MON

NAVAL No. S400.
R.A.F. Form 619.

ROYAL AIR FORCE.

~~EXPERIMENTS.~~ RADIO

Notebook for use in Schools.

1947.

MR. GILBERTS.

~~MON AM 21~~
THURS - R 24 PM G
FRI - 25 P.M "

James R. Williams
3aR.

91/7993. Wt. 7465. 500,000. 5/45. P. & T.

EXPERIMENT. 24. The measurement of Choke input and condenser input power filters.

Apparatus Power Transformer. 350-0-350 Volts 100 m.A
5 Volts 2 Amps. 6.3 V. 3 Amps.
Valve rectifier to suit above.
Two 4 μF 500 Volt working condensers.
20 Henry smoothing choke.
25,000 ohm fixed resistor. 3 watt.
25,000 ohm variable resistor 3 watt.
Avometer.
Milliammeter 0-100 mA

Transferred to Experiment book

Method: I). Connect the apparatus as shown in the diagram below, taking care that the correct filament winding is connected to the rectifier valve.

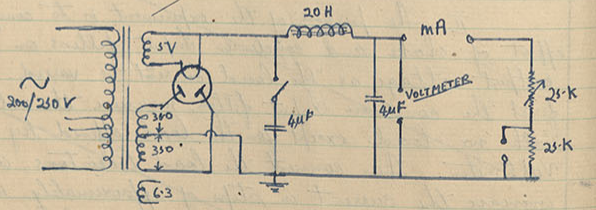
II The purpose of the experiment is to compare the effect of choke and condenser input filters on the output voltage as the load current is varied. Taking first the condenser input filter, measure the voltage with no load except for the load offered by the Voltmeter. Then connect the load resistors and increase the current in steps of approximately 10 m.A until the maximum current of 100 mA is reached. Note the output voltage at each increment.

III. Disconnect the filter condenser across the rectifier valve and repeat the procedure.

IV. Plot the data to show the output voltage as a function of the load current.

V. With no load on the supply, the voltage output is approximately the peak value of the 350 volt sine wave, on 350 x 1.41 = 490 Volts. This is true with either condenser or choke input filter.

6. Draw graphs from the above data, and deduce the reason why the condenser input filter gives a higher voltage output at low drain, and why the choke input filter produces a less variable characteristic.

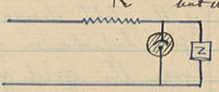


See Experiment Book for Conclusions

* The series Resistance R is fixed and an increase of current flow thro it the voltage drop would increase (IR) Voltage variation would only occur at this Rising ton but would be constant at the tube

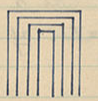
Voltage Stabalising

Neon Stabalisor



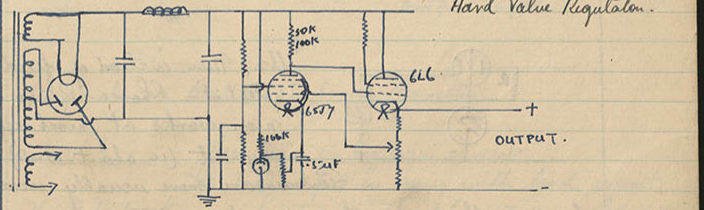
If a voltage is applied across the cct. it is found that the voltage increases until a certain voltage is reached at which the gas ionises. No current will flow through the NEON diode until critical voltage is reached. Any slight rise in voltage would increase ionisation thus decreasing the Resistance of the valve. the increase in current flow is proportional to the decrease in Resistance therefore voltage across the tube will be constant - *

Stabilovolt.



Series of bars arranged as shown in the diagram and enclosed in a Glass bulb with Helium and neon mixed - The striking voltage between each can is 70 Volts. Various voltages can be taped off.

Hard Valve Regulator.

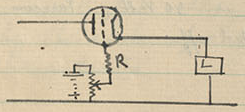


6L6 in series with H.T. Current - load in the cathode varying or fluctuating - Fed to grid of 6SJ7. Screen voltage reasonable constant with Potentiometer. Cathode Voltage stabalise by Neon Valve

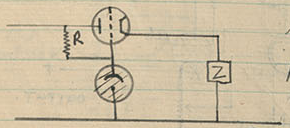
Function- Load current increases. Voltage at cathode of the 6L6 decreases. The grid of the 6SJ7 goes +ve The Impedance goes up. Therefore the voltage rises hence the grid of the 6L6 is made more +ve.

Hard Valve Regulator

Any valve (hard) has a variable resistance across it because of variation of V_g.



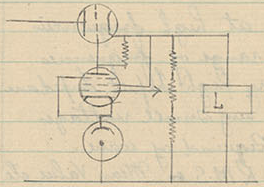
R is necessary to as to control grid current.



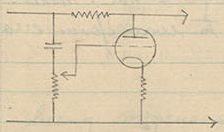
Use Neon instead of fixed potential - Choose R so that neon works at most efficient current (ie about 10mA)

Pentodes are more usually used because they are not as sensitive as Triodes -

Pentode Regulator ect.



Voltage Stabilisin on Anti-Jitter Valve.
Used in CRT Power Supplies
Does not control DC but smooths out ripple from D.C.
(Feed back Ripple cancelling output Ripple)



Amperite or Ballast Tube or Baretter

Iron wire in hydrogen envelope.
The tube is put in series with load current.
V_s input changes, heating of the filament iron changes hence it resistance in filament. Voltage drop across valve changes and hence keeps the load voltage constant

The Valve Volt Meter

Advantages:- Measures at high frequencies
Over wide range of frequencies
Has a very high Input Impedance
Measures very small voltages
Measure Required of wave.
ie Peak, R.M.S or Mean Value etc

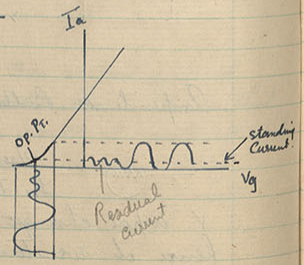
Disadvantages

Accuracy of calibration usually varies with change in valve characteristic H.T. Supply etc. Hence needs frequent re-calibration and is not usually so accurate as a D.C. M.C. Meter.
May be subject to wave form error.

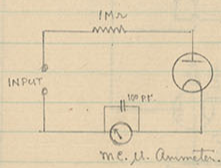
Value used as a detector

Anode Bend
or Diode

To measure not less than
1/4 Volt except by Amplification.



Simple diode Volt-Meter



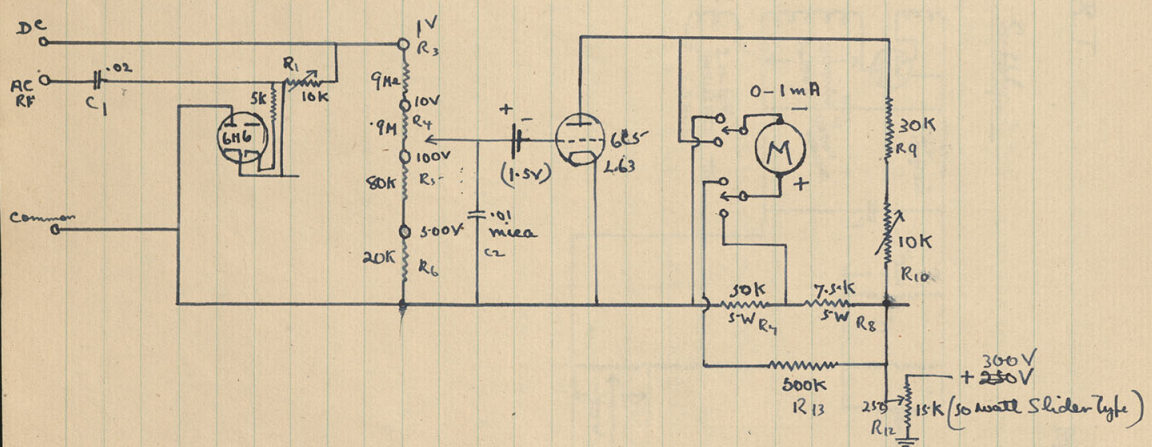
The anode current produced is dependant on the applied voltage the micro-ammeter is calibrated directly in Volt - The calibration holds good for all frequency ranges
Its advantange is that some Power is drawn from the source being measured.

SEE CENTRE PAGE

FOR.

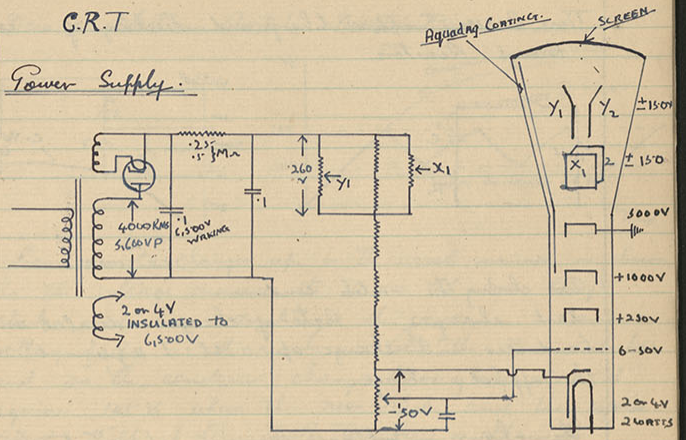
Mc MURDO SILVER. VALVE VOLT METER.

VALVE VOLT METER.

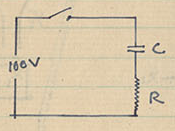


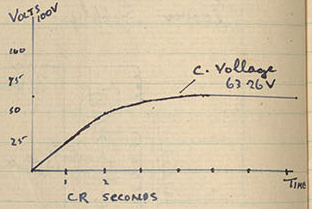
C.R.T

Power Supply.



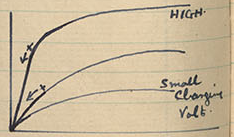
Time Bases Simple:- Charge and discharge of a condenser through Resistors.



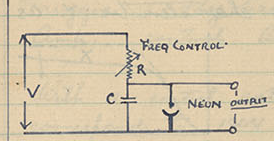


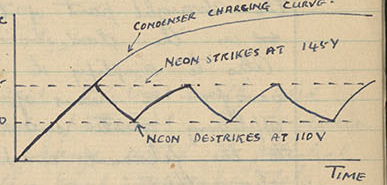
On closing the switch condenser starts charging. Rate of charge indicated on graph. Condenser will charge up until it aquires 63·26% of the applied voltage.

The charging voltage curve is exponential, but if the charging voltage is high a fairly straight line can be obtained. along which a time base can be operated.



Neon as Electronic Switch Neon Time Base





Condenser C. charges up in the usual manner as shown. As the voltage increases to 145·V the neon lamp strikes and hence discharges the condenser. Condenser voltage falls; as it reaches 110 Volts the Neon destrikes. and so the condenser charges up again until it aquires 145·V. when the neon strikes and the cycle repeats itself. (Saw Tooth Time base is obtained)

Disadvantages of Such Time Base.

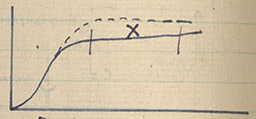
1. T.B. Small requires Amplification
2. Non Linear.
3. Fly back last too long. Slow freq.

The Variable Resistor R is used as a means of frequency control. Decrease would increase frequency. vice versa.

Condenser arrangement can also control frequency. With Variable Resistor Fine Frequency control is obtained. With condenser Coarse freq. Control.

To overcome non-linearity in the above "CR" combination. A Valve Diode or Pentode is used

instead of R. and the values are operated along the straight part of their characteristic X as ~~in~~ in the diode.

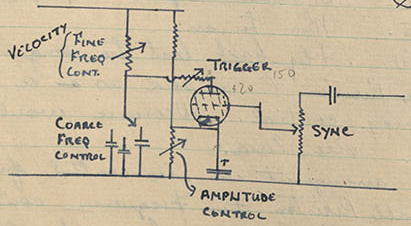


Also to amplify the wave form a means of applying greater current to the filament compensates. giving rise to the characteristic ------

The Pentode is usually used, and fine frequency control is obtained by varying the Screen Voltage.

Thyratron Time Base

Saw Tooth T.B.



Velocity control frequency.
Trigger " Fly back "
Amp. control Amplitude.

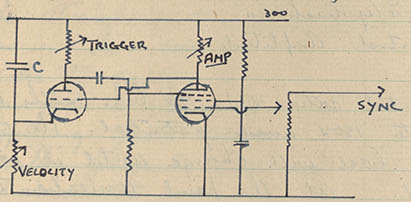
With a control ratio 20:1. 9V bias on the grid corresponds to 180V anode potential. The condenser of the time base will charge until its potential reaches 180 V. At this point ionisation takes place in the relay and the condenser discharges through it until it potential has fallen to below 20V when ionisation ceases and the discharge goes out. The range of voltage change across the condenser is 160V. To enable the travel of the beam to be accurately centered on the screen one of the plates is connected to a potentiometer across the H.T. supply (Known as the X shift).

The advantages of this T.B. with respect to the neon is as follows:-

(1) Greater Amplitude.
(2) Better control
(3) Ever more stable

Puckle's Time Base (Simple)

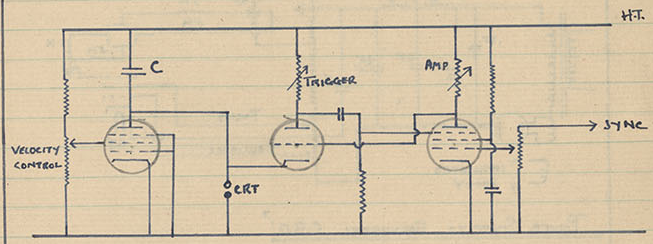
Negative going Saw Tooth



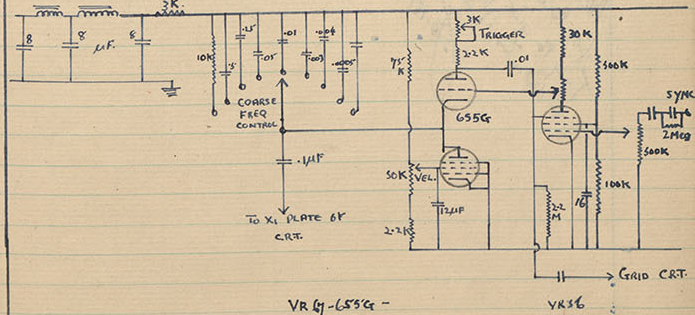
Pentode conducting;- voltage developed at the anode applied to the grid of the triode, as its cathode is at a high potential the triode fails to conduct. Condenser C charges causing the cathode to fall in potential at a point where the triode conducts. As the triode conducts it anode falls consequently the grid of the pentode falls causing a rise at it anode. A larger positive bias is now applied to the grid of the triode, heavyer current will flow. C discharges rapidly, bring the cathode again at H.T.. Triode cuts off. Pentode conducting - Operation repeat itself.

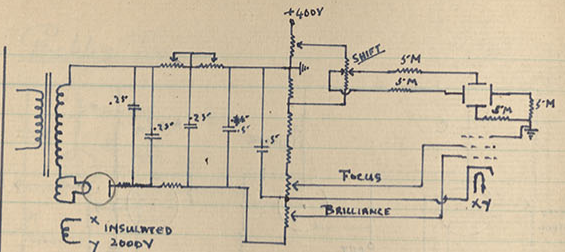
So as to ensure linear charging of C. Pentode is employed, and C is made to charge over the straight part of it characteristic.

The circuit now becomes :-



Puckle Time Base - as employed in Oscilloscope





Power Supply- Universal C.R.O.

Time Base. Universal C.R.O

Not many notes for this section. Try to give fuller description + details of circuits.

J.B. 18/7/47.

Mc Murdo Silver Valve Volt-Meter.