XLVI. SOME ERRORS IN TEXT-BOOKS.

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Last year, at the urgent request of one of our deans, we attempted to use a new text-book on Physics. This book had passed the first edition and should have been reasonably free from typographical errors. However, we find such statements as; "To melt one gram of ice requires 540 calories": "The watt is the unit of electrical energy": "The kilowatt-hour is the unit of electrical power".

In discussing the merits of various types of heating plants, the hot-air furnace is condemned, because "the air which has been burned in this way is devitalized." No suggestion is given as to what is meant by "devitalized" or "burned air".

After correctly stating the gas laws, and illustrating precision by means of the Bunsen ice calorimeter, the author proposes the following problem: "What is the increase in volume in 10 cm.^{3} of air when heated from 70 degrees Fahrenheit to 430 degrees Fahrenheit?" The problem is intended for college girls of the Sophomore year who have already taken a year of Chemistry, and the author solves it as follows: "$10 \times 360 \times .002 = 7.2$ cm^3." The correct answer is 6.3 cm^3, making an error of 14-2/7%.

In many books we find the indiscriminate use of the words "pound" and "gram' to mean both mass and force. If this is not a serious mistake, it is at least a serious handicap to the young student. Specific gravity has different meanings in different text-books.

Three college texts out of five selected at random from the stacks in our library were found to define mechanical advantage of a machine as the "ratio of weight lifted to power applied". Two of these three texts take pains later to state to the student that "power, as here used, does not mean the rate of doing work." The correction comes too late. The mischief is done when the student is told that mechanical advantage is weight divided by power. These same books properly define pressure as "force per unit area", and then proceed to use force and pressure interchangeably. Problems calling for pressure are proposed, and the answer expresses the total force over the whole area, not the force per unit area. Absolute temperature on the thermodynamic scale is confused with absolute temperature on the gas thermometer.

Perhaps there is no place in Physics where the relation between terms used in translation and the corresponding terms in rotation is clearer than in the case of mass and moment of inertia. Mass is the exact analogue of moment of inertia. Yet in a book, whose title is "Mechanics for Engineers", we find, "The term, moment of inertia, is somewhat misleading, and the student is apt to try to connect moment of inertia with inertia. The term has no such significance and should be regarded as the name arbitrarily applied to a quantity that engineers frequently use."

Finally, a number of texts on mechanics and college Physics in their treatment of dimensional equations, state that the angle has no dimensions. Some analytical geometries make the same statement. The argument is that, since the angle equals the arc divided by the radius, it is length divided by length and therefore without dimensions.

As a direct result of this non-dimensional angle, torque may be shown to equal work.

$$L = Fr = mar = MLT^{-2}L = ML^2T^{-2}$$
$$W = Fx = mar = MLT^{-2}L = ML^2T^{-2}$$

Of course no one thinks that work and torque are even synonymous. The discrepancy is accounted for observing that the two l's in work are in the same direction, while those in torque are at right angles to each other. Another way of showing this is

$$W = L\Phi$$
$$Fx = Fy\Phi$$
$$\Phi = Fx/Fy = L_x/L_y$$

Therefore, instead of the angle being without dimensions, the correct statement is that angle is L_x divided by L_y.