The galvanometer can be used in a number of ways

1. **AS A DETECTOR:** To check if a current is flowing in the circuit. We have come across this usage in the Wheatstone’s bridge arrangement. In this usage the neutral position of the pointer (when no current is flowing through the galvanometer) is in the middle of the scale and not at the left end Depending on the direction of the current, the pointer deflection is either to the right or the left.

2. **AS AN AMMETER:** The galvanometer cannot as such be used as an ammeter to measure the value of the current in a given circuit. This is for two reasons: (i) Galvanometer is a very sensitive device; it gives a full-scale deflection for a current of the order of \( \mu A \). (ii) For measuring currents, the galvanometer has to be connected in series, and as it has a large resistance, this will change the value of the current in the circuit. To overcome these difficulties, one attaches a small resistance \( r_s \), called shunt resistance, in parallel with the galvanometer coil; so that most of the current passes through the shunt. The resistance of this arrangement is,

\[
R_G r_s / (R_G + r_s) = r_s \quad \text{if} \quad R_G \gg r_s
\]

If \( r_s \) has small value, in relation to the resistance of the rest of the circuit \( R_c \), the effect of introducing the measuring instrument is also small and negligible.

**Current Sensitivity** of the galvanometer as the deflection per unit current. This current sensitivity is,

\[
\Phi/I = NAB/k
\]

A convenient way for the manufacturer to increase the sensitivity is to increase the number of turns \( N \).

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3. **AS A VOLTMETER**: as a voltmeter to measure the voltage across a given section of the circuit. For this it must be connected *in parallel* with that section of the circuit. Further, it must draw a very small current; otherwise the voltage measurement will disturb the original set up by an amount which is very large. Usually we like to keep the disturbance due to the measuring device below one per cent. To ensure this, a large resistance $R$ is connected *in series* with the galvanometer. This arrangement is schematically depicted in Fig.4.26. Note that the resistance of the voltmeter is now, 

$$RG + R = R: \quad \text{large}$$

The scale of the voltmeter is calibrated to read off the voltage value with ease.

**voltage sensitivity as the deflection per unit voltage.**

$$\frac{\phi}{V} = \left( \frac{NAB}{k} \right) \frac{I}{V} = \left( \frac{NAB}{k} \right) \frac{1}{R}$$