ILLUSTRATIONS FROM MARCUS MARCI'S "DE PROPORTIONE MOTUS"

by E. C. WATSON

IN THE PREFACE to his *Science of Mechanics*. Ernst Mach wrote:

> "In less immediate connection with the text stand the facsimile reproductions of old originals in my possession. The quaint and naive traits of the great inquirers, which find in them their expression, have always exerted upon me a refreshing influence in my studies, and I have desired that my readers should share this pleasure with me."

Some of the most interesting facsimile reproductions in the *Science of Mechanics* are from Marcus Marci's *De Proportione Motus* (Prague, 1639).

Joannes Marcus Marci was a professor at Prague and a contemporary of Galileo, from whom he probably obtained many of his ideas regarding the laws of motion. He was one of the most learned men of his time, as the two books of his still extant bear eloquent witness. His *Thaumantias.Liber de coelesti deque colorum apparentium natura, ortu et causis* (Prague, 1648) treats of the color phenomena associated with prisms and states "that the colors *originate in* refraction and that the *degree of refraction* determines the color." He recommends observing the spectrum in a darkened room and makes the important observation that the color, once obtained, will always remain the same, however much refracted. As pointed out by F. Rosenberger in *Die Geschichte der Physik* (1884), he might have anticipated Newton if he had known the exact law of refraction.

Marcus Marci's knowledge of the laws of motion, as displayed in his *De Proportione Motus*, was equally advanced for his time. While he did not succeed in reaching as clear ideas regarding the motion of falling bodies and hence of force and acceleration as did Galileo, he was the first to make substantial progress with the difficult problem of impact, a problem that Galileo touched on without success and that Descartes completely muffed. Thus he clearly states both that an elastic body making direct impact with a second body of the same size at rest will itself remain at rest after the impact, while communicating its entire motion to the second body, and that two equal elastic bodies moving in opposite directions with the same speeds will after impact simply reverse their motions, that is, exchange velocities. He also had a very considerable knowledge concerning pendulum motion, centrifugal force, and the composition of motions, and he restated Galileo's theorem that the time of descent down all chords which start from the top of a vertical circle is the same.

All this is cleverly summarized in the frontispiece to the *De Proportione Motus*. This charming engraving (reproduced above) shows weights being dropped from a high tower, shots fired from a cannon impinging upon other shot, an early form of a billiard table and a man batting a ball against a wall, as well as a man swinging from two ropes (pendulum motion) and sparks flying off tangentially from a grinding wheel (centrifugal force).

One of a series of articles devoted to reproductions of prints, drawings and paintings of interest in the history of science—drawn from the famous collection of E. C. Watson, Professor of Physics and Dean of the Faculty of the California Institute.