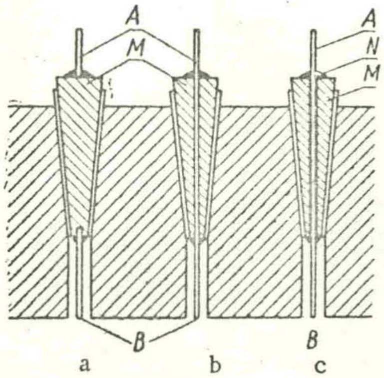

Fig. 1

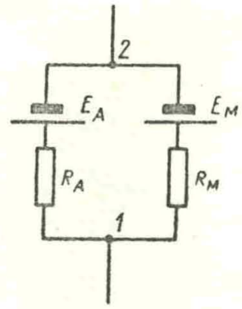

Fig. 2

Fig. 1. Three types of fittings for feeding the branches of a thermocouple into a high pressure chamber: a) cone with soldered lead at each end; b) cone with lead pressed in and soldered at both ends; c) cone with lead soldered in over its entire length of contact.

Fig. 2. Equivalent electrical circuit for the case of feed-in of a branch of a thermocouple using the fitting shown in Fig. 1b (see text).

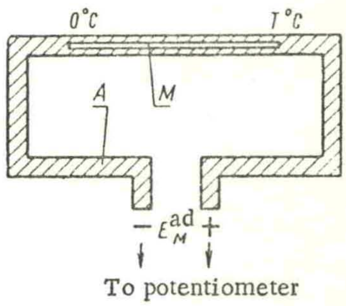

Fig. 3. Basic thermoelectric circuit layout used to verify Eq. (4). The signs of the terminals correspond to what was observed in the experiment.

longitudinal resistance of the conical fitting M, and

$E_M = \int_{T_1}^{T_2} \alpha_M d\tau$, where α_M is the coefficient of thermo-emf of the material M.

The total thermo-emf generated over the section between 1 and 2, E_{1-2}, will be equal to

$$E_{1-2} = \frac{R_A}{R_A + R_M} E_M + \frac{R_M}{R_A + R_M} E_A. \tag{3}$$

Then the additional component of the thermo-emf from this section E^{ad}_A is found to be

$$E_A^{ad} = E_{1-2} - E_A = -\frac{R_A}{R_A + R_M}(E_A - E_M). \tag{4}$$

Using the last equation, one can write an expression for the true value of the thermo-emf of a thermocouple A-B in the case examined, namely:

$$E_{AB}^{true} = E_{AB}^{m} + \frac{R_A}{R_A + R_M}(E_A - E_M) - \frac{R_B}{R_B + R_M}(F_B - E_M). \tag{5}$$

Since

$$R_A \gg R_M \text{ and } R_B \gg R_M, \tag{6}$$

Eq. (5) simplifies, and we obtain

$$E_{AB}^{true} = E_{AB}^{m} + (E_A - E_B). \tag{7}$$

The latter indicates that when the inequality (6) is taken into account, the problem being examined is, in fact, in no way different from the case we already discussed – where the branches of a thermocouple were fed in using the fitting shown in Fig. 1a – and E^{true}_{AB} is found by use of Eq. (2).