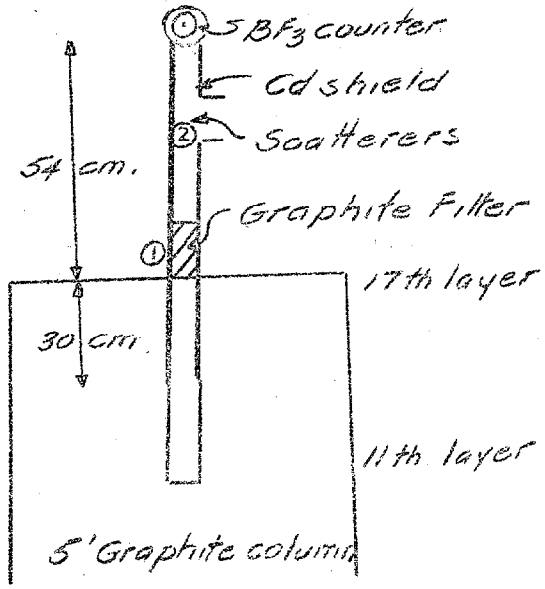
interference effects due to the crystal structure of graphite have a considerable effect on the diffusion of neutrons. A good beam geometry was set up in order to study the crystal effects in a more systematic way. The geometry is shown in Figure 1. Measurements were made of the total cross section of various substances placed either at position 2 or 3 in the beam with and without a graphite filter 23 cm long placed at position 1. The results are given in Table III. The first column gives the substances used, the second gives its thickness in grams per cm^2, the third and fourth column give the logarithms of the transmission and the total cross section in units of 10^{-24} cm^2 per atom, respectively, as measured without anything in position 1, while columns five and six give these quantities for neutrons which have been filtered through 23 cm of graphite. With the filter the absorption coefficient in boron (pyrex) increased by a factor of 3.5. This corresponds to a reduction in energy by a factor of 12.4 for the neutrons which emerge from the graphite filter. Such low energy neutrons are transmitted through the filter because their wave length is larger than the lattice spacing in graphite crystals. Destructive interference occurs for all directions except the straight-through direction, and consequently the only scattering which occurs is due to imperfections in the crystals. Since graphite is a polycrystalline material, Bragg reflection scatters all neutrons whose wave length is smaller than the lattice spacing. Thus the scattering cross section for unfiltered neutrons is 4.05B* while for the filtered neutrons the value was 0.70B. A similar effect was observed for Be.



*B = 10^{-24} cm^2.