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Author	長田, 幸憲(Osada, Yukinori)
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## **On Vibration of a Cylindrical Shell under Stresses, which is Immersed in Water**

Yukinori OSADA (長田幸憲)

In this paper a study is made of the effect of axial thrust, uniform lateral pressure and torsional moment on the vibration of a simply supported cylindrical shell, outside or inside of which water is filled up. When a cylindrical shell makes a vibratory motion, the surrounding water also vibrates, thus causing the so called effect of virtual mass upon the vibration. The natural frequencies of cylindrical shell vibration are derived from equations of motion. Whence the formula of relation between the natural frequency and external forces (i.e. axial and uniform lateral pressure and torsional moment) is obtained. Approximate, practical formula is also shown.

The numerical examples are illustrated for the case of steel pipe which is immersed in the water. Numerical results show that the natural frequency is decreased by axial compression, but increases by the effect of uniform internal external pressure and torsional moment. In most cases, uniform lateral external pressure is the most effective to the natural frequency, torsional moment slightly affect it. But axial compression gives considerably small effect. The natural frequency is zero when the values of the external forces are just equal to collapsing values (i.e. buckling loads of cylindrical shell) in the elastic stability. Under condition that torsional moment is zero, this practical formula is in accordance with the formula by F. Kito.

## **Torsionsknickung von Schraubenfedern mit Vorspannung**

Wilfried GEIST (ヴェルフリード・ガイスト)

Federn sind ein sehr wichtiges Maschinenelement, da sie in vielen Bereichen der Technik Anwendung finden. Deshalb muss der Untersuchung ihrer Eigenschaften, besonders ihres Festigkeits- und Stabilitätsverhaltens besondere Beachtung geschenkt werden.

In der vorliegenden Arbeit wird das Knickverhalten von Schraubenfedern unter Torsionsbelastung untersucht. Es wurden nur Federn mit rundem Drahtquerschnitt verwendet.

In einer Untersuchung am Massachusetts Institut of Technologie wurde eine