B-69

## Study of Ionosphere in Radio Wave Propagation

Research on the ionosphere in Japan was conducted by Kenichi Maeda and Shogo Nanba in the 1930s. The main achievements at that time were radio wave propagation in the ionosphere, the global distribution and height distribution of electron density in the ionosphere, the electrodynamic behavior of the ionosphere, and the discovery of the ionospheric equatorial anomaly. The relationship between the ionosphere and the reach of radio waves, and the relationship between the ionosphere and radio wave reception intensity were systematically expressed, and important basic research was also conducted, including important research taking into account fading. This form laid the foundation for post-war communications engineering reconstruction.

B-70

## Ultrasonic Vibration Device

An NA-type magnetostrictive vibration device capable of generating tens of thousands of cycles of powerful ultrasonic waves has been developed. Using this underwater wireless telephone, an experiment was conducted outside Shiogama Port, and under a water depth of about 2m and a distance of about 500m, calls of the same quality as a local telephone were successful.

B-71

## Wireless Multiplex Telephone System using Ultrashort Wave

A method for estimating the amount of crosstalk due to non-linear distortion required for the design of wireless multiplex telephone systems was clarified, and a plan for a carrier-based multiplex line using ultrashort waves was proposed. In 1940, the commercialization of a 6-channel ultrashort-wave multiplex telephone line (75 MHz) connecting Ishizaki (Aomori side) and Tobetsu (Hokkaido side) over 1 km was successfully implemented. This result has greatly contributed to the establishment of a multiplex communication system using microwaves. In addition, as a method of relaying unmanned and unpowered radio waves, a radio relay system using an unpowered antenna was studied.