CONCERNING A. S. GINEVSKII'S LETTER TO THE EDITOR OF INZHENERNO-FIZICHESKII ZHURNAL

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In connection with A. S. Ginevskii's letter concerning the book "Gas Dynamics of Diffusers and Exhaust Pipes of Turbomachines" we consider it necessary to wage a discussion on the pages of this journal with the enlistment of all the comments received by the publishing house "Energiya" rather than on the basis of the one-sided and far from objective evaluation of A. S. Ginevskii.

On our part we note the following. A. S. Ginevskii examined the entire book from the standpoint of just one problem – the determination of energy loss coefficients in diffusers based on the results of calculating the boundary layer. In so doing he ascribed to us features which are not in the book and completely ignored its actual content.

Thus, it is indicated in the letter that "unfortunately, the 'alluring prospect' of the wide use of the fundamentally erroneous Eq. (2.54) for calculating the boundary layer in diffusers is realized in the book." However, even with a fleeting reading of the text it is easy to establish that Eq. (2.54) is mentioned on pages 80, 136, 137, 140, and 277 and it is used not in place of, but along with the usual method of calculating the boundary layer, and only for conical diffusers is a concrete comparison of the values of thicknesses δ^* calculated by the two methods (pp. 3-29) on the basis of the von Karman equation and by Eq. (2.54) given.

In calculating annular diffusers it is indicated on p. 233 that Eq. (2.54) is simpler for concrete use. However, the nomograms given in the appendix were obtained on the basis of the usual relationships for the boundary layer.

The same stipulations were made in calculating axial-radial diffusers (p. 277). "Taking into account the certain disputability of Eq. (2.54), we have limited ourselves here to using the more customary relationships." Having referred to the start of this phrase, A. S. Ginevskii missed its main final thought.

The mention and not the use of Eq. (2.54) on six pages in a book with a volume of 22 printer's sheets can hardly be called the wide realization of an erroneous equation. Now about Eq. (2.54) itself. We would not like to dwell here in detail on the essence of this "elementary mathematical error" which leads to this equation, since the indicated error underlies the widely known approximate hydraulic equation for calculating diffusers and from this viewpoint we did not attempt to introduce any innovations but used the conventional method (see, for example, Idel'chik's book "Hydraulic Resistances," Gosenergoizdat, Moscow –Leningrad, 1954).

We agree than this method is controversial and for this reason we did not use Eq. (2.54) for concrete calculations and analysis, but only brought up the matter for discussion, steadfastly stressing the identity between the physical scheme and method of subsequent derivation used and the derivation of the hydraulic equations.

The next comment regarding the calculation of the coefficient of internal and total losses (incidentally, nothing was said about losses of total pressure – we did not write anything about their calculation in the book) indicates the clear reluctance to understand what was said.

A. S. Ginevskii indicates: "For this purpose it is recommended in the book without sufficient grounds to use the appropriate equation for the initial section of the diffuser with the only difference being that in calculating the integral layer thicknesses some arbitrary velocity on the channel axis should be used. The

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equation thus obtained does not lead to the correct equation, which is contained in my and A. V. Kolesnikov's article."

We must note that Eqs. (2.24), (2.24a), and (2.29) follow from the very definition of the coefficient of total and internal losses and are a consequence of averaging the experimental data on the loss coefficients in the exit section of any aerodynamic element.

This method of estimating losses at a point with subsequent averaging over the section is used widely in all aerodynamic experiments not only in our country but also abroad. Expressing the local loss coefficient in terms of velocity (which is usually done if the experimental data are treated by means of gas dynamic tables), we automatically arrive at the aforementioned equations.

A third comment has no bearing on the book at all, since we did not calculate the boundary layer in diffusers with a closed boundary layer. Concerning this it is stated on p. 138, where the calculated and experimental values of the displacement areas are compared, that the method being considered for calculating the coefficients ζ_n is limited to moderate degrees of expansion ($n < 3.5$-4). The coincidence of the calculated and actual ($\bar{\delta}^*$) and not the conditional ($\bar{\Delta}^*$) displacement areas up to $n < 6$ is explained by the weak reconstruction of the velocity profile immediately after closing of the boundary layer.

Unfortunately, A. S. Ginevskii did not notice that all concrete calculations were done by his equation for practically unclosed boundary layer, and an extensive comparison of the calculation results with the experiments of various authors clearly confirmed the possibility of such calculations, reduced to the simplest arithmetic operations. Here it is not clear to us at all how one can see discrimination in the use of methods of boundary layer theory for calculating diffuser channels (unless, of course, the author of the letter is against his own equation).

Finally, several words about the gratitude addressed to A. S. Ginevskii and about ethics in general.

We expected him to read the first version of the book with sufficient attentiveness. As a result the entire book was revised radically with consideration of the remarks of A. S. Ginevskii and other persons and stress was laid on factual experimental material rather than on theory. The possibility of the direct use of the experimental data without a theoretical calculation is indicated repeatedly in the book.

In addition, a number of substantial refinements were introduced into the text and experimental data on investigations of diffusers in various Soviet and foreign scientific organizations are widely used, which naturally eliminates the question of the soundness of the experimental data used.

For this reason we considered it necessary to express our gratitude to A. S. Ginevskii, since the considerable change of the edition was accomplished largely under the influence of critical comments, including those of A. S. Ginevskii.

In conjunction with this we are prepared to acknowledge that A. S. Ginevskii does not bear any moral obligations ostensibly following from the fact of gratitude expressed to him in the foreword. Unfortunately, A. E. Zaryankin did not have time to coordinate this act of courtesy addressed to him with A. S. Ginevskii.

Further, we consider it necessary to emphasize persistently that all reviews on the book collected by the publishing house "Mashinostroenie" were, on our initiative, requested by "Energiya" and are in its file. Furthermore, "Energiya" additionally reviewed the manuscript and these reviews were favorable. Thus, our behavior in sending the manuscript to another publishing house was irreproachable ethically.

In conclusion we are forced to stress once again that our book was examined by A. S. Ginevskii from the standpoint of just one particular problem. One can easily see in its objective evaluation that the material presented extends far beyond the scope of disputable features. One can be convinced of this even with a quite brief list of the new problems and solutions presented in the book.

Thus, the separate effect of Mach and Reynolds numbers on the characteristics of diffusers is considered for the first time in the book. The physical pattern of flow in diffusers at transonic speeds is examined in detail and a new interpretation of the effect of Mach and Reynolds numbers in this region is given. The role of the angle of opening of the diffusers is shown in a new manner and the gas flow near the corner point is investigated thoroughly. Experimental material known from the literature is generalized extensively for the first time. The complex calculation of diffusers on the basis of boundary layer theory is reduced to simple arithmetic operations, which permits comparing it with the semiempirical calculations based on equivalent angles. A new method of calculating losses with instantaneous expansion of the flow is given. Exhaust pipes are investigated extensively for the first time and their new developments are

given and a large body of data obtained in the laboratory of steam and gas turbines of the Moscow Power Institute are presented, the use of which will undoubtedly help also theoretical developments.