CATHODE RAY TUBES TYPES AH & BH.

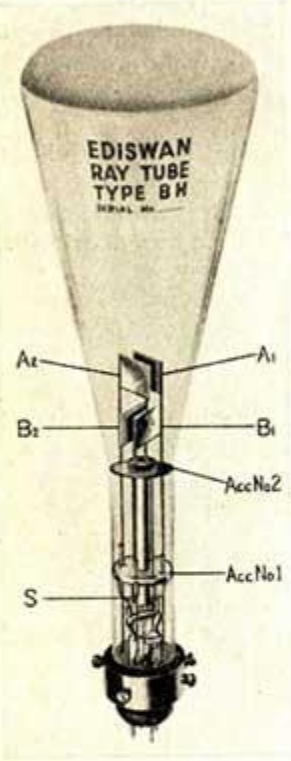


Fig 1

GENERAL.

The cathode ray tube consists of a conical bulb, with a slightly domed end on which a fluorescent screen is deposited internally. In the neck of the tube (See Fig. 1) are mounted a cathode for producing an electron current, and electrodes for controlling it. Surrounding the cathode is a shield (S) or cylinder which normally has a negative potential applied to it and which behaves in a similar manner to the grid of a thermionic valve. Above the end of the shield is a disc (Acc.No.1) perforated in the centre with a small hole. A second disc (Acc.No.2) is mounted some distance up the tube. These electrodes, usually called "accelerators" have a high positive potential applied to them and serve to attract the electrons produced by the cathode. By suitably adjusting the values of the potentials applied to the two accelerators the electron stream can be made to pass through the hole in the discs and to impinge on the fluorescent screen where it forms a small vivid spot of greenish colour.

Above the second accelerator are mounted two pairs of parallel plates (A1, A2 and B1, B2) at right angles to one another—the deflecting plates, or deflectors. If a potential is applied to these plates the electron beam can be deflected on its way up the tube and caused to trace a pattern on the screen corresponding to the variations of the potentials impressed on the deflector plates.

Among the many uses to which the tube can be put are :
Delineation of alternating current wave-forms.
Study of transient phenomena.
Investigation of acoustic vibrations, by means of amplifier equipment and microphone.
Measurement of output from radio receivers ; response curves of pick-ups, etc.
Alignment of intermediate frequency stages in superheterodyne receivers.
Demonstration of characteristics of radio valves.
Measurement of frequency, phase difference, dielectric loss, etc.
Plotting of hysteresis loops.
Examination of gas discharge tube phenomena, and effect of smoothing equipment, etc.

RECEPTION OF TELEVISION IMAGES.

Ediswan Cathode Ray Tubes are of the high vacuum sealed-off type, possessing a high luminosity fluorescent screen suitable for photographic and visual observations.

Tubes with screens of blue or white fluorescent material can be supplied on request.

Recent improvements in the design of the tubes have given several important advantages over the gas-focused type. These are :

Long life, owing to the absence of ionic bombardment of the cathode. Absence of "origin distortion."

Improved focusing properties of the beam, enabling waves of several megacycles frequency to be recorded with ease.

Improved modulation characteristics, with particular reference to television image reception.

SPECIFICATION.	AH.	BH.
Cathode Heater Voltage (approx.) ...	... 0·4	0·4
Cathode Heater Current (approx.)...	1·0 amp.	1·0 amp.
1st Accelerator Potential ...	250-800 volts	250-800 volts
2nd. Accelerator Potential ...	800-2,000 volts	800-2,000 volts
Negative Shield Potential ...	50-150 volts	50-150 volts
Tube length (approx.) ...	... 51 cm.	45 cm.
Screen diameter	17 cm.	13 cm.
Base	Standard 4 pin	Standard 4 pin
PRICE	**£10 10 0**	**£8 8 0**

Each tube is supplied carefully packed in a crate with full instructions for use. As the successful operation of the tube depends on these being carefully followed, no attempt should be made to use it until they have been read.

While the Company cannot accept responsibility for tubes which have once left the Works, every care is taken to ensure their safe arrival, and they are thoroughly tested before dispatch

Technical queries should be addressed to the Radio Division at Charing Cross Road, but if for any reason tubes have to be returned, they should be sent in the original crate to the Special Valve Dept., Ponders End Works, with a letter advising the reason of return.

OPERATION.

The tube may be operated from H.T. batteries or from rectified A.C. supply. A diagram of connections of a suitable exciter circuit is given (Fig. 2), which includes negative-bias for the shield and adjustment of 1st accelerator voltage for focussing the spot.

Full operating instructions and circuit diagrams are supplied with each tube.

In the reception of television images the modulating signal is applied to the shield circuit by means of a potentiometer connected in series with the auto-bias resistance.

It is advisable to include an ammeter in the cathode circuit to ensure that the correct operating conditions are maintained. The cathode is conveniently fed from a 2-volt accumulator and a fixed resistance of 1-1½ ohms should be included in the circuit to avoid the possibility of over-running.

Before connecting the tube to the circuit under test, the deflector plates should be connected together and to the 2nd accelerator. On switching on the cathode and H.T. supply, a spot will appear on the screen which can then be sharply focussed by adjustment of the shield bias, and 1st accelerator.

CAUTION.

Do not allow the spot to remain stationary on the screen for appreciable periods, or damage to the screen will result.

After the spot has been focussed the tube may be connected to the circuit under test, taking care that the deflector plates are always connected to closed circuits.

If the beam does not focus sharply, the cause may lie in too low a cathode temperature, incorrect ratio of accelerator voltages, or in external magnetic interference.

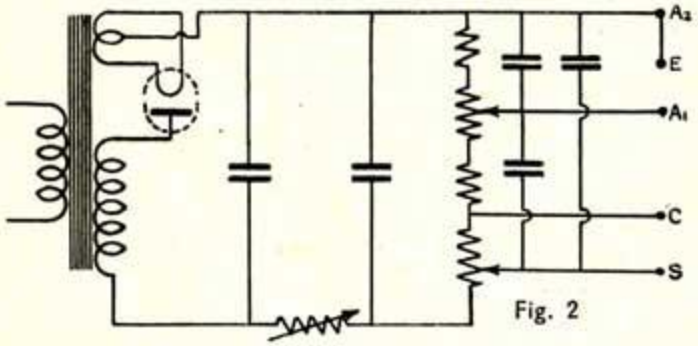


Fig. 2

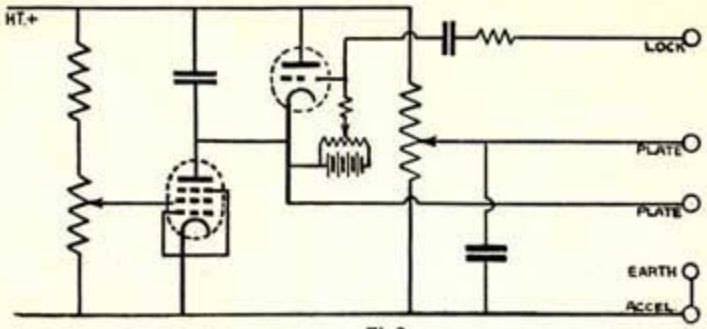


Fig3.

LINEAR TIME-BASE.

The majority of wave-form observations made with the cathode ray tube require to be referred to linear time scale. A suitable circuit for the deflection of the beam is shown in Fig. 3, in which a condenser is charged through a pentode acting as a constant current device and periodically discharged by the action of the mercury vapour relay. The frequency of charge is controlled by the impedance of the pentode, while the length of travel of the beam is varied by the bias applied to the grid of the relay. Suitable valves for this circuit are the Mazda AC/S2 Pen, and the M.R./AC1 mercury relay (page 102).

The value of charging condenser used depends on the speed required, and a selector switch giving values from 0·5—·005 mfd. is recommended to cover a wide range.

The wave-form observed can be held stationary on the screen by feeding a small proportion of the voltage to the grid of the relay through a ·01 condenser and 2 megohm variable resistance.

CENTRING THE BEAM.

The direction of the beam is easily influenced by external magnetic fields. It is advisable therefore, to surround the tube with a magnetic shield, which should be earthed. Steel shields specially designed for the purpose can be supplied.

The oscillograph should be placed as far as possible from local sources of interference, such as generators or electro-magnets.

Should the deflection of the beam not be symmetrical with reference to the screen after these precautions have been taken, it can be deflected by a weak permanent magnet placed in the rear of the shield.

GENERAL NOTES.

If it is required to deflect the beam magnetically, two coils should be attached to the outside of the tube parallel to a pair of deflector plates. The coils must be as nearly as possible identical, and should have a diameter approximately equal to the distance between them. The number of turns required will depend on the magnitude of the current to be measured.

When only one pair of plates is in use, the other pair should be short-circuited and earthed in order to prevent charges accumulating on them.

A preliminary test should be made to ensure that the deflection obtained is within the effective diameter of the screen. The amplitude of the potential supplied to the deflector plates can be adjusted by the usual methods of potentiometer or transformer, care being taken that the circuit under observation is not appreciably modified by their insertion.

TELEVISION AND THE CATHODE RAY TUBE.

The Cathode Ray Tube offers a satisfactory solution to the majority of problems in television reception, and the following advantages commend it to the consideration of the experimenter.

It is silent in operation.

It requires the minimum of energy to operate and to modulate.

The line screen produced can be varied in speed and amplitude by simple electrical adjustments.

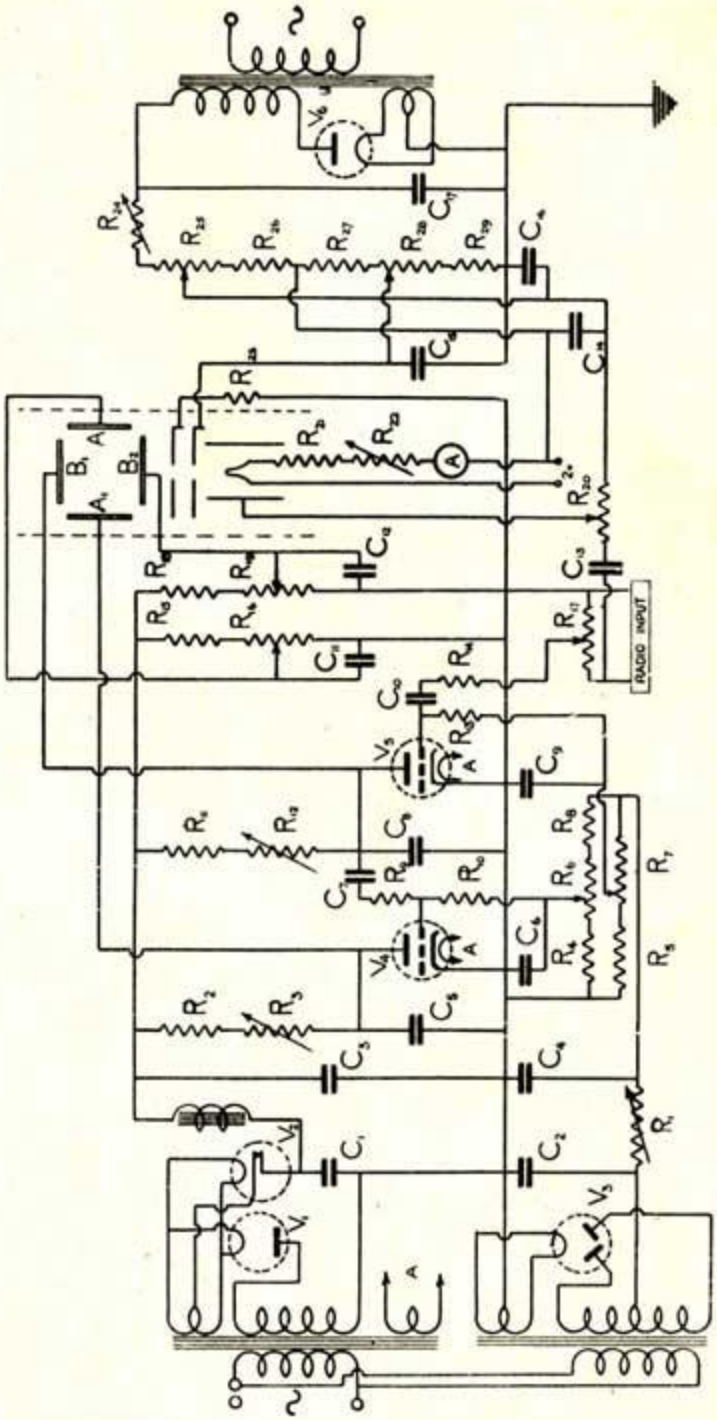
There are no moving parts of a mechanical nature.

The multi-line screen is produced by a combination of two linear time-base circuits shown on pages 106 and 107. The modulating signal is applied to the shield of the tube. Only about 10 volts is required for full modulation.

The output stage of the receiver need consist therefore of nothing more elaborate than a small power valve, and good results are assured if the signal is loud headphone strength.

This circuit is suitable for 30-line television reception and is only intended as a basis for the development of a high definition system.

C1 C3	=	4 mfd.		R5	=	250,000
C2	=	8 mfd.		R6	=	30,000
C4	=	50 mfd.	100v. wkg.	R7	=	30,000
C5	=	·25 mfd.	800v. wkg.	R8	=	25,000
C6	=	1 mfd.		R9	=	1 meg.
C7	=	·01 mfd.		R10	=	5,000
C8	=	·01 mfd.	800v. wkg.	R11	=	·3 meg.
C9	=	1 mfd.		R12	=	1 meg.
C10	=	·1 mfd.		R13	=	10,000
C11	=	·1 mfd.		R14	=	30,000
C12	=	·1 mfd.		R15	=	2 meg.
C13	=	·1 mfd.	1000v. wkg.	R16	=	2 meg.
C14	=	2 mfd.	500v. wkg.	R17	=	30,000
C15	=	1 mfd.	2,000v. wkg.	R18	=	1 meg.
C16	=	1 mfd.	2,000v. wkg.	R19	=	2 meg.
C17	=	1 mfd.	2,000v. wkg.	R20	=	30,000
V1	=	Ediswan MU.1		R21	=	1 ohm.
V2	=	Ediswan D.L.S.1		R22	=	½ ohm.
V3	=	Mazda UU.3		R23	=	20,000
V4 & V5	=	Ediswan MR/AC.1's		R24	=	2 meg.
V6	=	Ediswan MU.2		R25	=	100,000
R1	=	100,000		R26	=	10,000
R2	=	·7 meg.		R27	=	700,000
R3	=	1 meg.		R28	=	½ meg.
R4	=	50,000		R29	=	1 meg.



EDISWAN

Courtesy of Keith W