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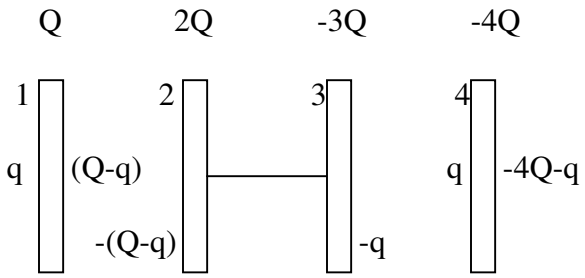
Problem (52)



The charges on the plates can be shown in the figure.

Since the plates 2 and 3 are joined, hence they have no charges on the joined portion.

Total charge on plates 2 and 3 is –Q.

Electric field inside all the plates is zero.

Considering plate 1,

$$\frac{q}{2\epsilon_0}=\frac{Q-q}{2\epsilon_0}+\frac{-(Q-q)}{2\epsilon_0}+\frac{-q}{2\epsilon_0}+\frac{q}{2\epsilon_0}+\frac{-4Q-q}{2\epsilon_0}$$
$$\Rightarrow q=-4Q-q$$
$$\Rightarrow 2q=-4Q$$
$$\Rightarrow q=-2Q$$

$\therefore$ Charge on the plate 3 = -q = 2Q

Hence charge flown through the wire = 5Q