be operated in conjunction with the brilliance control, and it adjusts the strength of the signal. If set too far back, the picture will be watery unless the brilliance control is turned back so far that the picture can only be seen comfortably in a dark room.



Two Video Amplifier Improvements—an adjustable bias by-pass condenser and a paralleled output valve.

As the contrast is turned up, or in other words as the strength of the signal is increased, the brilliance may also be turned up, until a stage is reached where the picture in full black and white can be viewed in a normally lighted room—provided, of course, that the light does not fall directly on the tube face. There is, however, a balance between the contrast and brilliance which it is most essential to retain. If one or other is too far, then some transmissions will be found too dark and others too bright—especially in the newsreels, for instance, where the lighting is varied and not under the control of the operator. If you find, therefore, that during a newsreel transmission you have to keep adjusting brilliance, then it is most likely that your contrast control is wrongly set. Unfortunately it is not possible to give an exact indication of the best setting, in view of circuit differences, but a good idea of the correct adjustment may be gained by the following procedure. Remove the aerial lead, turn the contrast (and sensitivity control if fitted) and brilliance right back. Switch on and when the receiver has warmed up, advance the brilliance control slowly. This procedure should be carried out in a semi-darkened room, or at least with the tube face screened from direct light. As the brilliance is advanced a point will be reached where the illuminated raster will become visible. The adjustment must be made very slowly so that there will be no backlash which might occur in some circuits. The moment the raster may be seen stop and wait a moment and see if it disappears; if so, advance the control a little further, and wait again. When a stationary raster may just be seen, turn back the control until it just vanishes. Again this should be done very slowly in case there be any circuit components which hold a charge or otherwise give a delayed action to the control. As soon as the raster has disappeared, plug in

the aerial and then very slowly advance the contrast and/or sensitivity controls. In some circuits one or other of these may have to be turned fully on before the other comes into effect, whilst in others they may both work together. In any case, one or both of these controls should be turned until the desired picture is obtained. If it is found that with the setting previously made with the brilliance control a picture cannot be obtained with the contrast control fully up, then a pre-amplifier is called for. If, on the other hand, directly the aerial is plugged in, the picture is too bright, then an attenuator should be fitted as the signal is too strong. A final slight adjustment may afterwards be made to the brilliance control, but it should be very little.

Video Stage

The video stage is the most important part of the receiver, and sometimes a picture may be improved by an adjustment of the by-pass condenser connected across the bias resistor. If this is .002 μ F or greater some attempt should be made to improve the tuning of earlier stages. A low value is preferable in this position, and again a fixed component may be removed and replaced by a fixed of half the present value with a pre-set of equal value in parallel as shown in the illustration. Adjustment of this pre-set will give a good indication of the conditions in the video stage. It will probably be found that at a low value the picture is not sharp, but as it is increased the image sharpens up until a stage is reached where all the objects are outlined in white. This is bad, and the control should be backed off until the outline disappears and if the picture is then not sharp, the tuning circuits need attention, and/or any peaking chokes or circuits in the video stage should be attended to. In many cases the valve used in the video stage is too small to deliver a signal capable of fully loading the picture tube being used, and an improvement may easily be effected in such a case by adding a further similar valve in parallel. Provided that the mains section will deliver the necessary extra H.T. and L.T. current, simply mount another valveholder as close as possible to the existing video stage and wire similar pins together. This has the effect of halving the impedance of the stage, and therefore it may also be possible to add a similar anode resistance in parallel with the existing one—the lower the anode load the straighter the frequency response. Instead of adding a valve in parallel an alternative valve may often be used, again, provided that the existing power unit will deliver the necessary extra load.

Weather Report and Forecast

THE daily weather report and forecast took a new shape as from January 11th.

Two meteorological experts, T. H. Clifton and George Cowling, both from the Air Ministry Meteorological Office, deliver the daily report and forecast. They appear in rotation, each taking two or three days at a time.

The experts will appear every night in vision, and with the aid of maps, show the current weather trends.

T. H. Clifton, 43, has been forecasting weather for fifteen years. During the war he was attached for this purpose to the R.A.F. Bomber Command for four years. George Cowling, 35, joined the Meteorological Office in 1939 and was also a meteorological officer in the R.A.F.

Pages from a TELEVISION ENGINEERS Notebook

13.—AUTOMATIC BRIGHTNESS SYSTEMS



IN modern TV systems where the average brightness of the studio scene is radiated as a variation in the carrier amplitude, the effect is equivalent to the transmission of the D.C. component of the scene. Since, however, the D.C. is not conveyed as such through the entire system, it is necessary to recover or reinsert the D.C. component at the receiver, such recovery providing a form of automatic brightness control.

Consider Fig. 1 (a) where a grid-modulated picture tube is fed through a resistance-capacity coupling CR1 from the anode of the video amplifier V1. A constant bias is given to the grid of the tube by the positive potential of the cathode derived across the potentiometer R2, the bias value being E_g as indicated. The condenser coupling from the video stage permits the vision signal appearing across R1 to swing about the average level of the waveform at any particular instant, this average level being such that equal areas of the vision waveform are developed on either side of the average level line.

In Fig. 1 (b) the I_a - E_g characteristic of the tube is shown with two widely differing vision signals applied to its grid. The first of these represents a predominantly white picture, while the second is predominantly black. Considering for the moment the application of the white signal, the tube bias E_g will be adjusted so that the sync pulses swing the tube beyond beam-current cut-off. The average level of the signal will centre about the bias point and the peak-white level of the signal will be near that part of the

tube characteristic corresponding to zero bias. With this setting of the bias (brightness control) the peak-white picture will produce a beam current I_a as the figure shows. During the sync pulses the tube is cut off and at peak white level the bias is reduced to near zero

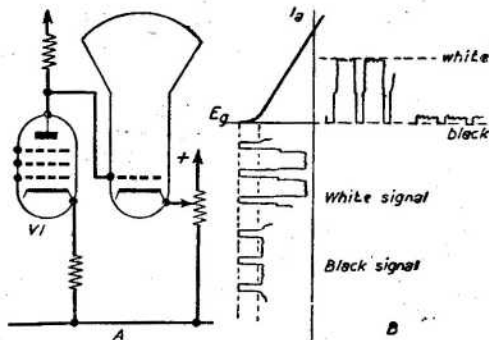


Fig. 2.—The effect of D.C. restoration is to provide a fixed base line on which all vision signals will rest.

When the signal changes to a level that is predominantly black, however, the brightness setting being the same, the average level again centres on the bias line but the beam current is not at cut-off during the sync pulses and the normal black level still produces a beam current that is not far short of the previous peak-white condition. The result is that the flyback lines are plainly visible and the general raster brightness is not far below maximum. It is seen, therefore, that the simple fixed bias operation of the tube fed through a condenser coupling is not satisfactory due to the serious distortion of contrast values and the appearance of flyback lines on most types of picture. For proper operation, the black level of all vision signals must be maintained at approximately tube cut-off and the bias level will then be set also at this point. The problem then is to get the vision signal to "sit" on the tube bias line, so that all degrees of brightness lift the beam current successively higher up to the limit of peak white or near-zero bias. It is

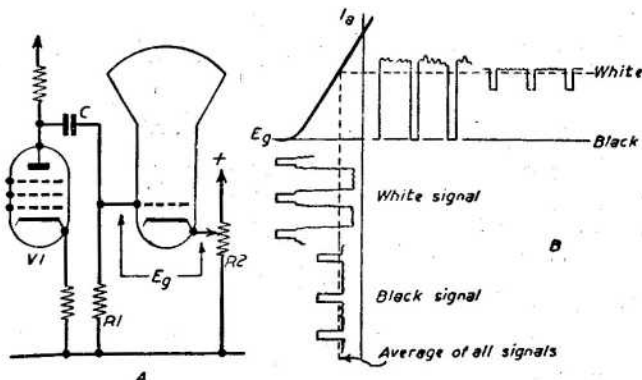


Fig. 1.—The condenser coupling removes the D.C. component of the signal.

assumed in the following notes that the video output is positive-going in phase and that the tube is grid modulated.

Direct Coupling

By using direct coupling between the video amplifier and the picture tube, the D.C. component is retained and the black level is maintained at a fixed point on the tube characteristic. This form of coupling therefore provides a simple form of automatic brightness. Fig. 2 (a) shows a basic system and with minor changes (usually concerned with the response characteristics of the amplifier) this circuit is now used on most commercial receivers.

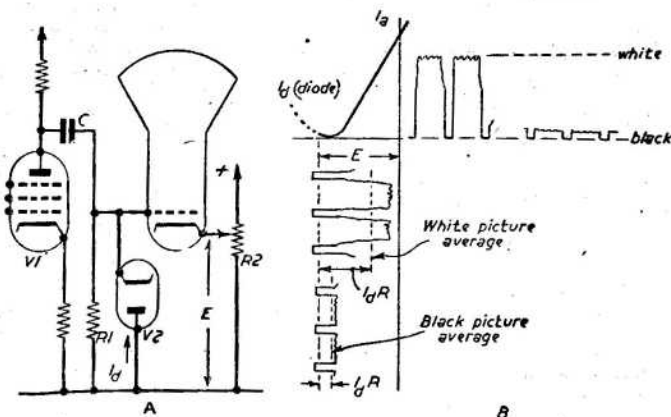


Fig. 3.—Showing the action of the restoring diode used with condenser coupling.

The vision signal of full white and predominantly black pictures is again shown on the grid characteristic at (b), and it is seen that the bottoms of the sync pulses are now held (or clamped) at the same level for both inputs. The resulting beam current is then seen to produce the proper contrast values above the cut-off line, and the sync pulses effectively increase the bias beyond cut-off during the periods of flyback. A disadvantage of this system is, of course, that if the video amplifier fails or the signal is cut off, the grid of the tube is carried beyond the cathode potential (positively) and there is the danger of damage. This can be easily overcome by modulating the tube cathode with a negative-going signal, or the insertion of a cathode follower between the video amplifier and the tube. The latter requires the insertion of a coupling condenser, however, and the D.C. component then has to be restored in the manner about to be described.

Diode Restoration

The use of a diode to bias the tube in accordance with the vision signal level appearing at the tube grid is well known and is a method of operation having several advantages for the home constructor who does not like the risk of direct coupling.

The basic circuit is shown in Fig. 3 (a), the coupling condenser C again being present. The tube bias now consists of two components, that due to the fixed cathode potential developed across the potentiometer R2, and a voltage generated by the diode wired across the input resistance R1. Consider again the application of the vision signals previously drawn; the conditions are shown in Fig. 3 (b).

The fixed bias E_g from R2 is normally set to a point just beyond beam-current cut-off. The average level of the signals (shown dotted) would centre about this bias as previously described if the diode were absent, but due to the action of the latter valve, another bias is developed, equal to $I_d R_1$, and nearly equal to the peak value of the signal, in opposition to the fixed bias E_g . The result of this action sets the vision signals so that the bases of the sync pulses just draw a diode current I_d to make up the normal leakage through R1 during the line intervals, i.e. near peak rectification of the vision signals.

The beam current produced by the all-white signal is shown in the figure with the peak-white level near to tube zero-bias and the sync pulses below cut-off.

With the same setting of the brightness control R2, the predominantly black picture still draws diode current on the bases of the sync pulses, but to a smaller degree than for the white picture, producing a positive bias proportional to the negative peak amplitude of the signal. The figure shows the operating condition, the beam current during the line scan being just above black level, and cut-off during the flyback period. This method of coupling is quite safe; for the video amplifier failure referred to above cannot affect the fixed cut-off bias of E_g .

A further advantage of diode restoration is that with normal values of the leak resistance (R1) the bias developed by the signal rectification is a linear function of the peak amplitude of the vision signal.

Design Considerations

Before proceeding to other systems of restoration, a few notes will be made on the design points of the diode method latterly mentioned.

The exact amount of bias developed by the diode depends upon several factors, and Fig. 4 (a) and (b) should be studied in connection with what is to follow. The video amplifier is considered as a generator producing a voltage e and having an internal impedance

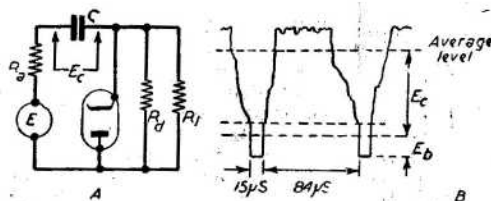


Fig. 4.—Diagram used for calculating design factors for the diode restorer circuit.

R_a , driving the diode through the coupling CR1. R_d is the diode resistance during conduction and will be a matter of some 500 ohms for the miniature valve types now available. When the diode is cut off, of course, R_d , may be taken as infinite.

The vision waveform of Fig. 4 (b) is that of the standard form of the present 405-line system.

The sync pulse width, in time, is about 15 μ secs., while that of the active line scan, operating at 10,125 cycles per second, is roughly 84 μ secs. If the diode is to charge condenser C during the period of one sync pulse, the time of charge will obviously be 15 μ secs., while the period of discharge will be 84 μ secs. In the figure, the voltages e_c and e_b represent respectively the voltage appearing across C in the form of bias and the voltage that permits the charge to be maintained. If the system is to remain in equilibrium, the quantity of charge supplied to C during the sync pulse must equal the quantity of charge lost through leakage during the active line scan. From this, the ratio of e_c to e_b may be determined.

Consider the time-constant of C and $R_a R_d$ in series, the charging state. If this is large compared with the discharge period of 84 μ secs., say 0.1 sec., the discharge current may be taken as a linear function of time equal to $e_b/(R_a + R_d)$. Further, if C ($R_a + R_1$)—the discharge circuit—is large compared with the sync pulse charging period of 15 μ secs., say 350 μ secs., then the charge current may be assumed to be constant also, and will be equal to $e_c/(R_a + R_1)$. For constant current, $Q = It$, therefore for a state of balance

$$I_d \times 0.85 = I_c \times 0.15$$

(percentages of line scan and sync pulse being taken here) where

$$I_d = \frac{e_b}{R_a + R_d} \quad \text{and} \quad I_c = \frac{e_c}{R_a + R_1}$$

$$\text{From this} \quad \frac{e_c}{e_b} = \frac{15}{85} \frac{R_a + R_1}{R_a + R_d}$$

Taking $R_d = 500$ ohms, $R_a = 3,000$ ohms, $R_1 = 1 \text{ m}\Omega$, and $C = 0.1 \mu\text{F}$, we get

$$\frac{e_c}{e_b} = 17$$

Turning back to Fig. 4, it will be seen that the sum of e_c and e_b is equal to the peak value of the vision signal in the direction of the sync pulses. From this the bias e_c may be found in terms of the peak value, and in the present case is 85 per cent. The signal of Fig. 4 (b) is predominantly white, but the above analysis as a function of the peak value applies equally well to a signal that is predominantly black. A white signal might, as an example, have a peak value of 40 volts which would produce 85 per cent. of bias (34 volts), while a black signal with a peak value of, say, 5 volts, would produce a bias of 4.25 volts.

Further systems of D.C. restoration and automatic brightness control will be described next month.

Making a Cage Aerial

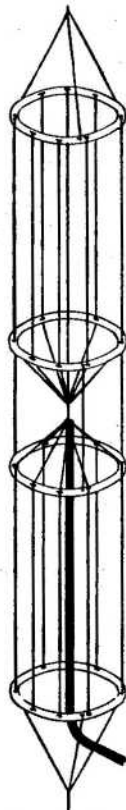


Fig. 1.—The Cage Aerial.

SEVERAL articles dealing with the subject of aeriels have appeared in previous issues of this paper. Whilst most types have been dealt with, the cage dipole seems to have been somewhat neglected. Excellent results can be obtained with this particular type of aerial. No other gives a wider bandwidth. This is a most important factor. No matter how good the receiver, high-definition pictures cannot be obtained if the aerial has insufficient bandwidth.

The aerial is simple to make, inexpensive and easy to erect. Experiments indicate that it is probably more efficient than the slot aerial, takes up considerably less room, and can be made directional by the addition of a reflector.

Construction

All that is required to construct the dipole are four wooden rings, 3in. to 4in. in diameter, plus some seven-stranded copper wire. This can be bought quite cheaply at the popular stores, a 50ft. coil costing 2s. It is built to form a cage, as shown in Fig. 1. The length of wire needed can be calculated from Table I. It will, of course, vary according to the particular channel. Referring to Fig. 1, it will be seen that the dipole is made up of two sections each comprising eight wires equally spaced around the rings. Before the wires are fixed into position it will be found advantageous to drill eight small holes

in each ring to enable the wires to be securely anchored. When this has been done the construction of one section of the dipole can be commenced. Table I shows the length of each half of the dipole. For instance, Channel five requires eight wires, each 3ft. 7in. in length for each half of the dipole. So, for the complete aerial 57ft. 4in. of wire would be required. Each one of the eight wires should be firmly secured to one of the rings. The other end of each wire is then threaded through its respective hole in the other ring, secured, and a sufficient length of wire left so that all eight wires can be soldered together, as shown in Fig. 1.

The other half of the dipole is made up in exactly the same way. Next comes the assembly, including the fixing of the co-axial cable. The inner wire of the co-axial should be soldered to the top half of the dipole. The braiding should be soldered to the bottom section. The gap between top and bottom of the dipole should be about half an inch. Three pieces of stout string should be used to keep the two sections correctly spaced. The whole aerial should then be firmly secured to the top and bottom beams in the loft.

For those who wish to add a reflector, details are given in the table below. The addition of a reflector increases the forward gain of the array and reduces the pick-up of noise from behind the aerial. The reflector differs from the dipole in that it is made up of one section only. It has no connections made to it, and it is so positioned that the dipole is directly between it and the transmitter. (P. DODSON.)

DATA FOR ADDING REFLECTOR

| Channel | Dipole (each half) | Reflector | Spacing |
|---------|-----------------------|------------|-------------|
| 1 | 5ft. 5in. | 1ft. 2in. | 3ft. 5in. |
| 2 | 4ft. 8in. | 9ft. 8in. | 2ft. 10in. |
| 3 | 4ft. 3in. | 8ft. 10in. | 2ft. 8in. |
| 4 | 3ft. 10½in. | 8ft. 0½in. | 2ft. 5in. |
| 5 | 3 ft. 7in. | 7ft. 5½in. | 2 ft. 1½in. |

ALTERNATIVE PROGRAMMES

By S. Simpson

SOME aspects of the question of providing a second and, perhaps, a third alternative television programme appear to have been overlooked during the recent discussions regarding alternative TV, and in this article the writer hopes to bring these points forward, illustrate their difficulties, and mention what might have been a solution to many of the problems.

That there is a need for alternative entertainment cannot be denied; not everyone likes ballet, and there are probably a lot of viewers who find no amusement in "Café Continental." All of us, however, pay a licence fee and many of us pay a fair amount for maintenance insurance. Quite rightly, viewers expect the maximum of entertainment from television; the development of the commercial TV question has interested them not a little.

Aerial Problems

As a first consideration of the problem, it is difficult to determine how reception is going to be achieved satisfactorily on frequencies greatly different from those now in use by the BBC while using a directional aerial tuned and oriented to the local BBC television transmitter. Harmonic reception will not provide a satisfactory answer since the reflector spacing which, for optimum reception, should be quarter-wave, approximately, cannot be readily altered, and certainly not in the middle of a dull BBC programme!

Other aspects of the aerial question arise; if more than one aerial is necessary—even a short U.H.F. dipole—what is to be done in the matter of obtaining permission from landlords to erect a multiplicity of aerials? In some areas, even at this stage of advancement of television throughout the country, it is quite difficult to obtain permission for the erection of one aerial, and that sanction itself costs a fair sum. What reaction to a request for a number of aerials can we expect?

Another matter which, perhaps, is not quite so evident, nevertheless, may soon pose a sticky problem is the question of technical staffing of "alternative" transmitters, whether under the direction of the BBC, the Government, or the private companies. Regarded from a national point of view, TV is still a very new form of entertainment and therefore has not the same technical "pool" from which to find its staff. Now, if the new programmes are going to hold the viewer's interest up to the introduction of the advertiser's products, the transmission and the setting must be of the highest quality. That is a simple statement of fact. It is not so simple to state where the men who can put over such high-quality performances are to be found. Keeping in mind the limited "pool," does this mean competition between the BBC and the proposed new Association for the services of the finest engineers and studio technicians? And, what

of the manufacturers? Are they to see their "key" men enticed away?

Fees

When one considers the nation-wide advertising available from TV, it is hardly to be expected that the advertisers will stint high fees, either for staff or artists, and here also looms a possible source of friction. How is the BBC to find the finances to compete with the new Association? The latest information tells of a BBC "request" for permission to increase the licence fee to £3 "or more"; in the same news review, we hear that the new Association may not have to depend on advertising income for the financing of their stations. Provided one lives quite close to a new transmitter and a BBC transmitter one should be in line for first-class entertainment from one side or the other.

Lack of Enterprise

Looking back over the last 12 months during which alternative programmes have been mooted, it is rather puzzling to the writer why no attempt has been made to forestall most of the problems outlined above by allowing sponsored programmes to be radiated from BBC transmitters outside normal BBC television hours. Admittedly, a great deal of re-arranging would have been necessary to permit of maintenance and rehearsals, etc., but would the problems have been anything like as difficult as they now appear? At least two hours could have been available in the early evening, and Sunday afternoon, still "dead" time with the BBC, could have been a most profitable session for the advertisers. In these circumstances, aerials would remain unchanged and no additions made thereto. Expensive converters to be added to existing televisions would be unnecessary. The threatened "licence" for commercial reception would never have been mentioned, and it is perhaps not too much to think that the revenue from advertising might largely have offset the heavy financial burden borne by the BBC, and which now seems, in part at least, about to fall on the long-suffering single-outlook televiewer.

The possibility of the introduction of alternative programmes, outside the existing BBC channels, raises a number of interesting problems, some of which are discussed here by our contributor. It would be interesting to know whether any manufacturers have yet attacked the technical problems raised.

STANDARD TEXT BOOKS

By F. J. CAMM

PRACTICAL WIRELESS ENCYCLOPEDIA, 21/-, by post 21/10. EVERYMAN'S WIRELESS BOOK, by post, 13/6. NEWNES RADIO ENGINEER'S POCKET BOOK, by post, 5/3. THE SUPERHET MANUAL, by post 6/4. RADIO TRAINING MANUAL, by post, 6/4. WIRELESS COILS, CHOKES AND TRANSFORMERS, by post, 6/4. REFRESHER COURSE IN MATHEMATICS, by post, 8/10. MATHEMATICAL TABLES AND FORMULAE, by post, 5/3. MASTERING MORSE, 1/-, by post, 1/3.

Obtainable from

GEORGE NEWNES, LTD.,

Tower House, Southampton Street, Strand, W.C.2.

FAULT SYMPTOMS

THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

By Gordon J. King, A.M.I.P.R.E.

(Continued from page 352 January issue)

SOME television receiver designers seem to prefer the use of a resistor capacitor combination, instead of the usual transformer, to couple the coils to the frame amplifier. Such an arrangement, used in Ultra V710 series receivers, is illustrated by Fig. 24 in the January issue. Here it will be seen that the 4.7 K Ω resistor R1 and the 24 μ F electrolytic capacitor C1 perform the function of coupling. For linearity correction a degree of N.F.B. is introduced into the stage by virtue of the un-bypassed cathode resistor, and also the value of which is selected to provide maximum linearity-compensating due to the curvature in the characteristic of the UL46 output valve. This receiver does not employ an adjustable form of linearity correction, and in practice a tolerable degree of frame scan distortion is evidenced, but this is quite normal and has no adverse effect on the entertainment value of the reproduction.

It will be observed here, however, that, since no transformer is used, high impedance scanning coils are demanded to facilitate a valve/coil impedance match, and for this reason the peak voltage developed across the windings during the flyback is in excess of that developed across the low impedance type. From the servicing aspect, the uncertain factor—the frame output transformer—is eliminated, and severe distortion of the kinds described is almost certain to be due to scanning coil failure.

It is important to remember, however, that the values of the coupling components are very critical, and any slight deviation from their original values is almost bound to result in scan distortion coupled with a reduction of picture height. Since a "leak" in C1 would allow a passage of current through the coils, producing a steady magnetic field across them, it is essential that the insulation of this component be of high standard. The effect of a steady magnetic field, due to a capacitor defect of this nature, for instance, would be to deflect the raster off centre in the vertical sense, and the magnitude of deflection

would, of course, be dependent on the leakage resistance of the capacitor.

Certain television receiver manufacturers economise in timebase by utilising back coupling between the scanning coils themselves to produce a sawtooth waveform, and thereby avoid the use of a separate generator stage and output transformer. Some pre-war Baird receivers adopted this principle, and it has also been used with a degree of success in Germany and the U.S.A. With the Baird receivers both line and frame timebases embodied such design, but a recent Murphy receiver employs it only for the frame timebase.

Fig. 27 depicts the old style Baird arrangement. Here the time constant comprises the inductance of the scanning coils and the sum of the resistances of the coils and the valve. In order to obtain a fairly linear scanning stroke the rise of current through the coils, to correspond to a full scan, is limited to the region of 10 per cent. of its final value (see Fig. 28).

The regenerative action of this circuit is quite simple to follow, and it is best to first consider the function during the frame flyback. For then the back E.M.F. developed across the grid winding L3 is such that the grid is made heavily negative with respect to cathode, and the valve is held beyond current cut-off.

As the current in the anode winding of the scanning coils collapses from maximum to zero (during the flyback) the grid potential becomes less negative, and is held at a value determined by the resistive element of the cathode circuit. The rate of consequent anode current rise through L1/L2 is controlled by the time constant of the network; and due to the changing anode current a back E.M.F. is set up across L1/L2 which opposes and lowers the anode potential. Similarly, an E.M.F. is developed across L3, the polarity of which is such that the grid is driven positively. A cumulative action ensues; for as the grid is driven more positively more anode

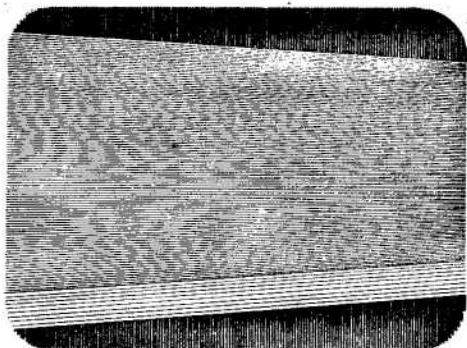


Fig. 25.—A wedge-shaped raster and foldover due to defective frame scanning coils.

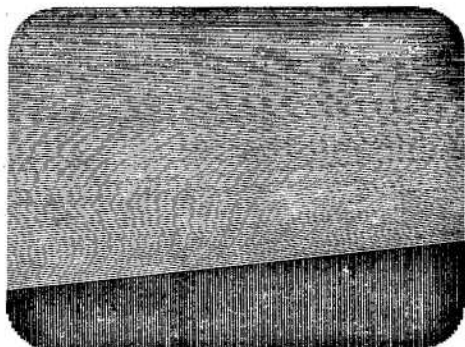


Fig. 26.—The effect when one frame coil breaks down.

Knowing this can expedite servicing of the receiver generally, because, for instance, should a fault develop which apart from its normal symptom also tends to shift the picture vertically on the screen, a lot of circuit diagnosis can be avoided. The valves affected are as follows: First vision amplifier (6F13); video output (6F13); sync separator (6D2); two sound R.F.s (both 6F13s); sound interference limiter (6D2); and the screen grid circuit of the sound output valve (6P25).

Inductive coupling exists between L1 and L2, which are in circuit with the anode and screen grid of the valve, and the feedback circuit is maintained through R2, C1, R3, and R4. A control of linearity is provided by the damping effect of R2 and C1 in the anode circuit, in association with the variable control R3. A coupling is introduced into the suppressor grid circuit to give a further degree of linearity correction, particularly towards the bottom of a picture.

Height control is effected by adjusting the cathode potential, and a variable resistor is appropriately included for this purpose. The frame hold control R5 varies the screen grid voltage, and hence the time constant of the charging circuit. It sometimes happens, however, that the characteristics of the oscillatory circuit are somewhat altered by component changes, particularly if the valve itself is replaced. This, as we have already seen, tends to put the correct time-base operating frequency outside the range of the hold control. For this reason, therefore, an additional fixed resistor R6 is included in series with the time constant circuit; this can be short circuited if it is found necessary to increase the frequency of the

generator—if R5 reaches the end of its travel in this direction.

The 150 K Ω resistor R7 merely serves to maintain the scanning coil laminations at the same potential as the coils themselves; this, it is said, tends to minimise the effect of an electro-chemical action, which might otherwise result in premature coil failure. When making adjustments to this section of the circuit it is therefore advisable to "kill" this exposed potential by temporarily short circuiting the laminations to chassis—the resistor itself need not be disconnected, for the short circuit current is diminutive.

No Sync—or Weak "Holds"

We have already considered the possibilities of a poor line or frame hold due to a time constant alteration in the charging circuit of the generator, which makes it necessary to set the appropriate control to the limit of its range. It is often found, however, that an approximate midway setting on the controls may provide the correct generator frequency, and yet picture stability is still far from satisfactory. It is probably observed that slight interference tends to provoke picture "rolling," or tearing horizontally, and that frequent adjustments are demanded during a programme sequence to hold a picture at all.

Symptoms such as these are generally indicative of weak sync pulses, although it should be pointed out that "noisy," or in some way defective, hold controls themselves can give rise to similar effects, which are, however, fairly obvious owing to the "touchy" nature of the control concerned. Nevertheless, the possibility of this cause should not be overlooked during initial investigation.

(To be continued)

Automatic Width Control

DETAILS OF AN INTERESTING AMERICAN CIRCUIT

By P. Dodson

IN some receivers the picture size varies with the adjustment of the brightness control. It is more marked in some sets than others. Poor regulation of the E.H.T. supply is, usually, responsible.

When the brightness is increased, the bias of the C.R. tube is reduced. This increases the load on the E.H.T. supply, the high voltage drops, and the picture tends to expand since the reduced velocity of the electron beam makes it easy to sweep over a large area.

When the bias is increased, giving a less bright picture, the load on the E.H.T. supply is decreased and the high voltage rises, giving a smaller size of picture.

The remedy is, of course, to have a supply that has perfect regulation. This is not always possible. Much depends on the type of E.H.T. supply used, some circuits giving better regulation than others.

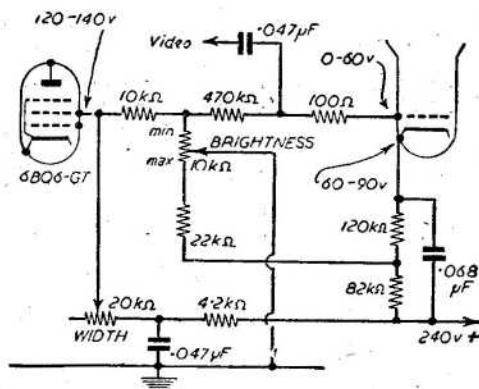
Some American TV. receivers use a special type of circuit which tends to keep the picture width constant whatever the setting of the brightness control. Fig. 1 shows the circuit used in some recent Philco models.

It will be noticed that the grid and cathode of the C.R. tube and the screen of the line output valve are supplied with voltages from two voltage dividers connected in parallel across the H.T. supply. Both dividers return to earth through the arm of the brightness control.

When the brightness control is adjusted for minimum brightness, i.e., maximum bias on C.R.T., the

grid of the tube is at earth potential, and its cathode is approximately 90 v. positive. This decreases the load on the E.H.T. supply, and the picture would expand but for the fact that at this setting the screen voltage of the line output valve is reduced from 140 v. to 120 v. This lowers the E.H.T. just enough to compensate for the increase brought about by the higher C.R. tube bias.

When the control is set for maximum brightness the screen voltage of the line output valve is increased to about 140 v., which compensates for the drop in E.H.T. which occurs when the bias is reduced.



The auto-width control circuit.

Phosphors and Colour TV

SOME INTERESTING DETAILS OF THE CHEMISTRY OF PICTURE TUBES

By "Physicist"

AS television becomes more and more commonplace we are apt to overlook the one thing without which television would be impossible, viz., the cathode-ray-tube screen material, and it is but little realised how much research has been carried out and what progress has been made in the search for suitable screen materials.

More especially, now that colour television is about to be commercially exploited, has this new field of science been the focus of intense activity, as the development of screen materials which can give a full coloured picture is being rapidly pursued. At least one system of colour television, which will be described later, has gone a long way towards producing naturally coloured pictures on one composite screen made from carefully selected and blended fluorescent materials.

Phosphors and Luminescence

Suitable screen materials, known as phosphors, are those which emit visible light when bombarded by a beam of electrons and in which the intensity of the emitted light is proportional, both to the velocity of the electrons and the intensity of the beam.

Not long ago the only available phosphors were a few naturally occurring minerals such as Willemite (zinc orthosilicate) and a few impure alkaline earth sulphides, e.g., calcium, cadmium and zinc sulphides.

Research investigations have shown that the property of luminescence in inorganic substances is caused by the introduction of a small quantity of "impurity" or activator, which during fusion at high temperature enters into the crystal structure of the material, introducing what are known as "lattice defects," in which the regular arrangement of the atoms within the crystal are periodically disrupted by the atoms of the "impurity."

As a result of these "lattice defects," the material is endowed with the peculiar property of being able to absorb energy from incident radiation, which it re-emits as visible light, Fig. 1. In most phosphors,

the emission is instantaneous and is called fluorescence, but a few substances are capable of emitting light long after the incident radiation has ceased. This effect is called phosphorescence, or persistence.

The precise mechanism of luminescence in inorganic crystals is not yet fully understood, but the processes described in Fig. 1 show diagrammatically how a single atom can absorb energy in one form and emit it later in another. For a single atom it is postulated that the incident energy is taken up by the atom in discreet amounts and causes one or more of the electrons which surround the nucleus of the atom to change their orbital paths (i.e., the path which the electrons describe in space about the nucleus). In so moving the electrons absorb the incident energy and the atom is said to be in an excited state.

For the most part the atom can only remain in this state for an exceedingly short interval of time, before most but not all of the energy which was taken up is given out and the electrons return to their normal orbits. The interval of time is so very short that the effect can be considered to be instantaneous, but because some of the incident energy is used up in the process the emitted light has a longer wavelength than that of the incident radiation.

The mechanism is best accounted for quantitatively by a rather involved mathematical analysis, known as the Quantum Theory, which predicts that the light emitted by a single atom will be virtually monochromatic, i.e., light of one wavelength. Where several energy states exist the light will consist of a few selected wavelengths distributed according to known laws throughout the visible spectrum. One justification of the Quantum Theory is that single atoms (e.g., gas discharge) under electron bombardment emit several monochromatic rays of light.

Although the absorption and emission of energy by a single atom can be described in such comparatively

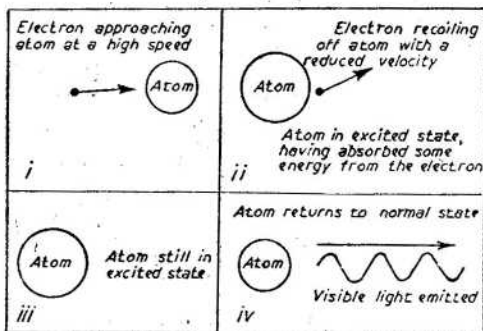


Fig. 1.—Much simplified representation of light emission by an atom after collision with an electron. This particular effect is usually only found in gaseous discharge. In phosphors, the energy which is absorbed from the electron is associated with the molecule rather than an individual atom, and when re-emitted covers a range of wavelength.

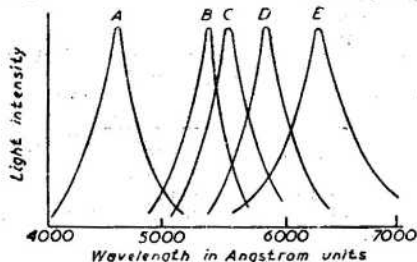


Fig. 2.—Light intensity—wavelength plot for five widely used phosphors, viz.:

- Zinc sulphide activated with silver [ZnS : Ag] blue colour.
 - Zinc orthosilicate activated with manganese [thom. $Zn_2SiO_4 : Mn$] green colour.
 - Zinc orthophosphate activated with manganese [$\alpha Zn_3(PO_4)_2 : Mn$] green colour.
 - Zinc sulphide activated with manganese [hex. ZnS : Mn] red colour.
 - Zinc orthophosphate activated with manganese [$\beta Zn_3(PO_4)_2 : Mn$] red colour.
- Phosphors a, b and e are widely used in colour television.

simple terms, the emission of light by complex aggregates of atoms, such as crystals, is an exceedingly complex phenomenon. That the effect is spread over several rather than one single atom is clearly brought out by the profound effect which the "impurity" or activator has on the nature of the emitted light.

It is therefore only to be expected that in place of the few discrete orbits which the electrons of a single atom can occupy, the energy levels of an aggregate of atoms will be neither clear cut nor sharply divided. Consequently, we must look upon the energy of the incident radiation as being shared by several associated atoms, and when emission occurs we cannot expect to get the clear-cut monochromatic radiation obtained from a single free atom.

The colour of the light emitted by a crystalline phosphor is characteristic of the main substance and the activator and covers a wide range of wavelength, Fig. 2. The extent of the influence which the activator can have upon the range of wavelength

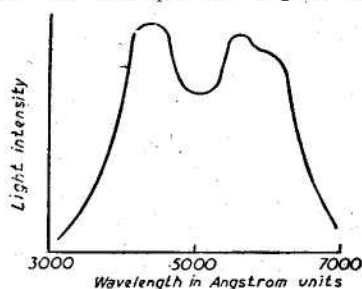


Fig. 3.—Typical light intensity-wavelength plot of a two component phosphor for white screen TV. The two peaks represent the region of maximum light emission of each separate phosphor, one in the blue and the other in the yellow region of the spectrum.

of the emitted light is clearly shown in this figure.

By careful selection and blending of the phosphors it is possible to obtain light emission covering any desired range of wavelength.

Although the activator is often referred to as the "impurity" this is somewhat of a misnomer; in practice the materials have to be of a very high degree of purity, and the activator is added in a minute yet definite amount (for some phosphors, as low as one part in a million of activator is sufficient).

For use as cathode-ray-tube screens the phosphor is prepared as a fine powder, which is coated uniformly on the inner surface of the tube face and held in position by an organic cement which bonds it to the glass. The electron beam is focused into a spot on this screen and modulated by the "picture signal," whilst timebases, suitably connected to the deflecting system of the cathode-ray tube, move the spot over the screen surface in some regular manner.

Uses of Cathode-ray Tubes

Cathode-ray tubes have found important uses in (1) electron microscopes and electron diffraction cameras; (2) radar systems and oscilloscopes; and (3) television. For each application new and specific phosphors have been formulated and developed.

Thus for the electron microscope one important factor is the definition of the image, and the light conversion efficiency is deliberately sacrificed to get high image resolution by using a thin layer of very finely divided phosphor. Phosphors which have been used in this application include: (a) a fused mixture of zinc and cadmium sulphides activated with silver ($6ZnS, 4CdS:Ag$), which gives a yellow image; and (b) a physical mixture of zinc sulphide activated with silver ($ZnS:Ag$) and a fused mixture of zinc and cadmium sulphides activated with silver ($1.3ZnS, CdS:Ag$), which gives white light.

For rapidly occurring events a short persistence is desired, and zinc orthosilicate activated with manganese ($ZnSiO_4:Mn$) which gives a green colour is often used. This material is similar to that used in the VCR97 tube, which has proved highly satisfactory in many home-constructed television receivers.

Long persistence is sometimes obtained by building up the screen from layers of different phosphors. A layer of short persistence zinc sulphide activated with silver ($ZnS:Ag$) which fluoresces blue is spread over a thin layer of a long persistence, yellow emitting zinc cadmium sulphide activated with copper [$(ZnCd)S:Cu$] to give a screen characterised by a bright blue image and a less pronounced yellow afterglow. Some readers will have had experience of this type of screen in some VCR517 type tubes.

Zinc sulphide activated with copper ($ZnS:Cu$) has proved a versatile phosphor having a long persistence, which can be curtailed to any desired extent by progressively replacing the zinc atoms by cadmium.

Phosphors of varying persistence have proved

| Name | Activator | Formula | Colour | Uses |
|-------------------------|-----------|-------------------|-----------|--------------------------------|
| Zinc Sulphide ... | Copper | $ZnS:Cu$ | Yellow | Radar Screens Long Persistence |
| Zinc Sulphide ... | Silver | $ZnS:Ag$ | Blue | TV Radar Short Persistence |
| Zinc Sulphide ... | Manganese | $ZnS:Mn$ | Red | Colour TV Short Persistence |
| Zinc Cadmium Sulphide | Silver | $(ZnCd)S:Ag$ | Yellow | TV Radar Short Persistence |
| Zinc Cadmium Sulphide | | | Copper | $(ZnCd)S:Cu$ |
| Zinc Ortho-Silicate | Manganese | $Zn_2SiO_4:Mn$ | Green | TV Radar Short Persistence |
| Calcium Tungstate | — | $CaWO_4$ | Blue | TV |
| Zinc Ortho-Phosphate | Manganese | $Zn_3(PO_4)_2:Mn$ | Red | Colour TV Short Persistence |
| Zinc Beryllium Silicate | | | Manganese | $(ZnBe)SiO_2:Mn$ |

Fig. 4. Table listing the Properties and Uses of some of the more widely used phosphors.

pre-eminently suitable in radar, where the low frequency of the signal repetition necessitates the formation of a persistent image to prevent flicker. It is now possible to formulate a screen composition to suit any given repetition rate.

The demands of mono-colour television are far more exacting than for radar and oscilloscope screens, for above all else the colour must be pleasing to the eye. Attention here has been devoted to discovering screen materials which give a good black and white image of reasonably short persistence and with a fair resolution and long stability under electron bombardment.

Various phosphors which have been used are listed in Fig. 4. They are invariably a blend of two or more phosphors, one having maximum light emission in the blue region of the spectrum and the other in the yellow region. Amongst the more popular phosphors are a mixture of zinc and cadmium sulphides and a mixture of zinc and beryllium silicates which is sometimes used in projection tubes, Fig. 3.

To increase the brilliance of the picture the layer of phosphor is often covered with a very thin film of aluminium which, whilst letting the electron beam through, reflects in a forward direction a high proportion of the light which would otherwise be lost in the interior of the tube.

Colour Television Screens

Basically, the problems of colour television in respect of true colour rendering are similar to those encountered in colour photography. Three images, each in a primary colour, have to be superimposed to reproduce the picture. Originally, when the choice of screen materials was limited, it was widely believed that colour television would only prove possible by using a scanning disc which carried three coloured light filters, through each of which the screen was viewed in turn as the disc was rotated in synchronisation with a similar disc attached to the television camera.

The difficulties inherent in maintaining perfect synchronisation of the two discs proved virtually insuperable, and in addition the colour rendering, even with the best "white" screen, left much to be desired.

The subsequent development of tri-screen receivers using either three cathode-ray tubes, each with a different screen material selected to give one primary colour, or the later modification in which the three tube assemblies and screens were sealed in one glass envelope, have all been described before and therefore need not be dwelt on here. They suffered a serious disadvantage, in that to see the three images correctly superimposed the observer had to be in a fixed position with respect to the set and this disadvantage could only be overcome by a projection system. Triple projection equipment is so costly that the technique is usually reserved for large screen television in cinemas, etc., and is never likely to prove an economic proposition for the private viewer.

R.C.A. Single Screen Coloured TV System

A notable step forward has been made in the R.C.A. colour television system which uses a special

screen, built up from a mosaic of three different phosphors, each selected so that it will give a primary colour.

Three electron gun units, one for each primary

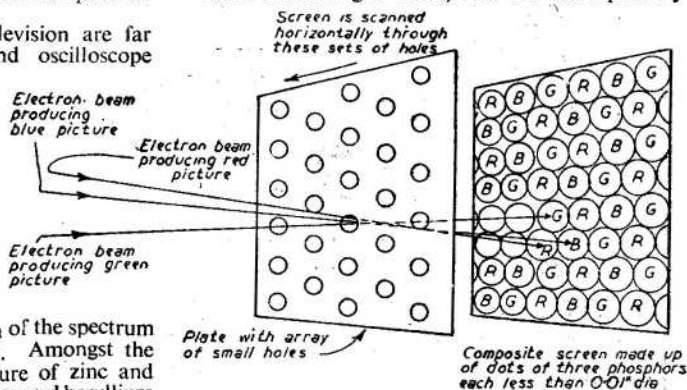


Fig. 5.—Diagrammatic representation of the R.C.A. single screen system of television. The screen is built up from a mosaic of dots of three phosphors, viz.: (1) Zinc orthophosphate, activated with manganese ($\text{Zn}_3(\text{PO}_4)_2 : \text{Mn}$) which gives a red colour. (2) Zinc sulphide activated with silver ($\text{ZnS} : \text{Ag}$) which gives a blue colour. (3) Zinc orthosilicate activated with manganese ($\text{Zn}_2\text{SiO}_4 : \text{Mn}$) which gives a green colour. The three electron guns, one for each primary colour, are assembled in such a manner that the beam from each falls only on the dots of one phosphor throughout each complete scan.

colour picture, are employed and arranged in such a manner that the electron beams after passing through the same tiny hole in a metal plate fall one on each of three areas of phosphors of different colour. These phosphors are arranged on the screen in such a manner that the beam corresponding to each primary colour picture falls always on a phosphor which emits light of that colour.

The picture is built up by inducing the three beams to scan horizontally across the metal plate, thus passing in turn through every hole on each row of the plate.

The Screen

The screen is made up as shown in Fig. 5, and the phosphors used are, (a) for the blue image, zinc sulphide activated with silver ($\text{ZnS} : \text{Ag}$); (b) for the green image, zinc orthosilicate activated with manganese ($\text{Zn}_2\text{SiO}_4 : \text{Mn}$); and (c) for the red image, zinc orthophosphate activated with manganese ($\text{Zn}_3(\text{PO}_4)_2 : \text{Mn}$). The actual size of each one of these areas of each phosphor is less than 0.01 in. in diameter.

In this system the electron gun assemblies are mounted in the same glass envelope, and although alignment of the electron gun, scanning plate and screen is a tricky operation this is done during manufacture and therefore presents no problem to the viewer.

In this article, it has only been possible to mention the more widely used phosphors. There are many more and new ones are being evolved almost daily—in fact, the science and manufacture of these valuable materials is now reaching the stage where they can be made to specification, covering any desired range of wavelength and with any degree of persistence.

PROJECTION T.V. SCREEN

Made from plastic and precision-milled on both sides to give a reflectionless surface. The cost of these from the manufacturers was 30/- each, but through a company going into liquidation we are able to offer these at 17/6 each. Size is 17 x 14in. but easily cut to suit cabinet opening. A limited quantity only, of course, is available.

PLASTIC TELEVISION MASK

This is a Mask and Implosion Guard combined, made for 12in. tube from moulded perspex and internally sprayed bronze. It is the type of mask which fixes on the inside of the cabinet and is thus suitable for the amateur-cut hole. It is the latest type of mask as fitted to most modern televisions. Brand new and perfect at less than manufacturer's price, viz. 15/- plus 1/6 carriage and insurance.

BUILD THIS FINE INSTRUMENT FOR 29/6 T.V. SIGNAL AND PATTERN GENERATOR

This generator has been carefully designed and although it can be built and used by any beginner it is at the same time a most useful instrument for the more advanced worker.



It can be tuned to the vision channel and will produce a pattern on the face of the C.R. tube. Alternatively, if tuned to the sound channel it will produce an audible signal in the loudspeaker.

Thus its owner will become independent of B.B.C. transmissions and can fault find or test at any time. It operates entirely from A.C. mains and is quite suitable for use with superhet or straight receivers.

A complete kit of parts (in fact, everything except the cabinet), with full constructional and operational data will be supplied for 29/6 plus 2/6 post and insurance; alternatively, data is available separately, price 2/6 (credited if you buy the kit later).

NOTE.—Cabinet as per the illustrated prototype will be available shortly.

SOMWEAVE

very suitable for covering plain wooden cases, for portable radio amplifiers, etc.

A FEW REMAIN

This cabinet is offered below cost. It is suitable for a television using tube sizes varying from 12in. to 17in., its overall dimensions being 3ft. 5in. high, 1ft. 4in. deep, 1ft. 10in. wide. It is complete with plywood back and "Bowler Hall." Originally made for a very expensive television, and really good quality. Unrepeatable. Offered at £75.0. carriage, packing, etc., 12/6.

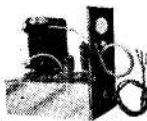
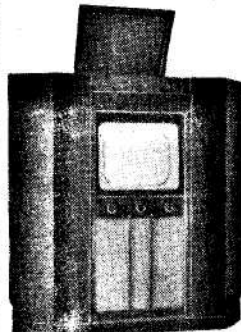
NOTE.—These are cut for 12in. tubes, but the holes for the controls are not drilled.

RINGING CHOKE E.H.T.

This unit gives 21 K.V. and is highly suitable for working the Government Tubes VCR97, etc. It will take the place of the E.H.T. transformer and has the advantages not only of being very much cheaper but should anything break down then replacement parts cost very little. We can offer a complete set of parts, including valves 5F61 and VU120, 1 meg. pot., 1 meg. resistor, 601 mid., 3 K.V. condenser, 2 valve-holders, metal chassis and E.H.T. transformer from 1335 receiver. Price 16/- for the complete outfit.

THE ELPREQ E.H.T. GENERATOR

This is a made-up unit working on the blocking oscillator over-voltage amplifying stage principle. It is of moderate power consumption (6.3 volt. 8 amp filament and approx. 59 mA. H.T.) and contains three B.V.A. valves. Output obtainable ranges from 6 kv. to 9 kv. with normal H.T. rail input, but somewhat higher outputs can be obtained with higher H.T. supply. Valve rectification is employed in the output stage. The dimensions are 6 1/2 x 4 1/2 x 7in. Price 69/6, post, packing, etc., 5/-.

**A RADIO UNIT FOR SUPERIOR 15**

also available now in light oak-wood finishes, and it really does look impressive, balance over 12 months.

About the Superior 15 itself, if you have not already ordered your set of parts for this, be advised and do so immediately. We are definitely getting down to the last batch of the 15in. tubes and once these are gone the Superior 15 T.V. cannot be repeated. At £37 10/- for all the parts (including 15in. Cosor Tube) this represents the finest value ever offered to the home constructor. If you doubt your ability to make it then send 7/6 for the data and study this first. Don't forget, we guarantee to help you to get perfect results and, if necessary, for a nominal charge, will take up in your television, completely check over your work, and return it to you in perfect order.

VIEW MASTER OWNERS

You probably know that a 15in. tube gives approximately 3 times as many square inches of actual picture as does a 9in. tube. You may not know however, that without any modification at all your View Master will scan the 15in. Cosor type 85 K, which we offer for cash or on H.P. If you would like to go over to the big 15in. picture, the easy way is to send for "View Master Big Picture Parcel" as follows:

1. 15in. type tube 85K.
2. Moulded rubber mask.
3. Tube clamping ring.
4. Special ion trap.
5. Sundries, plug, etc.
6. Blueprint showing connections, and method of fixing tube, ion trap, etc.

We offer the above six items at less than what a new 9in. or 12in. tube alone would cost, namely, £18. (cash with order, or £15/6 deposit and balance over 12 months. Limited quantity only at this price, so order by return.

**CONNECTING WIRE SNIP**

P.V.C. insulated 23 s.w.g. copper wire in 100ft. coils, 2/9 each. Colours available: Black, Brown, Red, Orange, Pink, Yellow, White, Transparent. 4 coils for 10/-.



Complete kit comprises H-control unit, starter lamp, lamp holders, clips and wiring diagram. Price less tube 22/6, plus 1/6 post. With tube 30/- carriage and insurance 3/6. Tubes 7/6 each, carriage free, minimum quantity 6 tubes.

CARBON RESISTORS

These will now be supplied in individual packets, with the value and wattage clearly indicated.

Prices:

1-watt, 5d. each; 1 watt, 6d. each.

SILVER MICA CONDENSERS

All sizes from 5 pf. upwards, 6d. each or 100 assorted, 30/-.

ELECTRONIC PRECISION EQUIPMENT
47-48 WINDMILL HILL, RUSH & MIDDLSEX. • 152-3 FLEET ST. LONDON E.C.A.
Dept. 5
ALSO AT 29 STROUD GREEN RD., FINSBURY PK.

HENRY'S

We have over 20,000 American and B.V.A. valves in stock.

ALL VALVES NEW AND GUARANTEED.

SETS OF VALVES

Ten EF50 (Ex-Brand New Units) 5/- each ... 45/- Set

6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G, or (K781) ... 37/6 ..

1R5, 1S1, 1T1, 1S4 or (3S1 or 3V4) ... 30/- ..

TP25, HL22, DD, VP23, PEN25 or (QP25) ... 25/- ..

6K8G, 6K7G, 6Q7G, 25A6G, 25Z5 or 25Z0G ... 37/6 ..

12K80T, 12K7GT, 12Q7GT, 35L6GT or 50L6GT 37/6 ..

12SA7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT or 50L6GT ... 37/6 ..

PX23, KT39C, KT96, GU50 ... 12/6 each

PX23's Matched Pairs ... 25/- pr

TEN 6AM6 (EF1130) ...

S.T.C. RECT'S.E.H.T.

K3 25 650v. 1 ma. ... 4/7

K3 40 1000v. 1 ma. ... 6/-

K3 100 8 500v. 1 ma. ... 14/8

K3 200 10 500v. 1 ma. ... 26/-

Westinghouse D11, 1,500 v. 2 ma. ... 17/6

R.F. UNITS

RF24 20-30 mc ... 15/-

RF25 40-50 mc ... 19/6

RF26 50-65 mc ... 45/-

RF27 65-85 mc ... 45/-

Post free.

ALL BRAND NEW WITH VALVES.

| | | | | | | | | | |
|-------|------|--------|------|---------|------|------------------|------|-------------|------|
| OOZAA | 7/- | 6K7G | 6/6 | 12SA7GT | 8/6 | EBC33 | 8/6 | KT68 | 12/6 |
| 1G8 | 6/6 | 6K7M | 7/6 | 12SQ7GT | 8/6 | EF36 | 6/6 | GU50 | 12/6 |
| 1R5 | 8/- | 6K8G | 9/- | 12SG7 | 7/6 | EF39 | 6/6 | XP2V | 4/- |
| 1S4 | 8/- | 6K8GT | 9/- | 12SH7 | 7/6 | EK32 | 6/6 | XH (L.5) | 4/- |
| 1S5 | 8/- | 6L6G | 8/6 | 12S17 | 8/6 | EF91 | 9/- | VU111 | 4/- |
| 1T4 | 8/- | 1Q2 | 11/6 | 12SK7 | 6/6 | E132 | 7/6 | VU133 | 4/- |
| 1A7GT | 10/- | 6U5 | 7/6 | 12SR7 | 7/6 | EF50 | 8/6 | VU120A | 4/- |
| 1C5 | 8/- | 6U5G | 7/6 | 14A7 | 8/6 | EF50 (Red. Svl.) | 10/- | CV54 | 5/- |
| 1LN5 | 8/- | 6L7 | 7/6 | 25Z9GT | 8/6 | EF50 | 8/6 | S130 | 7/6 |
| 2X2 | 5/- | 6N7GT | 7/6 | 25Z5 | 8/6 | EF50 | 8/6 | 7475 (VS70) | 7/6 |
| 3V4 | 8/- | 68Q7GT | 8/6 | 35Z4GT | 8/6 | (Ex-Units) | 5/- | CV66 | 6/- |
| 394 | 8/- | 68J7GT | 8/6 | 25A6 | 8/6 | SP2 | 8/6 | VR150/30 | 8/6 |
| 5Z3 | 8/6 | 6R7 | 8/6 | 35L6 | 8/6 | VP2 | 8/6 | CK510AX | 5/- |
| 5U4 | 8/6 | 6X5G | 8/6 | 50L6GT | 8/6 | VP2 | 8/6 | DI | 2/- |
| 5Z4 | 8/6 | 6SA7GT | 8/6 | 42 | 8/6 | TDD2A | 8/6 | AC | 6/6 |
| 6A7G | 8/6 | 68Q7GT | 8/6 | 43 | 8/6 | DR40 | 9/- | AC6PEN | 6/6 |
| 6AC7 | 8/6 | 68G7 | 7/6 | 73 | 8/6 | U41 | 9/- | AC5, PEN | 6/6 |
| 6AC5 | 7/6 | 68H7M | 7/6 | 78 | 8/6 | UY11 | 9/- | 12/6 | 6/6 |
| 6ABG | 8/6 | 68K7GT | 7/6 | 80 | 8/6 | UY11 | 4/- | PEN25 | 6/6 |
| 6AM3 | 9/- | 6SL7GT | 9/- | 883A | 15/- | 9D2 | 4/- | PEN46 | 7/6 |
| 6B8 | 7/6 | 6SN7GT | 9/- | 9001 | 6/- | 9D2 | 4/- | QP25 | 6/6 |
| 3C4 | 8/6 | 58C7 | 10/- | 9002 | 6/- | 15D2 | 10/- | SP61 | 4/- |
| 6CSGT | 5/- | 68S7 | 7/6 | 9003 | 6/- | 83 | 8/6 | SP41 | 4/- |
| 6C8 | 6/6 | 6V6GT | 7/6 | 9004 | 6/- | D41 | 5/- | HL23/DD | 6/6 |
| 6D8 | 6/6 | 7C5 | 8/6 | 9006 | 6/- | D42 | 5/- | VP23 | 6/6 |
| 6F8G | 8/6 | 7A7 | 8/6 | 954 | 6/- | D63 | 5/- | VP41 | 7/6 |
| 6G0G | 6/6 | 7C7 | 8/6 | 955 | 6/- | K2 | 5/- | U22 | 8/6 |
| 0H6GT | 5/- | 7H7 | 8/6 | 956 | 6/- | U52 | 8/6 | ATP4 | 4/- |
| 6HM | 8/- | 7B7 | 8/6 | 1299A | 7/6 | U17 | 10/- | TP22 | 6/6 |
| 6J5GT | 5/- | 787 | 10/- | TZ40 | 37/6 | U19 | 10/- | TH23 | 10/- |
| 6J5M | 8/6 | 12A8 | 7/6 | 931A | 50/- | Y63 | 8/6 | 41MP | 7/6 |
| 6J6 | 9/- | 12C8 | 7/6 | E450 | 2/- | P2 | 4/- | 215SG | 6/- |
| 6AK5 | 9/- | 12H6 | 8/6 | EF54 | 8/6 | MU11 | 8/6 | MS, PEN | 6/6 |
| 6J7G | 6/6 | 12K7GT | 8/6 | (VR136) | 6/- | PX23 | 12/6 | VT501 | 7/6 |
| 6J7M | 8/6 | 12K8GT | 8/6 | EF55 | 12/6 | PX23C | 12/6 | | |
| 6K6 | 9/- | 12Q7GT | 8/6 | EF94 | 3/6 | | | | |

SEND POSTAGE FOR NEW 1954 COMPREHENSIVE 23-PAGE CATALOGUE: CONTAINING COMPONENTS & EX GOVT. BARGAINS.

Please add postage up to £1. 1/-; £2 or over 2/-.

Open Mon.-Fri. 9-6, Thurs. 1 p.m.

5 HARROW ROAD, PADDINGTON, LONDON, W.2

TEL.: PADDINGTON 1003 9, 0401.

CATHODE RAY TUBES:
 VCR57, Guaranteed full picture, 40" carr. 2/-
 3BP1, Suitable for 'scopes and Tel., 25", carr. 3/-
 MU-METAL SCREEN for VCR57, 10/-
 VCR139A (ACR10), 35"- Brand new.

VCR517C Blue and White 6 1/2 in. Tube. This Tube replaces the VCR57 and VCR133 without alteration and gives a full Blue and White picture. Brand new in original crates, 35", carr. free.

"182A" INDICATOR UNIT.—Complete with VCR517 and Screen, 3-EP50, 4-SF61 and 1-SU4G, 9 w.v. controls. Ideal for TV or 'Scope. Brand New (less relay). In original cases. 67/6 plus 7/6 carr.

RECEIVER R1355. As specified for "Inexpensive Television." Complete with 8 valves VR65 and 1 each 5U4G, VU120, VR92. Only 29/- carriage 5/- Or Brand new in original packing case, 55/- plus 5/- carr.

CRYSTAL MICROPHONE INSERTS.—Ideal for Tape Recorders and Amplifiers, 8/6, post free.

RECORDING TAPE (Well-known Manufacturer).
 600 feet Reels.....12/6
 1,200 feet Reels.....21/-

E.H.T. TRANSFORMER

230 volt, 50v 1 PH., 2.5Kv., 5 mA., 2 volt, 2 v o., 2 v. 1 A. Complete with U22 valve.

— 27/6 —

CONDENSERS.—1 mfd., 2.5 Kv. at 2/6 each; B.E.C., etc. W.E. 450 volt wkg., 8 mfd., 2/6; 8+8 mid., 3/9; 16+16 mfd., 4/6.

DU BILIER.—16 mfd., 500 volt, 3/9; 32 mid., 5/-.

COAX-CABLE.—80/2 (1/2 in. dia., 8d. per yd.

R.A.F. MAGNETIC EARPIECES. 2/- each, 3/6 pr.

POTENTIOMETERS.—All valves to 2 meg., 2/6 each.

RESISTORS.—Brand new, 1, 1/2, 2 W. Our selection, 12/6 per 100.

R.F. UNITS.—Brand new. Maker's Pack. R.F.24 or R.F.25, £1 each.

VALVES

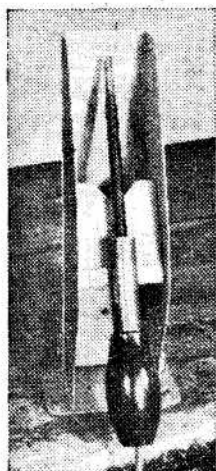
| | | | | | | | |
|-----------|------|-------------|------|-----------|------|-----------|-----|
| SP61, 2/6 | 4/- | EF50 | 4/- | SP41, 2/6 | | | |
| D1 | 2/- | EC52 | 5/- | EF36 | 4/- | EF39 | 9/- |
| EP34 | 2/- | ECC32 | 5/6 | FL32 | 6/6 | EF39 | 9/- |
| ECC31 | 6/- | EBC33 | 7/6 | 6V6 | 6/6 | 6V6 | 7/6 |
| KL50 | 7/- | 6SN7 | 12/- | KT65 | 12/6 | KT44 | 6/6 |
| 6K7 | 6/- | VR18 | 3/- | VT501 | 6/- | VU111 | 3/- |
| VR21 | 2/- | VU120 | 3/- | 1T4 | 7/- | 181 | 7/- |
| VU133 | 3/- | 1S5 | 7/- | 394 | 7/6 | CV65 | 4/6 |
| 1R5 | 6/6 | VU508 | 6/6 | ML4 | 4/6 | PT15 | 7/6 |
| CV73 | 4/6 | 3Z3 | 8/6 | 5Z4 | 8/6 | 6X5 | 7/6 |
| 5U4G | 8/6 | 12H9 | 5/9 | 12SH7 | 5/- | 12S17 | 5/6 |
| 6K8 | 11/6 | VR135 | 3/- | 7193 | 3/- | 955 | 4/6 |
| CV63 | 6/- | 90G1 | 5/- | 6AG5 | 3/- | 6N7 | 7/6 |
| 951 | 3/6 | 100Z20 | 2/6 | HLK2 | 2/6 | Pen46 | 5/- |
| 2X2 | 2/6 | MU2 | 7/- | FV4 500 | 8/6 | U19 20 | 8/6 |
| U22 | 2/6 | S110K(Stab) | 2/6 | HL41 | 8/6 | EK32 | 7/- |
| CV183 | 4/6 | | | VR37 | 6/6 | 1A5 | 6/- |
| 6AC7 | 7/6 | PX25 | 12/- | 6J5 | 5/- | 12J5 | 5/- |
| EP91 | 9/- | 1299A | 6/- | 2D21 | 8/6 | EF50(Syl) | 6/3 |
| 6SK7 | 6/- | VR18 | 4/6 | 807 | 5/- | | |
| EB31 | 2/- | CV18 | 2/6 | | | | |

VINER'S (Middlesbrough)

Radio Government Surplus Electrical
 26, EAST STREET, MIDDLESBROUGH
 Telephone: MID 3418.

ADCOLA

(Regd. Trade Mark)



Shields as illustrated 10/6 extra.

SOLDERING INSTRUMENTS

FOR

SUCCESSFUL HOME CONSTRUCTION AND ALL SOUND EQUIPMENT SOLDER JOINING

"STANDARD MODEL," as ILLUSTRATED, 25/6

Any volt range supplied, 6/7 to 230/250.

3/16" dia. bit Standard Model

Equally suited to daily or intermittent use

Made in England

Registered Design

(British, U.S.A., Foreign Patents)

Export Enquiries Invited

ADCOLA PRODUCTS LTD.

Sales, Offices & Works: CRANMER COURT, CLAPHAM HIGH ST., LONDON, S.W.4. > MACaulay 4272

The Plessey Multivibrator Circuit

A DESCRIPTION OF ITS WORKING AND A USEFUL MODIFICATION

By B. L. Morley

THE frame timebase of the Plessey chassis given in the November issue of PRACTICAL TELEVISION (Servicing TV Receivers), has a rather interesting and unusual feature. This is the use of a multivibrator for the frame oscillator.

Most commercial receivers employ some form of blocking oscillator for both frame and line timebases, and the use of the multivibrator has been rather neglected—in this country at least; it is much more popular in America.

This form of oscillator (sometimes called the

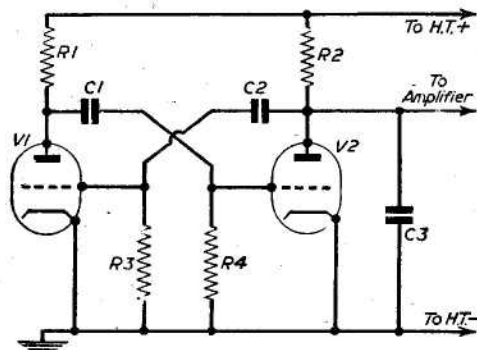


Fig. 1.—Basic circuit of the multivibrator.

"flip-flop") is capable of generating a square waveform rich in harmonics.

The type used in the Plessey chassis is known as the anode-coupled multivibrator as the coupling between the two halves of the duo-triode is effected by capacitors between the anode of the one valve and the grid of the other.

Fig. 1 gives the basic circuit of the anode-coupled multivibrator. It functions in a very simple manner.

Assume, for the moment, that the grid of V1 is made slightly more negative: this will cause the current through V1 to fall and hence the current through R1 will fall and the voltage drop across it will become less than it was before.

In other words the anode of V1 moves in the positive direction. The movement in the positive direction is communicated to the grid of V2 via the coupling capacitor C1, and as this grid moves positive more current flows through V2 and hence through R2.

Current through R2 increasing means that the voltage drop across R2 increases, or in other words the anode side of R2 becomes more negative than it was before. This move-

ment in the negative direction is communicated to the grid of V1 via the capacitor C2, and this still further reduces the current through V1 and hence the voltage drop across R1.

It will be apparent that the effect is cumulative and the current through V1 is rapidly cut off while that through V2 rapidly increases until V2 is driven to the point of saturation when grid current will flow.

When this point is reached V1 is completely cut off and the charge on C2 will leak away via the grid leak R3 and through R2, and the negative potential built up on the grid of V1 will fall until V1 starts to pass current.

As soon as this condition is reached then current will start to flow through R1 and hence the voltage drop across R1 will commence to increase. In other words the anode of V1 will start to move in a negative direction and the negative movement is communicated to the grid of V2 via C1.

V2 grid being made negative will cause the current through V2 to be reduced, hence the voltage drop across R2 will fall, or in other words the anode of V2 will move in the positive direction. This positive motion is communicated to the grid of V1 via the coupling capacitor C2 with the result that current through V1 (and therefore R1) is further increased and V2 grid is driven even more negative.

The effect is cumulative as before and V1 quickly reaches saturation point while V2 is quickly cut off.

Time Constants

From the foregoing it will be seen that the two valves will alternately pass heavy current and then be cut off and it only remains for the time constants of the coupling circuits to be adjusted, to enable a

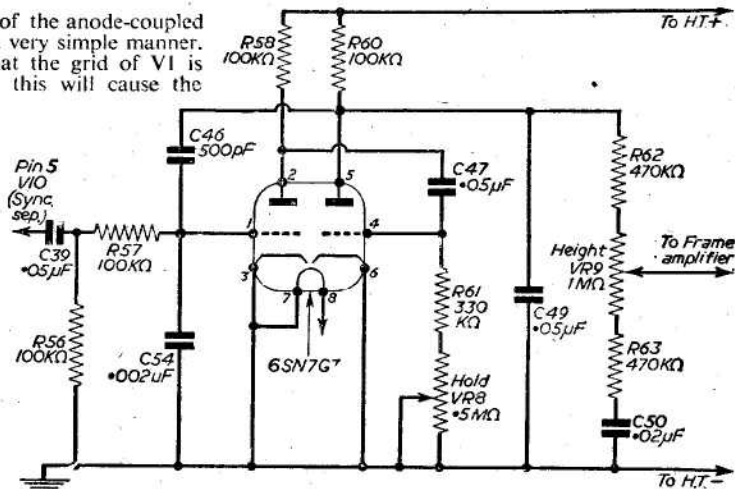


Fig. 2.—Frame oscillator of the Plessey receiver.

sawtooth waveform to be developed. The time constants are so arranged that one valve works during the scanning period and the other during the flyback.

In Fig. 2 is reproduced the frame oscillator of the Plessey chassis and the reader should be able to follow the operation of the circuit from the details given above. The leakage path of C47 is made variable (VR8) and as this controls the scan the potentiometer is labelled "Frame Hold."

The output is taken from the voltages built up across C49.

"Distant" Control

One rather important feature of the Plessey circuit is that the oscillator is "distant controlled." By this we mean that the circuit is static until the arrival of the negative sync pulse which initiates the commencement of the "flip-flop" cycle as it drives the grid heavily negative. Each "flip-flop" cycle is directly under the control of the sync pulse and no sawtooth waveform is produced without it.

The practical result of such a scheme is that the frame circuit is inoperative until the picture signal is received; no raster is obtained on the C.R.T., only a straight horizontal line from the line timebase.

Free Running

It is possible to make the circuit "free-running," by a simple alteration to the time constants of the coupling network.

When the circuit is free-running the "flip-flop" process commences as soon as the timebase is switched on and the anode currents differ to a small degree due to their structure. No sync pulse is necessary to initiate the oscillation and a complete raster

will, therefore, be available on the screen for inspection or testing.

The Frame Hold control functions as before and the sync pulse is applied during receipt of picture intelligence in order to keep the oscillator frequency in line with the vision signal.

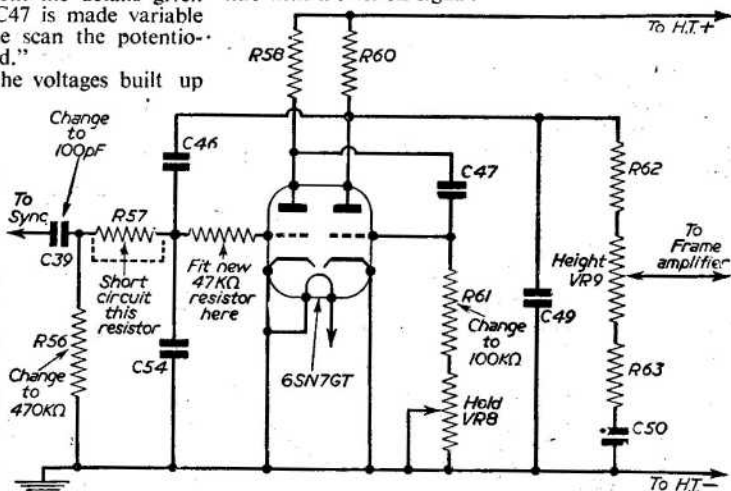


Fig. 3.—Modified version of Fig. 2.

The modifications are as follows: (See Fig. 3)

C39 is changed to 100 pF.

R56 is changed to 470 KΩ.

R57 is short-circuited.

R61 is changed to 100 KΩ.

The junction of C46/54 is disconnected from the grid of V1 and reconnected via a 47 KΩ resistor.

There is no difficulty in applying the modifications and it will be found much easier to service the television if a complete raster is available during periods when no transmissions are taking place.

TV Transmitting Station in the I.O.M.

THE Postmaster-General announced on July 2nd that the Government had authorised the construction of a television transmitting station in the Isle of Man. Special efforts were made by the BBC to find a site and instal the equipment so that a low-power temporary station could be working in the island before Christmas. A site was chosen on the south-western outskirts of Douglas.

The temporary station will serve the town of Douglas and its immediate neighbourhood and part of the south-east coast of the island—probably from Clay Head to Castletown. The transmitter works on the same channel as the existing stations at Wenvoe and Pontop Pike, the frequencies being 66.75 Mc/s for vision and 63.25 Mc/s for sound. The asymmetric side-band method of transmission is used, with vertical polarisation.

The temporary station will remain in use until the permanent station is completed. The latter will be erected on a site not yet selected and will have higher power and greater range; it will use the same channel as the temporary station so that receivers will not have to be altered.

A Compact Pulse Modulator

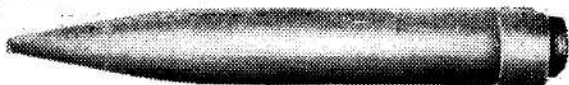
THE Mullard High Power Pulse Modulator is basically a device for generating microsecond pulses of high energy for the operation of magnetrons. It is based on a design for use with linear accelerators, and is suitable for other applications such as testing magnetrons and operating very high-power radar ground stations. The equipment is made to order.

The modulator in its normal form generates two microsecond pulses of the exceptionally high peak power of 5 megawatts. Other pulse lengths may be obtained by using alternative delay lines. Pulses for triggering the modulator are provided internally by a generator which gives pulse repetition frequencies of 100, 200, 350 and 500 pulses per second. The modulator can be triggered externally at any p.r.f. between 10 and 500 p/s. The output power can be varied by a single control, the actual power control mechanism being a motor-driven transformer which regulates the input to the three-phase mains transformer feeding the power rectifiers. The D.C. supply thus obtained can be varied between 6 kV and 12 kV. A magnetron filament supply of 9 amps at 18 volts is built into the modulator.

TELEMETRY

DETAILS OF TWO SYSTEMS DEVELOPED FOR THE GUIDED MISSILES PROGRAMME

ONE of the most important tasks in Britain's guided weapons programme has been the development of efficient telemetry equipment. Much information on the behaviour of missiles in flight can only be obtained by the firing of test

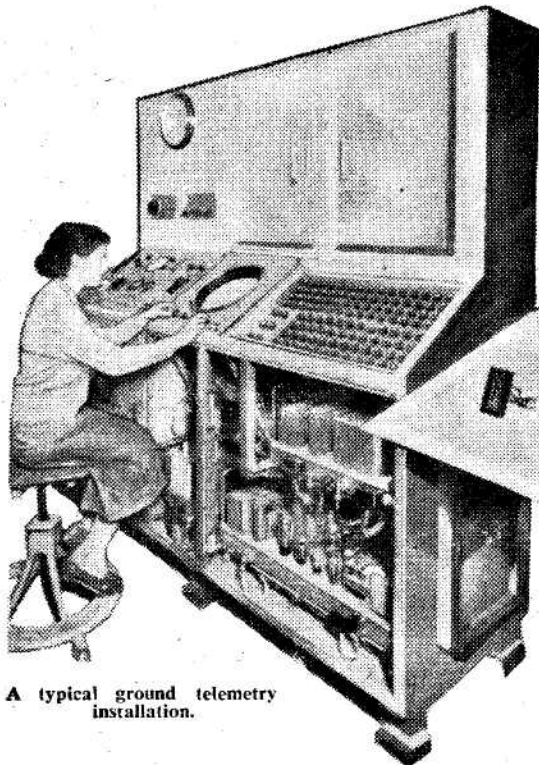


A shell and the equipment which it contains.

torques, the "time multiplex or sharing" system is adequate. This provides a large number of separate channels for the transmission of data, each with a low frequency response.

For measuring the wave forms occurring in electronic equipment carried by a missile, however, channels with a high frequency are required, for which the P.P.M. (pulse position modulation), and time division systems are usually employed.

Two systems fulfilling these requirements have been evolved by Ministry of Supply scientists and are at present in quantity production. Each consists of one type of ground receiver



A typical ground telemetry installation.

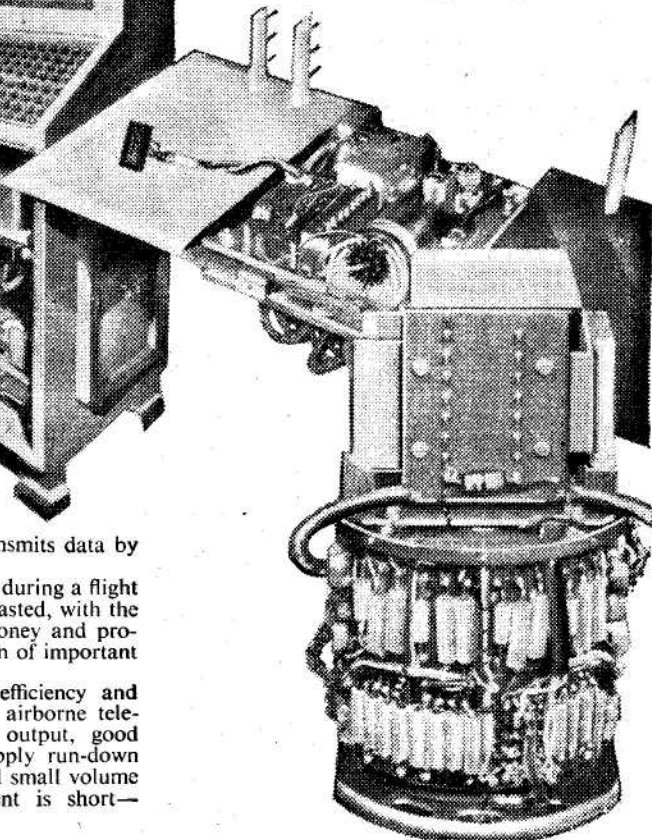
rockets carrying equipment which transmits data by radio to ground stations.

Failure of such telemetry equipment during a flight means that the test missile has been wasted, with the consequent loss of a good deal of money and productive effort, and that the compilation of important information is delayed.

Apart from a high standard of efficiency and reliability the main requirements for airborne telemetry transmitters are high power output, good frequency stability against power supply run-down and mechanical stress, low weight and small volume and—since the life of the equipment is short—economy in cost.

Two Systems Required

Two main types of equipment are needed. For the measurement of aerodynamic properties such as control surface positions, strains, pressures, and



A typical telemetry assembly showing the compact nature of the installation. Note the use of tag-boards.

with several varieties of airborne transmitter equipment.

These two sets provide adequate and largely complementary coverage for frequency response up to 200-230 cycles. The first system provides 23 channels for the transmission of data, a further channel being reserved for synchronisation. The second set gives up to 20 higher frequency channels any one or any number of which can be sub-commutated to give lower frequency channels.

If necessary, and if sufficient space is available, both sets can be installed in a missile, or two of the first systems and one of the second can be fitted to provide 46 lower frequency and 20 higher frequency channels.

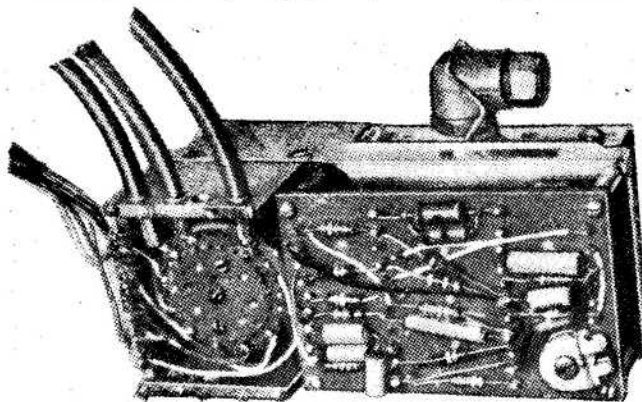
Time Multiplex System

The great advantage of this system is that it provides a calibration channel, enabling the accuracy of the equipment to be checked throughout its life.

The basis of the airborne transmitting section of the system is a rotating sampling switch, the contacts of which are connected to pick-ups which convert the physical data required into electrical variations.

The switch samples the pick-ups in turn and allows each to send its particular message to the ground for a small percentage only of the total time. This, coupled with the mechanised switch speed, accounts for the low frequency response of the system.

The output from the pick-ups passes, via the switch,



Another interesting piece of equipment. Its size may be judged from the coaxial plug.

to a modulator. This generates a sub-carrier whose frequency is directly related to the voltage, or inductance fed into it by the switch wiper. The resultant time multiplexed frequency modulation is used to amplitude-modulate an R.F. oscillator.

At the ground station the final records obtained are in two forms: a main low-speed record on which any channel or desired combination of channels is separately displayed; and a high-speed or histogram record from which all the possible information transmitted by the sender can be ascertained by analysis.

Transmitting Equipment

Since the set must be fitted to projectiles of varying sizes, from 3in. diameter upwards, flexibility is an important factor in its design. The components of the sending set have therefore been designed as

standard units which can be arranged on various sizes of chassis.

The dimensions of the smallest chassis yet fired were 5½in. × 3¼in. × 2½in. (telemetry chassis) plus a power-supply chassis measuring 4½in. × 3in. × 2¼in.

Pick-ups

Both the voltage and inductance types of pick-ups used in the system are produced in a variety of types and ranges.

Inductance pick-ups available include linear and angular accelerometers, pressure pick-ups and linear and angular movement pick-ups.

Voltage pick-ups usually take the form of a resistance potentiometer device. A number of such designs in the form of pressure pick-ups, general movement pick-ups from control surfaces or temperature pick-ups have been designed.

The Switch

On the speed of the switch unit depends the channel frequency response of the system.

Three models of the switch, with speeds of 120, 80 and 40 c.p.s. respectively have been designed.

The switch itself consists of a miniature motor, working from 6.3 v. D.C., driving a four-finger nickel silver brush assembly in a 2-way commutator, moulded in "Araldite." "Break before make" contacts, to avoid momentary coupling between channels, are made from the centre of the brush assembly. A small felt pad, serving the dual purpose of lubrication—with a specially-developed oil—and the collection of brass dust, is mounted diametrically opposite the brush fingers.

To make wiring easier and facilitate rapid switch changing a 24-way socket, moulded in nylon-loaded bakelite and using B7G valve base type clips as contacts, is included in the switch unit. When pushed into position it is clamped to the commutator by two screws.

Modulator Circuits

Three types of modulator are in use with the system, one accepting inductance inputs only, one voltage inputs only and one responding to both types of input.

Built on both sides of a bakelite board, all are compact and easy to service.

In the case of the inductance responsive modulator a normal triode oscillator is used, the pick-up providing the variable inductance of the tuning circuit. The output of the oscillator is then amplified to give the power needed to modulate the R.F. oscillator.

In the second modulator, responding to voltage inputs only, the frequency of oscillation of a tuned grid triode oscillator is controlled by a conventional reactance valve which forms part of its tuned circuit, the output frequency being again amplified to modulate the R.F. oscillator.

Dual-purpose Modulator

To provide a combined circuit responding to both voltage and inductance inputs, these two circuits are combined in a four-valve version. The first

valve acts as an oscillator for inductance inputs, the second as an amplifier which locks the third valve frequency to that of the first. The fourth valve is a straight amplifier.

In the case of voltage inputs the first valve is rendered passive by the damping of its tuned circuit and the voltage applied to the input to the second valve, which, acting as a reactance valve, determines the frequency of oscillation of the third valve. The fourth valve is, again, a straight amplifier.

In all cases the range of frequencies generated is 130-160 kc/s which in the case of voltage inputs is covered by a change of 6 volts.

Oscillators

To provide adequate power for all ranges, while keeping the direct current supplies needed as small as possible, three oscillators were designed for use in the system, with outputs measured on a C.W. basis of 0.2, 1 and 8 watts respectively. The earliest version was the 0.2 watt oscillator, built in the form of a push-pull tuned plate, tuned grid oscillator, using a CV858 (6J6). This is now obsolescent and is being replaced by the 1-watt version which has a similar circuit arrangement but is built around a specially developed sub-miniature valve.

The larger 8-watt unit, used for longer ranges, consists of tuned-anode, tuned-grid oscillator built around the CV397a disc sealed triode.

As the modulator, unaided, cannot control this oscillator, a driver-unit, supplying the necessary power, is included in this model.

Both the 1-watt and 8-watt oscillators can be arranged to work either C.W. or pulsed, the choice depending largely on the avoidance of interference with other R.F. circuits associated with the oscillators in missiles.

The fact that these oscillators must be easily controlled in frequency and permit coupling to whatever aerial system is available, and at the same time be stable over a wide range of temperatures and pressures, involved major problems of design. This was particularly the case with the high power oscillator, where high voltages combined with low pressures necessitated considerable development work to prevent flash-over.

As a by-product to this work the design of R.F. power-measuring and impedance measuring equipment at these frequencies had to be developed from scratch, as no suitable units existed for testing purposes.

The ground equipment of the system provides two records, a histogram (i.e., high-speed record) and the main record.

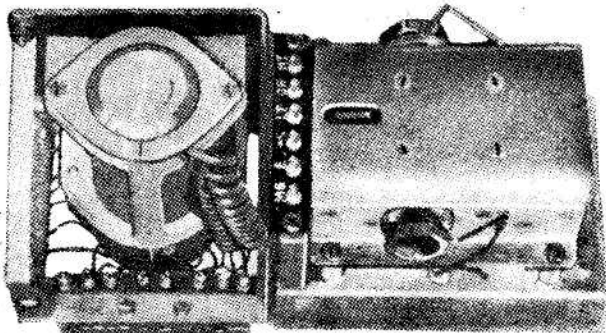
Ground Station

For the latter the signal received from the airborne sender, after demodulation, is changed to a series of direct current levels and the step function thus produced is applied simultaneously to the Y plates of 15 cathode ray tubes.

From the output of the R.F. receiver a filter separates out the synchronising signal, which is then used to generate the time base for a large monitor tube and also to produce strobes coinciding with each channel. These pulses are used to brighten the traces on the 15 cathode ray tubes. Any number of

them can be connected to each of the display tubes so that any channel or any combination of channels can be displayed on any of the 15 tubes. The whole 15 tubes are photographed side by side on a moving film 24in. wide.

Timing pips at each tenth of a second are recorded on each tube, as also is the firing pulse. On the completion of each firing short calibration lines from a crystal frequency generator are added to the record.



An assembly ready for installation.

Histogram Recorder

The histogram recorder is designed as a self-contained unit for producing records from single channel senders or histogram traces from multi-channel senders. It contains a receiver and discriminator similar to those used in the main equipment and is fed from a separate helical aerial. The display consists of three cathode ray tubes, one large and two small, which are photographed simultaneously by a continuous 35 mm. camera.

The large tube displays the single channel record or the series of 24 direct current levels corresponding to the channels in the sender. One of the small tubes is used to display a time scale, the lateral position of which is calibrated in terms of field strength, and the other small tube indicates any radio frequency deviation throughout flight.

The P.P.M. System

In this system channel information is given by the time interval between the trailing edge of a reference pulse (about 50 micro-seconds long) and the incidence of a one-micro-second channel pulse.

The carrier frequency is pulse modulated by the reference pulse and the channel pulses, the recurrence frequency of the complete pulse train being between 2,000 and 5,000 per second, according to the number of channels in the sender.

Up to 20 channel pulses, each of which can vary over a range of 400 micro seconds, can be accommodated between successive reference pulses. Normally, however, groups of pulses are confined to consecutive intervals of 80 micro-seconds, the range of time displayed on each of the five cathode ray tubes in the ground equipment.

Each channel is arranged to produce, either directly or via a transducer, a variation of voltage or a variation of capacity which is used to control the time interval between the trailing edge of a reference

square wave and the generation of the respective channel pulse.

Airborne Sender

The airborne transmitting equipment of the set, the main parts of which are a modulator and an oscillator, is made in the form of a cylinder with a diameter of $4\frac{1}{2}$ in. and an overall length of $6\frac{1}{2}$ in. for a 12-channel set.

For ease of manufacture and servicing, the modulator is split into sub-units, built around sub-miniature valves, consisting of a square wave generator and a number of four-channel blocks. Sub-units, each of which is "potted" in marco-resin, can be assembled to form modulators for 4, 8, 12, 16 or 20 channels.

The wave form generated by the modulator consists of a wide pulse of approximately 40 micro-seconds width, the trailing edge of which is the time reference for the system, followed by a number of narrow pulses of 1 micro-second width.

The wide pulse generator consists of a screen coupled phantastron. From the screengrid of this valve the pulse, negative in direction, is generated and fed to the grid of a feedback amplifier which inverts it and applies it to the grid of a cathode follower driver. The load of the cathode follower is taken to the bias line so that in the absence of the positive pulse the oscillator grid is cut off.

To derive the trigger for the narrow pulse generators the screengrid waveform of the phantastron is also differentiated and applied to the grid of a cathode follower, which cuts off the negative pips so that at the cathode a positive trigger pulse appears which corresponds to the trailing edge of the wide pulse.

This trigger pulse is the A.C. coupled (D.C. in later versions) to the suppressors of a number of phantastrons through individual diodes which act as D.C. restorers to the negative line through suppressor resistors.

In the absence of trigger the suppressors are held negative, so that no anode current flows. The screen grids are at a low potential due to the fact that the screens are taking the cathode current. When the trigger occurs the anodes begin conducting, starting their negative voltage excursion due to the Miller action of the circuit. This negative excursion is fed to the grids by the anode—grid feed-back capacitors tending to cut off the valve current. When this occurs the screen potentials begin to rise. Due to the capacity coupling between screen and suppressor this rise is fed to the suppressors and tends to drive them more positive and hold them there. This feed-back makes the screen waveform edge very sharp.

The valves remain in this condition until the Miller action ceases, i.e. until the valves "bottom." This occurs at different times due to the different components and inputs controlling the rate of anode rundown.

When a valve "bottoms" its anode can draw no more current, but as the grid tends to go positive the screen commences drawing current so that its potential falls. When this happens a sudden change-over of current occurs between anode and screen, due to the suppressor screen coupling. The anode remains in this condition because the suppressor is cut off by the screen waveform. The circuit then remains in this condition until the next trigger pulse arrives.

The screen waveforms are then differentiated so that a series of negative pulses are produced which correspond to the various "bottoming" positions of the

valves. These pulses are normally arranged in sets of four, each pulse having an excursion of 80 micro-seconds for full-scale deflection, the groups being constrained to occupy the time scales of 80-160, 160-240, 240-320, 320-400 and 400-480 micro-seconds—the time intervals required for full-scale deflection of the five display tubes of the ground equipment.

The pulses are then applied to the grid of the feed-back amplifier together with the wide pulse, so that the output at the anode is the wide pulse followed by the narrow pulses. This waveform is used to modulate the oscillator.

The oscillator normally used is a 2-watt (rated on C.W.) model, but for longer ranges an 8-watt oscillator similar to that used in the time multiplex system has been produced. With varying direct current supplies this meets all requirements from 2 to 8 watts.

A greater number of information channels can be obtained by introducing a time division switch on any one or more channels with the corresponding sacrifice of frequency response. Standard switch wafers at present in use have eleven contacts which can be arranged in a number of different ways, four capacity and four voltage channels or eleven voltage channels with the same voltage excursion being typical assemblies.

As these channels may be arranged to overlap, and up to four may be interlaced, some method of identification is needed. This is provided by the identification switch which runs at a low speed connecting each input to a fixed voltage, usually earth, in sequence so that once one channel has been identified all the rest follow in order.

Ground Equipment

The ground equipment of the P.P.M. system produces a maximum of five displays depending on the number of channels in use.

The time scales mentioned above—80-160, 160-240, 240-320, etc.—are used as the Y time bases for five separate cathode ray tubes, the channel pulses being used as brightening pulses for these traces. Each tube is photographed by a continuous 35 mm. camera, the speed of which can be varied from 2 to 120 inches per second.

To achieve this the signal is received on the ground, and after demodulation by a sensitive receiver the resultant train of pulses is fed into a voltage circuit box unit. Here the pulses are limited and the reference square wave is separated from the channel pulses.

A trigger pulse is then generated from the trailing edge of this square wave, and goes to each of the five time base generators, where two phantastron delay circuits are used to develop the appropriate Y axis time base for each display tube. At the same time the channel pulses, after further amplification and limiting in the voltage circuit box, pass through a pulse forming channel and are used as brightening strobes for the cathode ray tubes.

Before each firing the time-bases are set up accurately and checked by means of a built-in crystal calibrator, which is fed into the voltage circuit box and the scan on each tube adjusted accordingly.

A timing trace, obtained from the range master timing system, is displayed on a small cathode ray tube by the side of each of the channel recording tubes so that this is photographed simultaneously on the 35 mm. film. On firing, a pulse from the firing switch is arranged to displace this trace and indicate the instant of firing.



SOME DETAILS OF THE PROBLEMS INVOLVED AND OF
MODERN PROJECTION UNITS

By "Erg"

(Concluded from page 362 January issue)

THE tube operates with a final anode voltage of 25 Kv. and the glass face is specially toughened and treated so that it is not affected by the soft X-rays generated by the tube. The construction of the tube is shown in Fig. 11.

In front of the tube is placed a spherical mirror, the image being further reflected by the flat mirror which encloses the tube. The natural tendency of the spherical mirror to pin-cushion distortion is counteracted by the slight barrel distortion introduced in the picture on the tube by the special design of the deflector coils.

The deflection angle of the tube is only 38 deg. as compared with the 50 deg. for the 12in. tube and the 70 deg. for larger tubes; this low deflection angle enables full scanning to be obtained with the 25 Kv. E.H.T. with only a 25 per cent. increase in the scanning power required for a 50 deg. tube.

The flat mirror reflects the picture through the correcting lens which is the essential part of the Schmidt optical system.

This section of the optical system is built as a self-contained unit, the focus and deflection coils being contained within the unit. It is completely enclosed and is dustproof.

From the correcting lens the picture is projected on to a mirror which is silver surfaced, and from this mirror to the special translucent screen. The complete system enables a compact, self-contained television to be constructed.

Projection for the Cinema

For projection in cinemas the Schmidt optical system is used on a larger scale and the tube is

designed to operate with a final anode voltage of about 100 Kv.

The screen can be made of white material with a smooth finish. It is possible to obtain a greater degree of contrast with a silver beaded screen though the brightness of the resultant image falls off rapidly with the angle of view.

Protection Circuits

The high E.H.T. is generated by an R.F. unit, but although the screen of the tube is protected against ion burn by a backing of aluminium particles, failure of either the line or frame time bases would result in a horizontal or vertical line being burnt on the screen.

In order to avoid this condition a special protective circuit is introduced into the time bases so that in the event of either of them failing the tube becomes heavily biased and thereby blacked out.

The elements of such a protective system is given in Fig. 12. A portion of the applied mains voltage is tapped off the dropping resistor and is applied to the cathode of V1. From the anode a negative potential is derived, being built up across the condenser C1. This negative potential is applied to the grid of the tube via R1 and the brightness potentiometer; it is at the same time applied to the grid of the line output valve V2.

Now assume that V3, the frame output valve, is functioning (being fed with a sawtooth waveform from the frame oscillator), then a small proportion of the output is taken via C2 to the anode of V4a. At the cathode of this valve will appear a positive potential developed across C3. This positive potential is applied to the suppressor and control grids of the

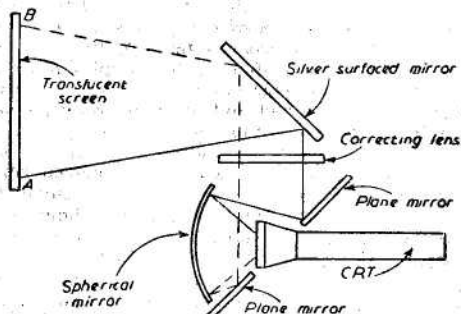


Fig. 10.—General details of the optical arrangement used in the projection system.

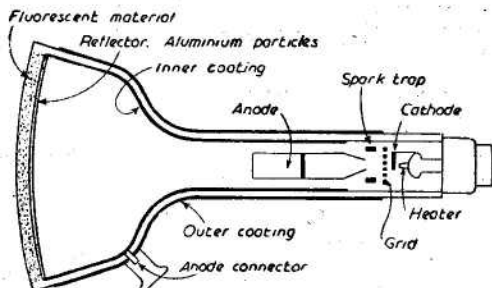


Fig. 11.—Details of the tube used for projection.

line output valve V2 which cancels the existing negative voltage developed by V1. The line output valve will therefore operate and pass the sawtooth waveform to its output transformer T. A small portion of this output is developed in the secondary winding Sb and is applied to the anode of V4b. A positive potential is thus developed across C4 in the cathode circuit of this valve and is applied to the grid of the CRT. The positive potential thus developed cancels the negative potential gained from V1 and the tube will pass current; the raster or picture will be seen.

Now we can have two conditions of failure: if the line oscillator output ceases due to a failure of the line oscillator or the output circuit then no voltage will be developed across the transformer T and its secondary Sb, hence no positive potential will be found across C4 and the grid of the tube, to cancel the existing negative potential on it.

If the frame oscillator or output valve fails then no positive potential will be developed across C3 and hence suppressor grid and control grid of V2; as there is an existing negative potential on the grid of V2 from V1, V2 will cease to function; no output is developed into Sb and therefore no positive appears across C4 to counteract the negative existing on the grid of the tube from V1.

Failure of either line or frame circuit will therefore black out the tube.

Projection and Colour

Of the two systems—projection or directly viewed tube—projection lends itself most readily to colour conversion.

A mechanically driven colour disc using the three primary colours can be rotated in the path of the image to produce a coloured picture on the screen. A system on these lines has been developed by the C.B.S. company of America, a cup-shaped colour wheel being fitted between the tube face and the spherical mirror. Fig. 13 shows the scheme.

The colour wheel is synchronised by the incoming signal so that correct colour reproduction is obtained.

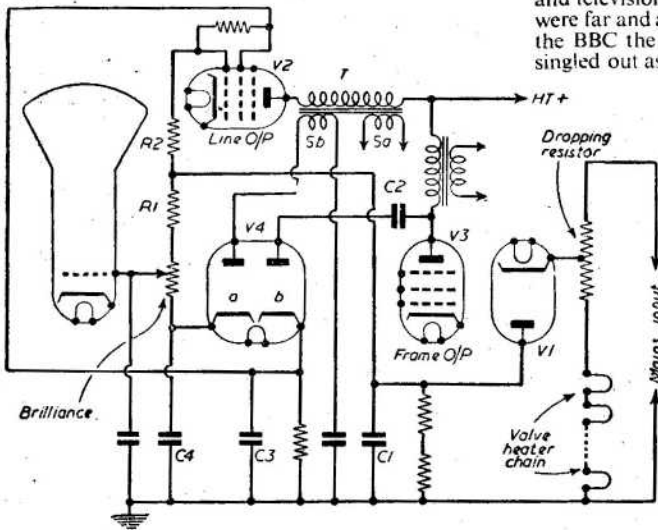


Fig. 12.—Circuit of the protective arrangement used in projection.

It should be possible to fit a similar system to existing projection televisions, when colour comes to this country, without drastic modifications in the layout of the television. There is sufficient room in the cabinets for the inclusion of such an item.

Projection and the Home Constructor

The optical unit developed by Mullard has been made available to manufacturers of television sets but has not as yet been made available to the home constructor.

The main secret of the system is in the production of the special corrector plate, and while the mirror system could undoubtedly be reproduced it would be a very difficult task for the home constructor to make such a plate.

For the time being, then, the system is not for us. Perhaps it is just as well because the tube develops a certain amount of soft X-rays which can be dangerous when it is viewed directly without its protective optical unit.

Service engineers are advised not to view the screen of the tube closer than 40 in. when it is not of its optical unit without the insertion of a lead glass shield. The equivalent lead thickness of the glass shield should be 0.5 mm.

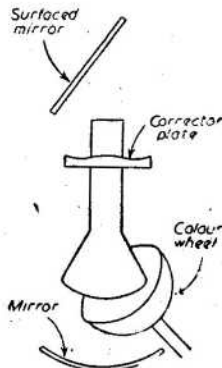


Fig. 13.—One suggestion for projection in colour.

BOOK RECEIVED

The Year that Made the Day

THIS book, published by the BBC, is a record and explanation of how the BBC planned and prepared the Coronation Day broadcasts on sound and television. Those broadcasts by common consent were far and away the best programmes ever put out by the BBC the television programmes themselves being singled out as especially meritorious. They were flawless.

For the first time in the history of the world a Coronation was seen by an audience, nation wide, estimated to be at least 20,000,000. The records will be preserved for all time. Sir Ian Jacob, K.B.E., C.B., Director General of the B.B.C., has written the foreword in which he says that millions of people all over the world were able to participate in the ceremonies and rejoicing on that famous day, June 2nd, 1953, when Her Majesty Queen Elizabeth II was crowned this book will undoubtedly interest all those millions for it is a very readable and well-illustrated account of the planning and preparation that enabled the two services to achieve an outstanding success. It costs 6s., is quarto in size, and printed on very good quality paper. The illustrations alone are worth the money.

RADIO SUPPLY CO. (LEEDS) LTD.

Dept. N.,
32, THE GALLS, LEEDS, 2.

Post Terms C.A.W. or C.O.D. No C.O.D. under £1. Postage 11 charged on orders over £1. From 1st to 23rd add 1/- over 23 post free. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.S. with enquiries, please. Full list 5d.; Trade List, 5d.

R.S.C. MAINS TRANSFORMERS (GUARANTEED)

Interleaved and Impregnated. Primaries 200-230-250 v 50 c/s Screened.

| TOP SHROUDED, DROP THROUGH | SMOOTHING CHOKES |
|---|--|
| 250-0-250 v 70 ma, 6.3 v 2.5 a ... | 250 ma 7-10 h 200 ohms Fully Shrouded 18/9 |
| 280-0-280 v 70 ma, 6.3 v 2.5 a, 5 v 2 a ... | 250 ma 3 h 100 ohms ... |
| 350-0-350 v 80 ma, 6.3 v 3 a, 4 v 2.5 a ... | 100 ma 10 h 375 ohms ... |
| 350-0-350 v 80 ma, 6.3 v 2.5 a, 5 v 2 a ... | 80 ma 10 h 350 ohms ... |
| 250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... | 80 ma 10 h 400 ohms ... |
| 350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... | 50 ma 40 h 1,600 ohms Potted ... |
| 350-0-350 v 150 ma, 6.3 v 4 a, 5 v 3 a ... | |
| 350-0-350 v 150 ma, 6.3 v 2 a, 6.3 v 2 a, 5 v 3 a ... | |

| FULLY SHROUDED BRIGHT | MIDGET TYPE, 21-33in. |
|--|---|
| 250-0-250 v 60 ma, 6.3 v 2 a, 5 v 2 a ... | 250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... |
| 250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a, for RT355 Conversion ... | 250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... |
| 300-0-300 v 100 ma, 6.3 v 4 a, 5 v 3 a ... | 350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... |
| 350-0-350 v 70 ma, 6.3 v 2.5 a, 5 v 2 a ... | 350-0-350 v 150 ma, 6.3 v 4 a, 5 v 3 a ... |
| 350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... | 350-0-350 v 180 ma, 6.3 v 6 a, 6.3 v 3 a, 5 v 3 a ... |
| 350-0-350 v 250 ma, 6.3 v 4 a, 5 v 4 a, 0-2 v 6 a, 4 v 3 v 3 a, for Electronic Engineering Telescopier ... | |

| FILAMENT TRANSFORMERS |
|--|
| All with 200-250 v 50 c/s Primaries: 6.3 v 1.5 a, 5/9; 8.3 v 2 a, 7/6; 0-4-3 v 2 a, 7/9; 12 v 1 a, 7/12; 6.3 v 3 a, 9/11; 6.3 v 6 a, 17/9. |

| CHARGED TRANSFORMERS |
|--|
| All with 200-250 v 50 c/s Primaries: 0-0-15 v 1.5 a, 13/9; 0-9-15 v 3 a, 16/9; 0-9-15 v 6 a, 22/9; 0-4-9-15-24 v 3 a ... |

| E.H.T. TRANSFORMERS |
|---|
| 2,500 v 5 ma, 2-0-2 v 11 a, 2-0-2 v 11 a, for VCR97, VCR517, ACRC2X ... |
| 5,000 v 5 ma, 2 v 2 a ... |

| OUTPUT TRANSFORMERS |
|---|
| Standard Pentode, 5,000 to 3 ohms ... |
| Standard Pentode, 7,000 to 3 ohms ... |
| Push-Pull 10-12 watts to match, 6V6 etc., to 3-5-8 or 15 ohms ... |
| Push-Pull 15 watts to match 6L6 etc., to 3 or 15 ohms Speaker ... |

| BATTERY SET CONVERTER KIT |
|--|
| All parts for converting any type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplied 120 v 90 or 80 v at 40 v, fully smoothed, and fully smoothed L.T. of 2 v at 0.4 to 1 a. Price, including circuit, 48/9. Or ready to use, 7/9 extra. |

| BATTERY CHARGER KITS. |
|--|
| For mains input, 200-250 v 50 c/s. To charge 6 v Acc. at 2 amps, 26/9; to charge 6 v or 12 v Acc. at 2 amps, 32/9; to charge 6 v or 12 v Acc. at 4 amps, 49/9. Above consist of transformer, P.W. Rectifier, Fuse, Fuseholder, Steel Case and Circuit. Or ready to use, 6/9 extra. |

| ALL DRY RECEIVER BATTERY SUPERSUED KIT. |
|---|
| All parts for the construction of a unit housed in metal case 5-4 1/2 in., to supply 50 v 10 ma, and 1.5 250 ma. Fully smoothed. From 200-250 v 50 c/s mains. For 4-valve receivers. Price inc. point-to-point wiring diagrams, 35/9. Supplied assembled and tested, at 42/6. |

| RECEIVERS |
|--|
| 4188S (16 v.v. Aluminium) Receiver. Type-71-21in., 3/3; 10-21in., 3/9; 11-6-21in., 4/3; 12-8-21in., 5/3; 16-8-21in., 7/6; 20-8-21in., 8/11; Amplifier type (4 sided) 12-8-21in., 7/11; 16-8-21in., 10/11; 14-10-31in., 13/6; 20-8-21in., 13/6. |

EX-GOVT. BLOCK PAPER CONDENSERS—4 mfd 500 v, 2/9; 4 mfd 750 v, 3/3; 4 mfd 1,500 v, 5/9; 0.1 mfd plus 0.1 mfd 8,000 v, common negative isolated, 11/9.

EX-GOVT. SMOOTHING CHOKES—50 ma 5-10 h ... 2/9; 100 ma 10 h 150 ohms Tropicalised ... 3/9; 150 ma 10 h 150 ohms Tropicalised ... 6/9; 200 ma 20 h 250 ohms Tropicalised ... 12/9; 250 ma 3 h 50 ohms Potted ... 7/11; 250 ma 15 h 250 ohms Tropicalised ... 14/9; 250 ma 10 h 100 ohms ... 16/9

| EX-GOVT. E.H.T. SMOOTHERS |
|--|
| .02 mfd 5 kv, 1/9; .02 mfd 8 kv, 1/11. |

| NEW VALVES (EX-GOVT.) | | |
|-----------------------|-------------|-------------|
| Each Each Each | | |
| IT4 8/9 | 6SN7GT 10/9 | 35L6GT 9/9 |
| 1R5 8/9 | 6SL7GT 11/9 | 35Z4GT 10/6 |
| 1R3 8/9 | 6SK7 9/11 | SC215 4/9 |
| 6S4 9/8 | 6BS7 8/9 | EA50 2/9 |
| 5Y3G 8/11 | 6V6G 8/9 | EPF50 5/9 |
| 504G 10/6 | 6X5GT 8/9 | EPF54 6/9 |
| 524G 9/6 | 6Y8 8/11 | EPF36 5/9 |
| 6P6G 7/9 | 6D2 8/9 | EPF91 9/9 |
| 6J5G 5/11 | 6D6 11/11 | EE81 8/9 |
| 6J6 9/6 | 612GT 10/6 | Ms PEN 5/9 |
| 6J7G 9/6 | 12Q7GT 10/6 | HL2 2/9 |
| 6K7G 6/11 | 12Y2GT 10/6 | SP61 2/9 |
| 6K8G 11/9 | 12SC7 6/11 | VU120A 2.11 |
| 6Q7G 9/11 | 15D2 5/3 | |

R.F. UNITS TYPE 26.—Brand new. Carton-tioned, 49/6, plus carr., 2/6.

CATHODE RAY TUBES (EX-GOVT.)—VCR517. Guaranteed full. Picture 29/6; ACRC2X, 12/6. Carr. 5/- extra on each.

SILVER MICA CONDENSERS.—5, 10, 15, 20, 25, 30, 35, 50, 60, 100, 120, 150, 200, 230, 300, 340, 400, 470, 500, 1,000 (.001 mfd), 2,000 (.002 mfd), 5d. each, 3/9 doz. 1 type.

VOL. CONTROLS (standard long spindles). All values, less switch, 2/9; with S.P. switch, 3/9; with D.P. switch, 4/6.

ELECTROLYTICS.—Tubular 3 mfd 450 v, 1/11; 16 mfd 450 v, 2/11; Can 8-4 mfd 450 v, 3/11; 6-16 mfd 450 v, 3/11; 16-16 mfd 450 v, 4/11; 32 mfd 450 v, 4/11; 32-32 mfd 350 v, 5/6; 32-32 mfd 450 v, 5/11; 64 mfd 450 v, 4/9; 64-120 mfd 450 v, 7/6.



OPEN TILL 6 P.M. SATURDAYS TELEPHONES: AMBASSADOR 4053 & PADDINGTON 5271/2

PREMIER RADIO Company

(REG.) B. H. MORRIS & CO (RADIO) LTD. EST. 40 YRS. THIS IS OUR ONLY ADDRESS (Dept. PT) 207-EDGWARE ROAD • LONDON • W2

| PREMIER — MAINS TRANSFORMERS |
|--|
| All primaries are tapped for 200-230-250 v. mains 40-100 cycles. All primaries are screened. L.T.s. are centre tapped. |
| SP175B, 170-0-175, 50 mA., 4 v. @ 1 a, 4 v. @ 2-3 a. ... |
| SP250B, 250-0-250, 60 mA., 4 v. @ 2-3 a, 4 v. @ 3-5 a. ... |
| SP300A, 300-0-300, 60 mA., 6.3 v. @ 2-3 a, 5 v. @ 2 a. ... |
| SP300B, 300-0-300, 90 mA., 4 v. @ 2-3 a, 4 v. @ 3-5 a. ... |
| SP350A, 350-0-350, 100 mA., 5 v. @ 2-3 a, 6.3 v. @ 2-3 a. ... |
| SP351, 350-0-350, 150 mA., 4 v. @ 2-3 a, 4 v. @ 2-3 a, 4 v. @ 2-2 a, 4 v. @ 2-3 a. ... |
| SP375A, 375-0-375, 250 mA., 6.3 v. @ 2-3 a, 6.3 v. @ 3-5 a, 5 v. @ 2-3 a. ... |
| SP501, 300-0-300, 150 mA., 4 v. @ 2-3 a, 4 v. @ 2-3 a, 4 v. @ 2-2 a, 4 v. @ 2-3 a. ... |
| ST425A, 425-0-425, 200 mA., 6.3 v. @ 2-3 a, 6 v. @ 3-5 a, 5 v. @ 2-5 a. ... |
| EHT Upright for VCR 97 tube, 2,500 v, 5 mA., 2-0-2 v, 1 a., 2-0-2 v, 2 a. ... |

| V.G.R. 516 | C.R. TUBES | RECTIFIERS |
|---|--|--|
| 3in. Blue picture. Rear and ins. Anode. 4 kv. In manufacturer's original carton. £3.19.6 Plus 5/- pkg., carr., ins. | VCR 517C 6in. picture, this tube is a replacement for the VCR97 and VCR517. Guaranteed full size picture. PRICE 35/- Plus 2/6 pkg., carr., ins. | E.H.T. Pencil Type S.T.C. Type K325 850 v, 1 mA. ... 4/7 .. K340 3.2 kv., 1 mA. ... 6/- .. K345 3.6 kv., 1 mA. ... 8/2 .. K350 4 kv., 1 mA. ... 8/8 .. K3160 12 kv., 1 mA. ... 21/6 |

AUTO TRANSFORMER, 50 watts. Input/Output 0-110-210-230-240-250 volt. Plus 1/- pkg. & carr., 7/6.

A.C.R.I. C.R. TUBES (DIRECT REPLACEMENT FOR CR 2X) 5in. screen, 4 volt heater. This Electrostatic Tube is recommended as eminently suitable for Television, 15/- plus 2/6 Pkg., Carr. and ins. Data sheet supplied.

Ex. W.D. STEEL AERIALS
Also ideal for fishing rods—BRAND NEW 12ft. 3 1/4 in. sections of copper-plated steel highly flexible tapering fin. to 1 1/2 in. Brand new in container. Plug-in type. 4/9. Screen type, 7/6. Packing and carriage, 1/6. Insulated Base 3/-. Webbing waterproof carrying case with shoulder-sling, 2/6.

SPECIAL OFFER
CRYSTAL HAND MICROPHONE
High Impedance. Excellent frequency response light weight gives very high quality results when used with tape recorder, amplifiers for any type of P.A. equipment. Complete with screen lead and plug, 29/6. Plus 1/6 pkg. and carr.

T.V. WHITE RUBBER MASKS (CORRECT ASPECT). We can supply a specially designed White Rubber Mask for 5in. C.R. tubes at 8/6 each. 9in. White Masks, 9/6. 12in. White Masks, 10/11. For Round or Flat faced Tube.

THE NEW PREMIER TELEVISOR
Wide Angle scanning, for 14in. or 17in. Tubes may be used with a 12in. Tube with minor modification. Tunable from 40-68 Mc/s without coil or core changing, completely isolated from the mains. The New Time Base may be used with existing Premier Televisors to convert them to the latest type of picture tubes. All the individual components may be purchased for a total cost of £31/19/7 (less tube). Data booklet, 3/6 post paid.

TERMS OF BUSINESS:—CASH WITH ORDER OR C.O.D. OVER £1 Please add 1/- for Post Orders under 10/-, 1/6 under 40/-, unless otherwise stated.

CLYDESDALE

Bargains in Ex-Services Radio and Electronic Equipment

INDICATOR UNIT TYPE 62A WITH EF50's

Used, good condition.
ASK FOR D/H863 **79/6** Each CARRIAGE POST PAID

INDICATOR UNIT TYPE 62

In original wood case.
ASK FOR D/H525 **£3.19.6** Each CARRIAGE POST PAID

INDICATOR UNIT TYPE 62

Used, good condition
ASK FOR D/E774 **49/6** Each CARRIAGE POST PAID

INDICATOR UNIT TYPE 6

In original wood case.
ASK FOR D/H524 **79/6** Each CARRIAGE POST PAID

INDICATOR UNIT TYPE 305

BRAND NEW Ref. 10QB/6504
Contains VCR521A-VCR525. 7 EF50's
ASK FOR D/H943 **£3.19.6** Each CARRIAGE POST PAID

5CP1 CATHODE RAY TUBE

In original carton.
6in. electrostatic type, heaters 6.3 v.,
0.6 a.
ASK FOR D/H529 **19/6** Each CARRIAGE POST PAID

INDICATOR UNIT TYPE 6H

In original wood case.
ASK FOR D/E777 **89/6** Each CARRIAGE POST PAID

REPRINTS FROM "PRACTICAL TELEVISION"

Components Price Lists Free on Request.
The "Beginner's Receiver" modifying the R3170A, April to July ... 1 6
The "Beginner's Timebase" ... 1 6
Economy Television, modifying Ind. 62 ... 2 6
Argus Televisor, data and blueprint ... 2 6

BEGINNER'S T.V.

Mains Transformer ... 32 6 each
Smoothing Choke ... 15 6 each
Output Transformer ... 9 9 each
Crystal Diodes ... 5 3 each

THE BEGINNER'S TIMEBASE

Mains Transformer ... 20 - each
E.H.T. Transformers ... 50- & 45 - each
Smoothing Choke ... 15 6 each

POWER UNIT TYPE 285

Ready made for T.V.
A.C. Mains. Input 230 v. 50 c.p.s. Outputs
E.H.T. 2 K.v. 5 m.a., H.T. 350 v. 150 m.a.
L.T. 6.3 v. 10 a. and 6.3 v. 5 a. Fully smoothed
and rectified with valves VU22, 5U4G,
VR91 (6P50), plus cond., resistors, etc.
ASK FOR D/H947 **£4.19.6** Each CARRIAGE POST PAID

Order direct from:

CLYDESDALE SUPPLY CO. LTD.

2, BRIDGE ST., GLASGOW, C.5.

Visit our Branches in Scotland, England and Northern Ireland.

'Phone: SOUTH 2706/9

ION TRAP MAGNET ASSEMBLY

Mfg. Surplus.
Type IT/6 by Elac for 35 mm. tube neck.
ASK FOR D/H919 **2/6** Each POST 3d EXTRA

I.F./A.F. AMPLIFIER UNIT R1355

In Transit Case.
With valves, I.F. frequency 7.5 mc/s. Dim: 18 x 81 x 7 1/2 in. Used, good condition.
ASK FOR D/E770B **32/6** Each CARRIAGE POST PAID

R.F. UNIT TYPE 24

In original carton.
Switched tuning 20-30 mc/s with valves, etc.
ASK FOR D/H580 **22/6** Each CARRIAGE POST PAID

R.F. UNIT TYPE 25

In original carton.
Switched tuning 40-40 mc/s with valves, etc.
ASK FOR D/H447 **22/6** Each CARRIAGE POST PAID

R.F. UNIT TYPE 27

With broken dial.
Variable tuning 65-85 mc/s., with valves, etc.
Used, good condition.
ASK FOR D/E771 **39/6** Each CARRIAGE POST PAID

RECEIVER UNIT R3601

ref. 10DB6037.
ASK FOR D/H493 **39/6** Each CARRIAGE POST PAID

Forrest

TRANSFORMERS

are supplied to many of the leading Radio Manufacturers, Industrial concerns, etc. We undertake the construction of single items or long runs using the finest possible materials.

OUR REWINDING SERVICE is used by most Dealers who come to us for prompt and efficient service.

OUR COMBINED BOOSTER AND ISOLATING transformers have been adopted as standard by several leading Insurance Companies and Maintenance Services, etc. Cheap and easy to fit at 18/9 retail post free, they have given many thousands of Cathode-ray Tubes a longer lease of life.

Literature on application.

H. W. FORREST,

349, Haslucks Green Road, Shirley,
Birmingham SH1 2483

Armstrong

Specialists in Chassis manufacture for over 20 years—offer to the enthusiast their

14" AND 17"

TV.5. RANGE

—in Chassis form

BOTH Models are similar in general specification, having 19 Valve Superheterodyne Circuits with Instantaneous 5-channel selector switching and aluminised rectangular, flat-faced Cathode Ray Tubes with tinted filter.

THE CHASSIS THAT GIVES THE TRUE BLACK AND WHITE PICTURE

Prices:

TV.5. 14in. Chassis, £54.0.3 (inc. P.T.)

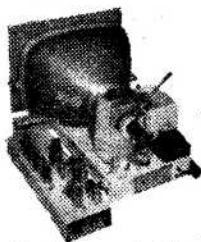
TV.5. 17in. Chassis, £64.15.11 (inc. P.T.)

Also available in handsome Cabinet form.

ARMSTRONG WIRELESS & TELEVISION CO. LTD.

Walters Road, Holloway, London, N.7.

Telephone: NORTH 3213/4





TELENEWS

More Detector Vans

THE Post Office intends to increase its big drive in locating viewers who have not taken out licences.

Until now, only two G.P.O. detector vans have been employed in finding houses where TV receivers are in operation, but within the next year there will be eleven. Not only will they be able to trace receivers to individual houses, but also to the actual room in which the set is working.

Television Licences

THE following statement shows the approximate number of licences issued during the year ended November, 1953. The grand total of sound and television licences was 13,216,644.

| Region | Number |
|----------------------|---------|
| London Postal ... | 848,500 |
| Home Counties ... | 315,386 |
| Midland ... | 570,433 |
| North Eastern... .. | 359,671 |
| North Western ... | 385,290 |
| South Western ... | 113,109 |
| Wales and Border ... | 129,616 |

| | |
|---------------------------|------------------|
| Total Eng. and Wales ... | 2,722,005 |
| Scotland | 117,360 |
| Northern Ireland ... | 6,862 |
| Grand Total | 2,846,227 |

TV Aids an Editor

THE editor of the *Glasgow Evening News* supervises the layout and make-up of his newspaper with the aid of television.

A camera and receiver, which work on a closed circuit, have been installed by Pye Telecommunications, Ltd., the camera in the printing room and the receiver in the editor's office where he is able to check the layout and see the printers setting the type into position.

Engineering Division Appointment

THE BBC announces the appointment of Mr. L. Evans as Engineer-in-charge of the low-power television transmitting station near Douglas, Isle of Man.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of radio apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Copyright in all drawings, photographs and articles published in "Practical Television" is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

Mr. Evans joined the BBC in 1941 and has served at a number of the Corporation's sound and television transmitting stations. He served with the Royal Corps of

Signals from 1943-46 and was transferred to the BBC television transmitting station at Sutton Coldfield in 1949 and to the television transmitting station at Wenvoe in 1952.

Users Must Pay

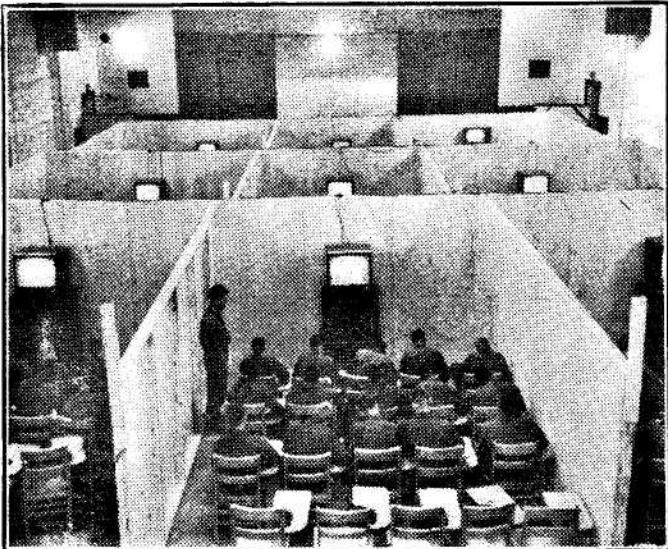
THE Housing Minister has stated that when a master television aerial is erected on top of a block of flats the cost must be met by the residents in the form of increased rents.

These increases, he adds, should not fall on the people in the flats who have not been able to afford or have not wanted receivers but on the viewers themselves.

Norwegian Service

ACCORDING to the director of Norwegian broadcasting, Hr. Kaare Fostervoll, an experimental television service is due to begin in Norway early this year.

As many technical difficulties exist with equipment and techniques, the cost of each pro-



A view of the nine television classrooms as seen from the control room in the rear of a theatre on an army post. Here, the U.S. Army Signal Corps is conducting experiments to test the merits of military instructions by television.

gramme is likely to be high. Licences will probably be around £5 a year but at the moment no advertising is contemplated.

Filling the Breach

WHEN New Yorkers spent a long period at the end of last year without their usual big newspapers, TV stepped in and efficiently filled the breach.

The day-long edition included large photographs and captions

Signal Corps Mobile Television Section is carrying out the experiments and is a mobile, self-contained and self-powered television system capable of televising and controlling presentations from three field cameras, an airborne camera and an iconoscope film chain.

The present equipment used by the Mobile Television system is not considered to be tactical in nature, but the unit has pointed

well as the normal black-and-white copy which viewers see at the beginning of every transmission.

The symbol is of an abstract pattern, consisting of two intersecting eyes which scan the globe from east to west, symbolising vision and its power. Flashes of lightning on either side represent electrical forces, the whole form taking the shape of wings which suggest the creative possibilities of television broadcasting.

Island Reception

IT is revealed that the Isle of Wight TV transmitter will probably be operating by October or November.

A 200ft. temporary mast is to be erected by the BBC with transmitting aerials at the top. Half-way down the mast will be a receiver to receive vision, which will be beamed from Golden Pot, near Alton. A land-line will carry the sound direct from Alexandra Palace.

Free-lancer

MAX ROBERTSON, well known to the TV public as a top sports commentator and his introduction of "Panorama," has left the BBC to take up duties as a free-lance.

No Scope Here ?

IN a written reply on coin-in-the-slot TV, which enables the viewer to insert a coin and choose his own programme, Mr. L. D. Gammans, Assistant Postmaster-General, has stated that there would be no scope for the system in this country.

Pye Industrial TV for Export

RADIO ITALIANA are to be the first overseas buyers of the new Pye Industrial Television. Recently, Pye supplied the Italians with the most up-to-date outside broadcasting unit for Turin. They are now to be the first television service to use miniature cameras—for caption scanning. The industrial cameras, more than £100 cheaper than their American counterparts and with a much better picture quality, are likely to prove a great attraction to Britain's export customers.

Capable of being run off ordinary power points, these cameras have been designed for industrial purposes ranging from the remote viewing of dangerous processes to security work and advertising.



The new BBC Television symbol which viewers see at the beginning of every transmission.

which were shown to viewers. The pages were turned over automatically to the accompaniment of music.

Record Output

AN all-time production record was set up in November, 1953, by the British radio and television industry, when 140,000 television sets were manufactured.

The trade had set a target of a million receivers by the end of December but this figure was reached by November, compared with 811,000 sets for the whole of 1952.

Half a million have been sold in the four months following the Radio Show.

Warfare of the Future

EXPERIMENTS are proceeding at the Signal Corps Pictorial Centre, Long Island, New York, in the use of television.

At the battlefield, the U.S.

the way toward the development of the best types suited for tactical use.

Fees for Footballers

WHEN commercial television is introduced in this country, it is probable that viewers will see a great deal of sport, including association football which hitherto has not been seen very often because of its ultimate effect on gate takings.

Mr. J. Guthrie, chairman of the Soccer Players' Union, is anxious that when commercial backing does enable big matches to be televised, the professional soccer men themselves will receive some financial benefit and is asking on behalf of the union that a fixed fee be paid to all players taking part in televised games.

BBC Symbol

WE understand that a colour film has been made of the new BBC television symbol as

Used C.R.T. Tubes. Heater cathode short 9in., 45/-; 12in., 75/-; Ion burn, 9in., 35/-; 12in., 55/-; P. & P. on each 7/6.
 Trimmers, 5-40 pf., 5d.; 10-100, 10-250, 10-450 pf., 10d.

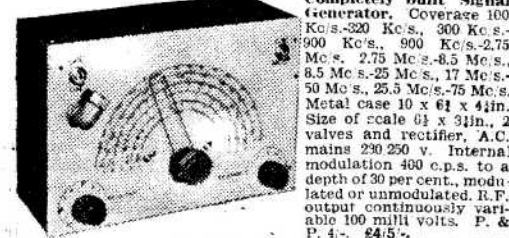
P.M. SPEAKERS

| | with trans. | less trans. |
|-----------------|-------------|-------------|
| 3 1/2in. | 16/0 | 13/6 |
| 5in. | 16/6 | 12/6 |
| 6in. | 18/6 | 15/- |
| 8in. | 18/6 | 15/- |
| 10in. | 19/6 | 16/6 |

Post and packing on each of the above, 1/- extra.
Output Transformers. Standard type, 5,000 ohms imp., 2-ohms speech coil, 4-9; Miniature type 32.4, 33. Multiratio 3,500, 7,000 and 11,000 2 ohms speech coil, price 5/6. 10 watt push-pull 6vz matching 2 ohms speech coil, 7/-.
Mains Trans. Pri., 230-250v. Sec., 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., 13/- P. & P. 1/6.

Line and E.H.T. Transformer. 9KVA using ferrocort core complete with built-in line and width control. Mounted on All-chassis. Overall size 4 1/2in. x 1 1/2in., EY51 Rec. winding. P. & P. 2/6, 27/6.

Heater Transformer. Pri. 230-250 v. 5 v. 1 1/2 amp., 6/-; 2 v. 2 1/2 amp., 5/- P. & P. each 1/-; 2, 4, or 6 volt 2 amp., 7/6.



R. and A. T.V. energised 6 1/2in. Speaker with O.P. Transformer. 6V6 matching, field coil 175 ohms. Requires minimum 150 mA to energise maximum current 250 mA. P. & P. 2/- 15/-.

Battery Charger Kit, comprising metal case 4 1/2in. x 5 1/2in. x 4 1/2in. Transformer, 230-250 v., and metal rectifier. Output 6 or 12 v. 1 1/2 amp. P. & P. 2/6, 19/6.

Amplifier Case, black rexine covered, leather carrying handle, chrome plated corners, rubber feet, felt lined, detachable lid. External dimensions 13 1/2in. and 13 1/2in. x 9in. P. & P. 2/6, 20/-.

R.I. MAINS TRANSFORMERS, chassis mounting, feet and voltage panel. Primarys 200-250. 300-0-300 60 mA. 6.3 v. 1 a., tapped at 4 v. 6.3 v. 2 a. tap 4 v., 13/6. 350-0-350 75 mA. 6.3 v. 3 a. tap 4 v. 6.3 v. 1 a., 13/6. 350-0-350 70 mA. 4 v. 5 a. 1 v. 2.5 a. C.T., 18/6. P. & P. on the above transformers, 2/-; 500-0-500 125 mA. 6.3 v. C.T. 4 a. 3.3 v. C.T. 2 a. 5 v. C.T. 2 a., 27/6. 500-0-500 125 mA. 4 v. C.T. 4 a. 4 v. C.T. 4 a. 4 v. C.T. 2.5 a., 27/6. 500-0-500 250 mA. 4 v. C.T. 5 a. 4 v. C.T. 5 a. 4 v. C.T. 4 a., 39/6. P. & P. on the above transformers 3/-.

Valve Holders, moulded octal Mazda, and octal, 7d. each. Paxolin octal, Mazda and octal, 4d. each. Moulded B7C, B7A and B7A, 7d. each. B7G moulded with screening can, 1/6 each. 32 mfd., 350 wkg., 2/-; 16 x 24 350 wkg., 4/-; 4 mfd., 200 wkg., 1/3; 40 mfd., 450 wkg., 3/6; 16 x 9 mfd., 500 wkg., 4/6; 16 x 15 mfd., 300 wkg., 5/9; 8 x 16 mfd., 450 wkg., 3/9; 32 x 32 mfd., 350 wkg., 4/-; 32 x 32 mfd., 350 wkg. and 25 mfd., 25 wkg., 6/6; 25 mfd., 25 wkg., 11d.; 250 mfd., 12 v. wkg., 1/-; 15 mfd., 300 wkg., wire ends, 3/3; 8 mfd., 500 v. wkg., wire ends, 2/6; 8 mfd., 350 v. wkg., tag ends, 1/6; 50 mfd., 25 v. wkg., wire ends, 1/9; 100 mfd., 500 wkg., 4/-; 100 + 200 mfd., 350 wkg., 9/6; 16 + 16 mfd., 350 wkg., 3/3; Ex-Govt. 8 mfd., 500 v. wkg., size 31 x 1 1/2, 2 for 2/6; 60 + 100 mfd., 230 v. wkg., 7/-; 16 x 32 mfd., 350 wkg., 6/-; 50 mfd., 180 wkg., 1/9; 65 mfd., 220 wkg., 1/6; 8 mfd., 350 wkg., 1/6; 60 + 100 mfd., 260 wkg., 8/6; 50 mfd., 12 wkg., 11d.; 32 + 32 mfd., min., 275 wkg., 4/-; 50 mfd., 50 wkg., 1/9; Miniature wire ends moulded, 100 pf., 500 pf., and .001 ea., 7d.

Combined 12in. Mask and Escutcheon in lightly tinted perspex. New aspect, edged in brown. Fits on front of cabinet, 17/6. P. & P. 2/-.

Frame Oscillator Blocking Trans., 4/6.
Tube Mounting Bracket, size 9 1/2 x 4 1/2in., 12in. tube clamps, 2/-.
Smoothing Choke, 5 henry 250 mA., 7/6. 250 mA. 4 henry, 5/-; 250 mA., 10 henry, 10/6; 250 mA. 8 henry, 8/6.

P.M. Focus Unit for any 9 or 12in. tube except Mazda 12in., with Vernier adjustment, 15/- P. & P. 1/6.

P.M. Focus Unit for Mazda, 12in., with Vernier adjustment, 17/6. P. & P. 1/6.

Wide Angle P.M. Focus Units, Vernier adj., state tube, 25/- P. & P. 2/-.

Energised Focus Coil, low resistance mounting bracket, 17/6. Plus 2/- P. & P.

Scan Coils, low line, low impedance frame, complete with O.P. transformer, 17/6. P. & P. 2/-.

Ion Traps for Mullard or English Electric tubes, 5/-, post paid.

Terms of business — Cash with order. Dispatch of goods within three days from receipt of order. Where post and packing charge is not stated, please add 6d. up to 10/-, 1/- up to 41 and 16 up to £2. All enquiries and Lists, stamped, addressed envelope.

D. COHEN

RADIO AND TELEVISION COMPONENTS
 23, HIGH STREET, ACTON, W.3.

(Opposite Granada Cinema)

Hours of Business: Saturdays 9-6 p.m. Wednesdays 9-1 p.m. Other days 9-4.30 p.m.

Five Tips FOR FASTER SOLDERING

TRIGGER-FEED SOLDERGUN

The Wolf Type 51 with its trigger-feed action is indispensable to all modern assembly

GENERAL INDUSTRIAL PURPOSES



FINE INSTRUMENT WORK

Type 21 — complete with chisel bit and perfectly balanced easy-grip handle. Heavy chrome finish. Net weight 7 1/2 oz.



FINE TO MEDIUM WORK

Type 31 — complete with two bits, one straight and one angular — easily interchangeable. Net weight 8 oz.



MEDIUM TO HEAVY WORK

Type 41 — complete with easily adjustable diagonal bit — the temperature can be controlled by extending or shortening the bit. Net weight 8 oz.



EXTRA HEAVY WORK

Type 71 — complete with square section bit, heavy chrome finish, plastic easy-grip handle. Net weight 9 1/2 oz.



Type 81 — complete with 16 oz. bit and easy-grip plastic handle heavy chrome finish. Net weight 2 lb.

SOLDERING IRONS

Models 21 and 31 also available with straight handles and heat deflecting skirt. Ask for models 22 and 32

Wolf Electric SOLDERGUNS AND SOLDERING IRONS

* Obtainable from all leading tool merchants and factors.

WOLF ELECTRIC TOOLS LTD

PIONEER WORKS · HANGER LANE · LONDON · W.5

Branches: Birmingham Manchester Leeds Bristol Glasgow Tel. Perivale 5631-4

"YOU CAN RELY ON US"

E.H.T. OSCILLATOR COILS AND UNITS
Brandenburg coils wavyound on Polyester formers. 6 to 9 kV. 39 - : 8-12 kV. 45-. Coil and U25 valve mounted with anti-Corona wiring. 6-9 kV. 67.6 : 8-12 kV. 75-. Brandenburg E.H.T. Unit, complete in louvered case. 6-9 kV. 66.6 - : 13-17 kV. 69.9-. Nera E.H.T. Unit. 8-12 kV. 66.10-.

T.C.C. E.H.T. SMOOTHING CONDENSERS
.001 6 kV. 6-. : .001 12 kV. 10-. : .001 15 kV. 10-. : .01 6 kV. 10-. : .17 kV. 20-. All Visconol types.

E.H.T. RECTIFIERS
Westinghouse. 36EHT35. 19-. : 36EHT40. 21.6 : 36EHT45. 23.3 : 36EHT50. 26-. : 36EHT100. 32.10. S.T.C. KV. 40.5 kV. 7.6-. : K3 43.5 kV. 8.2-. : K3 50.4 kV. 8.8-. : K3 100.7 kV. 14.8-. : K3 160.12 kV. 21.6.

H.T. RECTIFIERS
RM1 60 mA. 5.3 : RM2 100 mA. 5.9 : RM3 120 mA. 7-. All above are 125 v. (two in series for 250 v.). RM4 250 v. 275 mA. max., 21-. : 14D36. 11-. : 14A86. 20.4.

METER RECTIFIERS
1 mA. F.W. Bridge Westinghouse. 12.6 : 12 v. 5 mA. H.W. 1- (surplus).

CHARGING L.T. RECTS.
State 6 v. or 12 v. : a. 5 - : 2 a. 10.6 : 3 a. 12-. Full wave (Bridge). 4 a. 14 - : 6 a. 18.9.

COILS
All Denco coils stocke. Maxi "Q" dual purpose for plugging in B9A base or permanent mounting. 3 1/2 each. Wearite "P" coils. 3-. All Osamor coils and coils packs in stock. Osamor "Q" coils. 4 each. All Weymouth coils stocke. Super midget iron cored "H" coils. 3.9 each. 3-wave superhet pair CS3W3. 12.3. M.W./L.W. T.R.F. pair CT2W2. 10.3.

M.W./L.W. H.F. choke HFCL 2.9. Mains suppressor choke. 3.3. Q2 I.F. filter. 3.9.

TV COILS
Wearite "Viewmaster" coils. London. 20-. : Birmingham. Holme Moss. Kirk o' Saotts. 28-. : Wenvoe. 28-. 1.9 choke. 2-. Pre-amp. coils. 4- the pair. Allen coils. TK1 to TK9. 53.4. Denco coils. L1 to L12AB. 38-. Video chokes (Denco). 2.6 each. W.B. boost choke. 5.9.

TV SCANNING COILS
WB108. 33.3. Denco WA DCAI. 43-. Allen DC900. 42-. Haynes S112. S914. S914H. 42-. : S27. 45-.

TV WIDTH AND LINEARITY
Denco WA LCI 7.6 : WA WCL 7.6. Allen GL15. 7.6 : GL13. 7.6. Haynes VL5. 12.6.

LINE O.P. TRANSFORMERS
WB107. 23.6. Allen L0308. 50-. Denco WA L0T1. 42-. Haynes TWS 128. 43-. : TW5 109. 43-. : T33. 43-. : T27. 132.8.

TV FRAME O.P.
WB106. 23.6. Haynes TK10.41. 38-. Denco Allen F0305. 21-.

TV BLOCKING OSC. TRANSFORMERS
Denco Allen BT314. 15- (frame). Denco WAFBTL. 16- (frame). Haynes TQ132. TQ223. 13- (dine). TQ135. TA6. 18.6. Plessey surplus line. 7.6 : frame 8.6.

FOCUS UNITS
WB109.1. WB109.2. WB109.3. 22.8 (state tube). Blac R17MK11. 28.6 : R20 MK11. 30-. : R25 MK11. 32.6 : W20 MK11. 50-. : W22 MK11. 52.6 : W25 MK11. 57.6. Focus coils. Denco WAFCAI. 31-. Allen FC302. 35-.

VALVE HOLDERS AND CANS
B7G. B8A. B8A. moulded with skirt. 1-. Cans. 6d. 1.0. moulded. 1.1. 3-piece can. 1.6. 7-. 5-pin moulded. 1-. Mazda. 1-.

Q MAX CUTTERS
Chassis punches without hammering. 2in. 1in. 10.3 : 1in. 1in. 11in. 1in. 13.6 with keys.

I.F. TRANSFORMERS
Wearite M890. 21- pair. Denco IFT11. 12- pair. Olympic. 12.6 pair. Weymouth P1. 15- pair. Wearite 501. 302. 20- pair. All 455 kc s iron-cored.

JACKSON SCALES
SL8. 27.6 : SL5. 26.6. Full vision. 13-. Airplane 13-. Callband. 21-. Square-plane. 12.9. Drums 11in. 11in. 1.3 : 2in. 21in. 1.6. Cord drive. 1.9. (state inside or outside.)

TRIMMERS
Best Cylcon ceramic postage stamp. 4.70 pf. 9d. : 10-100 pf. 9d. : 50-150 pf. 9d. Chassis mounting. 20-250 pf. 1- : 100-500 pf. 1.3 : 150-700 pf. 1.3.

WIREWOUND RESISTORS
25. 33. 40. 50. 68. 109. 125. 150. 300. 500. 380. 490. 450. 500. 600. 680. 800. 1 k. 1.5 k. 2 k. 2.5 k. 3.3 k. 4 k. 4.5 k. 5 k. 6 k. 6.8 k. 8.2 k. 10 k. Max. 7-watt. 2.3 : max. 10 watt. 2.9. Above are new Welwyn Lab of small dimensions.

WIRE-WOUND POTS.
Colvern Preset 2 w. CLR901 100. 250. 500 1 k. 2 k. 2.5 k. 5 k. 10 k. 20 k. 25 k. 30 k. 3.3. Standard 2 w. incl. 50 k. and 100 k. 6.4 : 2in. spindle midget 1 watt. 1in. diam. 25. 50. 100. 5.9. Soundmaster. Viewmaster. Supervisor. Lynx. P.W. Teletest. Electronic. parts in stock. "Motek" Truvox tape decks. Goodmans Axiom speakers. Celestion P4. Instruments Amplion. Taylor. Avo. Pifco.

Tyana Irons. 16.9. Adcols. 25.6 Solon oval bit. 23.8 : pencil. 25.4. Phillips pencil type neon voltage indicator. 5-.

CATALOGUE NO. 12 PRICE 1/- (Fully Illustrated) RADIO SERVICING CO.

EALING 5373

82 SOUTH EALING ROAD, LONDON, W.5.

Next to
Sth. Ealing Tube
Station. 65 Bus.

DO YOU GET AN ANNOYING

PATTERN ACROSS YOUR SCREEN ?

If this is due to break-through by a nearby transmitting station, connect a LABGEAR ANTI-SWAMP FILTER to your set.



Makes an outstanding improvement against interference from transmitters on frequencies lower than the TV channels. One required for co-ax aerial feeders, two for balanced twin-lead. Price 10/6, plus 9d. P.P. only, direct from :

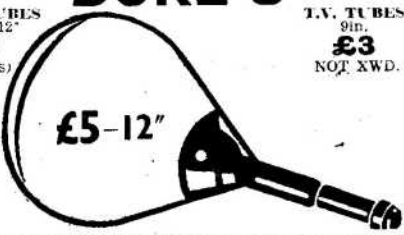
Labgear (Cambridge) Ltd.
WILLOW PLACE, CAMBRIDGE.

Tel. 2494—2 lines.

DUKE'S

T.V. TUBES
10" or 12"
£5
(seconds)

T.V. TUBES
9in.
£3
NOT XWD.



Guaranteed picture shown to personal shoppers. Checked and certified if sent by post. Insured carriage 15.6.

TELEVISION LENSES. Magnifies picture 1 1/2 times. For 8in. screens. 50 - : 10in. or 12in. screens. 70 -. De-Luxe type 5 - extra. Clear or tinted for daylight viewing, no extra.
TELEVISION COLOUR FILTERS. Gives you blue sky and green fields on your television, for the small cost of 6.9. Any size. Post 6d.

SUPPRESSORS. T.V. and radio, mains interference and noise eliminators. 8.9, post 1.3. Free drawing.
PICK-UP TRANSFORMERS. As new, E.M.I. type. Fully shielded. 3.9, post 1.6.

MICROPHONE TRANSFORMER. Ex W.D. but unused, new condition in fully shielded case. 3.9, Post 9d.

AMPLIFIERS. 9.6. As new (X.W.D. unused), contains EF38 valve. 2 transformers, 400 ohm relay, volume control, various condensers and resistors, etc. Case measures 5in. X 5in. Post 1.6.

ROTARY CONVERTORS. 12.6. Ex W.D. but new condition. Input 12 volts, output 200 volts at 50 m.p.a., and 13 volts at 1.8 a. Post 2.6.

POWER SUPPLY UNITS. 47.6. Ex No. 19 set (ZA3103). New condition. 12 volts input. Two H.T. output at 275 volts and 500 volts. Post 2.6.

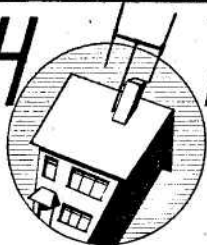
AMPLIFIER. 57.6. 3 valve, 4 watts output, post 2/6.
AMPLIFIER. 77.6. 4 valve, 7 watts output, post 2/6. 55.9.6 for 4 valve T.R.F. kit with full wiring instructions. With a white or walnut plastic cabinet, or wooden cabinet or already assembled, 21 extra. Post 3/6.

INSULATING TAPE. Always handy. In 1lb. rolls 1in. wide. 1/6. Post 6d.

821, ROMFORD ROAD, MANOR PARK, LONDON, E.12.
GRA. 6877. Write for our FREE catalogue 1954. Post 2d.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

ARTY-CRAFTY

MANY years ago a well-known stage producer wrote: "Lighting is the most important of the accessories of the stage, because lighting makes acting visible." He also stressed that audiences paid their admission money to hear as well as to see, and that the mumbling and throwing away of lines was unforgivable. The association of sight and sound is important from the point of view of intelligibility. Actors are sometimes nearly as bad on TV as on stage and screen, so far as the mumbling of lines is concerned. The last word or so of sentences are frequently "thrown away" at the request of the director, who is striving to achieve a so-called natural effect. The limit was reached recently when an actor played a scene with a girl, who was talking at such a low level that he couldn't hear her and took his cues from the moment her mouth remained closed! On the whole, diction was above normal in *Britannia of Billingsgate*, a comedy with a somewhat contrived story about a woman cleaner at a film studio who becomes a star overnight. The story hinges upon the reaction of her family to the sudden acquisition of wealth, and Lana Morris and Vi Stevens gave creditable performances. Nothing too arty-crafty about this play anyway! I must say that when I see all the facilities now available at Lime Grove Studios I wonder just how the producers ever managed to put over such good play productions at the Alexandra Palace two or three years ago. Or were we less critical then?

PARLOUR GAMES

TV Parlour Games come and go, but "What's My Line?" seems destined to be with us forever. And why not? This feature has had its ups and downs, but with the interesting personalities recently presented and the admirable guidance of Eamon Andrews in the chair it seems all set to achieve a new high in viewer appreciation. The womenfolk on the panel have a big responsibility: their make-up, hair styles, jewellery and dress are having, through the

medium of TV, a tremendous influence on the trend of feminine fashions. These courageous ladies—Lady Barnett, Barbara Kelly, Patricia Medina and others—sit there, enduring the searching scrutiny of lengthy close-ups while they coolly put their questions to the "victims" or the unknown celebrity. One recalls the high standard of elegance for the female element of the panel set by Elizabeth Allan, and ever since then our pleasure has been enhanced by gazing upon these smart women.

PATRICIA MEDINA SCORES

PATRICIA MEDINA made an immediate hit on "What's My Line?" when she stood-in for Barbara Kelly. Starting nervously, this charming actress held our attention as she tried vainly to guess the "victim's" line—and how glad we all were when she eventually succeeded in guessing the occupation of Mrs. Blogg, the signalwoman! The BBC's make-up department are the backroom boys (or girls) who play an important part in making this feature such a success, but there are times when they should pay a little more attention to participants other than those who sit on the panel. Joan Collins, for instance, was an "unknown celebrity" who played her part well, despite a pair of make-up eyebrows which would win the approval of George Robey. She talked quite a lot about her new colour film, *Our Girl Friday*, without mentioning its name! Another stand-in who scored an immediate success was Robert Morley, who took the place of Gilbert Harding while he was indisposed.

PICTURE RECORDING

DURING November RCA gave further demonstrations in Hollywood of their colour TV system and also announced that

they had perfected a method of recording or reproducing colour or black-and-white pictures on magnetic tape. The RCA tape is $\frac{1}{2}$ in. wide, plastic-base coated with iron oxide and travels at 200ft. per second compared with a TV tape system developed by Bing Crosby Enterprises which is 1 in. wide and travels at 100ft. per second. It is envisaged that in due course magnetic recording from electronic cameras will displace photographic methods in both television and motion picture studios. It is even contemplated that magnetic recording tape systems will be available for home recording of television pictures from either black-and-white or colour sets. But the prospects of these magnetic developments are not viewed with enthusiasm in many quarters. One man from the film industry was heard to remark, "This is the end!" But American TV manufacturers and dealers are also not too happy about the newest developments of colour TV or magnetic recording methods; complicated new techniques and increased costs of colour operation are scaring the TV producing companies and sponsors. The only people who seem to be wholeheartedly in favour of these new systems are the cinema newsreel companies which consume millions of feet of photographic film base at present. They visualise the wiping and re-use of magnetic film recordings of news events after the very short life each edition has before it becomes stale news. The time factor and costs of film stock and processing have prevented the newsreel makers from using colour except for special events, such as the Coronation. Magnetic recording of colour pictures from electronic cameras would enable them to give colour news speedily and cheaply. However, it may be two or three years before such a proposition can be tackled.

HIGH DEFINITION FILMS

MEANWHILE Norman Collins' High Definition Films electronic camera system has made much progress. The Highbury Studios are now fully fitted out with lighting equipment and all

the other accessories of normal film production, and commencing in February a regular output of films for American—and possibly British—commercial television will be maintained. At a recent trade luncheon Mr. Collins spoke of the progress of the system. With three TV cameras and a mixer, he said, it is possible to record on both 35 mm. and 16 mm. film, thus making simultaneously negatives suitable for retransmission on British or American television. He claimed that with the electronic cameras, 45 minutes of programme material could be recorded each day, which compares with the three minutes a day achieved by the normal means in a film studio. The High Definition Co. employs a fine team of ex-BBC TV engineers, including T. C. Macnamara, Kemp, Spooner—all specialists in one or other of the complicated techniques involved. Mr. Kemp's contribution to the development of teleciné recording cameras is well known and Mr. Spooner was a pioneer with "inlay," "overlay" and other trick processes now in regular use. These systems offer great possibilities for photographing real "exterior" scenes indoors by a travelling matte process. The actors, lit with yellow or incandescent light, play their parts 15ft. or 20ft. in front of a blue backcloth, which is illuminated with arcs. Colour separation by beam-splitting or other methods provides a subsidiary silhouette picture, which actuates an electronic changeover switch to a filmed background picture. To put it more plainly, the actors can be superimposed upon a filmed picture of any exterior scene, without resorting to back projection methods. Thus, they can stagger towards the cameras in the Highbury Studio stage, appropriately perspiring (perspiration supplied by make-up department), covered with desert dust (supplied by prop. department) and their efforts can be made composite with a background picture filmed on the real Sahara Desert (obtained from a film library). What tricks it is possible to achieve!

SUNDAY NIGHT GLOOM

UNTIL the advent of TV, Sunday night used to be radio night. Pleasant, popular, easy-to-listen-to music of the Palm Court Orchestra type from Grand Hotel and elsewhere filled the bill nicely. Nothing to offend any-

body and yet the fare was sufficiently light and pleasant to fortify the listeners for the cold douche of Monday morning. I don't know whether the Head of BBC Television has the same worthy objective, but if so his programme planners have been very wide of the target. *Wuthering Heights*, *Rope* and *Once in a Lifetime* were Sunday night plays which left many viewers in a state of acute pessimism, quite inappropriate for facing up to the rigours of Monday morning. I am not advocating the presentation of crazy comedy or revues on Sunday night, or the entire elimination of serious drama. *Wuthering Heights* is pretty grim and hardly suitable for a rewrite as *Wuthering Heights on Ice*. *Once in a Lifetime* was a satirical comedy of 20 years ago which failed to induce many laughs because it was not old enough to be a "period" piece and yet was too old to be anything

but "dated." Harry Green gave a tempestuous portrayal of Herman Glogaver, a Hollywood film magnate, which seemed to me to have more of the traditional broadness of farce rather than the straight and serious interpretation which seems so necessary for satire. Colin Gordon gave a sound performance as Laurence Vail, a frustrated playwright, and he alone of the players seemed to convey the true satirical atmosphere. The rest of the cast, which included some fine players such as Paul Carpenter, Michael Balfour, Margaret McCall and Elaine Dundy, did their best with lines which, in the course of time, seem to have lost a great deal of their humour. Perhaps in another 10 years, with 3-D and other innovations sweeping over the cinema, this comedy of the early days of "talkies" will once again carry the humorous appeal of its first presentation as a stage play over 20 years ago.

HERE AND THERE

The "Zoom" Lens

THE BBC is to fit the "zoom" lens to all outside broadcast cameras. The lens, which is manufactured by a British optical company, can focus on a man in a crowd from a mile distant. Its most successful use was in the Coronation broadcasts last June.

East Anglia Waits

ALTHOUGH Sir Ian Jacob, Director-General of the BBC, had forecasted that East Anglia would be "on the map," as far as TV coverage was concerned, within the next two years, it is now understood that this period is likely to be longer.

A BBC spokesman has said that there are seven other stations to be completed before work can begin on the transmitter for the Eastern counties. The proposed site for the station is near Tacolneston, nine miles south-west of Norwich, covering Norfolk and East Suffolk.

Sponsored in Italy?

IT is reported that Italy is planning a sponsored television service and that an American company is bidding for the rights.

At present a licence for the normal programmes from Milan and Rome costs the Italian £8 15s. a year.

Trouble over Church Relay

MINISTERS and elders of the Church of Scotland are angry over the televising recently of a Communion service from the parish church at Dunbarney, near Perth. The ministers are indignant because only the vicar of the church was approached for permission instead of the Church authorities. At a Perth Church meeting, the Rev. W. Drummond Hunter said: "A stunt is the very life-blood of the BBC. If the BBC had been present at Sinai with one of their recording vans, I have no doubt they would have pursued Moses into the Holy of Holies."

BBC Expenditure

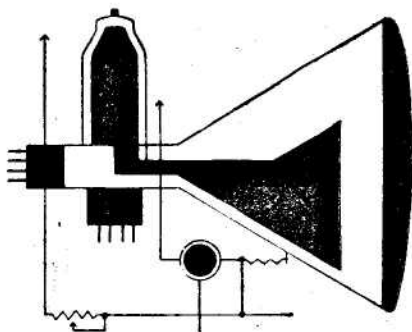
IN 1952-53, the BBC spent £4,334,474 on television of which £1,679,000 was covered by viewers' licence revenue and the rest by reserves and other sources.

If the BBC had to rely on the money received from licences alone, the present £2 licence would have to be increased to £3 10s.

Projection for Commons

THE Members' television room at the House of Commons has recently been equipped with a projection receiver.

A picture of 3ft. by 4ft. now affords comfortable viewing for 60 to 100 Members at a time.



**Smith's
for
current
"know how"**

From Smith's shops and book-stalls you can quickly obtain technical books on the latest developments in circuit design, new components, methods and new theories. Books not actually in stock can usually be supplied within a day or so.

Smith's Postal Service can send books to any address at Home or Overseas. Lists of the standard works on any subject gladly supplied upon request.

**W. H. Smith
& Son**

FOR TECHNICAL BOOKS

HEAD OFFICE: STRAND HOUSE, LONDON, W.C.2



**THE UNEX T.V. AERIAL
WITH THE DRIVEN ARRAY**

For simplicity in fitting, high electrical performance and long and trouble-free service, the UNEX has no equal.

Like the popular Dublex, the Unex is a driven array with excellent electrical and mechanical features.

Vitaly important points to note on the Unex are :-

- **EASY FITTING.**—Diametrically opposed elements screw into each other and automatically make contact with down-lead terminals.
- **SIMPLE DOWNLEAD CONNECTIONS.**—Excellent accessibility plus spring loaded braiding clamp ensure speedy and positive connections.
- **HIGH ELECTRICAL PERFORMANCE.**—Forward gain of 3dB Front/Back ratio of 25dB guarantee excellent electrical efficiency plus maximum interference rejection.
- **INEXPENSIVE.**—Prices are low despite the high quality materials used. 83S—complete with 6ft. alloy mast, single lashing bracket, etc. **£3.19.6.**

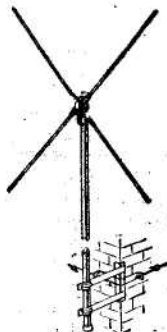
83T complete with 10' x 2" lightweight mast, double lashings, etc. **£6.15.0.**

83F complete with 14' x 2" lightweight mast, double lashings, etc. **£7.12.6.**

83C complete with cranked arm, single lashing bracket **£3.19.6.**

83X array only for own mast fitting ... **£2. 4.0.**

Above are for all vertical channels. Add 5/- extra for horizontal versions.



Aerialite LTD.

CASTLE WORKS STALYBRIDGE CHESHIRE



OFFER THESE

VALVES

Guaranteed New and Boxed

MT1. Primary 6-210-230-250 v. Secondary, 250-9-250 v. 80 ma., 6.3 v. 4 amps., 5 v. 2 amps. with taps at 4 v. on filament winding. Price, 17 6 each.

MT2. Primary 6-210-230-250 v. Secondary, 330-9-250 v. 80 ma., 6.3 v. 4 amps., 5 v. 2 amps. Both filament windings tapped 4 v. Price, 17 6 each.

Moulded Bakelite Case Condensers
 .001 mfd. 4 kv., 1- each
 .01 mfd. 4 kv., 1 1/2 each.
 25 mfd. 800 v., 1 3/4 each.
 1 mfd. 1,000 v., 1-.

Dial Bulbs M.E.S. Types
 6.3 v. .15 a., 61d. each.
 6.3 v. .3 a., 81d. each.

M.B.C.T. Types
 6 v. .3 a., 5d. each.
 6.3 v. .3 a., 5d. each.

20 amp rotary switch, 4 position, complete with knob, 4- each.
 Goodmans' 12in. heavy-duty loud-speaker, 15 ohm speech coil, £4 19 6. (A super job.)

Travox Model BX11 Lightweight type 12in. loudspeaker, 49 6 each.

| | | | | |
|------------------|-------|-------------|---------------|-------|
| 0Z1 | 6- 0- | 5Y3GT (U56) | 606 | - 0-6 |
| 1C5GT (DL35) | 8- 1- | 5Z4G | 616 | 7-3 |
| 1R5 (DK91) | 8- 1- | 6A7 | 6FGG (KT63) | 8- 1- |
| 184 (DL91) 7/9 | 7/9 | 6ASG (X59) | 6H6G | 7- 6- |
| 185 (DAP91) | 7/9 | 6AC7 | 6J5G (L63) 5- | 6- |
| 1T4 (DF91) 7/9 | 7/9 | 6AL5 (EB91) | 6J5M | 6- 6- |
| 2X2 | 5- 1- | 6AM6 (EF91) | 6J7G (KTZ63) | 6- 1- |
| 3Q5 (DL33) | 5- 1- | 6AT6 (DH7) | 6K7M | 6- 6- |
| 384 (DL92) 8/6 | 8/6 | 6AM5 (N77) | 6K7GT | 6- 6- |
| 3V4 (DL94) 8- 1- | 8- 1- | 6B8G | 6K8G | 8- 9- |
| 42 | 5- 1- | 6C5GT | 6J6 (ECC91) | 8- 8- |
| 504G (U52) | 8/6 | | 6L6G (KT95) | 8- 8- |
| | | | | 9- 9- |

| | | | |
|--------------|-------|--------------|--------|
| 6Q7G (DH63) | 9- 0- | 7H7 (EP22) | 9/6 |
| 6AK5 | 9- 1- | 787 (X148) | 8/6 |
| 6BK7 | 8/6 | 747 | 8/6 |
| 6B4T | 8- 1- | 7F4 (U149) | 8/6 |
| 68N7GT (B65) | X75 | X75 | 10- 0- |
| 6V6G | 7/6 | X80 | 8/6 |
| 6X6GT | 7/6 | X867 | 8/3 |
| 6X4GT | 7/6 | X12AT7 | 8/6 |
| 6X5GT | 7/6 | X12AX7 | 8/6 |
| 6B7GT | 6- 6- | 12K8 | 8- 1- |
| 6B7GT | 6- 6- | 12K7 (W76) | 9/6 |
| 6B8G | 8- 9- | 12K8GT (X76) | 9/6 |
| 6J6 (ECC91) | 8- 8- | 12SJ7 | 7/6 |
| 6L6G (KT95) | 8- 8- | 12SK7 | 8/6 |
| | 9- 9- | 12X7 | 9/6 |

| | |
|-------------|------|
| 12Q7 (DM76) | 9/6 |
| 25A6G | 9/6 |
| 25L6GT | 9/6 |
| 25Z4G (U31) | 9/6 |
| 25Z6GT | 8/6 |
| 35L6GT | 8/6 |
| 35Z4GT | 8/6 |
| 50L6GT | 8/6 |
| EB41 | 9/6 |
| (DH150) 11- | 11- |
| EAP12 | 9/6 |
| (W150) 11/6 | 11/6 |
| ECH42 | 9/6 |
| (X150) | 10/6 |
| 12Q7 | 8/6 |

Hand Microphone by "Reent," complete with screened lead and plug—Crystal insert, nickel chrome plated lead, listed at 2 gns. Our price, 21- each.

Set of Valves
 Ten VR91 (EF50) Valves, ex-brand new units, 6- each, 45- set.
 6K8G, 6K7G, 6Q7G, 25A6G, 6V6G, 37 6 set.

1R5, 185, 1T4, 184 or 3V4 or 384, 37 6 set.
 6K8G, 6K7G, 6Q7G, 25A6G, 55Z4G, 37 6 set.

12K8G, 12K7G, 12Q7G, 35Z4GT, 35L6GT, or 50L6GT, 37 6 set.

RECEIVER 1132A
 Complete with all valves, VR53, VR65 and VR57, etc., tuning meter and full-scale dial. In good condition.

TERMS — Cash with order or C.O.D. Postage to be added to orders as follows: 9d up to 10-; 1/- up to 20-; 1/6 up to 40-; 2/- up to £5. MAIL ORDER ONLY.

Send 6d. in stamps for illustrated catalogue.

ADDRESS Your Requirements to Alpha Radio Supply Co. (Dept. P.T.)

50- each. Carriage and packing, 7/6. **SPECIAL OFFER**

Co-axial Cable
 Best quality Grade "A" cable solid 1/222 70 ohms, 71d. yd.
 Best quality Grade "A" cable—stranded 7/0076, 81d. yd.

Soldering Irons
 964 Solon oval bit type, 19/- each.
 968 Solon pencil bit type, 21/- each.

Goldring Pickup Heads
 Pickup head Type No. 112 (2,000 ohms), complete with lead. Price, 20- each.

Dubilier Nitrogen Condenser, 8 mfd.—20%, 1,000 v. D.C., 13- each.

T.C.C. Visconal Cathodray Condenser, .001 mfd. 6 kv D.C., 3 8 each.

T.C.C. Visconal Cathodray Condenser, .001 mfd. 6 kv D.C., 3 8 each.

denser, .001 mfd. 12.5 kv D.C., 6 9 each.

Enamelled Copper Wire on 1lb. Reels
 14 S.W.G., 1 1/4 30 S.W.G., 2 1/2
 16 S.W.G., 1 1/4 32 S.W.G., 2 1/4
 18 S.W.G., 1 1/4 34 S.W.G., 2 1/4
 20 S.W.G., 1 1/4 36 S.W.G., 2 1/4
 22 S.W.G., 1 1/4 38 S.W.G., 2 1/4
 24 S.W.G., 1 1/4 40 S.W.G., 2 1/4
 26 S.W.G., 1 1/4 42 S.W.G., 2 1/4
 28 S.W.G., 2-

J.B. Drives, etc.
 SLS Spin Wheel Drive, 27/6
 Airplane Drive, 13-
 Full Vision Drive, 13-
 Square Plane Drive, 12 9.

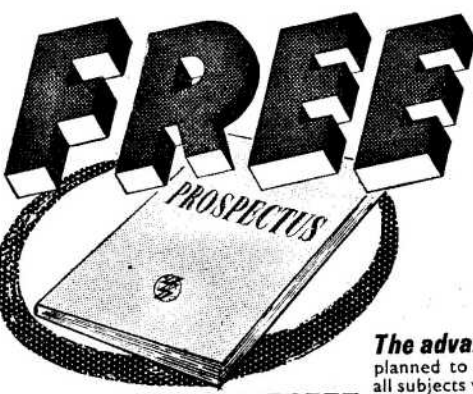
815 RV Drive, 20 6.
 Send for catalogue of drives, condensers etc.

100 mfd. 25 v., 1/6 each.
 Dubilier BR50, 8 mfd. 500 v., 2 8.
 TCC micro cap, 25 mfd. 25 v., 4 1/2 1/2, 1 9 each.

Dubilier BR505, 50 mfd 50 v., 2/- each.
 B.I. .02 mfd. 1,000 v., 7d. each.

ALPHA RADIO SUPPLY CO.

5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS 1.



POST THE COUPON TODAY FOR OUR BROCHURE ON THE LATEST METHODS OF HOME TRAINING FOR OVER 150 CAREERS & HOBBIES

PRIVATE AND INDIVIDUAL TUITION IN YOUR OWN HOME

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

The advantages of E.M.I. training. ★ The teaching methods are planned to meet modern industrial requirements. ★ We offer training in all subjects which provide lucrative jobs or interesting hobbies. ★ A tutor is personally allotted by name to ensure private and individual tuition. ★ Free advice covering all aspects of training is given to students before and after enrolling with us.

NEW LEARN THE PRACTICAL WAY.
 With many of our courses we supply actual equipment thus combining theory and practice in the correct educational sequence. Courses include: Radio, Television, Electronics, Draughtsmanship, Carpentry, Photography, and Commercial Art, etc.

Courses from £1 per month

POST THIS COUPON TODAY

Send without obligation your FREE book. E.M.I. INSTITUTES, Dept. 138K
 43 Grove Park Road, London, W.4.
 Phone: Chiswick 4417/8.

EMI INSTITUTES
 The only Postal College which is part of a world-wide Industrial Organisation.

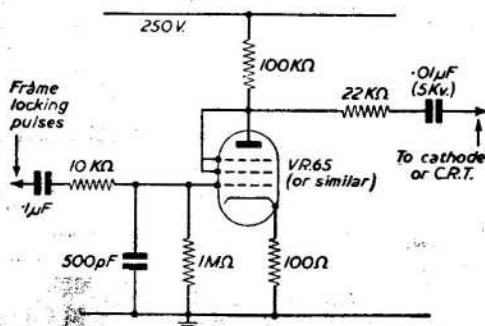
NAME _____
 ADDRESS _____
 SUBJECT(S) OF INTEREST _____

CORRESPONDENCE

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

FLYBACK SUPPRESSION

SIR,—I have read with interest the article in the December issue on "Flyback Line Suppression," and am prompted to send you details of a circuit I have been using for the past 18 months on my 6in. TV. I would point out that I modulate my tube on both the grid and cathode and therefore require a rather large pulse to suppress the flyback lines.



The circuit used by C. Robinson (Leicester).

From the circuit you will see that the driving voltage is obtained from the frame locking pulses (in my case from the highly successful two pentode stage sync separator) and applied to the grid of a VR65 (or any similar valve) which is strapped as a triode. The lengthened frame locking pulses are taken from the anode and are applied to the cathode of the tube through a $.01\mu\text{F}$ (5kV.) condenser. The current taken by this valve is about 2 mA. and will have no effect on picture quality or locking of the frame time base whilst making flyback lines a thing of the past.—C. ROBINSON (Leicester).

W.A. "VIEW MASTER"

SIR,—May I be permitted to thank you for the advice given in the current number of PRACTICAL TELEVISION to a correspondent from Glasgow in trouble with an alteration of a View Master to W.A. tube.

The correspondent is recommended to try re-aligning his coils and exchanging R21, the resistor which with C18 forms the C.R. value in the sync separator anode lead.

My View Master had been in trouble for a long while with flyback lines, which I could not remove by any artifice known to me; with frame rolling over and line lock of almost uncontrollable "touchiness."

A 6d. resistor substituted for the original 3.3 MΩ has cured the trouble after I had spent much time and money in substitution of most components save the right one, which I never suspected, and which did not reveal its weakness under resistance meter test, due presumably to lighter load conditions. Many thanks. It has been a long road.—A. E. COBILL (Bexleyheath).

"THREE-ELEMENT AERIAL"

SIR,—I should like to point out that the "Three-element Aerial" (PRACTICAL TELEVISION, June, 1953) has been built *partly* from material provided by a local engineer, and with *all* the properly dimensioned vertical elements obtainable from Gladstone Radio (formerly Rebus Electric Ltd.), and has been in constant use at this location for the last three months for receiving the Kirk o' Shotts transmissions, conservatively estimated to be 116 miles away.

The aerial is erected on a 25ft. pole, and the whole array can be taken down to ground level and re-erected in a very few minutes. The feeder is 80Ω twin cable and seems to give a very slightly better gain than 80Ω coaxial. Reception is very satisfactory except when transmissions are reduced to half-power and even then the signal isn't entirely lost. The receivers are the conventional R1355s and RF26 units for sound and vision, plus the 208A pre-amplifier, but noticeable improvement has been effected by the modification of the R1355 vision receiver to conform to the output circuit of Fig. 5(b) ("An Inexpensive Receiver," PRACTICAL TELEVISION, November, 1953).—THE REVEREND J. RODGER (Aberdeenshire).

"H" AERIALS

SIR,—The article by Mr. Harknett on the relative merits of "H" type aerials and multi-element types was read with considerable interest, by me at least. I could not agree more with his final comment.

However, I cannot agree with his figures or his reasoning.

When measured in free space a quarter-wave spaced dipole and reflector (H type array) has a gain of 3.0/4.3 db. and an impedance of 60 ohms. These figures may be slightly modified by minor adjustments of rod lengths.

Similarly, the gain of the average three-element array is 7 db. to 7.5 db. The impedance of this type is of the order of 15 ohms (excepting folded dipole types).

Thus, it will be observed that Mr. Harknett's figures were on the high side; however, the 3 db. difference is maintained.

Mr. Harknett is correct in assuming that there is a loss due to mismatch when using multi-element arrays, as experience has shown that the anticipated 3 db. extra gain is not always evident, if ever.

This is not because a three- or four-element array cannot be produced with, or matched to an impedance of 60 or 70 ohms. It is not at all difficult by means of a folded dipole to match to any impedance between 50 and a 100 ohms as required.

The mismatch occurs upon erection. The impedance figures refer to an array in free space. These figures are considerably reduced when the array is placed within one wavelength of earthed objects such as supporting metal mast, roofing and chimney stack, and lead flashing, etc. The relative phasing between elements is also affected.

This applies to any aerial array, but since multi-element arrays have more supporting structure, more elements, and the fact that the mast is commonly in close proximity to the driven element, the effect is more pronounced. Some manufacturers can and do take these effects into account when determining their matching arrangements.

However, as conditions differ considerably between

aerial sites there is unavoidably a serious mismatch in many instances.

I estimate that this results in a loss of one to two db. This gives the three-element array a possible extra gain of one db. over the conventional quarter-wave "H" type. Unless a receiver is working at maximum gain this is not noticeable.

Finally, although agreeing that a perfectly balanced system is to be preferred, there is nothing to be gained in using twin feeder if the receiver is designed to accommodate co-axial feeder.

The use of unscreened twin feeder may seriously increase the amount of interference. On the other hand, screened twin feeder is no cheaper than co-axial feeder and has increased losses.

I trust that the foregoing remarks do not detract from the main theme of Mr. Harknett's article, that is, the "H" aerial correctly installed is difficult to beat.

Summing up, I would say that up to 80 miles at least the "H" type aerial is satisfactory; if not, the receiver design is at fault, in which case a possible db. or two extra will not materially assist. I have proved this by experience and by experiment.—H. W. CRITCHLEY, A.M.Brit.I.R.E., C.G.I.Telecomm. (Scarborough).

SIR—On reading Mr. M. R. Harknett's recent notes concerning "H" and multi-element array aerials, one is rather inclined to the view that the arguments employed are specious. It is surely not difficult to secure good matching conditions to an aerial; alternatively, by employing a mast head amplifier as part of the aerial system, ideal matching conditions are readily secured. It is also to be noted that the ideal pure resistance of 70 ohms to which Mr. Harknett refers is rarely present in an aerial and in any event only over a relatively narrow frequency range. Mr. Harknett also mentions that the use of a twin feeder provides an almost perfectly balanced system, thereby providing cancellation of interference picked up on such a feeder. Unfortunately, this is only the case when the input circuit of the receiver is also perfectly balanced. This is a very difficult condition to achieve, and it is probably for this reason that very few receivers employ such input circuits. There is, however, a point concerning multi-element arrays which Mr. Harknett does not mention, and it is a rather important one because it provides an explanation for the disappointing results often provided by such arrays. The addition of elements to an aerial will improve the directivity characteristics of the assembly. There is thus secured an increased effective gain together with an increase in the front/back ratio. This change in the directivity characteristics tends also to occur in the vertical plane so that the vertical acceptance angle of the assembly becomes restricted.

This is an undesirable state of affairs, for the fringe viewer has to orient his aerial for optimum reception in two planes, the vertical one probably varying with reception conditions in any case. The optimum arrangement for the fringe viewer would appear to be an aerial having elements employed to reduce unwanted interference rather than to secure extra gain, and to arrange these elements so that the aerial is not excessively directional in the vertical plane above the horizontal. In addition, the inclusion of an amplifier as part of the aerial proper will effect a substantial improvement for three reasons. First,

it is easy to secure maximum transfer of signal to what becomes the first stage of the receiving system, secondly, the first stage of the receiving system picks up less direct interference due to its elevated position, and thirdly, the gain provided by the amplifier unit renders innocuous any interference picked up on the feeder.—S. WEST (Gt. Yarmouth).

SIR—Mr. Flude's criticisms of my article "H Versus the Multi-element Array" call for an explanation of the points which he did not appreciate.

First, while it is admitted that manufacturers would adjust their aerials for the best possible match, a multi-array (being undisputedly superior for narrow band requirements) is impossible to match correctly over the wide band required for television. This means that a compromise has to be sought which results in an impedance which is far from 70 ohms over the whole band.

Secondly, the impedance of a quarter-wave spaced "H" aerial is usually given as 60 ohms and in any case an impedance of 50 ohms is quite a reasonable match. Values of 10 and 20 ohms are quite common for multi-arrays.

Thirdly, for nearby objects to affect the twin feeder they must be close in relation to the spacing of the wires. A coaxial feeder is by no means perfectly screened, as it is only earthed at one point. At distances of odd quarter wavelengths from this point, the impedance to earth can be very high, and unless special precautions, such as cutting the cable to an exact length, are taken, serious interference pick-up can result.

Fourthly, a multi-array, being inherently very critical in adjustment, is much more easily upset by the metal pole. Also, the pole is usually placed at the centre of gravity of the array for mechanical reasons and thus comes very near to the element being fed in the case of the multi-array.

Fifthly, when the minimum detectable signal level is determined, as it is in fringe areas, by a general background of external noise, i.e., galactic and man-made noise, and not by valve noise as was once supposed, then the number of noise sources in range of both polar diagrams will be the same to a first approximation since the areas covered will be the same. Even in the case where a nearby point source of interference is giving trouble, the "H" is still favoured for eliminating this, as it has a definite null in its polar diagram opposite to the direction of propagation, whereas in the case of the multi-array there are parasitic lobes extending backwards which will easily pick up interference.

Finally, I would like to say that I do not consider Northampton with its 500 micro-volt per metre signal from Sutton Coldfield to be a fringe area, and therefore do not feel that Mr. Flude is writing from practical experience. In the area where I have been conducting experiments, the signal strength is less than 50 micro-volts per metre.—M. R. HARKNETT (Hants).

FREE BLUEPRINT NEXT MONTH!

Every copy of next month's issue will contain a full-size blueprint of our "Simplex" TV receiver which employs the popular VCR97. ORDER NOW!

TELEVISION SPECIALS

WIDE ANGLE FOCUS MAGNETS. Suitable for all types and makes of C.R. tubes with 38 mm. neck. Fitted with vernier and picture shift control. By Goodmans. 25/-.

WIDE ANGLE SCANNING COILS. With aluminium shield. Low impedance line and frame. 19/6.

P.M. FOCUS MAGNETS. For tubes with 35 mm. neck. With vernier adjuster. Tetrode, 15/-; Triode, 17/6. Less vernier adjuster. All types. 12/6.

MULTI RATIO FRAME OUTPUT TRANSFORMER. By Parmeko. 10/6.

FRAME BLOCKING OSCILLATOR TRANSFORMERS. For standard circuits, 10/-; For wide angle circuits, 10/6. Auto type, 4/6.

Line B/O. trans. Auto, 4/6.

LINE FLYBACK E.H.T. TRANSFORMER. Output 7-9 Kv. E.H.T. with heater winding for EY91, 19/6.

SPECIAL BRAND NEW T.C.C. TV CONDENSERS. 324-100 mfd. 450 v.w. Type CEIPE. Price 7/6. .04 mfd. 12.5 kv. Type CP59VO. Price 7/6.

SCANNING COILS. Low impedance line and frame. No. 1, 7/6. No. 2, 12/6.

ELAC DUOMAG FOCALISERS. Low, medium and high flux types. 9/78 each.

1-lb. REELS RESIN CORED SOLDER. 12/6.

LASKY'S TELEVISION CONSTRUCTOR'S PARCELS

No. 1. Igeronic components. 1 each E.H.T. flyback line transformer 7-10 kv. with ferrite core and rectifier heater winding; scanning coils; frame o.p. trans.; Elac focus unit with vernier adjuster; U37 E.H.T. rec.; 12 inch cathode ray tube and ion trap; mask and glass.

PRICE £15 19/6. Carriage 15/- extra.

No. 2. The parcel as above, but less C.R. tube and ion trap.

PRICE 79/6. Carriage 3/6 extra.

No. 3. Condenser parcel. 1 Each: 0.04 mfd. 12.5 Kv.; 22+32 mfd. 350 v.w.; 32+100 mfd. 450 v.w. and 24 of 1,000 pf. ceramic tubes; 6 1 mfd. 500 v.w.; 6 .01 mfd. 500 v.w. ALSO 12 assorted "pf" condensers. PRICE 45/- POST FREE.

No. 4. Chassis and metalwork. Unassembled. Comprises main chassis, tube supports for 12in. C.R.T.; and valveholders. In steel (less sound-vision chassis).

PRICE 25/- Carriage 3/6.

No. 5. Resistances. 4 Watt. 85 of your choice.

PRICE 18/- POST FREE.

No. 6. 1 Each of the following: Ion trap IT6; Duodecal tube holder, low imp. line and frame scan coils.

PRICE 15/- Post 1/6 extra.

No. 7. 1 Each: TV Mains auto transformer: 60+100 mfd. 350 v.w. condenser; 5H. 250 ma a choke. 14A100 rectifier.

PRICE 60/- Post 2/6 extra.

SPECIAL C.R.T. OFFER. Brand new and unused 12in. ion trap television cathode ray tubes, 6.3 volt heater, 7-9 kv. E.H.T. 35 mm. neck. Black and white picture. By famous manufacturer. Tetrode type. £12 19/6. Carriage and insurance 15/- per tube extra. Ion Trap Magnets, 3/- each. Duodecal, bases 1/6.

LASKY'S RADIO,

LASKY'S (HARROW ROAD), LTD.,

370, HARROW ROAD, PADDINGTON, LONDON, W.9

Telephones: CUNningham 1979-7214.

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m.; Thurs., half day, 1 p.m. Postage and packing charges (unless otherwise stated): on orders value £1-1s. 0d. extra; £5-9s. 0d. extra; £10-3s. 6d. extra; over £10 carriage free. All goods fully insured in transit.

LASKY'S RADIO

CRYSTAL DIODES. Glass type with wire ends. 1/6.

DE LUXE TV CABINETS. Our new 1954 Mark 11 model.

For 12in. C.R. tubes. Finished in beautiful figured walnut veneer, with either light, medium or dark polish. Supplied complete with mask, glass, back, speaker baffle and fret castors and C.R.T. neck protector. Inside dimensions: 16in. deep, 17in. wide, 28in. high. Overall height 32in. and width 19in.

LASKY'S PRICE, £9.10.0. Carriage 12/6 extra.

This cabinet can be supplied with aperture for 16in. or 17in. C.R.T. at no extra charge, but the mask and glass will be omitted.

TRIPLEX DARK SCREEN FILTERS. 14 x 12 x 3.16 ins., 7/6. 15 x 13 x 3.16 ins., 9/6.

Postage and packing 5/- per piece extra. (This charge is necessary owing to extra packing required).

Ion Trap Magnets. For all tubes. LASKY'S PRICE 3/- EACH. State tube type number when ordering.

SENERCELL S.T.C. Selenium TV. rectifiers.

K340, 3.2 kv., 7/6.
K345, 3.6 kv., 8/2.

K350, 4.0 kv., 8/8.
K3109, 8.0 kv., 14/8.

K3160, 12.8 kv., 21/6.

NEW!

EXPERIMENTAL OUTFITS

LEARN THE PRACTICAL WAY

Specially prepared sets of radio parts (which you receive upon enrolment) with which we teach you, in your own home, the working of fundamental electronic circuits and bring you easily to the point when you can construct and service radio sets. Whether you are a student for an examination; starting a new hobby; intent upon a career in industry; or running your own business — these Practical Courses are intended for YOU — and may be yours at very moderate cost.

EASY TERMS FROM £1 A MONTH

A tutor is available to give individual help and guidance throughout the Course.

POST THIS COUPON TODAY

Please send me your FREE book on Practical Courses:

I am interested in.....

To: E.M.I. INSTITUTES, Dept. 138X, 43 Grove Park Road, Chiswick, London, W.4.

NAME.....

ADDRESS.....

EXPERIMENTAL OUTFITS:

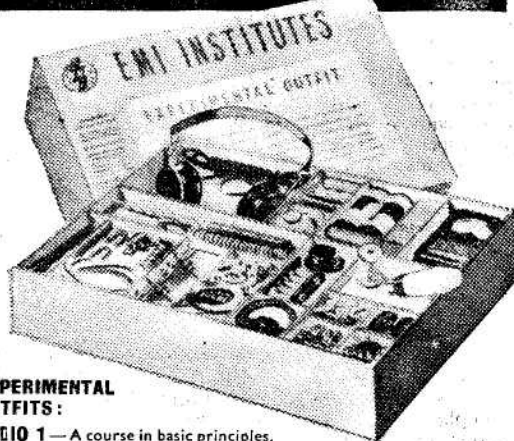
RADIO 1 — A course in basic principles.

RADIO 2 — Instruction and equipment from which you build a Radio Receiver.

TELEVISION — Instruction and equipment for building a Television Receiver.

Also for Mechanics, Electricity, Chemistry, Photography, Carpentry, Draughtsmanship, Commercial Art, Amateur S.W. Radio, Languages.

E.M.I. INSTITUTES The only Postal College which is part of a world-wide Industrial organisation.



U.E.I. CORPN.

THE RADIO CORNER, 138, GRAY'S INN ROAD,
LONDON, W.C.1. (Phone TERminus 7937.)

PYE 45 MCS. STRIP. Ready made for the London vision channel, and easily modified for other stations as per details published in "Practical Television." Complete with 6 valves EF50 and 1 EA50. BRAND NEW. ONLY 70/- (postage, etc., 2/6).

R 1355 RECEIVER, as specified for "Inexpensive Television," a copy of which is supplied. Complete with 8 valves SP61, and 1 each 5U4C and VU130 or VU111. Used, excellent condition. ONLY 29/6 (carriage, etc., 5/6).

RF UNITS FOR USE WITH THE ABOVE.—Type 24, complete with valves and details of mods. for all TV Channels. ONLY 25/-. TYPE 28, for Suttons field, Holme Moss and K.O.S., complete with valves and BRAND NEW IN MAKERS CARTONS. ONLY 59/6d. TYPE 27, for Wenvoe, complete with valves and BRAND NEW IN MAKERS CARTONS. ONLY 59/6. Postage, etc., 2/6 per unit, please.

INDICATOR UNIT TYPE 62A. A two deck chassis job, this contains VCR97 Tube with mu-metal screen, 12 valves EF50, 4 of SP61, 3 of EA50, and 2 of EB31. IN NEW CONDITION IN MAKERS TRANSIT CASES. ONLY 99/6 (carriage, etc., 10/6).

AMPLIFIER 29S.—Ideal for conversion into a high gain TV. pre-amp. Complete with 2 valves EF50. ONLY 15/- (postage, etc., 1/6).

VALVES

| | | | | | |
|------|------|----------|------|----------|------|
| 1G5 | 6/6 | 6SS7 | 7/6 | 1T4 | 8/- |
| 1C6 | 6/6 | 7A7 | 8/6 | 1R5 | 8/- |
| 1E7 | 6/6 | 7C5 | 8/6 | 5Z4 | 10/- |
| 1LH4 | 8/- | 7F7 | 8/6 | 5U4 | 10/- |
| 1LN5 | 8/- | 7W7 | 8/6 | 6AC7 | 6/6 |
| 1L4 | 7/6 | 12H6 | 8/6 | 6K7GT | 6/6 |
| 2B7 | 8/6 | 12J5 | 6/- | 9Y7 | 7/6 |
| 3A4 | 9/- | 12AH7 | 12/6 | ECH35 | 12/6 |
| 3B7 | 8/6 | 12SK7 | 7/6 | EA50 | 3/6 |
| 6AG5 | 7/6 | 12SK7 | 8/6 | ECB33 | 3/6 |
| 6AK7 | 9/6 | 12SR7 | 7/6 | EB34 | 3/6 |
| 6B4 | 7/6 | 28D7 | 7/6 | EF36 | 6/6 |
| 6B8 | 7/6 | 32 | 7/6 | EF39 | 6/6 |
| 6C8 | 8/- | 36 | 7/6 | EF50 | 6/6 |
| 6C6 | 6/6 | 50Y6 | 8/6 | Red | |
| 6H6 | 5/- | 58 | 8/6 | Sylvania | 8/6 |
| 6K6 | 9/- | 1622 | 11/- | EF55 | 12/6 |
| 6L7 | 7/6 | 1625 | 7/6 | EK32 | 6/6 |
| 8N7 | 7/6 | 1926 | 4/- | EL32 | 7/6 |
| 8R6 | 8/6 | 1299A | 7/6 | SP61 | 4/- |
| 6U5 | 8/6 | VR159 20 | 8/6 | MU14 | 10/6 |
| 6V6 | 10/6 | VR137 | 5/9 | RL47 | 6/- |
| 6SA7 | 8/6 | KT44 | 8/6 | V879 | 7/6 |
| 6SC7 | 7/6 | KT2 | 5/- | 934 | 6/- |
| 6SH7 | 7/6 | VP23 | 6/6 | 955 | 6/- |
| 6SJ7 | 8/6 | HL23DD | 6/6 | 9003 | 6/- |
| 6SK7 | 7/6 | TP25 | 8/- | 9004 | 6/- |
| 6SL7 | 9/- | 1S5 | 8/- | 831A | 50/- |

RECEIVER R 3118.—A further supply of the very popular unit we sold out of a few months ago. Ideal for conversion to TV, having a built-in A.C. Mains Power Pack for 180-240 volts, is tremendously powerful, employing 7 I.F. stages of 12 mc/s with 4 mc s band-width, and has 16 valves: 6 of VR65, 4 of VR92, 2 of VR136, and 1 each VR137, P61, 5Z4 and Y63 "Magic Eye." In new condition, ONLY 97/6 (carriage, etc., 7/6).

TRANSFORMERS.—Manufactured to our specifications and fully guaranteed Normal Primaries. 425-0-425 v. 200 ma. 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a. ONLY 50/- 350 v.-0-350 v. 150 ma., 6.3 v. 5 a., 6.3 v. 3 a., 5 v. 3 a., ONLY 42/6; 250 v.-0-250 v. 100 ma., 6.3 v. 6 a., 5 v. 3 a., ONLY 32/6; 350 v.-0-350 v., 150 ma., 6.3 v. 5 a., 5 v. 3 a. ONLY 32/6. The above are fully shrouded, upright mounting, 6.5 kv. E.H.T. with 2 windings of 2 v. 1 a. ONLY 72/6; 7 kv. E.H.T. with 4 v. 1 a. ONLY 82/6. PLEASE ADD 2/- POSTAGE FOR EACH TRANSFORMER.

E.H.T. TRANSFORMER FOR VCR97 TUBE.—2,500 v. 5 ma., 2-0-2 v. 1.1 a. 2-0-2 v. 2 a. (post 1/6), 37/6.

VCR97 TUBE, carriage paid, 42/6. ■

PM SPEAKERS.—6in. Rola with transformer, 17/8; 10in. ELECTRONA with transformer, 27/6; 12in. GOODMANS, 15 ohm speech coil, less transformer, 99/6. All speakers BRAND NEW AND UNUSED. Postage 2/- each, please.

Open until 1 p.m. Saturdays, we are 2 mins. from High Holborn (Chancery Lane Station), 5 mins. by bus from King's Cross.

Cash with order, please, and print name and address clearly. Include postage as specified and on Component Orders under £2.

HANNEY of BATH offers:—

P.T. SUPER VISOR

TCC Condenser kit, £8 6/4; Erie resistor kit, 5/4; 4 w/w pots., 26/-; 7 Erie carbon pots., 35/-; Alien coils, 44/6; Alien DC300C, 39/6; GL15 and GL18, 7/6 each; SC312, 21/-; FC302, 21/-; OP117 output trans., 9/-; Denco WA FMA1, 21/-; WA LOT1, 4/2; Denco chassis kit, 51/6; Westinghouse WK.5, 3/10; WGA4, 7/6; LW7, 26/8; Emelish Electric polystyrene mask, 42/-; persplex filter, 19/6; anti-corona ring, 10/10; Tube sheath, 6/2; T.901 tube, inc. carriage and insurance, £22 14/10; Elac IT 8 ion trap, 5/-.

THE SOUNDMASTER

| | |
|---|----------|
| Constructor's Envelope | 6/6 |
| W.B. Components, complete | £11 13/2 |
| 3 Collaro Motors | £5 15/0 |
| Lab. Resistor-pot. Kit | £2 7/6 |
| T.C.C. Condenser kit... | £4 3/0 |
| Wearite Kit | £7 0/0 |
| Bulgin Kit | £3 10/0 |
| N.S.P. Switch Kit | £1 15/6 |
| Brenell Tape Desk, unassembled | £13 13/0 |
| W.B. Cabinet | £6 0/0 |
| 6 Mullard Valves | £5 18/2 |
| Lustraphone Type C.51Z high fidelity microphone | £5 15/0 |
| Base, extra | 10/6 |

TELEKING. Constructor's Envelope, 6/-; Coils, 44/6; Chassis kit, 50/-; T.C.C. kit, £7 4/3; RM4 rectifier, 21/-; Alien Components, LO308, 40/-; PO305, 21/-; DC300, 39/6; FC302, 21/-; GL15 and GL18, 7/6 each; BT311, 15/-; SC312, 21/-; AT310, 30/-; OP117, 9/-; Duffier Resistor/pot. kit, 31/6.

MAGNAVUEV. Denco coils, 41/3; Erie resistor kit, 59/2; Denco W.A. components, WA DCA1, 43/-; WA FCA1, 31/-; WA LCI and WC1, 7/6 each; WA FMA1, 21/-; WA LOT1, 42/-; WA FET, 16/-; Valveholders, pot. and T.C.C. condensers as per our TV list.

Send 6d. in stamps for our GENERAL LIST which contains details of components for Viewmaster, Teleking, Magnaview, Super Visor, Lynx, Coronet Tour, Williamson Amplifier, Soundmaster, etc., etc. Please add postage to orders under £2.

L. F. HANNEY

77, LOWER BRISTOL ROAD, BATH. Tel. 3811



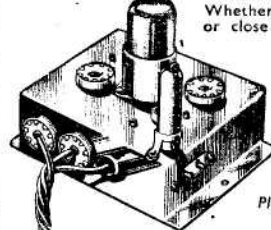
QUALITY TELEVISION COMPONENTS
SCANNING COILS
6/10 kv. R.F., E.H.T. UNITS
E.H.T. and OUTPUT TRANSFORMERS
LINE FLY-BACK E.H.T. UNITS

Write for illustrated list (Publication 75)

HAYNES RADIO Ltd., Queensway, Enfield, Middlesex.

IMPROVE YOUR TELEVISION BY FITTING THE

"VIEWMASTER" Frc-Amplifier



Whether you are in a fringe area or close to transmitter the Viewmaster pre-amplifier will enable you to improve the strength and definition of your picture. Full constructional details and component price list 1/3, post paid. Complete kit of parts including valve sent by return, 35/- post paid.

Please state channel required.

HOME RADIO

137, London Road, Mitcham, Surrey. MIT: 3282

"The QUALITY Component Specialists."

YOUR Problems SOLVED

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** The coupon from p. 431 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

OVERDRIVEN VALVE

I have bought a second-hand Murphy V114 television set, but it has developed a fault in the line time base. The second grid in the Pen46 valve glows red when the set is turned on and stops the horizontal scanning lines from filling the tube face, also the two resistors get very hot which are connected to the base of the Pen46. I had the valve tested but have found it perfect. I have checked the circuit but can find nothing wrong. Could you please help me?—W. M. Broadey (Basildon).

Insufficient saw-tooth drive to the line output valve may be responsible for the over-run grid, and in this connection you should investigate the frame generator and associated coupling circuits. Try replacing the relevant T41 valve, and ascertain that the coupling capacitor possesses adequate insulation. If the smaller components appear to be up to standard, however, you should suspect the line output transformer for short-circuited turns.

FRAME FOLDOVER

I have had my "Argus" television working for some time and get an excellent picture, but with one exception; this is right across the top of the picture I get a bright band, which is approximately $\frac{1}{2}$ in. to $\frac{3}{4}$ in. wide or deep. The artists, etc., get their heads into this, and completely spoils the picture. Some scenes are worse than others. I will be very pleased if you will tell me cause and give me the cure.—G. A. Peers (Newton).

Your trouble is due to foldover at the top and the simplest cure is to reduce C44—a value of 0.002 μ F is suggested.

VISION ON SOUND

I am troubled with bad hum that comes in on picture signal. No trace of hum at all when speech only is being transmitted, i.e., between items, or when picture is finished at night and news is being read out. Picture is quite good. Set is now just two years old and has always had a certain amount of same trouble. Extra mains smoothing makes no difference at all. At times, volume of hum is not too bad, but at other times volume has to be kept at a whisper to be bearable. Set has been tried on different aerials, several miles apart. I would be pleased if you could help. Set is a G.E.C. model 5145—A. W. Branson (Cosby).

This trouble is caused by the vision signal breaking into the sound section of the receiver. It can be cured by carefully adjusting—with an insulated trimmer tool—the two air-spaced trimmers positioned on the

top of the sub-chassis for minimum vision break-through. In extreme cases it is also necessary to adjust the first core in horizontal line with the chassis connecting socket for maximum sound.

"VIEW MASTER"—PICTURE SIZE

I am still having trouble with my picture size on my "View Master" 12in. screen. I have increased the E.H.T. to 9.3kv. with good results and I wonder if a further reduction of value of R60 would improve things.

Another spot of bother I have is picture slip after one hour of viewing; a slight adjustment of R59 and it is all right until the next time.—W. Coleman (Birtley).

There is no reason why the value of R60 should not be reduced further to increase picture height, or alternatively R56 could be reduced slightly.

Regarding picture slip, this may be due to R21 being too high in value or to the vision receiver alignment being incorrect, particularly those coils in the V3, V4 circuits.

FOLDOVER

I have a Marconiphone VT73DA on which the first inch of picture (left-hand side viewing tube face) seems to fold over on itself. Whereas this portion is a little brighter than the rest of the screen, it is not too noticeable until sideways movement takes place on the picture, then this position becomes a revolving mass, but the rest of the picture stays O.K. Also to lock the picture the line hold has to be at its limit, and even this sometimes fails to hold, consequently too much gain has to be turned up to make it lock, thus giving a very contrasting picture.—W. Schaefer (Cannock).

Sometimes low H.T. line voltage causes a form of foldover to the left-hand side of a picture on your receiver. This is probably the case if it is necessary to use a maximum setting on the picture width control in order to obtain a full horizontal scan. On the other hand, the U35 reclaim diode may be low in emission to cause the symptom. Also check, by substitution if possible, the B36 (line/frame generator valve), and the KT36 line output valve.

A faulty B36 valve may also be provoking the line hold control defect. Another cause in this respect is the 0.33 megohm resistor connected to the slider of the horizontal hold control going high in value.

MAINS SECTION BREAKDOWN

I should value your opinion on the following:

I have a Kolster Brandes television set, console model EV40B, purchased in 1950. This set broke down at the end of a show: the picture faded out normally, along with the sound, then the set went dead. On looking in at the back of the set, smoke and sparks were seen; the set was immediately switched off. On examination it was found that both fuses on the set had blown, the reservoir and smoothing capacitors had failed, a resistance of 470 ohms connected at anode of line output valve had dropped to a few ohms. Line valve was tested and was found to have dropped in emission.

A new valve resistance and fuses and capacitors were inserted, set switched on, result being no sound or picture. A test for H.T. voltage was made at either side of smoothing choke, but no H.T. was registered; the choke was tested and found O.K. Valve and tube heaters light up, which makes me think that the auto-transformer is O.K. Rectification is by metal rectifiers of which six are used, centre-cell type RM3.

I am wondering if these rectifiers have failed. If so, is there any method I can try to test same as they are easily removed from set? — A. R. Baker (Sheffield).

The 10 ohm wire-wound resistor connected from the mains transformer to the A.C. input side of the rectifier bank may have gone open circuit due to the short circuit across the electrolytic capacitors. Try to obtain the use of an A.C. voltmeter to measure the mains input to the rectifier bank. If this is normal and still no D.C. exists across the reservoir capacitor you should suspect the rectifiers. There is no simple test for these, and in any case it is not advisable to replace just one RM3. The complete bank should be discarded and a single RM4 should be used in place.

AERIAL SELECTION

My television aerial is a horizontal "X" mounted on a 10ft. pole. I live about 8 miles from Pontop Pike station and about 80 yds. off the road. I get a lot of white spots on my Bush screen when motor-cars and motor-cycles are passing. Will a wide-spaced "H" aerial with balanced twin-feeder clear the white spots? — Wm. Scott (Ryton-on-Tyne).

We cannot advise you on the best type of aerial to use in your location, for experience of the local reception conditions is the only guide in this respect. We would point out, however, that buildings can successfully be used as screens against ignition interference, but the best position for the aerial must be found by trial and error, and it is frequently one in which the aerial placing is most unorthodox. The use of screened balance feeder is generally considered desirable in high interference zones.

SOUND ON VISION

I have a Regentone "Big 12" television (Holme Moss), two years old, and recently a fault developed which I think may be sound signals breaking into vision. The picture shakes according to the volume of sound, and very loud signals momentarily break up the picture. I have cut the dipole aerial rods to tune in to vision wavelength and this seemed to improve but not cure it. I would be grateful if you could tell me what I can do to cure the trouble. Also, if you can (as I have only had experience with sound radio, and have no wiring diagram) give me instructions to identify the faulty parts.—C. E. Pickvance (Bolton).

Sound on vision is almost certainly the cause of this trouble. The cure is generally quite simple, and adjustment to the local oscillator trimmer for maximum sound output consistent with minimum sound on vision is all that is necessary. The oscillator tuning adjustment takes the form of a threaded brass rod protruding through the R.F. chassis. Looking at the chassis from the rear of the cabinet a 6F1 valve will be observed positioned at the far end of the chassis, in line with the contrast control. The oscillator adjustment is directly behind this valve.

VARYING BRILLIANCE

I have a G.E.C. TV set, model BT4542 (identical in circuit to table model BT5145), which gave good service for nearly two years. Recently a fault has developed which I would like to remedy. At intervals of about half an hour and sometimes much longer the brightness of the screen rapidly increases to an extremely high level and then suddenly drops again to

the original value or even less and then performs normally for another long interval. Can you help me to find the cause? Another trouble with the appearance of the picture is a cramping at the bottom of the picture which cannot be satisfactorily corrected by the linearity control.—G. W. Gordon-Smith (Teddington).

This trouble may be caused by an intermittent heater-to-cathode short in the vision interference limiter diode, or in the picture tube itself. The D77 diode concerned is positioned on the main chassis to the left-hand side of the focusing unit when viewing chassis from the rear of the cabinet. The picture cramping vertically is often provoked by one (or sometimes both) of the frame timebase valves altering in characteristics. The valves in this section are the L63 (frame generator), positioned on the main chassis to the left of the deflector coils, and the N37 (frame output), positioned in the far left-hand corner of the main chassis, adjacent to the frame blocking oscillator transformer.

"ARGUS" VOLTAGES

I have just completed building an "Argus" as per your blueprint and instructions.

I am having difficulty in getting my sound and vision units to function. I get a good-sized and properly-proportioned raster, so I think my tube and time-base units are O.K. When I connect up my vision unit it does not seem to have any effect on the raster at all. It does not seem to make any difference if the aerial is connected or not. I have tested this on a friend's aerial as well; in fact, I have had a neighbour's set working on my aerial, so I think my aerial is O.K.

I have a cheap voltmeter with an 0-240 v. and 0-12 v. scale. I have taken readings on the vision strip as follows:

V1 and V2 anodes 80 volts L.T. 6 volts.

V3 and V4 anodes 120 volts on all valves.

I have checked my meter against a high-class meter at my works and I think it is reading about 5 per cent. low.

I am very much an amateur and have not attempted anything like this before, but I have been reading up your journal and judging by some of the readings for some of your other designs these figures seem low to me. I checked my H.T. connections for sound and vision in power pack and I get a full reading there and I am thinking some components are at fault.—C. R. Young (Worthing).

You are losing a lot of voltage somewhere and this must be checked. Typical voltage readings were published in PRACTICAL TELEVISION, April, 1953, issue. V1 screen and anode should be 180 v., V2 anode and screen 170 v., V3 200 v., V4 210 v. and V5 200 v. anode, 240 v. screen.

The most likely source of loss will be leaky condensers and these should be checked, by connecting the condenser in series with H.T. and a voltmeter, the other side of voltmeter to earth; no reading beyond an initial kick should be obtained.

When the voltage readings are nearer the figures mentioned above, tune in the vision signal as given in the data and peak each coil; a turn can be added or subtracted from any coil which does not peak, to overcome stray wiring capacitances.

"DIRECT T.V. REPLACEMENTS" enables you to purchase all your components, valves and T.V. books from one supplier. Largest stock of manufacturers' and home constructors' components. Spares Manual and Supplement, 9d. 134-136, Lewisham Way, New Cross, S.E.14. (TIDeway 2330 and 3696.)

50 SECONDHAND Televisions always for sale; famous makes. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR. 5497.)

BOOKLETS: "How to use ex-Gov. Lenses and Prisms." Nos. 1 and 2, price 2/6. Ex-Gov. Optical lists free for s.a.e. H. ENGLISH, Rayleigh Road, Hutton, Brentwood, Essex.

"RADIO UNLIMITED" OFFER: "Viewmaster" Valves, set of 12 as listed, £6/2/6; EL38, 17/6; PY80, PY62, ECL80, EP80, 11/- each; 6AL6, 6J5M, 6C5GT, 6D6, 7D9, EP92, 3A4, 1L4, 6K6, 6/6 each; 1T4, 1S4, 1R5, 1S5, 6F6, 6J7, 6N7, 6SK7, 7S7, 7Y4, 7B7, 7C5, 7H7, 12AG, EP39, EBC33, EL32, 6X5, 12SL7, 12SG7, 7/9 each; 3S4, 3V4, 6Q7, 6V6, 12K7, 12K8, 12Q7, 35L6, 50L6, 25L8, 35Z4, 25Z4, 25Z6, 6AT6, 6X4, 12AT7, 6BE6, 6BA6, 6BW6, U4, U50, 5Z4, 5U4, 6SN7, 12SL7, 6K8, 8/9 each; free list. **RADIO UNLIMITED**, Elm Road, London, E.17. (KEY. 4813.)

WINWOOD FOR VALUE. "Viewmaster" Coils, complete set, incl. choke, 17/6; please state area; Co-axial Cable, std. lin., 80 ohm, 8/6 doz. yds.; CRT isolation Trans., 2v. 4v. or 6v type, 6/9 each; Fil. Trans., 230v, 6v at 1.5 amp, 5/6. For the last time: Receiver R109, complete with 8 valves and power supply, £5/5/-; **WINWOOD**, 12, Carnarvon Road, London, E.10. (Mail only.)

RESPONDER 4790: Valves, VR136, 2/EA50 VR137, 6 VR65 for band 3 (160/220 mcs.), or any band 1 T.V. by inclusion of 3 trimmers, less power pack, 35/- (carr. 5/-); Min. Var. Condensers, spindled, 15, 25, 50 75pfs., each 1/6; EHT Filter Units, with chokes and 15kVw. 750 and 500pfs. ceramic coils, 5/-; D.C. Filter, with 4 dust chokes and 4 cond. on small panel, 2/6; S.W. Filters with 7 coils in small box, 3/6; L.U.51 8-way Turret Coil Assy., 5/6; 12v Relay Actuating Toothed Wheel, 2/6; R.F. Units, type 2A, 15/-; 25, 17/6; 27, 35/-; 1 valve QPP Amplifier (bat.), 6/6; Amp. with 1/EP36, relay, small trans., 5/6; Control Unit, wood case, sloping metal panel, chassis with 4 jacks, pots, trans., etc. 7/6; postage extra; immediate delivery; s.a.e. lists and enquiries W.A. BENSON, 308, Rathbone Rd., Liverpool, 13.

6IN. TELEVISION, Holme Moss, £6; Moving Coil Microphone in stand, 15/-; 50 assorted Valves, 50/-; 68, Broomhead Rd., Wombwell, Yorks.

"VIEWMASTER," Sutton Coldfield, in cabinet, 12in. tube; requires attention; accept £30. **BROMLEY**, Sandford Ave., Church Stretton.

PREMIER T.V. constructed units for timebase, vision tuner, power pack, 12in. aluminised flat tube; all unused; offers? Box No. 162, c/o PRACTICAL TELEVISION.

TELERADIOGRAM, new 9in. tube, 6-band radio, Williamson amplr., 12in. t/c Goodman spkr. cabinet, £45. 57, 5th Ave., Chelmsford, Essex.

ARGUS, excellent picture; built on 62A Ind. chassis; no cabinet; offers. 62, Hydefield Avenue, Egham.

RATES

4/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2.

AERIAL ASSEMBLIES (not kits), alum. alloy, 3-element folded dipole Aerial, basically to design of Mr. Gordon A. Symonds in June issue (with 75ft. co-axial), £4/5/-; "H" Aerial, mast mounting, with 60ft. co-axial, £2/10/-; Single Dipole Aerial, 9in. stand-off with fixing bracket for wall or wood, £1/10/-; Co-axial Cable, 9d. yd. extra; Alloy Mounting Bracket for 2in. pole, 8/-; 10ft. Alloy Pole, 2in. dia., £1/17/6; 20ft. Alloy Pole, 2in. dia., £3/15/-; "Single" Chimney Lashing and 15ft. wire cone bracket with 2 pole fixings, £1/5/-; "Double" Chimney Lashing and 30ft. wire (2 brackets, separate), £1/18/-; all carr. paid. New R.F. Assembly by famous manufacturer; over 30 Condensers and Resistors; 3 Coils; 3 Ceramic B7G Holders, 5/- (1/- p. and p.). **GLADSTONE RADIO**, Gladstone Place, Newton Abbot, Devon.

T.V. TUBES, £1 9in., 30/- 12in., work perfect, but have ion burns; ideal for testing or standby; post and insurance 15/6 extra. **DUKE & CO.**, 621, Romford Road, Manor Park, E.12.

"VIEWMASTER" Valves, exact to specification, guaranteed new and boxed, comprising 5 EF50, 1 6P28, 1 KT61, 1 6P25, 1 EBC33, 2 6K25, 1 EB91, set of 12, £6/2/6, post free; "Tele-King" 17in. Receiver, complete set of 17 valves, exact to specification, £9/9/-, post free; 6AM6, EF91, 6F12, Z77, 6D3, 6C4, L77, EP92, 6A35, E14, 12AX7, 7/9, any 8 for 53/-; EB91, 6AL5, 6X5GT, HV2A, 6/9; 1.4V. Miniatures, 1S5, 1R5, 1T4, 3V4, 3S4, 1S4, DK92, DF92, DL93, 7/6, any 4 for 27/6; 6V6G, 6V6GT, 6F6G, KT63, 1C5GT, DL35, U22, EBC33, EF50, 20D1, 7B7, 7C5, 7C6, 7H7, 7S7, 7/6; 5Z4G, 5U4G, 5Y3GT, U50, MU14, 7Y4, 12AT7, 12AU7, ECC81, U78, 6A7, DH77, 6A76, 6J6, 6A8G, 25Z5, 25Z6GT, 25L6GT, 35L6GT, 50L6GT, 35Z4GT, 80, 6X4, 6BA6, 6BE6, 6BW6, EC91, Pen46, PY82, 6LD20, 807, 8/6; PL38, EL38, 2/6; PZ30, GZ32, 6U, 5/6; E14, DK22, 1A7GT, EP42, 6P25, EL33, N78, 15/-; U25, EBF80, UBF80, UF42, UAF42, U37, R16, UCH21, ECH35, 13/6; EY51, U16, PL83, N339, 6F14, 1H5GT, DAC32, 1N5GT, DF33, 3Q5GT, DL33, CY31, ECC91, 12/-; PL81, PL82, PY81, 11/-; ECL80, EP80, 6F1 10C2, 6F15, 6C9, 10F1, 10P13, UCH42, EAF42, R10, 10/6; PY60, EL41, ECH42, EBC41, UBC41, UF41, 10LD11, 10F9, U309, U319, KT33C, 10/-; 25Z4G, 25A6G, 6K6G, 6K33GT, 6Q7GT, 12K8GT, 12JGT, 12K7GT, 12Q7GT, 6SN7GT, UY41, UL41, EF41, EZ40, EAC91, U09, U404, 9/-; 6K7G, 6K7GT, EF8, EP39, 3A4, KP35, KL35, 6/-. All new and boxed. Postage, 4d. per valve extra. **READERS RADIO**, 24 Colberg Place, Stamford Hill, London, N.16. (STA 4587.)

RADAR UNITS, 15 x 9 x 8in.; brand new (less relays); contain 14 variable resistors (2 W/W 4W), 4-way 6 bank wavechange switch, 4 ceramic EF50 bases; a geared 5.0w-motion drive with large tuning knob. Hosts of Resistors and Condensers, etc.; chassis and case make ideal amplifier; spotless condition, 12/6 (carr. 4/6), or complete with 4 EF50s, 30/6 (carr. 4/6). Output Units: Type '23, designed to amp. C.W. but easily converted to a stand amp. Contains 8 valves: 2 Pen. 3833, 1 Pen. 45, 3 SP35, 2 DD41s, and a V970 (rect.), a 20-0-20mA meter and almost everything required for an amplifier, housed in a normal amp. case, 19 x 12 x 8in.; a few only at 30/- (carr. 7/6). **SERVIO RADIO**, 156/8, Merton Rd., Wimbledon, S.W.19. (L1Berty 6525.)

HOODED TELEVISION gives "Darkness in Daylight." A Wilson Hood converts grey images to sharp black and white; no more shading of day or artificial light; definitely reduces eye strain. The Golden Hood is easily located on set; no fixing; state width of cabinet; price 25/-, post free; money back guarantee. **WILSON CALCULATORS LTD.**, Newton Abbot, Devon.

VALVES (prices in brackets for 5): VR92, 2/- (7/6); VR65, 3/- (12/6); KTW63 (6K7G), 4/- (17/6); VR91, 4/6 (20/-); VR91, silvania red, 8V6G, 7/6 (35/-); 5Z4G, 5U4G, 8/- each; post extra. S.A.E. list. **THE RADIO SERVICES**, Lr. Bullingham, Hereford.

TUBES! Mazda 12in. CRM 121, new and perfect, £8; ditto, imperfect, Heater-Cathode Insulation, £5; others from £2; all guaranteed; please add 7/6 p.p.i. **MARTINS RADIO**, 205, Lower Parliament Street, Nottingham.

WOUND COIL SETS, P.T. Lynx, complete, 35/-; P.T. Super-Visor, complete, 37/6; both plus 1/- post. C. O. **PRESTON & SON**, Healey Lane, Batley, Yorks.

CONSOLE CABINET, unused, walnut, cost £8/10/-, will take £7, o.n.o. **HARRISON**, 336, St. John St., E.C.1. (TER. 4030.)

WANTED

NEW VALVES WANTED, small or large quantities, 3Q4, 6V6, 5Z4, ECL80, EP80, EY51, PL81, PY82, KT61, 6L6N, VR150, 5H4, 80, etc. etc. Prompt cash. **WM. CARVIS**, 103, North Street, Leeds, 7.

EDUCATIONAL

I.P.R.E. Data for constructing T.V. Aerial-strength Meter, 7/6; 5,500 Alignment Peaks for superhets, 5/9; sample copy "Practical Radio Engineer", 2/-; Membership-examination particulars, 1/-. Syllabus of seven postal courses free and post free. **SECRETARY, I.P.R.E.**, 20, Fairfield Road, London, N.8.

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the hobby enthusiast, and for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations. Train with the college operated by Britain's largest electronic organisation; moderate fees. Write to E.M.I. INSTITUTES, Postal Division, Dept. PT28, 43, Grove Park Road, London, W.4. (Associated with H.M.V.)

Volume Controls 80 ohm COAX
 Model Latisswan type. Low impedance. Guaranteed 1 year. No S.W. S. P. Sw. D.P. Sv. 49
ALL VALVES. 19,000 ohms to 2 Megohms. Guaranteed 1 year. No S.W. S. P. Sw. D.P. Sv. 49
BALANCED TWIN FEEDER per yd. 1 30
TWIN SCREENED FEEDER per yd. 1 30
50 OHM COAX CABLE. 81. per yd.
TRIMMERS. Ceramic. 20. 70 p.f. 9d.; 100 p.f. 15 p. 13; 250 p.f. 16; 600 p.f. 18.
RESISTORS. All values: 1 w. 4d.; 1/2 w. 6d.; 1 w. 8d.; 2 w. 1. 1
 1 w. 1. 2 w. 1. 7 Day Service.

WIRE-WOUND RESISTORS.—Best Makes. Mixture Ceramic Type. 3 w. 15 ohm to 4 K. 1.9; 10 w. 20 ohm to 6 K. 2.3; 15 w. 30 ohm to 10 K. 2.9; 5 w. Vitrosun. 12 K. to 25 K. 3.
WIRE-WOUND POTS. 3 WATT. FAMOUS MAKES
PRE-SET MIX.—20 V. Taps. Knurled. Slotted Knob. All values 25 ohms to 50 K. 60 K. and 100 K. Carbon Track. 3 w. each. 50 K. and 100 K. W. W. 4 each. STANDARD SIZE POTS.—25m. Spinlock. High grade. All Values. 10 ohms to 50 K. 5/6; 100 K. 8/6

O.P. TRANSFORMERS.—Tapped small pentode. 3 P. Heavy duty 70 ma. 4.8. D104, tapped. 4.9. L.F. CHOKES 10 h. 65 ma. 4.6. 250 ma. 150 ma. 12.6. 15 h. 100 ma. 10.6. LYNX. 2 h. 250 ma. 13.6

MAINS TRANS.—Made in our own workshops to high grade specification. Fully inter-linked and inter-insulated. Heater Transformer. 6-200 v. 200 v. 6.3 v. 14 amp. 7.8. 15 v. 20. 7.6. 6.5 v. 3 a. 10.6. 350-0-350. 80 ma. 6.3 v. 4 a. 5 v. 2 a. ditto 300-0-300 ditto 250-0-250. 21 v. Newmaster. auto type. 35 v. Teleson. 30 v. LYNX. 30 v. Comet. 30 v. Super Visor. 30 v.

TV. AERIALS.—Full range popular types in stock. Aerialite, etc. All channels. Indoor loop type Iav. T. 13.6. Outdoor single dipole. 37.6. H type with chimney leadings, etc. 92.6. X type Duxib, 71t. neck and chimney leadings, etc. 88.6.
TYANA.—Wide angle aerial. 200/220 v. or 250/250 v. 16.9. Triple Three loop, with detachable bench stand, 19.6. Solon Midset Iron, 19.8.
TAG STRIPS.—2- or 3-way. 2d.; 4- or 5-way. 3d.; 6-way. 4d.; 6- or 10-way. 8d.

RESISTOR TAG PANELS.—Clearance Bargain from Brand New Units. A fair mixture of 1, 1/2, 1 and 2 w. and 5 w resistors (average 45-50). Sold by weight—price while they last, 3 p per lb. post 1d.

TOGGLE SWITCHES EX-GOV'T. "On-Off." 9d. Ergle Moore solder 60 40, 16G., 5 6 1 lb.: 4d. yd.; T.C. wire 18 to 22 s.w.g., per yd., 2d. PVC Connecting wire 10 colours. Single or Stranded. 2d. 1/2. BTG V.H. and Serecing Can. 6. Vholders, octal, pax. 4d.; moulded, 6d.; EP50. BTG Moulded, 9d.; Ceramic. 1-; BSA, BBA. 1-; B12A (CERN), 1.3. etc. 2 K. 5 w. H.D. w wots. 4.6. 10 K (CERN) w w Pot. Tin. spinlock. 3 w. SREEMED GRID CAPS Int. oct. or Mazda. 6d. each. FUSES 15m. 60 ma. to 10 a. 6d. ALADDIN FORMERS and cores. 1m. 8d.; 1m. 10d. INT. OCTAL PLUG (8-pin). 1- 200 250 Volt. SELECTOR SOCKET (2m. x 1m). with Plug. 1-.

| NEW BOXED | VALVES | ALL GUARANTEED |
|-----------|---------------|---------------------------|
| 145 | 5 8 6F12 | 9-12A6 7 6 EP20 9 6 |
| 145 | 8-6H4 | 10 6 EP20 9 6 |
| 185 | 8-6J5 | 7 6 12AX7 10 6 EP50 Equip |
| 174 | 8-6J7 | 8 6 12K7 10 6 |
| 184 | 8-6J6 | 7 6 12B8 10 6 British 7 6 |
| 284 | 9-6K7 | 6 6 12Q7 10 6 Servotran |
| 3V4 | 6-6K8 | 9-12A6 10 6 Red 10 6 |
| 2X2 | 6 6 EP80 | 10 6 3Z4 10 6 EP91 9 6 |
| 3106 | 2 6 6L6 | 10 6 91A6 9 6 EP132 9 6 |
| 3F4 | 10 6 6P25 | 15-100 7 6 EP22 9 6 |
| 3-3 | 3-6G7 | 9 6 5X3 12 6 |
| 6X4 | 7 6 6S47 | 8 6 6091 7 6 British 7 6 |
| 6A4G | 7 6 6SH7 | 6 6 6066 7 6 PY80 11 6 |
| 6AM5 | 9-6S17 | 9-12A6 6 6 PY81 11 6 |
| 6AT9 | 10 6 6SN7 | 11-12HT8 8 6 PY82 10 6 |
| 6B8 | 7 6 6UG(Y)6B8 | 8-11L48 4 6 6P91 9 6 |
| 6BE9 | 10 6 6V6 | 8-12A6 2 6 12U2 9 6 |
| 6BW6 | 10 6 6X3 | 9-12A6 2 6 V1416 6 6 |
| 6C4 | 7 6 6K3 | 10 6 EB91 7 6 ECL80 12 6 |
| 6C6 | 7 6 6T87 | 9 6 EBC33 9 6 251A 10 6 |
| 6P6 | 9 6 810 | 9-12A6 7 6 G232 15 6 |

Huge Stock B.V.A. Valves at 1951 low tax prices. SPECIAL PRICE PER SET—6K8, 6K7, 6Q7, 6V6, 1B5, 1T4, 18T, 284 or 3V4, 30 v. VIEWMASTER. 12 valves. 26 10/-, TELEKING. 17 valves. 29 10/-, LYNX. 17 valves. 29. LINECORD.—2 a. 100 ohms per foot. 3 a. 60 ohms per foot. 2 way 1.6 a yard, 1 way 1.8 a yard. SLEEVING.—Various colours. 1, 2 mm., 2d.; 3 4 mm., 3d. yd.; 6 mm., 5d. yd.

T. & P. 6d. 21 orders post-free. Lists 2d.
T.R.S. RADIO COMPONENTS
 307, WHITEHORSE ROAD, WEST CROYDON.
 Mail Order. 71, MEADOWS ROAD, EAST CROYDON.

C.R.T. HEATER ISOLATION TRANSFORMER.—Low leakage winding with 250, sec. heat, 2 v. 10 8; 1 v. 10 6; 6.3 v. 10 6; 12 v. 10 6. REMITORS.—CZ1 20 ma. 5 6; CZ2 15 ma. 2.6. CRYSTAL DIODE.—Very sensitive. G.E.C. 2 6. B.T.H. 2 6. H.B. PHONES S.G. Brown. 15 6 p. CONDENSERS, new stock, best makes.—2001 mfd. 5 v. T.C.C. 5 6. Ditto, 12.5 kv. 9 6. 2 p. to 500 p.f. 6d. 5001, 605, 701, 62, 641 3 p. v. Tub. and 1 mfd. 350 v. Tub. 9d.; Hunt's Model seal 05, 1 mfd. 500 v. Tub. 1-; 25, 1 6; 5 mfd. 500 v. 1. SILVER MICA CONDENSERS.—10 s. 5 p. to 500 p.f. 1-; 600 p.f. to 3,000 p.f., 1/3 DITTO 1 s. 4 Day Service. 1-30 p. to 100 p.f. 1 6. 1/2 p. to 1,000 p.f. 2-.

| ELECTROLYTIC ALL TYPES NEW STOCK. | Can Type, T.C.C. 3d. ea. |
|-----------------------------------|-----------------------------|
| 2.450 v. B.E.C. | 2 3 |
| 4.500 v. Hunt's | 2- 16 500 v. Dabbler, 4- |
| 8.450 v. Hunt's | 2-32 350 v. B.E.C., 4- |
| 8.500 v. Dabbler | 2-8 60 350 v. T.C.C., 4- |
| 16.500 v. Dabbler | 4- 200 250 v. B.E.C., 8 6 |
| 8-8.500 v. Dabbler, 4 6 | 8-16 450 v. B.E.C., 5 6 |
| 16.350 v. B.E.C. | 3- 8-16 300 v. Dabbler, 5 6 |
| 22.500 v. Dabbler, 4 6 | 16-16 450 v. B.E.C., 5 6 |
| 32.500 v. Dabbler, 5 6 | 16-16 450 v. Dabbler, 5 6 |
| 32-42.500 v. Dab., 7 6 | 24-42 275 v. Dab., 4 6 |
| 50 150 v. Dabbler, 5 6 | 24-42 500 v. 25 25 v. 4 6 |
| 25 25 v. Dabbler, 1 9 | in same can B.E.C., 6 6 |
| 50 12 v. T.C.C., 1 9 | 60-100 350 v. Hunt's 11 6 |
| 50 25 v. Dabbler, 1 9 | 16 mid. 700 v. Hunt- 6 6 |
| 50 50 v. T.C.C., 2- | 16 mid. 700 v. Hunt- 11 6 |

SENTERLO RECTIFIERS.—FHT Type. Fly-back Voltage.—K3 25 2Kv. 4 3; K3 40 2Kv. 6 6; K3 45 2Kv. 6 6; K3 50 2Kv. 7 2; K3 100 8 Kv. 12 6; K3 160 14 Kv. 18-; MAINS TYPE.—R.M1. 125 v. 60 ma. 5-; R.M2. 100 ma. 4-; R.M3. 120 ma. 5 9; R.M4. 250 v. 75 ma. 16-.

KNOBBS. GOLD ENGRAVED.—Walnut or Ivory. 15m. diam. 1 6 each. Focus. 7. Octonut. 7. "Brilliance." "Brilliance-Offset." "On-Off." "Volume." "Vol.-On-Off." "Tone." "Tuning." "Trebble." "Bass." "Wavechange." "Radio-gram." "S. M. L. Gram." "Record-Play." "Brightness." Ditts not engraved. 1 s. each.

COOPER EMERALD WIRE.—1 lb. 14 to 20 p.f. 22 to 25 v. 2 s. 8; 3 to 10 v. 2 s. 6. **GOODMANS.**—Latest Wide Angle Dinosat type. Focus Unit. Adjustable controls for Focus and Picture Shift. 25 v. ELAC.—C.R.T. Ion Trap. 3 6. **LOUDSPEAKERS P.M. 3 OHM.**—15s. Plewey. 12 8. 5in. Goodmans. 13 8. 6in. Goodmans. 14 6. 8in. Loudman. 15 8. 8in. Goodmans. 15 6 10in. Loudman. 25 v. 12in. Travox. 55 6.

FIRST-CLASS TELEVISION and RADIO COURSES
GET A CERTIFICATE!
 After brief, intensely interesting study—undertaken at home in your spare time—YOU can secure your professional qualification or learn Servicing and Theory. Let us show you how!
FREE GUIDE
 The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtmanship (all branches), etc., together with particulars of our remarkable Guarantee of SUCCESS OR NO FEE
 Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.
FOUNDED 1885—OVER 150,000 SUCCESSES.
NATIONAL INSTITUTE OF ENGINEERING
 (Dept. 462), 148, HOLBORN, LONDON, E.C.1.

MODERN RADIO, BOLTON
VIEWMASTER COMPONENTS. any item sold separately. Specified components: Constructors Envelopes. 7 6; Resistors. 35 3; T.C.C. Condensers. 47 10/-; Westinghouse 14A/88. 20 4; 14D/36 11 7; W33. W34. 3 9; WEHT100. 29 5; WEHT100. 29 1; WEHT100. 29 1; Sound and Vision Chassis. 18 8; WB101. 6-; Time Base Chassis. 18 6; Colvern Pot. Kit. 22 2; Belling Lee Kit. 8 9; WB103. 42-; WB103A. 52 6; WB104. 15 6; WB105. 47 6; WB106. 25 6; WB107. 22 6; WB108. 35 3; WB109. 65 2; WB110. 10 6; WB111. 5 9; WB112. 12n. 21 6; Wearite Coils. 25-; R.P. Choke. 2-.
SPECIAL OFFER.—Holme Moss Coils and Choke. 15/-.
SOUND MASTER, HOME-BUILT TAPE RECORDER.—Constructors Envelope. 6 6; Brenell Kit (Drum, Levers, etc.). 13-; T.C.C. Kit. 43 3; Colvoro Kit (3 motors). 45 15-; Lustrephone Mike. 25 15 6; Bulgin Kit. 23 10-; Lab. Resistors and Pots. 22 8 6; N.S.F. SM20. 21-; SM21. 7-; SM22. 7 6; W.B. Parts 201 35-; WB302 31 6; WB303. 11 2; WB234 67 6; WB305. 10 6; WB320. 8-; WB321. 8-; W.B. H.F.610 Speaker. 37 6, plus 13/- tax; W.B. Cabinet. 16.
WEARITE.—Pair Red Seal Heads. 24 4.
WEARITE.—Pair Gold Seal Heads. 27 7-; W.B. Osc. Coil. 7 6.
WEARITE.—Inductor. 25-.
WEARITE.—Transformer. 30-.
Sold as Kits, Red Seal. 27-; Gold Seal Kit. 21 0.
TELEKING COMPONENTS.—In stock, see previous advert. Other Wide Angle Components in Stock.
EX-GOV. VALVES (New) Boxed.—5U4G. 9 6; 6SN7. 9 6; 6V6G. 8-; 6K7G. 6-; V91. 6-; 6Q7G. 10 6; 5Z4G. 10-; 5Y3G. 10-.
TYANA SOLDERING IRON. 16 9.
SOLO SOLDERING IRONS. 23 8. 25 4.
STANDARD COAX CABLE. 91d. per yard (75 80 ohm).
TELEVISION FAULT-FINDING BOOK. 5-.
 Please enclose postage on all orders below £2.
MODERN RADIO, 103, Derby St., Bolton, Lancs. Phone: Bolton 1116

W. B. SUPPLIES
 100, Oldham St., Manchester 4
 Tel: Central 4246
TERMS.—Cash with Order. Orders under £1, add 6d. postage. Over £1, 1/- postage.
VALVES.—EA50, 2/-; V570, 2/-; VR54, 2/6; VT61, 2/11. EF50, 4/6. 6V6, 6/11. EF55, 8/6.
TUBULAR CONDENSERS.—1 mfd. 250 v.; .25 mfd. 350 v.; .025 mfd. 500 v. All at 2/3 dozen. Screw can. 9 mfd. 500 v. 1/6 each. Special offer, 32 x 32 mfd. 350 v., 2/-.
COAXIAL CABLE.—22ft. coils with 2 Pye plugs. 3/11.
YAXLEY TYPE SWITCHES.—2 pole 6 way, 1 pole 10 way, 11 pole 7 way. All at 2/3 ea. 4 pole 3 way widgeits, 1/6.
H.T. BATTERIES.—60 volts. Size 4in. x 3 1/2in. All tested, 3/6.
6in. MAGNIFIERS.—Oil filled for VCR97, etc., 17/6.
CHOKES.—5 Hys. 200 mls., 7/6. H.F. Chokes, 6d.
GERMANIUM DIODES.—1/9 ea., 2 for 3/-.
MORSE TAPPERS.—De Luxe model with silver contacts, 5/-.
PHILCO 4 VALVE Superhet Portable Receivers. with built-in speaker, 1.4 Mc to 4 Mcs, 37/8, less valves.

News from the Trade

SINGLE UNIT, FORWARD PROJECTION RECEIVER

WHAT is claimed to be the first 4ft. x 3ft. forward projection receiver to be completely housed in a single cabinet, is now being produced by Nera of England, Ltd. This new model is designed to meet the demand from hospitals and institutions for a self-contained, transportable, large screen television receiver, which may be safely locked up when not in use.

The cabinet, which is mounted on castors, is comparatively small in size when closed, enabling the receiver to be moved easily through narrow doorways and to negotiate awkward corners. In operation, the screen is raised from the back of the cabinet and the centre panel lowered. In this position the screen locks into place giving it a most convenient height and angle for viewing by a large audience. Since both optical focus and screen position are fixed, no mechanical adjustments have to be made, and the folded beam arrangement has the additional advantage of reducing the length of throw required to about half that of a normal projector.

On closing the cabinet, the action of lowering the screen automatically switches off the receiver, and after closing the centre panel the cabinet may be locked so that the receiver can neither be switched on nor tampered with by unauthorised individuals.

This new instrument, Model C 48, is constructed to the same high standard as the other Nera models, and employs interchangeable chassis for the R.F., timebase and power supply units, a method which facilitates rapid servicing, since a complete chassis may be changed in a matter of minutes should a fault occur. The standard Nera remote-control panel is fitted, giving complete control over contrast, brilliance, focus and sound volume. This remote control is normally supplied to operate at any distance up to 20ft. from the receiver, but this distance may be extended to order, as required. The special

activated screen enables the equipment, when correctly positioned, to give a brilliant picture under normal room lighting conditions, an important factor when used in hospitals and public rooms. Ample sound volume is obtained from a push-pull output stage feeding twin speakers.

The dimensions of this model are: Closed, 24in. deep, 45in. high, 51in. wide; open, 56in. deep, 77in. high, 51in. wide.

The list price is £187, in stained and polished cabinet, and £198, in attractively veneered cabinet. Both prices are tax free.—Nera of England, Ltd., Jeffries Passage, High Street, Guildford.

NEW MEDIUM POWER TX VALVE

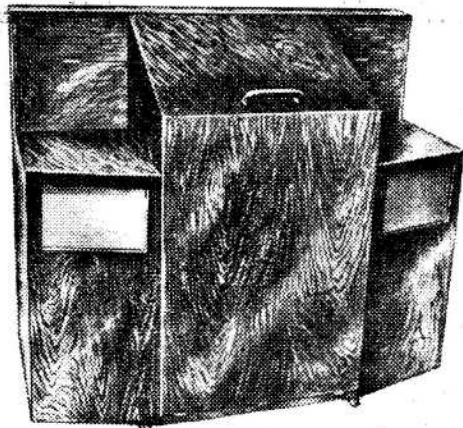
A HIGH-FREQUENCY tetrode valve with an anode dissipation of 3 kW. and a maximum frequency rating of 220 Mc/s has recently been introduced by the Communications and Industrial Valve Department of Mullard, Ltd. The new valve, designated type QY5-3000A, will deliver approximately 2.5 kW. of R.F. power when operated as a grid modulated class "C" amplifier for television at its maximum frequency of 220 Mc/s. It is therefore ideal for medium power television stations in band three.

Type QY5-3000A is a ring-seal tetrode of glass and metal construction. It has an external finned anode designed for forced-air cooling. An anode dissipation of 3 kW. is achieved in a comparatively small valve, the overall height and diameter being only 172 mm. (6.75in.) and 92 mm. (3.6in.) respectively. In common with other tetrode valves, type QY5-3000A has the advantages of high power gain and low output capacity. These features are particularly valuable at very high frequencies and video bandwidths.

While its power and frequency ratings make this new valve an obvious choice for medium powered V.H.F. transmitters, it has other applications as a driver, frequency multiplier, or modulator.

TWENTY-FIRST ANNIVERSARY OF AERIALITE, LTD.

HIGH spot of the evening at the Annual Staff Christmas Party of Aerialite, Ltd., on December 21st, was the presentation of a gold wristlet watch and strap to the Managing Director, Mr. L. S. Hargreaves, on the occasion of the Company's Twenty-first Anniversary. In thanking the staff for the gift, Mr. Hargreaves referred to the company's successful record up to the present time and stated that continued success would be ensured by the team spirit which existed throughout the company. To mark the occasion a two-tier cake was cut by Mr. L. S. Hargreaves.



The new Nera self-contained projection receiver.

QUERIES COUPON

This Coupon is available until February 21st, and must accompany all Queries.

PRACTICAL TELEVISION, February, 1954.

OPPORTUNITIES IN TELEVISION



144 pages
Free!

Television offers unlimited scope to the technically qualified. Details of the easiest way to study for A.M.Brit.I.R.E., R.T.E.B. Cert., City and Guilds, Television, Television Servicing, Sound Film Projection, Radio Diploma Courses, etc., are given in our 144-page Handbook "ENGINEERING OPPORTUNITIES" which also explains the benefits of our Appointments Dept.

We Guarantee "NO PASS—NO FEE"

If you are earning less than £15 a week you must read this enlightening book.

Send for your copy NOW—FREE and without obligation.

WRITE TODAY!

British Institute of Engineering Technology
237, College House,
29-31, Wright's Lane,
Kensington, W.8. **BIET**

Television, Radio, Record CABINETS MADE TO ORDER

ANY SIZE OR FINISH

CALL OR SEND DRAWINGS FOR QUOTATION

B. KOSKIE

(DEPT. B)

72-76 Leather Lane,
Holborn. E.C.1

Phone: CHAncery 6791/2

HIGH GRADE TRANSFORMERS

**FOR ALL PURPOSES
SINGLY OR IN QUANTITIES
TO YOUR SPECIFICATION
VARNISH IMPREGNATED
BAKED WINDINGS
WITH OR WITHOUT TAG PANELS
GOOD DELIVERIES**

Our rewind dept. will handle your repairs promptly and efficiently.

S.A.E. with enquiries please.

P. HOWORTH

(Dept. P.T.)

51 POLLARD LANE - BRADFORD

Tel: 373030

COVENTRY RADIO

189, DUNSTABLE ROAD
LUTON

Tel.: Luton 2677

COMPONENT SPECIALISTS SINCE 1925

All B.V.A. and Tungram valves in stock.

EDDYSTONE COMMUNICATION SETS AND COMPONENTS

Short Wave Components Catalogue 6d
T.C.C., Hunts & Dubilier Condensers
Welwyn and Erie Resistors.
Lab/Morganite, Erie, Dubilier, Colvern and
Amplion Potentiometers.
Denco, Osmor, Wearite and Weymouth
Coils and Packs.
Eddystone, Denco, Wearite and Weymouth
I.F.s.
Woden and Elstone Transformers.
Elac, Goodmans, Plessey, Rola/Celestion
Speakers.
Avo and Taylor Test Meters.
E.M.I., Scotch Boy and Grundig Recording
Tapes.
Valradio Vibrator Convertors.

SPECIAL OFFER

Ready Punched 5-valve chassis, size 12½ x 8 x 2½, complete with attractive glass dial, 11½ x 4½, Reflector Plates, Pointer and Pulleys. Price 12/6, plus 1/- postage

These are some of the components we stock. Send for our 50-page Components Catalogue, price 6d.

| | | | | | |
|------------|------|---------|------|-------------|------|
| OZ4 | 8/9 | 6AM6 | 8/- | 25L8GT | 9/- |
| 1A5GT | 7/- | 6QT7 | 10/- | 25Z4G | 8/6 |
| 1C5GT | 7/- | | | 25Z6GT | 8/6 |
| 1LN5 | 6/- | 68G7 | 8/- | 35Z5GT | 9/- |
| 1R5 | 7/6 | 6S17GT | 9/6 | 50L6GT | 6/6 |
| 1S5 | 7/6 | 6SN7GT | 10/- | KT61 | 11/- |
| 1T4 | 8/- | 6U5G | 6/6 | KT68 | 11/6 |
| 1P11 (3V4) | 8/6 | 6U7G | 6/6 | UY41 | 10/- |
| | 8/6 | 6V6G GT | | ECH35 | 10/6 |
| 2X2 | 5/- | | | VR53 | 7/6 |
| 3D6 | 2/- | 6X5G GT | 8/- | VR35 | |
| 4D1 | 4/- | 7R7 | 7/6 | (EBC33) | 7/- |
| 4U4G | 9/6 | 7C5 | 7/6 | VR56 (EP36) | |
| 5Y3GT | 8/- | 80 | 8/- | VR94 (SYL) | 6/6 |
| 5Z4GT | 8/6 | 90T | 8/- | | |
| 6F5GT | 5/6 | 12AT7 | 10/- | VT52 | 8/6 |
| 6J3M | 6/- | 12F6GT | 5/- | VU39 | 8/6 |
| 6K9GT | 7/6 | 12Q7GT | 9/- | R3 | 9/- |
| 6K7G | 5/6 | 12K7GT | 9/- | W77 | 8/- |
| 6K8G | 9/- | 12K8GT | 9/- | 16Z5 | 5/6 |
| 6L6G | 10/6 | 15D2 | 5/9 | | |

Many other types in stock—your enquiry, our pleasure.

CONDENSERS.—New Stock: 450v. 8 2/6; 8+8 4/3; 16 3/6; 350v. 8+8 3/6; 16 2/9; 275v. 32+32 4/-; 25 25v. 1/6; 50 50v. 2/-; 10 70v. 2/-.

BLOCK CONDENSERS.—5 mfd. 500 v. 1/3.

MAINS DROPPERS.—2 amp 717 ohms Vitreous 2/-.

VOLUME CONTROLS.—meg. with S.P. switch 4/-; 2½in. spindle.

FILAMENT TRANSFORMERS.—200 250 input 6.3v. 1.5 amp output 5/9.

SPEAKERS.—3½in. 11/6; 5in. 12/-; 8in. 14/6. P.M. less transformer.

T.R.F. COILS. boxed with circuit, 6/6 pair
THIS MONTH'S SPECIAL OFFER:
7-pin Maxolin Valve Bases, 3/- per dozen or £1 per 100.

Postage 1/- under £3. C.W.O.; or C.O.D. extra. Orders over £3 post free.

ELECTRO SERVICES & CO.

242, Battersea Bridge Road, S.W.11.
Battersea 2264 7155

TELEVISION RECEIVER CONVERSION

The type AC 4 unit permits receivers to be used for reception of other channels without re-tuning or alterations.

Type AC 4KL (New Brighton transmitter or Kirk o'Shotts on a London receiver).

Type AC 4WL (Wenvoe on a London receiver).

Type AC 4WB (Wenvoe on a Sutton Coldfield receiver).

Also available for all other conversions. The unit is complete with 5 valves and self-contained power supply unit. Price 15 gns. complete from your Dealer or C.O.D.

Type AC 3 neutralized triode PRE-AMPLIFIER without doubt the best Pre-amplifier available. Price complete, 10 gns. from your Dealer or C.O.D.

Illustrated leaflets, etc., on request.

SPENCER - WEST

Quay Works, Gt. Yarmouth

Phone: 3009. Telegrams: Spencer-West, Gt. Yarmouth.

ALUMINIUM, LIGHT ALLOYS, BRASS, COPPER, BRONZE,

IN ROD, BAR, SHEET, TUBE, STRIP, WIRE, ANGLE, CHANNEL, TEE

3000 STANDARD STOCK SIZES

H. ROLLET & CO., LTD.

6, CHESHAM PLACE, LONDON, S.W.1.
SLOane 3463

Works:

36, ROSEBERY AVE., LONDON, E.C.1.

Branches at Liverpool, Manchester, Birmingham.

"No Quantity too Small"

WATERLOO RADIO

35, Tenison Way,

(Waterloo Bridge Roundabout)

LONDON, S.E.1

CHARGER TRANSFORMERS.—200-250 v. A.C. input to charge 6 v. or 12 v. batteries at: 1.5 amps., 12/6; 3 amps., 21/6; 6 amps., 29/6; Bridge rectifiers, suitable for use with above transformers. 2 amp. 11/3; 3 amp. 12/6; 4 amp. 15/-; 6 amp. 23/6. Post 1/2. Half-Wave, 125 v. A.C. input, RM1, 60 mA., 3/9; RM2, 100 mA. 4/8; RM3, 125 mA., 5/3; RM4, 250 v., 275 mA. (for TV.). 15/6. Post 6d.

VALVES.—6AM6, 6CH6, 6BH6, 6BE6, 12BE6, 6BW6, 6OC5, 19AQ5, 6C6, 6P6, 3A4, 1U5, 1T4, 6AL5, W77, N18, 6BJ6, 185, 12AX7, 7/6 each.

EVERYTHING FOR VIEWMASTER & SOUNDMASTER

ELECTROLYTICS—150v. wkz. (Std. New Stock), 4 mid. 1.6, 8 mid. 2-, 16 mid. 3-, 8-8 mid. 3/6, 8-16 mid. 4-, 16-16 mid. 4/6. **P.M. LOUD-SPEAKERS** (3-ohms), 3in. 13/6, 5in. 24/6, 6in. 15/6, 8in. 18/6, 10in. 22/6. **GERMANIUM CRYSTAL DIODES** 3.6. B.I.L., 0.1 mid. 3. K.V. Condensers, 10.6. I.R. HEADPHONES, 15/6. **SOLOID Miniature SOLDERING IRONS**, 19/6. 6in. ENLARGERS (for VCRs), 17/6. 10. 50 mA. **SMOOTHING CHOKES**, 5/6. 2in. Old Aspect **CREAM RUBBER MASKS**, 5/6. **WEARTE "P" COILS**, 3/- **ALL CHASSIS**, 2/1in. Deep. 6in. x 4in. 6/6, 8in. 6/-, 10in. x 7in. 7/-, 12in. x 8in. 9/-, 14in. x 8in. 13/-, 16in. x 8in. 14/- **ELAC FOCUS RINGS**, R17/MK. II 28/6. **ROZ/MK. II 30/-**, R25/MK. II 32/6. **TRANSFORMERS** (Mains Input, Standard Primaries), 250-0-250v. 80 mA., 0-4-0v. 4 A., 0-4-5v. 2 A., 19/6; Ditto but 350-0-350v., 19/6; 250-0-250v. 100 mA., 6/3v. 3.5 A., 5v. 2 A., 26/6; Ditto but 350-0-350v., 26/6. **MAINS TRANSFORMERS for PRE-AMPLIFIERS, TEST-SETS, etc.** PRIMARY, 230-240v. SECONDARIES, 0-250v. 30 mA. (or 250v. from a half-wave rectifier), and 6.3v. 1 A. Price, new and guaranteed, 14/9.

ORDERS UNDER £1 please add 1/- P. & P. Orders £1 and over please add 1/0. FOR INSTANT SERVICE—WRITE:

CITY & RURAL RADIO
101, HIGH ST., SWANSEA, GLAM.
Telephone: Swansea 4677.

TELEVISION COMPONENTS

always in stock for the

P.T. LYNX

P.T. SUPER-VISOR

THE E.E. TELEVISOR

(Standard, de luxe and wide-angle versions)

VIEWMASTER, TELE-KING

also components for the

SOUND MASTER and

CORONET FOUR

Separate price lists available on request.

J. T. FILMER,
Maypole Estate, Bexley, Kent
Tel.: Bexleyheath 7267

BENTLEY ACOUSTIC CORP. LTD.
28, Chateaufort Road, N.W.1. *Price lists 9/90*

| | | | | | |
|------|------|-------|-----|-------|------|
| 6B8M | 5/6 | 6V8 | 7/- | EBB1 | 7/6 |
| 6CD8 | 11/- | 705 | 7/- | ECC33 | 9/- |
| 6J5G | 5/- | 708 | 7/- | ECC81 | 9/- |
| 6K7G | 5/- | 7H7 | 7/- | 6AM6 | 6/6 |
| 6K9 | 6/- | 7V4 | 7/- | 6BA5 | 7/- |
| 6L7 | 6/- | 12A7T | 7/- | 6BE8 | 7/- |
| 6N7 | 7/- | 12AU7 | 9/- | 6BW6 | 7/- |
| 6P7 | 8/- | 12AX7 | 7/- | UBL21 | 13/- |
| 6S17 | 8/6 | 12SQ7 | 8/- | UCH21 | 13/- |
| 6SN7 | 8/6 | 50L6 | 8/- | UCH42 | 11/- |

Post extra. 24 hr. Service. Refund Guarantee. S.A.E. Free List.

**A NEW COMPACT
TAPE DECK**
taking 600ft. Reels, size only 11in. x 7in. Best Quality Heads. Price £8.18.0 complete. Send Stamp for details to—E. W. A., 266, Warbreck Drive, Blackpool.

LYONS RADIO LTD.

3, GOLDHAWK ROAD, Dept. M.T.
SHEPHERDS BUSH, LONDON, W.12.
Telephone: SHEPHERDS Bush 1729

THIS MONTH'S SPECIAL BARGAIN INDICATOR UNITS TYPE 96.—These units provide a first-class source for TV spares or for conversion. Principal contents are: Cathode Ray Tube type VCR97 TV Picture Tested to ensure freedom from cut-off, 6-VR65's (SP61), 3-VR54's (EB34), 1-VR92 (EA50), slug-tuned coils, extension spindles, spindle couplers, Mu-metal screen, H.V. Condensers, resistors, tube mask and dozens of other useful parts. Size over outer case 19 x 9 x 7ins. Condition is as new and unused. PRICE ONLY 59/6 or less valves 45/-. Carriage 6/6.

FLEX.—Twin P.V.C. insulated, conductor 7 0076 Bells, copper. For radio and electrical work, tins, extension speakers, telephones, etc. O.K. for 230 v. mains. 100 yards, 18/-; 50 yards, 10/-; 25 yds., 6/-.

0.30 A.C. AMMETERS.—Switch board, flush mounting type 5in. dia., M.I. first grade calibrated at 50 c.p.s. PRICE 29/6, post 2/-.

24 VOLT ACCUMULATORS.—American made, as new and unused, 11 amp-hour capacity. (At 5 Hr. rate.) Size 10 1/2 x 10 x 5 1/2ins. with terminal cover on one side protecting 3 tins. PRICE 52/6, carriage 7/-.

TEST SETS TYPE 102.—Mains operated test sets emitting 25 and 50 c.p.s. synchronizing pulses. Amplitude calibrated 0.2 to 1.4 watts for output lamp. Provision is made for comparison of outputs by means of Photometer type Comparator. Housed in smart metal instrument cases 11 x 10 x 9ins. and fitted with built-in A.C. mains power pack using transformer Pri. 200/250 v. Sec. 6.3 v., 12 v., and 300 v., a 1-wave selenium rectifier, a double triode valve CV18, 1 spare lamp, valve type 6J5, etc. In good condition with circuit diagram. PRICE 32/6, carriage 4/6.

—JUST PUBLISHED—

Electronic Gadgets For The Constructor

By E. N. BRADLEY

64 Pages. 53 Diagrams.

This book fully describes the construction of a large variety of devices: Capacitance Relays; Electronic Musical Instruments; Mystery Displays; and a Photo-Electric Novelty. Also, a number of units designed for extremely practical uses are given. They include various Intercomm. Systems; Baby Alarms; and Capacitance Testers. 3s. 6d., postage 3d.

Television Test Equipment, by E. N. Bradley, 5s. 0d., postage 3d.

Television Principles and Practice, by F. J. Camm, 25s. 0d., postage 6d.

TV Fault Finding; Data Book No. 5, 5s. 0d., postage 3d.

Practical Wireless Encyclopedia, by F. J. Camm, 21s. 0d., postage 9d.

Television & Radio Repairing, by J. Matkus, 48s. 0d., postage 1s. 0d.

Radio Valve Data, compiled by "Wireless World", 3s. 6d., postage 3d.

THE MODERN BOOK CO.,

Britain's largest stockists of English and American technical books

19-23, PRAED STREET,
LONDON, W.2.

Please write or call for new catalogue. Phone: PADINGTON 4185. Open all day Saturday.

VALVES

All Valves Guaranteed. 24 Hours Service

| | | | | | |
|-------------|-----|--------|-----|-------|------|
| FY32 | 8/6 | Y63 | 8/6 | 6SN7 | 9/6 |
| 6X4 | 7/6 | 428PT | 6/6 | 6L6 | 10/6 |
| 954 | 2/6 | 38Z4 | 9/6 | 78T | 9/6 |
| EA50 | 2/- | 35L6 | 9/6 | 7B7 | 9/6 |
| SP41 | 3/6 | 2X2 | 4/6 | 7Q7 | 9/6 |
| SP61 | 3/6 | 428PT | 6/6 | 50L6 | 8/6 |
| MSPEN | 5/- | 1F2 | 4/6 | 504G | 8/6 |
| VR107 | 4/- | KT24 | 4/6 | 80T | 7/6 |
| 80 | 9/6 | HD4101 | 5/6 | ECL80 | 11/6 |
| 605 | 8/6 | DD1A | 5/6 | EF80 | 11/6 |
| 708 | 9/6 | 6U5 | 9/6 | 12K9 | 9/6 |
| 6K7 | 5/6 | 7T4 | 8/- | 12K7 | 8/6 |
| EF50 (Syl.) | 1R5 | 5R5 | 8/- | KT3C | 10/6 |
| VR115 | 4/6 | 1S5 | 8/- | EF81 | 7/6 |
| 524 | 8/6 | 6V8 | 9/- | 41MTL | 6/- |
| UV39 | 8/6 | 6K8 | 9/6 | ARPTL | 9/- |
| 6Q7 | 9/- | EF39 | 8/6 | 12Q7 | 8/6 |

- * G.E.C. crystal diodes, 2/-.
- * Pvc plug and sockets, 6d. pair.
- * Chokes, 10 Henry 12in. a., 5/6, plus 1/- post.
- * Co-axial Cable, 80 ohm per ft., 9d. yd. (not W.D.). Post 1/- per 12 yds.
- * Twin Transparent Flex, 18.6 per 100 yds.
- * RM1, 5.11; RM2 S.T.C., 4/6; RM4, 15/-.
- * E.M.I. V.C. W.S. 1 (M.C.G.) mek., 4/-.
- * E.L. TRANSFORMERS, 2-5 v. at 1.5amps. Tapped at 200, 220, 240, 6.9, plus 9d. Post.
- * STANDARD O.P. Primary current 30 mA. D.C. Secondary Current 2-3 ohms. Impedance 5,000 ohms. Ratio 40:1, 5/9, plus 6d. post.
- * MIDGE TELEPHONE Transformers, approx. 100-1, 1/3, post 3d.
- * CONDENSERS.—Sprague 1,350, 8/- dz. 0.1-1,000 v.w., 8/- dz. Hunts, 2 mid., 500 v.w., 1.9. B.I. 4 mid., 500 v.w., 1/9.
- * REGENT Hand Mike (Crystal). Complete with screened lead and jack plug, £12.6.
- * FUSES, 11in. length, 1 A., 1.5 a., 2 a., 3 a., 5 a., 3.6 dz.
- * BULBS.—6.3v. 3A 8d.
- * EPIC V.C.D. DRIVES, 9d.
- * JACK SOCKETS, Two hole fixing, 6d.
- * MAINS DROPTERS.—One hole fixing, 2 a., 1,300 ohms, 3-750 ohms, 4/9.


Post—9d. to 10/-, 1/- up to 20/-, 2/- up to 40/-.

REX RADIO, 37, LOUIS STREET, LEEDS, 7.
Mail Order Only. Catalogue 6d.

Introducing the: —

TYANA TRIPLE THREE

MAKE SOLDERING
A PLEASURE
SMALL
SOLDERING IRON



Complete with detachable BENCH STAND 19/6

The smallest high-power soldering iron. Length only 8 1/2; adjustable long bit dia. 3/16; mains voltages 100/110, 200/220, 230/250.

The "STANDARD" Popular Soldering Iron now reduced to 14/11.

Replacement Elements and Bits for both types always available.

KENROY LIMITED
152/297 UPPER ST.,
ISLINGTON, LONDON, N.

Telephone: Canonbury 4905-4663

James H. Martin & Co.
for

"VIEWMASTER," "TELEKING," "SOUNDMASTER," "TRUVOX TAPE DESKS," Components, Valves, Cabinets, etc.

Mail Order ONLY, Easy Terms available.

FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCs.

Are you converted...

from a 9-inch or 12-inch receiver to big-screen viewing?

If not, the new 'Viewmaster' wide angle circuit will show you how to make use of the 'ENGLISH ELECTRIC' 16-inch Metal C.R. Tube. This is the British made tube giving you long life and a first-class performance — yes, really first-class, with a brilliant picture!

Write for details of the 'ENGLISH ELECTRIC' T.901, Britain's first and foremost Metal/Glass C.R. Tube.

'ENGLISH ELECTRIC'