efficients at the open side surfaces of the fins and the ends of the distance pieces, at the ends of the fins; λ_o, λ_f, λ_d, thermal conductivities of the heat carrier, fin material, and distance-piece material;

$$m^2 = 2\alpha_0/\Delta\lambda_f;\ m_{f1}^2 = 2/r_c\Delta\lambda_f;\ m_d^2 = 2/r_c\delta\lambda_d;\ \omega = \Delta/\delta L;\ L = \lambda_d/\lambda_f;\ \mu = \sqrt{\omega};\ \rho = \sqrt{1+\omega};\ M = \sqrt{m_{f1}^2 + m_d^2};$$

$$\lambda_{ef} = (\Delta\lambda_f + \delta\lambda_d)/(\Delta + \delta);\ \beta_{ef} = \lambda_{ef}/\delta k;\ \beta_{c.f} = r_{c.f}\lambda_f/\delta;\ \beta_{c.d} = r_{c.d}\lambda_f/\delta;\ \beta_T = \lambda_f/\delta\alpha_T;$$

$$\beta_0 = \lambda_f/\delta\alpha_0;\ \beta_c = r_c\lambda_f/\delta;\ \theta = H/\delta;\ \eta = h/\delta;\ u = \beta_{c.f} + L\mu^2\beta_{c.d};\ \vartheta = \beta_{c.f} - L\beta_{c.d};\ x = \Phi\mu\sqrt{\beta_0 L/2} - \beta_0 L;\ z = \Phi\sqrt{\beta_0 L/2} + \beta_0 L\mu.$$

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DYNAMIC VISCOSITIES OF MIXTURES OF n-BUTYRALDEHYDE AND ISOBUTYRALDEHYDE OVER WIDE RANGES IN THE STATE PARAMETERS

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Dynamic-viscosity measurements are reported for liquid mixtures in the system formed by n-butyraldehyde and isobutyraldehyde.

The dynamic viscosity has been measured with an apparatus based on the capillary method involving the use of a viscometer designed by Golubev [1]. The viscosity has been measured over the temperature range 293-503°K and the pressure range 0.1-58.9 MPa. The basic viscometer parameters at room temperature were as follows: capillary radius 1.1×10^{-4} m and length 9.05×10^{-4} m, volume of measurement vessel 214.13×10^{-4} m^3. The geometrical dimensions of the viscometer were determined with an MIR microscope and KM-8 cathetometer by the method of [2].

TABLE 1. Dynamic Viscosities of Mixtures of n-Butyraldehyde and Isobutyraldehyde, $\eta \times 10^7$ Pa·sec

T, K	P, MPa							
	0,1	5,0	9,9	19,7	29,5	39,3	49,1	58,9
88% n-butyraldehyde+12% isobutyraldehyde								
293,51	23207,0	24200,0	25209,0	27211,5	29213,8	31216,0	33218,3	35220,5
317,08	17252,3	17998,2	18744,2	20236,2	21728	23220,1	24712,0	26204,0
333,89	14344,2	14985,7	15627,4	16910,9	18194,2	19477,5	20761,0	22044,2
364,90	—	11172,5	11702,0	12761,0	13820,0	14879,0	15938,0	16997,0
399,90	—	8407,4	8874,5	9808,8	10743,0	11677,3	12611,5	13545,8
434,52	—	6429,0	6866,3	7740,9	8615,6	9490,2	10364,8	11239,4
465,02	—	5159,2	5587,1	6443,1	7299,0	8155,0	9010,9	9866,8
483,05	—	4548,9	4976,2	5830,9	6685,6	7540,3	8395,0	9250,0
503,51	—	3963,0	4393,1	5153,5	6114,0	6974,4	7835,0	8695,3
80% n-butyraldehyde and 20% isobutyraldehyde								
293,50	23069,3	24074,4	25079,7	27090,4	29101,0	31111,5	33122,1	35132,6
318,11	16984,7	17725,2	18465,8	19946,8	21427,8	22908,8	24389,9	25870,9
333,86	14271,3	14915,0	15559,0	16846,5	18134,2	19421,8	20709,4	21997,0
364,15	—	11182,0	11714,7	12780,0	13845,4	14910,8	15976,2	17041,5
399,10	—	8368,0	8835,3	9769,7	10704,0	11638,4	12572,7	13507,1
424,60	—	6863,6	7306,0	8190,4	9075,0	9960,0	10844,0	11728,5
454,96	—	5476,6	5905,1	6762,1	7619,0	8476,0	9333,0	10190,0
473,12	—	4795,7	5222,0	6074,7	6927,3	7780,0	8632,6	9485,3
503,00	—	3876,0	4306,5	5167,5	6028,6	6890,0	7750,6	8611,7

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Table 1 gives the results.

The dynamic viscosity was calculated from the measured data by means of the P—V—T data we have obtained [3] for binary mixtures.

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INFLUENCE OF ULTRASOUND ON HEAT TRANSFER UNDER THE CONDITIONS OF FORCED FLOW OF A HIGH-TEMPERATURE MELT

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The influence of elastic oscillations at a frequency of 20 kHz on the heat transfer associated with the forced flow of a high-temperature melt in a tube is investigated experimentally. It is shown that the heat-transfer coefficient can be as much as doubled.

Resonant acoustic oscillations in tubes are known to be capable of eliciting significant variations in the local values of the heat-transfer coefficients in laminar and turbulent forced flows [1-3]. However, the literature is practically devoid of quantitative data on the influence of elastic oscillations at ultrasonic frequencies on the magnitude of heat transfer toward the wall of a tube in the forced flow of high-temperature melts, even though it is clear from the practical point of view that a major increase in the heat-transfer coefficient offers a basis for the intensification of heat- and mass-transfer processes in industrial equipment.

We have carried out an experimental study of the influence of elastic oscillations on the heat transfer from a flow of molten steel to the wall of a water-cooled tube. The experimental apparatus contained a water-cooled tube of dimensions $l/d \approx 3$, $l \approx 0.1$ m with magnetostrictive ring transducers fitted onto it; the transducers were driven at a frequency of 20 kHz. Axisymmetrical radial oscillations were excited in the wall of the tube to establish conditions of uniform influence of the applied field on the heat-transfer along the axis of the duct.

The experiments were carried out for various values of the bulk velocity of the flowing metal, for various hydrodynamic parameters of the molten metal, and with variation of the electrical power supplied to the transducers. Ultrasound was also generated and turned off intermittently during pouring of the metal. The temperature of the metal as it was poured into the tube was equal to 1520 ± 10°C.

The experimental measurements were carried out according to the arrangement shown schematically in Fig. 1. The magnetostrictive transducers were driven by an oscillator with an independent excitation circuit consisting of the master stage 1, the buffer amplifier 2, and the final amplifier 3. The amplitude of the oscillations was measured by means of the transducer 5, whose electrical output signal was sent to the voltmeter 6.

The active electrical power W_e supplied to the transducers 4 was measured with the thermal wattmeter 7 and was recorded on the KSP-4 automatic potentiometer 8, and the electric

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