would seem from the figure as if Dr. Mayr's *Pinus pumila* might be referred to *P. Cembra*, whilst *P. pentaphylla* is obviously a near ally of the East American *P. strobus*.

Dr. Mayr's "diagnose," however, is really a rather diffuse description in German, not conveniently adapted for the comparison of one form with another. In this absence of concise comparisons in Latin, modern botanists, especially German ones, compare unfavourably with their predecessors. On the other hand, Dr. Mayr establishes some sectional characters which may prove useful, such as the three sections into which he divides the genus *Picea*, viz. *Morinda*, *Casieta*, and *Omorica*, the last, indeed, having been already proposed by Willkomm.

Hybrid forms between *Pinus Thunbergii* and *P. densiflora* are mentioned, as well as a whole series of garden varieties which have either originated in Japanese gardens or have occurred as "sports" on the wild trees, and which have been propagated by grafting by the Japanese gardeners. These are likely to prove of scientific interest, and will be specially interesting for garden purposes.

Seven quarto coloured lithographic plates accompany the volume, giving details of the foliage and cones. We could have wished that representations of the trees themselves could have been supplied, and that an alphabetical index of species and varieties had been added to the classified table of contents. When we have so much that is valuable and interesting presented to us, it may seem ungracious to hint at deficiencies, but really in this case to ask for more shows how greatly we appreciate what we have, and is about the greatest compliment we can pay to the author. MAXWELL T. MASTERS.

ELEMENTARY HYDROSTATICS.

Solutions of Examples in Elementary Hydrostatics.

By W. H. Besant, Sc.D., F.R.S., Fellow of St. John's College, Cambridge. (Cambridge: Deighton, Bell, and Co., 1891.)

THIS is a collection of solutions, or a *crib*, to the author's well-known "Elementary Hydrostatics," which has held the ground in elementary instruction unchallenged since 1863.

It was cruel, though, as Dr. Besant apologetically explains, unavoidable, to keep the world of instructors waiting so long for these much-needed solutions and explanations of the questions in his *Hydrostatics*.

The Solutions are stated to be almost entirely drawn up by Mr. A. W. Flux, who has found it necessary to explain that the equation $p = gpz$ must be interpreted as giving the pressure p in *poundals per square foot* (or in C.G.S. *barads*, might well have been added); but he has not explained that the effect of this reverential interpretation is to make p and w signify the same thing; so that two symbols are used to denote the same quantity, although one, p , is called the *density*, and the other, w , the *intrinsic weight*.

But in 1863 the word *poundal* was not known, nor was any mode of measuring force and pressure in use, except in terms of gravitation units.

It would take too long to recount the despair of the instructor and the confusion of the student at the different

modes of reconciliation of the equations $p = gpz$ and $p = wz$, variously used as measuring the pressure at a depth of z feet.

Because thirty and more years ago it was thought convenient in dynamical equations to replace W/g by a single letter M , merely for purposes of convenience in writing and printing, it was and is still taught in our theoretical treatises that the equation $W = Mg$ is the expression of a subtle and fundamental law of Nature, to be introduced even into a treatise on Elementary Hydrostatics, presumably taken up before a student has commenced Dynamics, and before he can understand what acceleration in general, and the particular acceleration g , can mean.

What must, for instance, be the feeling of Tommy Atkins, when the Musketry Instructor begins on p. 1 of the official "Treatise on Military Small Arms," 1888, with this definition of Mass, taken in a garbled form from chapter ii. of the *Hydrostatics* and elsewhere.

"Mass: The *quantity of matter* in any body, the sum of all the particles of the body; it is proportional to the weight, whatever be the figure, or whether the bulk or magnitude be great or small; for the weight is equal to the mass multiplied by the force of gravity, or $W = Mg$, and the letters M and W are usually employed to denote the *mass* and *weight* respectively."

In short, this definition amounts to saying that *mass* is something we denote by the letter M , while *weight* is something we denote by the letter W ; but we must always remember that $W = Mg$, where g is something unexplained, even when we measure mass in pounds and weight also in pounds; so that if g appears in one place, it will cancel again somewhere else, and not affect the ultimate numerical result.

But if, according to former instructions, we calculate the pressure from the equation $p = gpz$, we must notice that p , the density as defined in chapter ii., "Elementary Hydrostatics," is the weight in pounds of one- g -th part of a cubic foot of the liquid, or gp is the weight in pounds of one cubic foot of the liquid, so that gp and w now measure the same quantity.

The unfortunate instructor was formerly called upon to reconcile these opposing statements, that w is sometimes the same as p , and sometimes as gp ; now, however, he can take refuge behind the definite statements of this authorized collection of solutions.

But what is most wanted is a mathematical Censorship, to go through our hydrostatical treatises, expunging all the g 's.

As to the mere mathematical geometrical part of the solutions, this is doubtless carried out with true Cambridge elegance, of which Dr. Besant is so well known an exponent; a trifle however, in comparison with the difficulty of the interpretation of the units in some extraordinary questions relating to the equations $W = sV$ and $W = gpV$, questions at one time considered a valuable test of clear thinking on the part of the student.

We counsel everyone who values his peace of mind to procure a copy of these Solutions, if called upon to interpret and expound the numerical results of the original "Elementary Hydrostatics."

A. G. GREENHILL.