PREFACE TO THE 2nd RUSSIAN EDITION

There does not seem to be any branch of engineering that is not somehow involved with the necessity for moving liquids or gases through pipes, channels, or various types of apparatus. The degrees of complexity of hydraulic or fluid systems can therefore be widely different.

In some cases these are systems that for the most part are composed of very long straight pipes, such as oil pipelines, gas lines, water conduits, steam pipes, and air ducts of ventilation plants in industrial use. In other cases they are pipelines that are relatively short but that abound in fittings and branches, various impedances in the form of valves, orifices, and adjusting devices, grids, tees, etc. as found in air ducts of complex ventilation systems; gas flues of metallurgical works, chemical and other factories, boiler furnaces, nuclear reactors, and dryers; fuel and oil pipes and various manifolds of aircraft and rockets.

Most frequently the system through which a liquid or gas moves constitutes a large single unit (e.g., boilers, furnaces, heat exchangers, engines, air- and gas-cleaning equipment, and chemical, petrochemical, metallurgical, food, textile, and other manufacturing equipment).

In all cases, it is essential that the fluid resistance of these systems be properly calculated. Furthermore, the adequate design of sophisticated present-day installations consisting of complex-shaped parts of hydraulic and fluid lines is impossible without insight into the principal physicomechanical processes occurring in them and consideration of suggestions for the improvement of flow conditions and reduction in the local fluid resistance of these elements. The requisite information is given in this handbook.

A great body of new data on resistance coefficients accumulated since the first edition of this book has required an extensive revision of the text to account for the results of recent studies. But since it was not practically possible to incorporate all the newly published data on such flow resistance, this gap has been supplemented by an extensive listing of pertinent references.

The handbook consists of 12 chapters. Each chapter, except for the first one, contains data on a definite group of fittings or other parts of pipelines and fluid net-

work elements having similar conditions of liquid or gas motion through them. The first chapter is a synopsis of general information on hydraulics of pressure systems and aerodynamics needed for design calculation of the elements of air-gas pipelines and hydraulic networks. All of the subsequent chapters contain:

- An explanatory part giving, as a rule, a brief account of the subject matter of the section, an outline of the main physicochemical processes occurring in complex elements of pipelines, additional clarifying remarks and practical recommendations for the calculation and choice of separate network elements, and recommendations on ways to reduce their hydraulic resistance.
- A computational part giving the coefficients or, in some instances, the absolute values of the fluid resistances of straight sections and of a wide range of complex-shaped parts of pipelines, fittings, various impedances, and other elements of the fluid networks. In each chapter the data are represented by special diagrams that contain a schematic of the element considered, calculation formulas, graphs, and tables of the numerical values of the resistance coefficients.

It is essential for the present-day design analysis of hydraulic (fluid) networks with the use of electronic computers that the resistance coefficients be given in the form of convenient design tormulas. Moreover, it is often practical to represent in a concise form the functional dependence of the resistance coefficient on the main governing parameters.

Graphical representation of this dependence is advantageous because, on the one hand, it furnishes a rather vivid illustration of the nature of this dependence and, on the other hand, it makes it possible to obtain intermediate values of the resistance coefficients not listed in tables. The resistance coefficients given in tabular form are the principal values, which can be conveniently used in calculations.

The measurement units are given in the SI system. In selected cases, for convenience of usage, some quantities are also given in the meter-kilogram (force)-second system.

I. E. Idelchik