4.4 ELECTRON DIFFRACTION- G.P.Thomson Experiment

G.P.Thomson made investigations with high speed electrons, accelerated by a potential difference ranging from 10,000 to 50,000 volts and studied the electron diffraction effects.

Thomson found the diffraction patterns exactly an alogous to X-ray patterns.More over he was able to determine the wavelengths associated with electrons.

Experimental arrangement and working:

The experimental arrangement is shown in fig. It consists of a discharge tube in which the electrons are produced from the cathode C. The electrons are accelerated by potential upto 50,000 volts.

These accelerated electrons are passed through a slit S to obtain a fine beam of electrons.Then,they are allowed to fall on a very thin metallic film G of gold foil.

The thickness of the film is of the order of 10^{-6} cm.

The whole apparatus is exhausted to a high vacuum so that the electrons may not lose their energy in collision with the molecules of the gas.

The electron beam coming out of the foil is recorded the photographic plate P. After developing the plate, a symmetrical pattern of concentric rings about central spot diffraction pattern is obtained.This pattern is similar to pattern produced by x-rays.

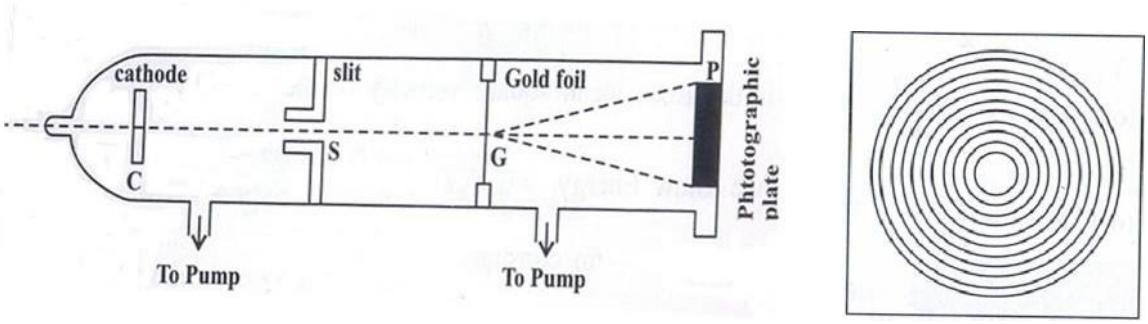

Fig-4.4.1- G.P.Thomson Experiment

The diffraction pattern can only be produced by waves and not by the particles. So Thomson concluded that electrons behaved like waves. He also calculated the associated wavelength of electrons.

It found that the wave length of electron depends only on the accelerating voltage and it is independent of the nature of the target material. Thomson's experiment led to the discovery of electron microscope.