to an intermediate one and disappears entirely in the free-molecular mode. This is confirmed by a comparative analysis of experimental data on isothermal Poiseuille flow and thermomolecular pressure.

**NOTATION**

Here $N_K$ is the Knudsen number; $\gamma$, the universal exponent of thermomolecular pressure; $R_0$, the radius of a cylindrical capillary; $P$, the pressure; $T$, the temperature; $v$, the logarithmic pressure gradient; $\tau$, the logarithmic temperature gradient; $U$, the macroscopic gas velocity; $q$, the thermal flux density; $T$, the gas rarefaction index; $l$, the length of the mean free path; $I_N$, the numerical mean-over-the-section gas flux; $I_q$, the mean-over-the-section thermal flux; and $\alpha$, the tangential-momentum accommodation coefficient.

**LITERATURE CITED**


**MEASUREMENT OF NONSTATIONARY HEAT FLUXES BY "AUXILIARY WALL" SENSORS**

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Computational dependences are obtained to determine the nonstationary heat flux by using sensors executing the method of an auxiliary wall. The dependences are valid for an arbitrary relationship between the thermophysical properties of the sensor and the object on which it is located.

The peculiarities of measuring nonstationary heat fluxes by heat meters executing the method of an auxiliary wall are considered in [1]. A number of dependences is presented to determine the flux $q(t)$ of heat meters located on the surface of a semi-infinite body for particular values of the thermophysical properties of the heat meter and the base, defined by the magnitude of the criterion $\kappa = (\lambda_2/\lambda_1)(\alpha_1/\alpha_2) = 0; 1.0; \infty$. A solution of the problem is presented below for any values of $\kappa$. As in [1], the model of the heat meter is represented in the form of a plate located on a half-space (sketch). The temperature fields of the heat meter $t_1(x, \tau)$ and the base $t_2(x, \tau)$ are described by the equations

$$\frac{\partial t_i}{\partial \tau} = a_i \left( \frac{\partial^2 t_i}{\partial x^2} \right), \ i = 1, 2. \tag{1}$$

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The surface \( x = -\delta \) absorbs the heat flux

\[ q(t) = -\lambda_1 \frac{\partial t_1}{\partial x} \bigg|_{x=-\delta}, \tag{2} \]

whose magnitude must be determined. Other boundary conditions have the following form:

\[ \frac{\partial t_1}{\partial x} \bigg|_{x=0} = 0, \text{ or } t_1 |_{x=0} = \text{const}, \tag{3} \]

\[ \lambda_1 \frac{\partial t_1}{\partial x} \bigg|_{x=0} = \lambda_2 \frac{\partial t_2}{\partial x} \bigg|_{x=0}, \quad t_1 |_{x=0} = t_2 |_{x=0}, \]

\[ t_1 |_{t=t_0} = t_{w_1}, \quad t = 1; 2. \]

Let us note that the following are assumed in formulating and solving the problem: the thermophysical properties are independent of the temperature and an ideal thermal contact holds between bodies 1 and 2.

The solution of the problem formulated in the form of transforms can be written as [1]

\[ \Delta \theta (s) = Y_q (s) Q (s), \tag{4} \]

\[ Y_q (s) = \frac{V a_1}{\lambda_1} \left( \frac{\text{ch} \sqrt{\frac{s}{a_1}} \delta + \chi \text{sh} \sqrt{\frac{s}{a_1}} \delta - 1}{\text{sh} \sqrt{\frac{s}{a_1}} \delta + \chi \text{ch} \sqrt{\frac{s}{a_1}} \delta} \right) \tag{5} \]

from which the transform of the desired flux is

\[ Q (s) = \frac{1}{Y_q (s)} \cdot \Delta \theta (s). \tag{6} \]

Analyzing (6) it is easy to show that \( 1/Y_q (s) \) is of the order of \( \sqrt{s} \) and hence, additional manipulations presented in [1] are necessary.

Consequently, it is established that the form of the function \( \phi (\xi) \) which is the original of the expression

\[ F(s) = \frac{1}{s Y_q (s)} = \frac{\lambda_1}{V a_1} \frac{\text{sh} A \sqrt{s} + \chi \text{ch} A \sqrt{s}}{\text{sh} \sqrt{\frac{s}{a_1}} \left( \chi \text{sh} A \sqrt{s} + \text{ch} A \sqrt{s} - 1 \right)}, \tag{7} \]

\[ A = \frac{\delta}{V a_1}, \quad \chi = \frac{\lambda_2}{\lambda_1} \sqrt{\frac{a_1}{a_2}}, \]

must be found to solve the problem.

Furthermore, to determine the flux, the dependence can be used [1]:

\[ q(t) = \int_0^T \phi (\tau - \xi) \frac{d [\Delta t (\xi)]}{d\xi} d\xi. \tag{8} \]

The derivative of the temperature drop, which can result in substantial errors in a practical