Melbourne Technical College.

CATHODE RAY OSCILLOGRAPH (A.W.A. TYPE R.6673).

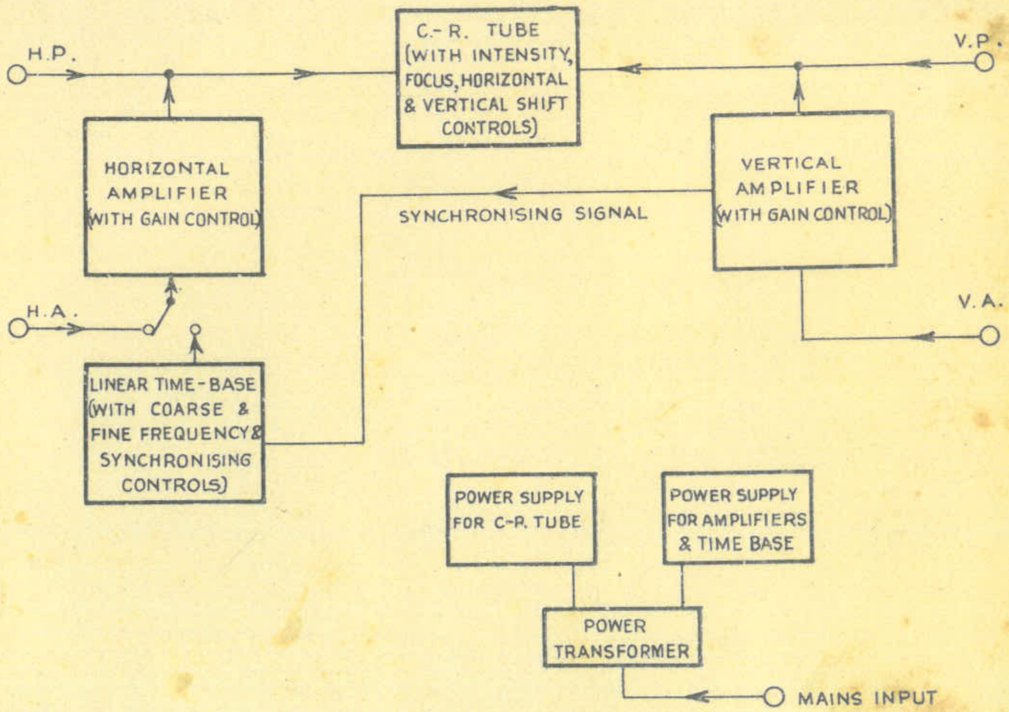


Fig. 1 - Block Schematic.

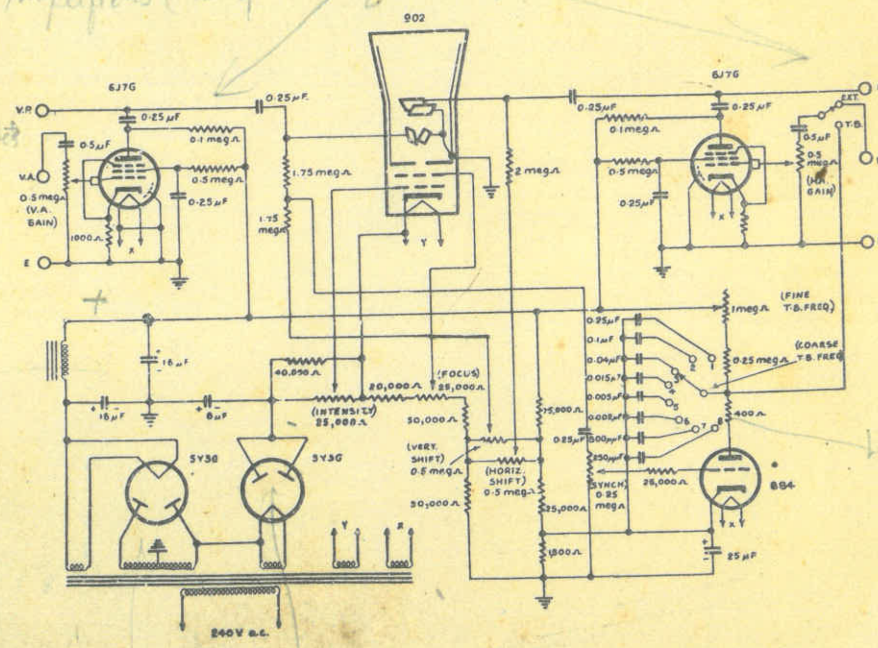


Fig. 2 - Circuit Diagram.

The Melbourne Technical College.

CATHODE RAY TUBE PRINCIPLES.

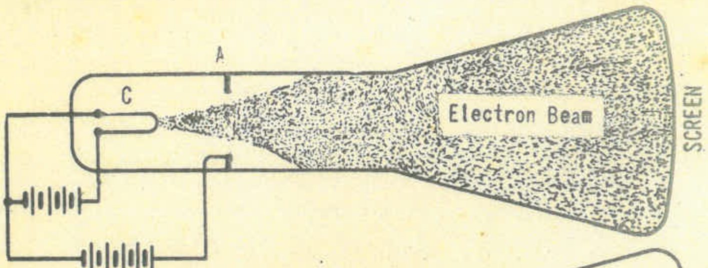


Fig. 1.
Simple cathode Ray Tube showing how the cathode electron stream travelling at high speed passes the anode and hits the end of the tube. The impact of the electrons causes the zinc silicate covering to glow uniformly.

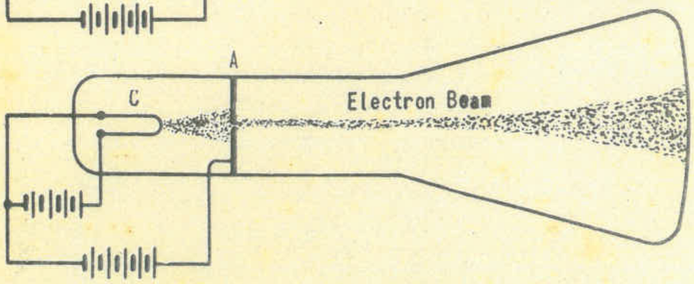


Fig. 2.
By placing only a small hole in the anode a thin stream only can pass to the end of the tube. The ray diverges because of mutual repulsion between the electrons in the stream.

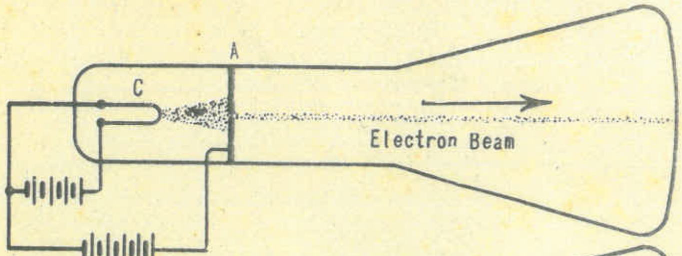


Fig. 3.
If a low pressure inert gas replaces the normal vacuum the beam is kept in a concentrated form and a small brilliant spot appears on the end of the tube.

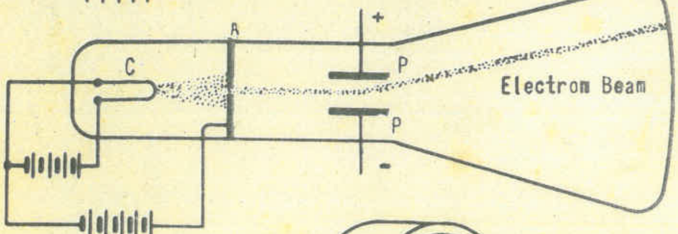


Fig. 4.
Bending of the cathode stream by charged metal plates. The positive plate pulls the beam up because of attraction, while the negative plate helps by repulsion.

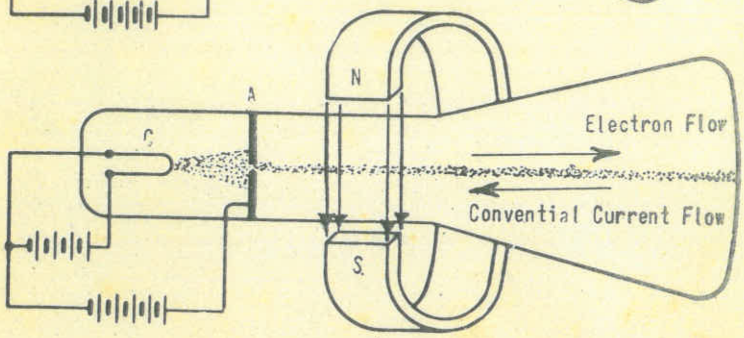
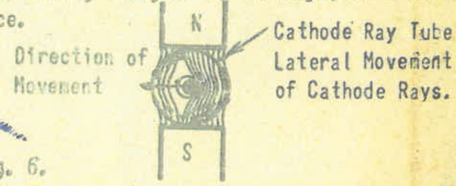


Fig. 5.
If a magnet is placed as shown the cathode stream is forced out sideways toward the reader, i.e. out from the page. The cathode stream always moves at right angles to the magnetic lines of force.



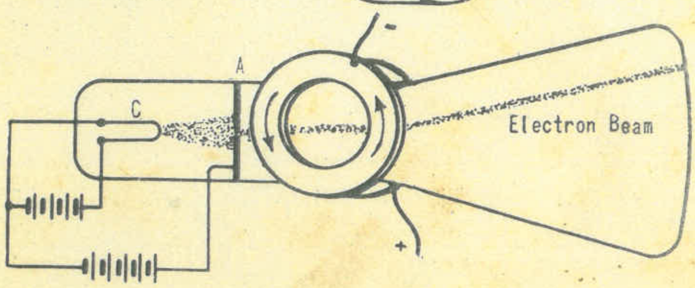


Fig. 6.
If the permanent magnet is replaced by an electro-magnet and its coils are arranged as shown, the cathode stream is forced upwards.
Compare this diagram with the previous one.

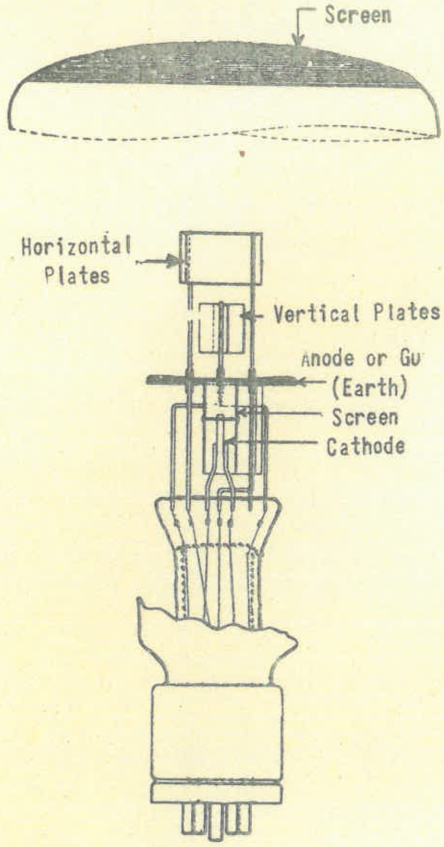


Fig. 7 - Electrode Assembly of a gas filled or soft tube Western Electric or Standard Telephones Pattern.

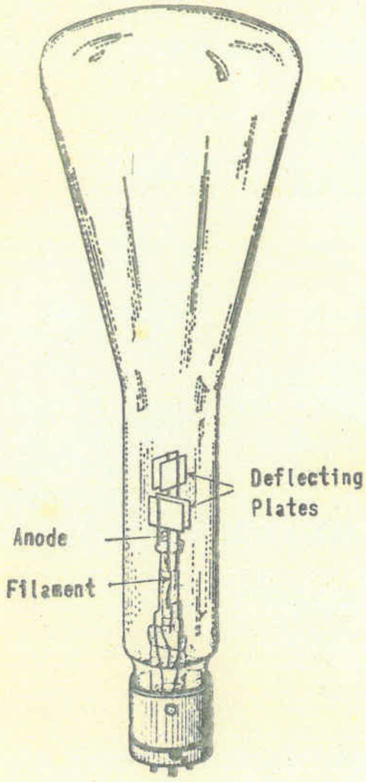


Fig. 8 - Arranged for Electrostic Deflections.

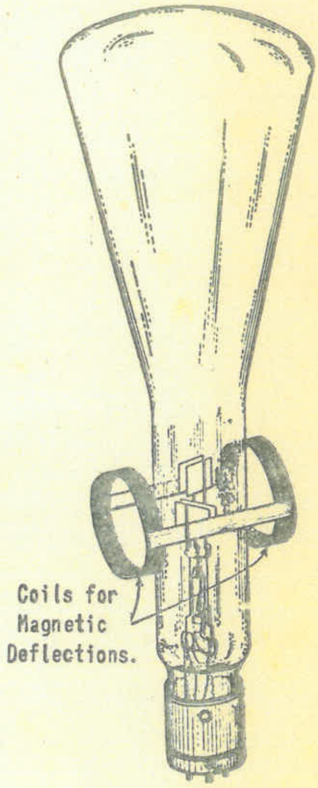


Fig. 9 - Arranged for Electromagnetic Deflections.

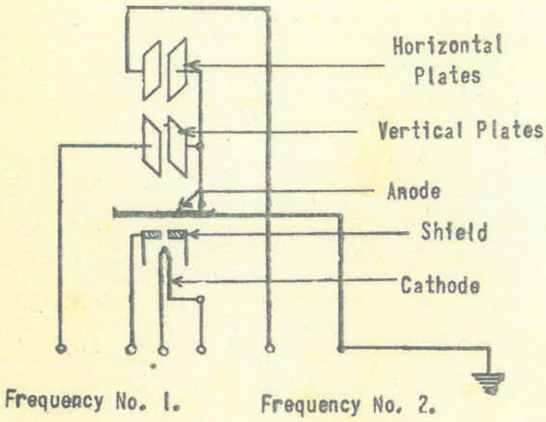


Fig. 10 - Theoretical Element Assembly of Cathode Ray Tube shown above.

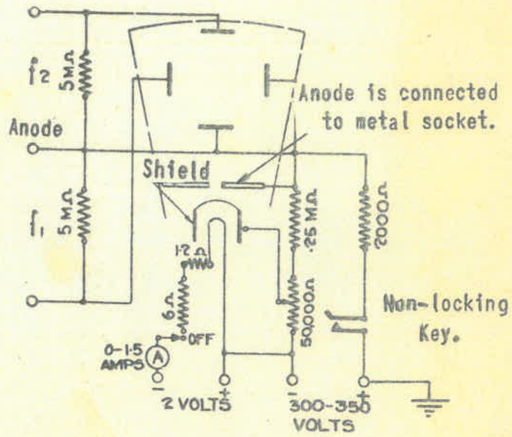


Fig. 11 - Circuit Diagram for Typical Gas filled or soft Cathode Ray Tube.

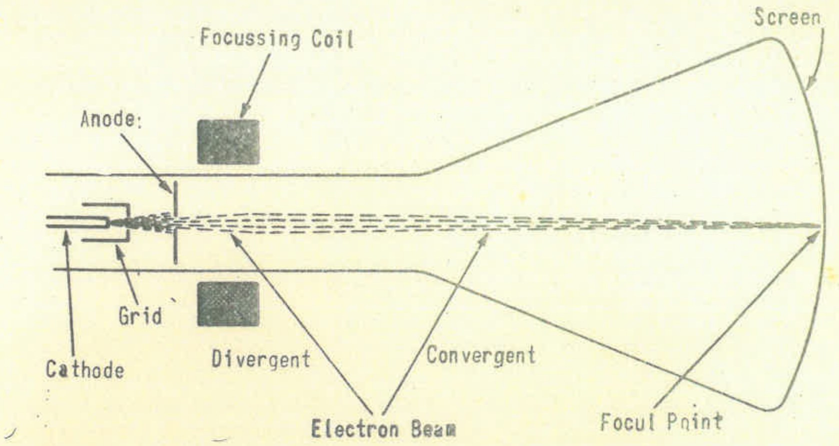


Fig. 12 - Focussing Coil Method of preventing the mutual repulsion effect from diverging the cathode electron stream.

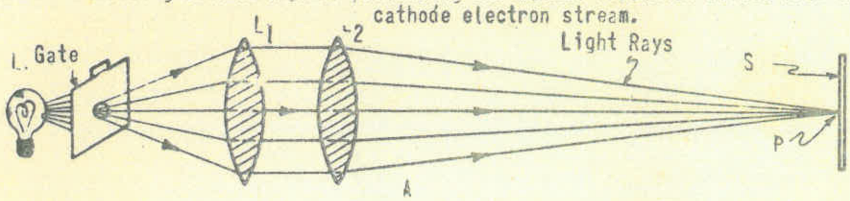


Fig. 13 - Focussing of a beam of light by means of biconvex lenses.

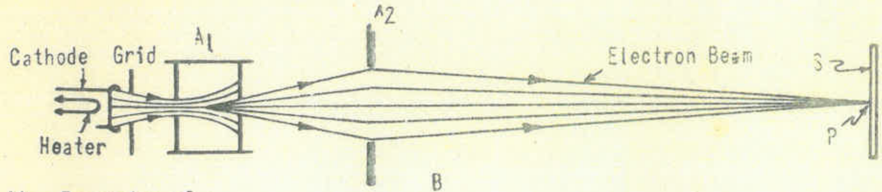


Fig. 14 - Focussing of a
Cathode electron stream by charged electrodes which converge the electron stream in exactly the smae manner as the lenses converge the light rays.

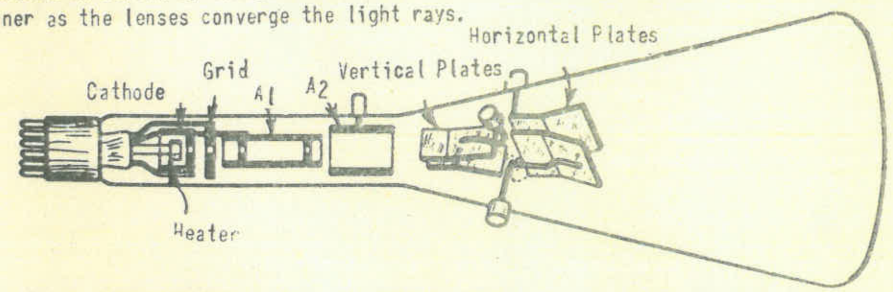


Fig. 15 - Typical High Voltage Vacuum Cathode Ray Tube showing disposition of the electrodes and electrostatic deflecting plates.

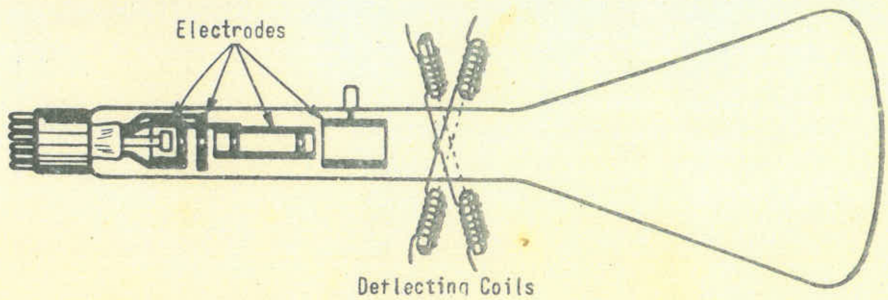


Fig. 16 - Arrangements used for electromagnetic deflection of the cathode electron stream.

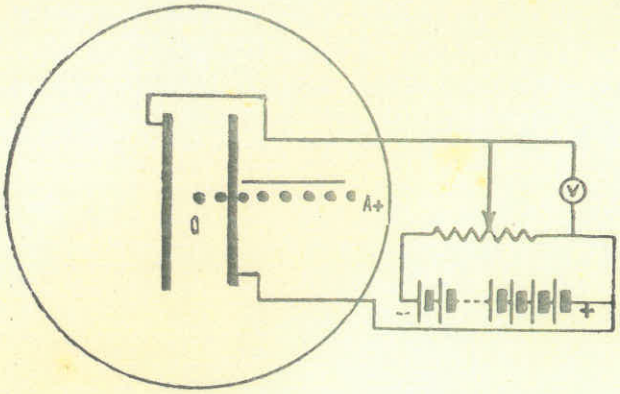


Fig. 17 -
Effect of placing varying D.C. Voltages on the horizontal deflection plates. The spot starts in the center with zero volts and moves to the right due to attraction from the + charge on the right plate and due to repulsion from the left plate.

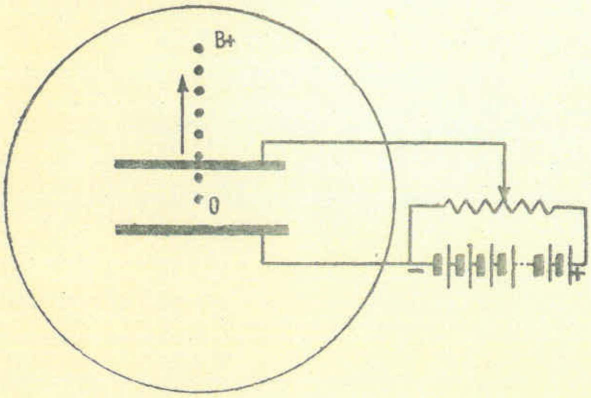


Fig. 18 -
Note that horizontal plates are vertical deflection plates. As in Fig. 17 the greater the operating potential on the plates the greater the movement from the center.

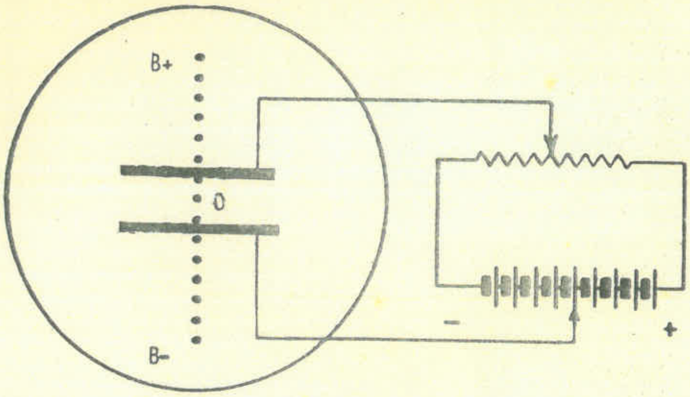


Fig. 19 -
Effect of using a center tapped potentiometer to change the potential on the individual plates from plus to minus maximum. The spot now moves over the extreme range of the face of the tube.

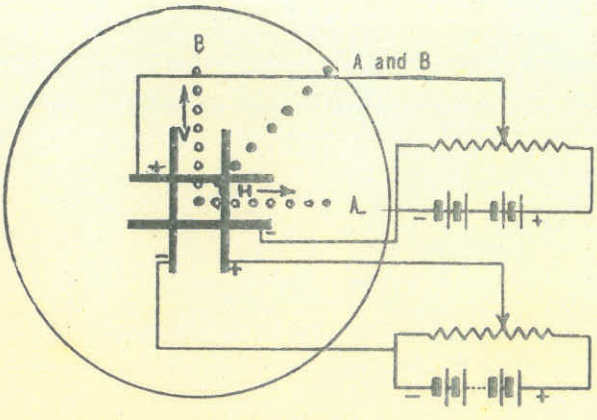


Fig. 20 -
Effect of placing equal potenials of varying amounts on the vertical and horizontal deflection plates. Taking Figs. 17 and 18 as examples, Fig. 20 gives the Vector result of the two when applied, simultaneously

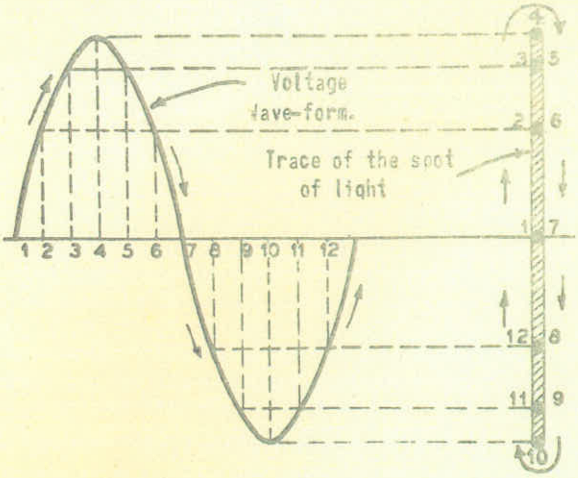


Fig. 21 -
The effect of A.C. when applied to the vertical deflection plates as previously shown with varying D.C. in Fig. 19.

The spot traverses the entire length of the screen if the peak voltage is sufficient and the result is a solid vertical line.

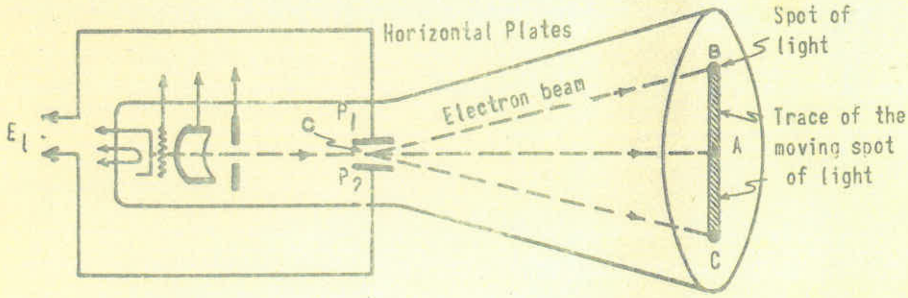


Fig. 22 - Resulting trace on the cathode ray tube screen if A.C. is applied to vertical deflection plates.

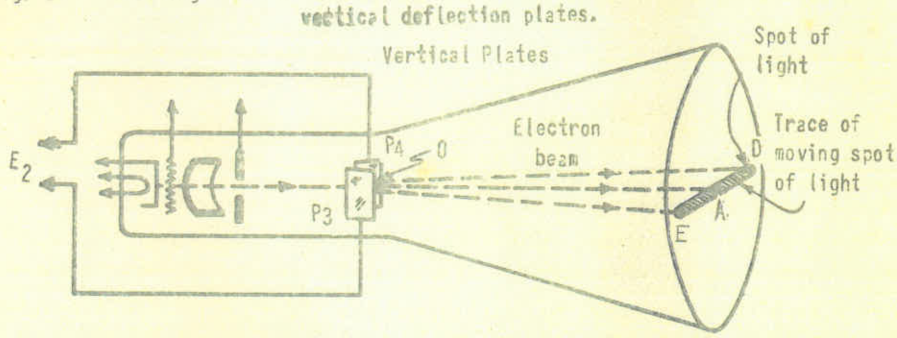


Fig. 23 - Resulting trace on the cathode ray tube screen if A.C. is applied to the horizontal deflection plates.

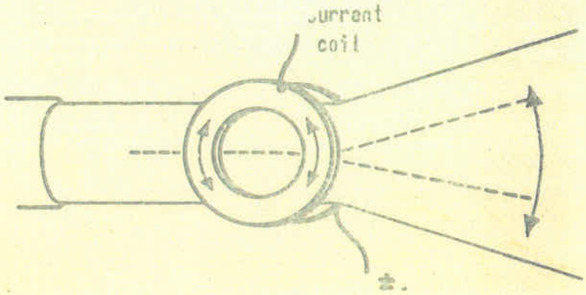


Fig. 24 -
Resulting trace on the cathode ray tube screen if a set of electromagnet coils similar to those in Fig. 6 are excited by A.C.

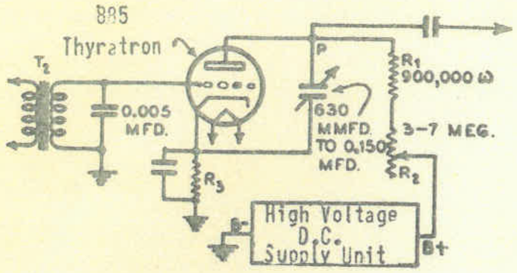


Fig. 41 - Gas Triode or "Thyratron" using a resistance instead of a saturated diode.

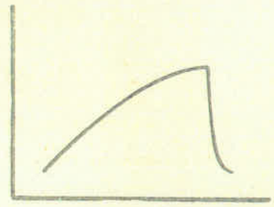


Fig. 42

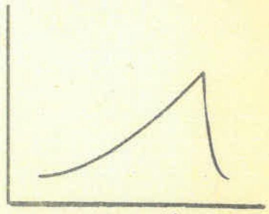


Fig. 44

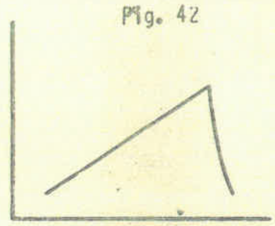


Fig. 42 - Exponential sweep curve caused by the use of a resistance instead of a diode.

Fig. 44 - Distorted wave produced by circuit of Fig. 43.

Fig. 45 - Resultant of waves of Fig. 42 and Fig. 44.

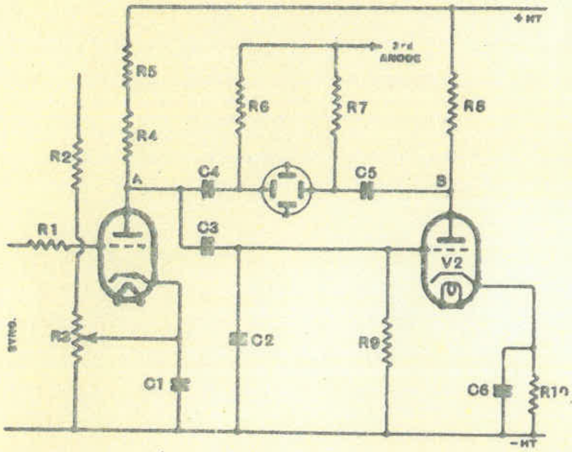


Fig. 43 - Sweep circuit with special distorting circuit wave shown in Fig. 44 to counteract Fig. 42. The result will be as in Fig. 45.

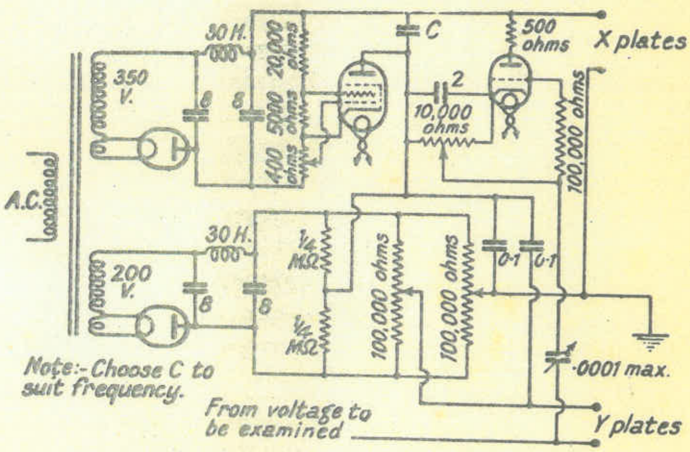


Fig. 46 - Linear sweep circuit using a pentode instead of a diode which is usually difficult to adjust

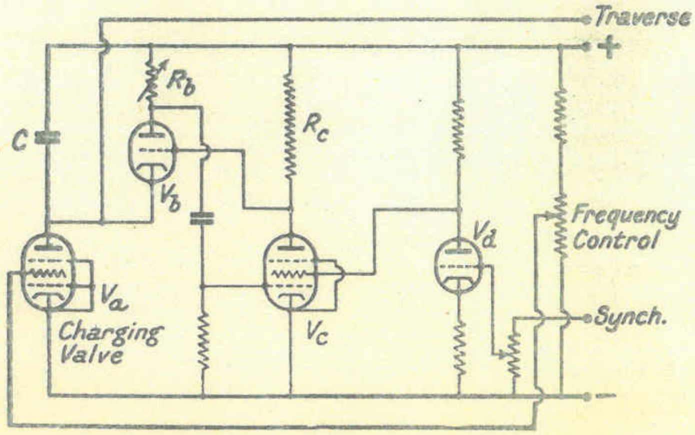


Fig. 47 - Special high speed linear sweep used when the speed is too great for gas triode to deionize. Hard valves are used throughout. Developed by O.S. Puckle of Cossor Laboratories.

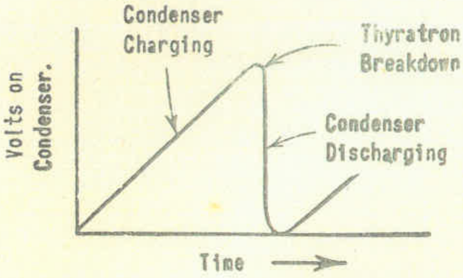


Fig. 36 - Sweep voltage developed by circuit of Fig. 34.

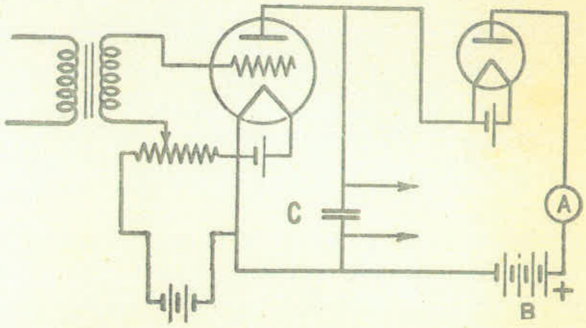


Fig. 34 - Circuit of a linear sweep using a gas triode or "Thyratron" valve in place of a neon tube and a diode as a variable resistance.

Fig. 37 - Effect of varying diode Internal Resistance.

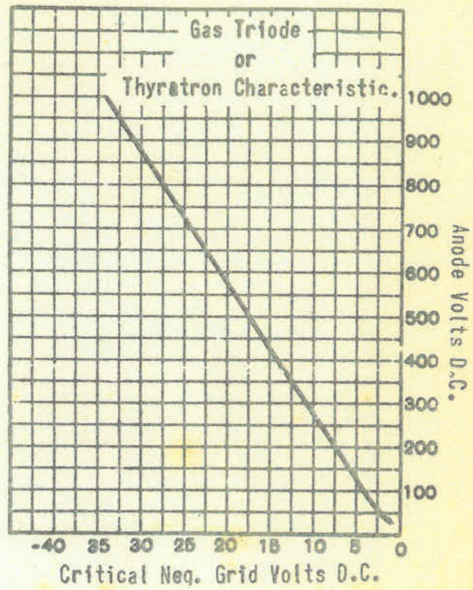


Fig. 35 - Characteristic operating curve of striking voltages in terms of grid bias voltages.

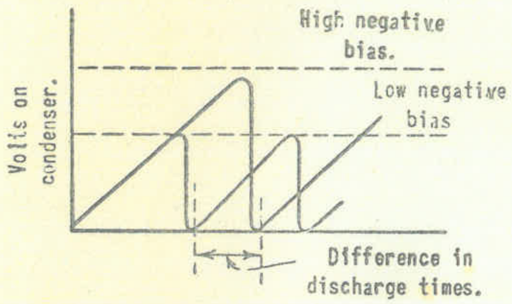


Fig. 38 - Effect of varying applied grid voltage to the gas triode.

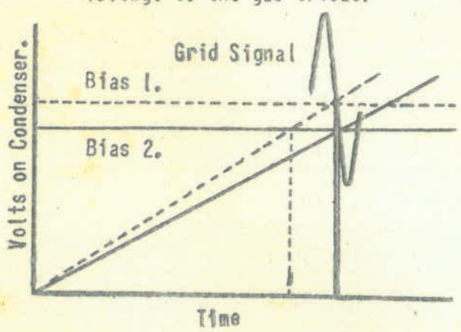


Fig. 39 - Effect of adding some signal voltage to the grid of the gas triode in Fig. 34. The time of operation is locked into sychronism with the signal to be observed and the trace remains steady on the screen.

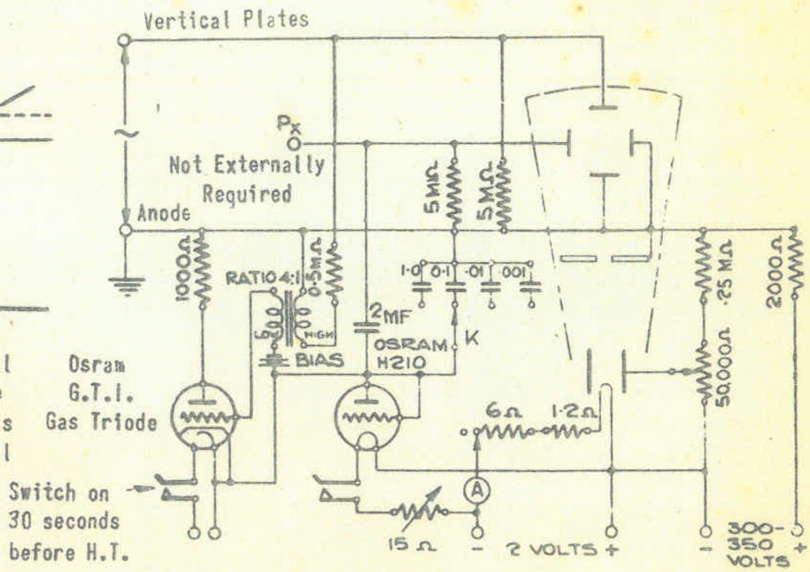
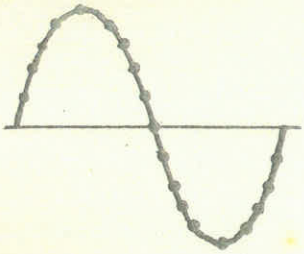


Fig. 40 - Complete low voltage cathode ray tube circuit and gas triode sweep.



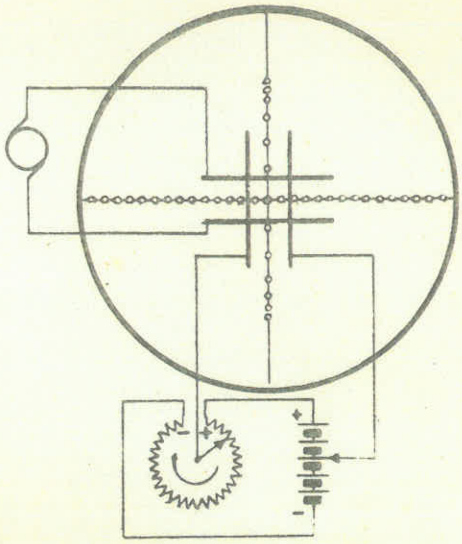


Fig. 28 - Step by step effect of separately varying the potential on the horizontal deflection plates in a linear manner from a center tapped potentiometer and the effect of the A.C. wave of Fig. 24 when applied to the vertical deflection plates.

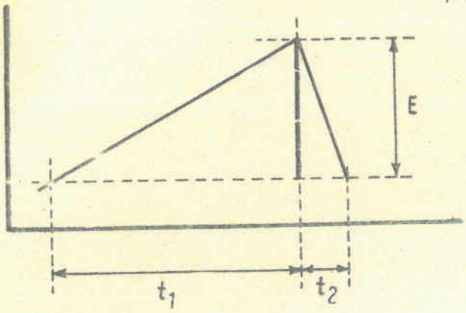


Fig. 30 - The so called mechanically produced "saw toothed" wave, produced by the potentiometer t_1 is the time required to move over the winding from + to — and t_2 is the time to jump from - to + . To start again t_2 should be as near to zero time as possible.

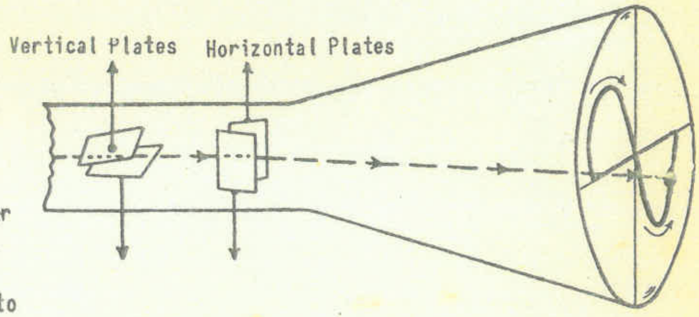


Fig. 29 - Resultant effect of simultaneously varying the potentials of Fig. 28 a cycle of A.C. is traced on the screen.

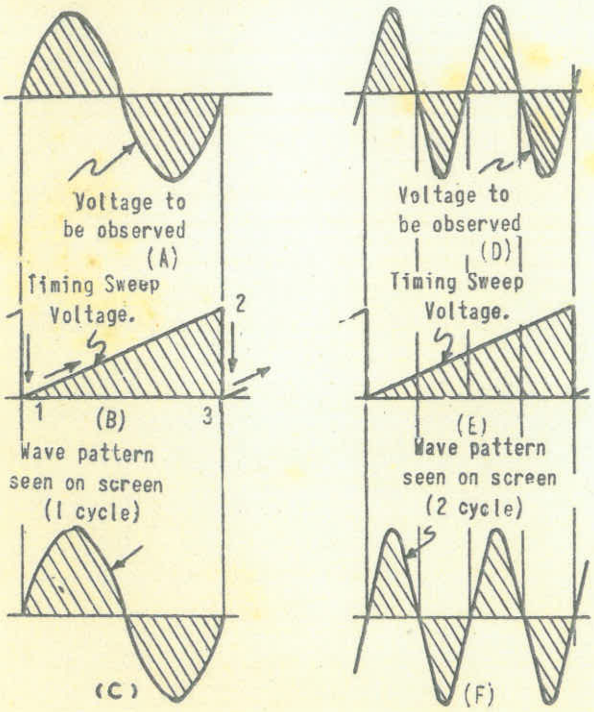


Fig. 31 - Sweep times to produce a single cycle wave and two waves.

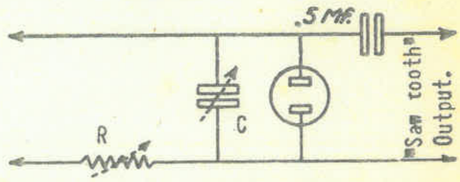


Fig. 32 - Electrically produced "saw toothed" sweep wave from a neon tube and condenser.

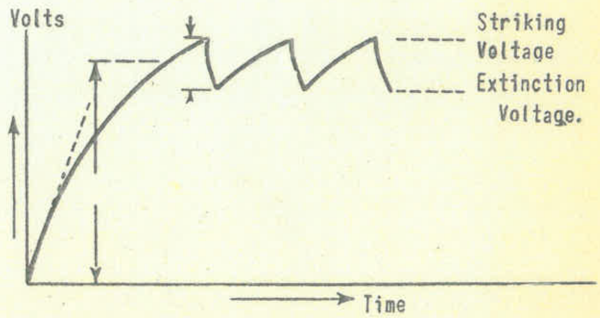


Fig. 33 - Characteristic operating curve of a neon sweep circuit.

CATHODE RAY TUBE DEFLECTIONS WITH A.C. ON ALL PLATES.

Fig. 25 - Effect of placing equal A.C. potentials on both the vertical and horizontal deflection plates. If the waves are of equal frequency and commence their positive or negative alternations together i.e. they are in phase;, the result will be a straight line. The action is an extension of the D.C. changes shown in Figs. 19 and 20.

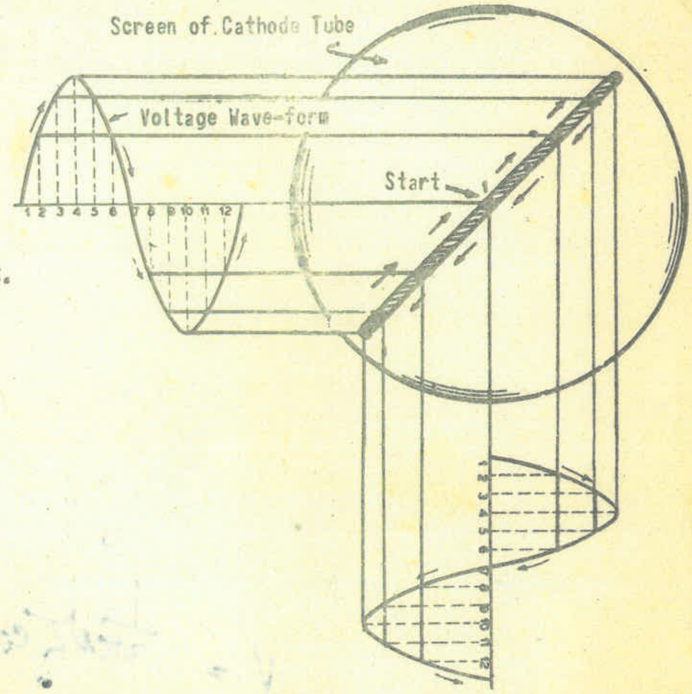
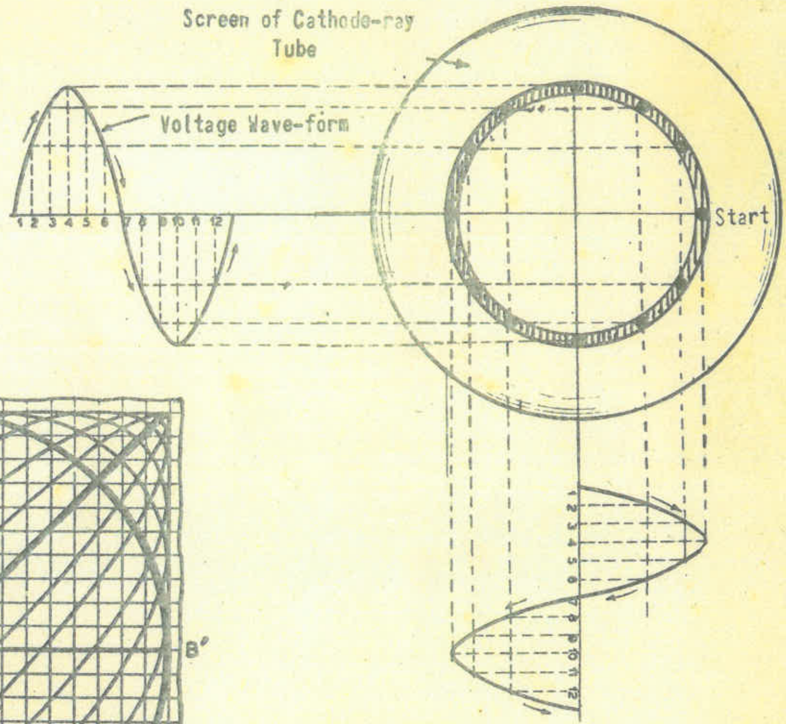


Fig. 26 - Effect of placing equal A.C. potentials on the plates as referred to in Fig. 25, but in this case the two A.C. potentials are out of phase to the extent that one wave commences one quarter of a cycle after the other. The result is a circular path of light.



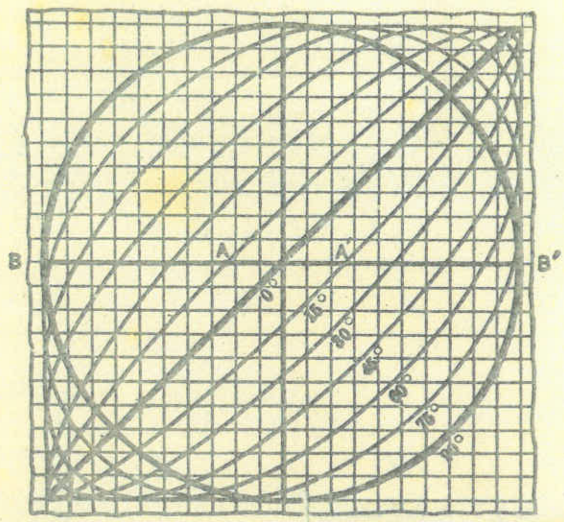
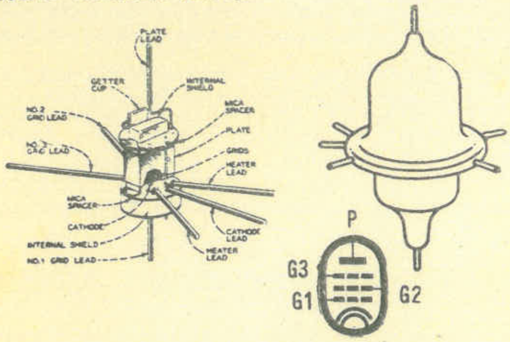
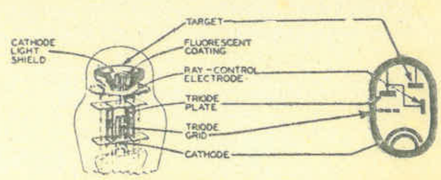


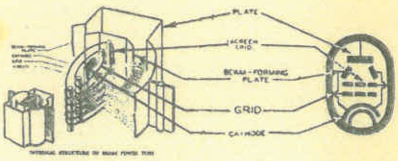
Fig. 27 - Effect of changing the phase relationship of the two waves between the inphase straight line and 90 degree out of phase circle. See Figs. 25 and 26.



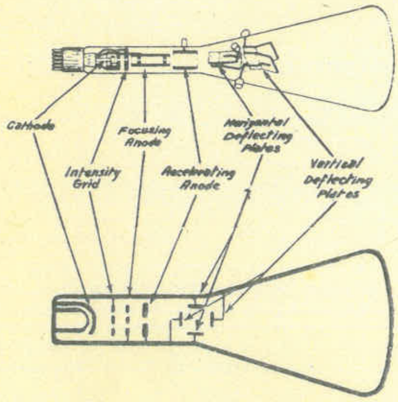
Ultra high frequency "Acorn" Pentode.



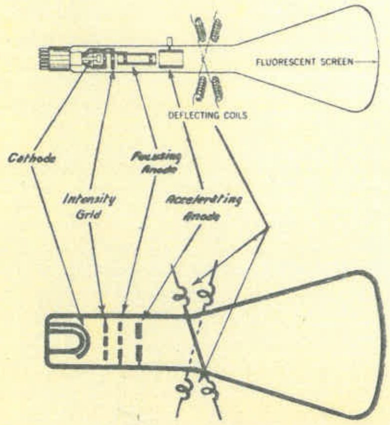
Cathode-ray tuning indicator



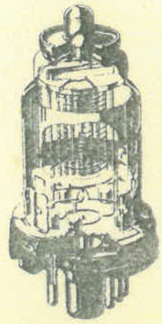
Internal structure of Beam Power Valve



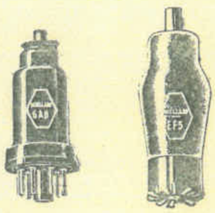
Cathode - ray Tube with symbol (Electrostatic Deflection)



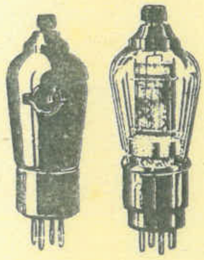
Cathode-Ray Tube with symbol (Magnetic Deflection)



Pentagrid Converter

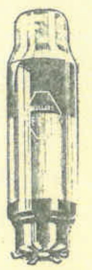


Variable - Mu Pentode

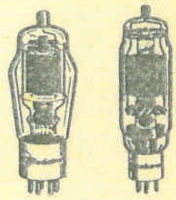


Tetrodes

Duo-diode Pentode

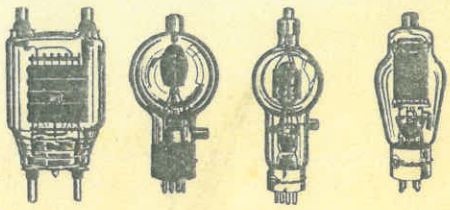


Power Pentode



Beam Tetrodes (High Power)

Pentode



High Power Ultra-High-Frequency Triodes.

"Triode" High Impedance