

*Memoirs of the*  
FACULTY OF ENGINEERING  
KYOTO UNIVERSITY

**VOLUME XXII**

**1960**

Published by the University  
KYOTO, JAPAN.

## CONTENTS

| PART 1  | PAGE   |
|---|--|
| Fundamental Analysis of an Electrohydraulic Servo-<br>mechanism Operated by PWM Mode. ....  | Taizo SAWAMURA<br>Hideo HANAFUSA<br>and Takashi INUI ..... 1                   |
| Stress Waves in Rocks and their Effects on Rock<br>Breakage. ....   | Ichiro ITO<br>Makoto TERADA<br>and Takehisa SAKURAI ..... 13                   |
| Nitrogen and Sulphur in Coal. ....  | Wataru FUNASAKA<br>and Chikao YOKOKAWA ..... 30                                |
| Ion Optics of Sector-Type Magnetic Focusing Fields.   | Noriaki KADOTA<br>and Seiichi ISHIDA ..... 41                                  |
| Studies on the Flow Patterns of Liquids in a Cylindrical<br>Mixing Vessel, Over a Wide Range of Reynolds<br>Number. ....                      | Shinji NAGATA<br>Kazuo YAMAMOTO<br>Kenji HASHIMOTO<br>and Yūji NARUSE ..... 68 |
| Mass Transfer in Agitated Liquid-Solid Systems. ....  | Shinji NAGATA<br>Iwao YAMAGUCHI<br>Seizo YABUTA<br>and Makoto HARADA ..... 86  |
| <b>PART 2</b>   |  |
| Frequency Characteristics of PWM Mode Electro-<br>hydraulic Servos.....   | Taizo SAWAMURA<br>Hideo HANAFUSA<br>and Takashi INUI .....123                  |
| Some Numerical Methods for Analysis of Transient<br>Responses of Nonlinear Control System. ....   | Yoshikazu SAWARAGI<br>and Hidekatsu TOKUMARU...136                             |
| Eine Erklärung über unstationäres Schneiden im Boden<br>und ein praktisches Beispiel für Modelgreifer. ....                                   | Shōjirō HATA .....150  |
| On the Moisture Condition of Highway Subgrade. ....   | Kano UESHITA .....164  |
| The Combustion Process in Swirl Chamber Type<br>Diesel Engines. ....  | Fujio NAGAO<br>and Harutoshi KAKIMOTO...176                                    |
| A Theoretical Treatment of the Frequency Entrain-<br>ment of a Reflex Klystron. ....  | Jun-ichi IKENOUE<br>and Kiyoshi FUKUI .....197                                 |
| Eine Untersuchung über die Einflüsse, die die Verän-<br>derungen der Temperatur der einziehenden Luft<br>auf die Grubentemperatur haben. .... | Yoshio HIRAMATSU<br>und Jun-ichi KOKADO.....216                                |

|  | PAGE   |
|--|--|
| Fundamental Study on Vacuum Melting of Pure Iron and Stainless Steel. I. On the Crucibles, Ingotism and the Recovery of Alloy Additions. ....  | Hiroshi SAWAMURA<br>Toshisada MORI<br>Masao YAKUSHIJI<br>and Hiromasa INOUE .....236 |
| Mass Transfer and Chemical Reaction in Liquid-Liquid Agitation Systems. ....   | Shinji NAGATA<br>and Iwao YAMAGUCHI.....249  |
| <b>PART 3</b>  |  |
| Fundamental Studies on Earthquake Response of a Long Span Suspension Bridge. ....  | Ichiro KONISHI<br>and Yoshikazu YAMADA.....277                                       |
| A Method for Obtaining the Residual Load Duration Curve of the Project Power After the Completion of a Run-off-River Hydro-Power. ....   | Tatsuro OKUBO<br>and Takeshi SUYAMA .....292   |
| Experimental Methods for Determining Aerodynamic Stability Derivatives of an Airplane in Wind Tunnels. ....  | Hiroshi MAEDA.....301  |
| Effect of Liquid- and Gas-Mixing on the Rate of Mass Transfer between Two Phases in Crosscurrent Flow. ....  | Wataru EGUCHI<br>Makoto HARADA<br>and Shinji NAGATA .....326                         |
| Fundamental Studies on Impact Crushing. ....   | Yuzo NAKAGAWA<br>and Kunio MATSUI .....343   |
| <b>PART 4</b>  |  |
| The Annual Average Stream Flow for Hydro-electric Power. ....  | Tatsuro OKUBO<br>Hiroshi NISHIHARA<br>and Takashi SOMA .....363                      |
| Determination of the Workability of a Coal Face Underground by Measuring the Friability of Coal. ....  | Toshio AIDA<br>and Takashi OKAMOTO .....387  |
| The Effects of Molybdenum, Wolfram and Copper on the Solubility of Graphite in Liquid Iron and the Method for Calculation of the Activity Coefficient of Carbon in Multicomponent Alloys. .... | Toshisada MORI<br>Kan AKETA<br>Hitoshi ONO<br>and Hiroshi SUGITA .....401            |
| Studies on the Fluorine Generation by Fused Salt Electrolysis of $KF \cdot 2HF$ at about $100^{\circ}C$ . ....   | Shiro YOSHIZAWA<br>Nobuatu WATANABE<br>and Masahito ISHII .....422                   |