621.224.01:532.5

Runaway Characteristics of Propeller Turbines*

(by Airfoil Theory)

by Yasuo ISHII**

In this paper, the author presents the theoretical formulae concerning the characteristics of the propeller turbines at runaway state. These formulae, with their simple expressions, agree with the experimental results.

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621.6-3:532.5

Opening and Closing Moments of Valves Combined with Turbomachines*

(Examples of Butterfly Valves)

by Yasuo ISHII**

In this paper, the author has made a study on the method of calculating opening and closing moments of valves located at iniet or outlet of turbomachines such as water turbines, pumps and pump-turbines. Several examples calculated with this method revealed the typical features peculiar to the kinds of the machines.

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536.46 : 662.612.32

Stability of Diffusion Flame*

(4th Report, Experiments on the Stabilities of Aerated Flames in Parallel Air Flows and of Flames in Lateral Air Flows)

by Hisao HATTORI**

Blow-off limits of aerated propane flames in forced parallel air flows and in open atmosphere are determined experimentally. When concentration of fuel is very rich (fraction of stoichiometric >2.58), the experimental results agree qualitatively with the blow-off equation in the first report.

As the last experiment of these investigations (1st~4th reports), blow-off limits of aerated and diffusion flames in lateral air flows are determined. The main results obtained are as follows:

(1) Blow-off air velocity ${}_{bl}v_a$ gradually increases with the increase of gas velocity ${}_{bl}v_f$ in laminar conditions, but suddenly decreases when flame becomes turbulent.

(2) As ${}_{bl}v_f$ decreases, ${}_{bl}v_a$ tends to reach constant values which are functions of burner dimensions and fuel properties, and the relations of these converged ${}_{bl}v_a$ to the burner diameter, minimum quenching distance and maximum burning velocity of the fuel proper and fraction of stoichiometric F are given by experimental formula.

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532.542:621.6.04

Some Experiments on Mixture Flow of Sand and Water in a Horizonatal Pipe*

(2nd Report, Some Considerations on Sliding Flow)

by Sadao KUZUHAHA**

A sliding flow of sand or gravel (about 0.5~5.0 mm in granular size) in water in a horizontal transparent smooth pipe (38.5 mm in inner diameter, 4 000 mm in length) was observed and loss of head was measured.

In order to analyze such a flow, the author worked out a calculating formula which expressed the loss of head when water and granular solid flow formed two separated layers in a closed pipe under some assumptions, and compared the calculated results with the data obtained by measurement.

From the calculation of the correlation coefficients between the calculetsd values and the measured data, and observation of the flow, it is concluded that gravels of 1~3 mm form a typical sliding flow.

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532.542:621.6.04

Some Experiments on Mixture Flow of Sand and Water in a Horizontal Pipe*

(3rd Report, Some Considerations on a Flow with Alluvial Bed)

by Sadao KUZUHARA**

In the hydraulic transport of sand or gravel

in a horizontal pipe line, the loss of head increases owing to a decrease of the effective area of pipe, when the mean velocity of mixture flow is so slow that grains settle at the lower part of the pipe.

The author measured the loss of head and observed the movements of grains on the surface of an alluvial bed using sand or gravel (0.5~5.0 mm in granular size) in a transparent smooth pipe (38.5 mm in inner diameter, 4 000 mm in length).

Furthermore, he worked out a formula which expressed the loss of head when water flowed through a semicircular path formed by two different wetted perimeters of smooth pipe wall and rough surface of the bed, and calculated the coefficient of loss due to the resistance of grains.

Grains moved just like those of alluvial stream in an open channel.

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532.57.082

Study on Gibson Method of Flow Measuring*

(3rd Report, On the Effect of Variation of Reservoir Head)

by Takao NISHIKAWA** and Minoru SUITA***

When the Gibson method is used in practical hydraulic plants, the reservoir head over the intake changes with the closure of guide vanes. Especially in the run-off-river type, the rate of head rise at the reservoir is larger than that of the head rise in Gibson method. In practical application of Gibson method, the total head line of time-pressure diagram is calibrated with the record of the reservoir head line. But it seems that the process has undergone no analysis on the elastic water column theory. In this paper, anthors dealt with the effect of variation of reservoir head from the standpoint of elastic water column theory. In the case of a simple condition, the results of calculation showed that a possible error of the process would be negligibly small.

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621.646.3:532.54

On Jumping Phenomena of Oil Hydraulic Flow Control Valve*

by Toshio TAKENAKA**, Eizo URATA***, Takahiro KOMIYA****, and Michinobu KONNO****

The jumping phenomena of a flow control valve coupled with a fixed displacement pump used in an oil hydraulic circuit occur at the beginning of its action when a direction control valve connected to a load is operated. In this report, the mechanism of the phenomena is studied experimentally and analytically. In the transient phenomena, strong nonlinearity was observed, which was thought to originate mainly from the pressure-displacement relation of a pressure compensator contained in the flow control valve. As the result of the study, the authors concluded that the time-lag in the action of the pressure compensator is the chief cause of the jumping phenomena.

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536.242:532.542.2

Laminar Flow Heat Transter in Circular Tubes with Non-Isothermal Surfaces*

by Osamu KUGA**

Numerical calculation is performed on the heat transfer to laminar flow in a circular tube with sine-shaped wall temperature distribution. In case of isothermal wall temperature, heat flows only from wall to fluid when the wall temperature is higher than that of fluid, but in sine-shaped wall temperature distribution, there is a part where heat flows inversely from fluid to wall, thus making the Nusselt number discontinuous.

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621.433.06

Scavenging Process in the Inward Compression Type Free Piston Gas Generator*

by Morio NAKAHARA**, Hirotoshi BABA**, Eiichiro IDENO**, and Yoshiyuki KAMIKAWA**

This paper reports the experimental and