CHAPTER III.—THERMOMETER.

Section I. Conversion.

1.	R.	to	C.
2.	F.	,,	C.
3.	C.	,,	F.
4.	F.	,,	C. differences
5.	C.	,,	F. ,,

Section II. Reduction of Temperature to Sea-level.

1. Metric.
2. English.

CHAPTER IV.—BAROMETER.

1.	Barometer to 0° C. Metric (0°·1 C. and 5 mm.).				
2.	,, ,, 32° F. (0°·5 F. and 0·2 ins.).				
3.	Gravity	...	Latitude	...	metric.
4.	,,	...	,,	...	English.
5.	,,	...	Altitude	...	metric.
6.	,,	...	,,	...	English.
7.	Barometer to sea-level	...		...	metric.
8.	,, ,,	...		...	English.

CHAPTER V.—HYGROMETRY, RAIN, AND EVAPORATION.

1.	Vapour-tension to 0·1 C. from − 30° C. to + 101° C.		
2.	,, ,, 0·2 F. ,, − 20° F. ,, + 214° F.		
3.	Boiling-point (from 680 mm.—800 mm.)	...	metric.
4.	,, ,, ,, ...	...	English.
5.	Vapour-tension about 100° C. ...	...	metric.
6.	,, ,, 212° F. ...	...	English.
7.	Weight of water in cubic metre of air	...	metric.
8.	,, ,, foot ,,	...	English.
9.	Relative humidity	...	metric.
10.	,, ,, ...	...	English.

CHAPTER VI.—WIND.

1. Lambert's formula.
2. Natural tangents.
3. Kilometres per hour to metres per second.
4. Metres per second ,, kilometres per hour.
5. Miles per hour ,, metres per second.
6. Metres per second ,, miles per hour.

CHAPTER VII.—MAGNETISM AND ELECTRICITY.

1. English mag. units to C.G.S. units.
2. C.G.S. ,, Eng. mag.

Weight and Mass.

THE review of Kennedy's "Mechanics of Machinery" in NATURE, December 29, 1887 (p. 195), strikes at least one responsive chord on this side of the world. There are some questions in reference to the nomenclature of dynamics which "will not down" until they are "downed" by a convention or agreement between those who have to do with the theory of mechanics and those who have to do mostly with practice, and in this some concessions will doubtless be necessary on both sides. While in hearty sympathy with much that the reviewer says in his discussion of dynamical terms (the book under notice I have not yet seen), I wish to dissent from and to protest against one of his leading propositions.

It must be admitted that in the "vernacular" the word pound is used in two distinct senses—that is, as a unit of force and a unit of mass. Authors of mathematical treatises have sometimes, and perhaps unconsciously, ignored the latter meaning, and at other times have failed to recognize the former.

The proposition of the reviewer is to eliminate the word *mass* altogether and to use weight in its stead. To accomplish this he is obliged to use the word *weight* as meaning what is now generally expressed by the word *mass*. This, it seems to me, would be a grave error. Is it not true that *weight*, as understood by both the "learned and the unlearned" always carries with it the idea of force, the force of attraction between the earth and the particular body under consideration? And is it not also true that there are many problems in the work of the practical engineer in which *mass*, in the ordinarily accepted sense, is the essential element, rather than weight, in the ordinarily accepted sense? In short, in my judgment, the engineer *does* require the word "mass," and he also needs the word "weight." It is a misfortune when one word must be used to mean two entirely different things (as is the case of the word "pound"), and we ought to congratulate ourselves that we have the words "mass" and "weight" so commonly and generally used to represent two distinct ideas. To discard one of them and force the other into its place would be to introduce confusion rather than order. To satisfy the requirements of both mathematical or theoretical and practical convenience I have been accustomed to use the following :—

The word *pound* is used in two senses; it may mean a unit of mass or a unit of force. It is always easy by the context to tell in which sense it is used.

As a unit of force it *has not yet been accurately defined*, but it means, in general a force equal to the attraction between the earth and a mass of one pound. As this attraction varies slightly, the pound as a unit force cannot be regarded as absolutely constant, but is sufficiently so for practical purposes.

When, by a convention of authorities, the conditions under which this attraction is accepted as equal to one pound are prescribed, it will become an invariable unit.

There are in the English system two units of force, the poundal and the pound. There are also two units of work, the foot-poundal and the foot-pound; each is the work done by the corresponding unit of force working through a distance of one foot.

The ordinary equations of dynamics, when the foot-pound-second units are used, give results in poundals or foot-poundals, which may at once be reduced to pounds or foot-pounds.

The above is open to the objection that the pound as a unit of force is not constant, but the remedy for this is indicated, and the errors introduced are of no moment in "practice."

To lessen the confusion somewhat, I have often used, in writing, the symbol *lb.* to represent the unit of *mass*, and the word *pound* that of force. In my own experience the adoption of these definitions has greatly facilitated the work of students.

I entirely agree with the criticisms made upon the equation so constantly appearing, $w = mg$. To the learner it is generally "confusion confounded," and I would cheerfully join in a "boycott" against it. T. C. MENDENHALL.

Rose Polytechnic Institute, Terre Haute, Indiana, U.S.A., January 26.

ONCE more Prof. Greenhill devotes a large portion of a review to emphasizing and insisting on his peculiar, and I may say extraordinary, mode of regarding the meaning of elementary terms (see NATURE, February 16, p. 361; also December 29, 1887, p. 195).

One must assume, therefore, that these views are regarded by him as useful and conducive to clearness.

I find it difficult to express strongly enough my entire dissent from such a proposition without being apparently impolite.

That engineers are entitled if they see fit to employ as their third fundamental standard a standard of force rather than one of mass, I admit. I do not think the plan satisfactory or clear, but there are temptations towards it, and perhaps no very serious objections. My own experience of engineering students is, however, that they are beautifully uncertain whether to put g into the numerator or the denominator of a new expression, or whether to leave it out altogether; and that they generally get over the difficulty either by asking where it must go, or by seeing which plan will give an answer of most reasonable magnitude. The real rule on engineers' principles would be to put g somewhere into the expression for any quantity with which gravity has nothing to do, and to leave g out whenever gravity is primarily concerned.

But, irrespective of this standing and well-known controversy, Prof. Greenhill's attempt to simplify matters does indeed make confusion worse confounded. He says that in the vernacular the term "weight" does not mean the force with which the earth pulls a body, but does mean the body's mass or inertia.

What kind of "vernacular" can he be thinking of?

Ask any ordinary member of the British public what he or she means by the "weight" of a thing, and you will get answers such as "its heaviness," or "its heft," or the "force required to lift it," or "the difficulty of raising it," or "the pull up you must give it," or any number of such replies; but if he ever got the answer, "I mean the mass of the body, in other words its inertia, a measure of the quantity of matter the body contains," surely he would not be satisfied with this as a fair specimen of the vernacular, but would rather regard it as one of those answers so frequently given to examiners—the product of a mind so tortured by instructors that its common-sense and vernacular are completely atrophied. OLIVER J. LODGE.

The Composition of Water

Two days after the publication of my letter in NATURE (p. 390), on the composition of water, I received the Manchester