A resistance r_b is then unplugged, so as to give a suitable deflection, after which the measuring apparatus is disconnected and

Fig. 96.

attached to a standard cell, when a resistance r_b' is found, by trial, such that the deflection is the same as before. Evidently the current, which flowed through the galvanometer in the first case, is equal to the current flowing in the second case; hence, if $p_a'-p_b'$ be the difference of potential between the points A and B, whilst the measuring apparatus is connected, and P' the E. M. F. of the standard cell.

$$\frac{r}{r+r_b+g}\cdot\frac{p_a-p_b}{\frac{r(r_b+g)}{r+r_b+g}}=\frac{P'}{r'_b+g+\rho'}$$

or

$$p'_a-p'_b=\frac{r_b+g}{r'_b+g+\rho}.P' \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(a)$$

228. It will be observed that the introduction of the measuring apparatus alters the resistance of the circuit, and this will affect the difference of potential between A and B. A correction must therefore be applied, as follows: Let R be the total resistance in the circuit, and r the resistance between A and B, before the introduction of the measuring apparatus, then

$$p_a-p_b=rC=\frac{r}{R}.P \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(b)$$

Now, when the measuring apparatus is connected, as a loop, to to the points A and B, the resistance between these points will no longer be r, but becomes $\frac{r(r_b+g)}{r+r_b+g}$, and the current is altered to

$$C'=\frac{P}{R+\left\{\frac{r(r_b+g)}{(r+r_b+g}-r\right\}}$$

and hence

$$p_a'-p_b'=\frac{r(r_b+g)}{r+r_b+g}.C'$$

$$=\frac{r(r_b+g)}{r+r_b+g}\cdot\frac{P}{R+\left\{\frac{r(r_b+g)}{(r+r_b+g}-r\right\}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(c)$$