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(Illustrated articles are marked with an asterisk.)

LAND AND WATER---ARE EARTHQUAKES LAND MAKERS?

A writer in a late number of *Chambers' Journal*, under the caption, "The Usefulness of Earthquakes," attempts the theory that these phenomena, combined with volcanic eruptions, are the means of repairing the waste made by the action of the sea on shores and of rainfall on interiors. He assumes that "*If* the solid substance of the earth formed a perfect sphere in ante-geologic times—that is in ages preceding those to which our present geologic studies extend—there can be no doubt that there was then no visible land above the surface of the water; the ocean must have formed a uniformly deep covering to the submerged surface of the solid globe. In this state of things, nothing but the earth's subterranean forces should tend to the production of continents and islands."

The *if* which we have italicized is the best reply to his doubtful assumption; there is no evidence that the earth was ever a perfect sphere; in fact, not only astronomy but geology witnesses the contrary. The earth is an oblate spheroid, and, so far as our means of ascertaining extends, was always of this form. If the earth was ever, for any geologic period, submerged with water, some evidences would have remained in every portion of its surface. By a "geologic period," we mean the duration of time between one great natural condition, as determined by geologists, and its successor; periods counted by a lapse of time compared to which our historical period is as the dust in the balance. Any one who carefully reads the records of geological investigation will see that the probabilities are strongly in favor of a condition of the earth's surface as regards protuberances and depressions—mountains and valleys, elevated plateaus and depressed plains, land and water—in ancient times very similar to that which now exists. To be sure, it is evident that portions, now dry land, formed once the bottom of seas, and mountains were but islands, but there is no reason for doubting that the present seas might have been dry land; our means for determining this fact, however, are meager compared with those afforded for an examination of dry land. We cannot traverse the ocean's bottom as we can the valleys of the habitable earth. It may be possible that a larger proportion of the earth's surface was once covered by water than at present; but while this opinion may be entertained, it is morally certain that where seas now roll their unobstructed waves dry land in many instances existed. Why could not the peninsula of Yucatan with Cuba, Hayti, Jamaica, and the group of Caribbean islands once have inclosed as an inland lake what is known now as the Caribbean Sea? And why not the peninsulas of Florida and Yucatan with western Cuba have similarly inclosed the Gulf of Mexico? So at the Straits of Dover, there is evidence, from recent soundings and examinations, that England and France were once physically united as they subsequently were politically.

The writer makes this statement: "At first sight it may seem paradoxical to assert that earthquakes, fearfully destructive as they have so often proved, are yet essentially preservative and restorative phenomena; yet this is strictly the case. Had no earthquakes taken place in old times, man would not now be living on the face of the earth; if no earthquakes were to take place in future, the term of man's existence would be limited within a range of time far less than that to which it seems likely, in all human probability, to be extended."

This *does* seem paradoxical, because, for every case of the permanent upheaval of barren rock by earthquakes there can be brought the record of permanent disappearance of fertile lands. Indeed, the destruction caused by earthquakes in the sinking or ingulfing of tracts of land and producing in their place lakes of noxious waters, or allowing the inroads of the sea has been so great and so much more frequent than the gift of solid land, that earthquakes are, the world over, and in all times, regarded with dread as the most destructive agent in nature. From the time that (as the "New England Primer," published in 1770, has it),

Proud Korah's troop
Was swallowed up,

down to the recent destruction of Arequipa and other cities on the western coast of South America, the earthquake has been a destroyer and not a restorer. From the disappearance of the island, Atlantis, mentioned by Plato in his *Timæus* to the recent reports of similar disappearances, the earthquake has diminished rather than increased the amount of habitable land.

IMPORTANCE OF ACCURACY IN THE USE OF MECHANICAL AND SCIENTIFIC TERMS.

The general employment of technical terms and phrases among scientists and mechanics, and the necessity for their use to avoid inconvenient paraphrases and involved sentences, make a thorough understanding and a discriminate use of these terms a duty to all who employ them. In our descriptions of machinery and processes we have always studiously avoided those terms, which, not being commonly used, were either generally unfamiliar or not self-defining. It may be that at times the article as published appeared to be too elementary in character, but it is better to use language understood by all than a *patois* intelligible to the initiated only. There are in use many technical terms, however, that of themselves are far more expressive than any phrase in common use, and these should be employed in preference to an explanatory sentence which reaches its point only by seeming to aim at another. In such cases the technicals are the proper terms. Many of them are not laid down in the dictionaries, and different ones are used in different sections of the country by men engaged in the same business; but some are so apparently demonstrative and in their sound so well convey the idea that they are always understood. For instance, if a smith speaks of a "suant" heat, every one knows at once that it means a soft, even heat, permeating the mass of iron—the very sound of the word conveying the idea. The "bite" of an acid or file, the "hang" of a hammer, the "rake" of a turning tool, and many others beside those which show their applicability by their derivation, are better than any phrase that is simply descriptive or definitive.

But all technical terms to be useful should be definite. Though a "stringer" may be a "beam," it does not follow that a beam is a stringer. A railroad "sleeper" may not be also a railroad "tie." A "bit" may be a plane iron or an instrument for boring wood. "Force" and "power" are not synonymous, neither are "weight" and "pressure." So we might go on indefinitely, and give examples of the indiscriminate and improper use of technical terms. We have a letter before us in which the writer, speaking of his steam boiler, uses the terms "fire surface" and "heating surface" as synonymous. Another speaks of the "force" of steam and the "pressure" of steam, also as synonymous or interchangeable terms. It is sometimes difficult, under such circumstances, to really understand what is meant. In such cases it would be better to use language of a less concise but more explanatory character.

Yet there is a pedantry affected by many in the use of technicals that is as annoying as it is pretentious. It is seen in the use of geometrical terms in defining well-known and familiar forms, and of algebraic formulas to state simple arithmetical problems. There are occasions when this is not only proper, but absolutely necessary for the defining of the subject. As to those who air their superficialties by a malapropos employment of all the technical terms they have been able to pick up, they do not deserve notice; such are beneath criticism and beyond improvement.

But even our professional teachers, the compilers of manuals designed to aid the beginner, are open to the charge of pedantry, and not unfrequently to that of writing about what it is evident they do not themselves understand. It would be unkind and harsh, perhaps, to refer by title to such works, but we have been several times much surprised to note the ingenuity of two, at least, of these authors in concealing their own ignorance while assuming to teach others. Nystrom, in his "Technological Education" says: "We frequently find most valuable formulas given by scientific men in such a shape that it requires to know more than the author in order to employ them; they are not only not trimmed to a practical shape, but even the meaning of letters is rarely explained in proper technical language."

We are convinced that the reason why our mechanics do not generally take kindly to scientific education applicable to their department, is not because of a dislike to the subject, but because of the needless obstructions in the way of ambiguous and involved statements that seem to be made or presented in a form purposely designed to annoy, or carelessly calculated to mislead.

HOLLOW vs. SOLID SHAFTING.

Hollow shafting, where large diameter is not objectionable, has long been in use, made generally of cast iron, and frequently used as a drum or continuous pulley for the reception of belts. Such a shaft was used in the "pistol shop" of Colt's factory before the destruction of the building by fire about four years ago, and a similar line may now be in use in the reconstructed building. This shaft was five hundred feet long and fifteen inches diameter, made of hollow cast-iron cylinders, connected with each other by a solid shaft or bearing at each end, resting in a box as a journal. The result was an almost continuous drum, of five hundred feet in length, from which belts led to the counter shafts of the machines, the speed of each machine being regulated by the diameter of the pulleys on the countershafts. We have heard also of wrought iron pipes of only two inches diameter being used as shafting successfully.

Tredgold says that a round tube whose internal and external diameters are as seven to ten, respectively, has twice the lateral strength of a solid cylinder containing the same amount of material. A cylinder (solid) of cast iron, five inches diameter, has a transverse strength of 21,104 pounds, while one of eight inches diameter, containing the same cross sectional area of metal, has a transverse strength of no less than 45,416 pounds.

These facts would seem to show plainly the possibility of reducing the weight, materially, of shafting without a diminution of its strength. The weight of shafting is a mass the inertia of which must be overcome by the driving power, and in some cases the amount of power, otherwise useful, that is thus absorbed, is not less than twenty per cent. If by the use of lighter shafting this could be reduced only five per cent, the saving would be worth an effort. Shafting must be of sufficient diameter to sustain the weight of pulleys and the strain of belts without springing, but if the requisite stiffness—resistance to torsion and springing—can be obtained by hollow shafts of much less weight, not only is money saved in the first cost (shafting being furnished by the pound), but the continual expense in the absorption of unnecessary power in driving the unnecessary weight would also be prevented. That hollow shafting of wrought iron can be made cheaply is sufficiently apparent when we examine specimens of pipe used for various purposes. And not only would the first cost be less, but the ease of handling, owing to reduction in weight, would lessen the cost of turning, etc. Such shafting could also be easily oiled from the inside which would seem to be the proper method.

THE WICKEDNESS OF WASTE.---VALUE OF BONES.

If persons who carelessly and thoughtlessly throw away what they consider useless to themselves, understood the intrinsic value of these discarded trifles or this unpleasant rubbish, we are certain some little trouble would be taken to preserve and direct them to their real use. We will, from the thousand and one of these unconsidered trifles, select but one—bones—as a text for a few words in regard to their waste; and we will not refer even to their use in the arts as material for manufacture into various forms of use and beauty in which they reappear on our persons and in our dwellings, but confine our remarks to the value of bones as a fertilizing agent.

Let us see, first, of what bones are composed. Take ox bones, which comprise the larger part of household bone waste. Berzelius gives the following as the constituents of the dry bones:

Phosphate of lime with a little fluoride of calcium	57·35
Bone gelatin	33·30
Carbonate of lime	3·85
Phosphate of magnesia	2·05
Soda and common salt	3·45
	100·00

Every intelligent farmer knows that these are just the elements for combining with inorganic matter to make a fertile soil. It is, however, maintained by some that the nitrogen—contained in the gelatin—is not beneficial as a fertilizing element, from the fact that calcined bones deprived of their nitrogen, are still very valuable as a manure. But we believe that the nitrogenous element is really a valuable ingredient in fertilizers, for nitrate of soda, NaO, NO_5 is known to be a valuable fertilizer, and where found in natural beds as on the west coast of South America, it is exported for agricultural use as well as for the manufacture of nitric acid. The necessary amount of soda to form this combination exists in bones, and as the oxygen of the atmosphere readily combines with it, the objections against it as being unfit for fertilization do not seem to be tenable.

Prof. Johnston (than whom no better authority can be quoted) says that one hundred pounds of dry bone-dust add to the soil as much organic animal matter as three hundred or four hundred pounds of blood or flesh, and also, at the same time, two-thirds of their weight of inorganic matter—lime, magnesia, common salt, soda, phosphoric acid—all of which should be present in a fertile soil. From this it will be seen that even if the usefulness of bones was limited to their application to the soil, their value is sufficient to induce care in their saving and preparation. The superphosphate of lime so favorably known to our farmers is simply bones treated with one-third their weight of sulphuric acid and an equal quantity of water. The farmers of England understand the value of bones. Beside those gathered in their own country, they import them from the pampas of South America, the feeding and slaughtering grounds of millions of semi-wild cattle, and prepare them for their soil.

VEGETABLE OILS USED IN PAINTING.

There are two kinds of oils found in plants, called respectively *volatile*, or essential oils, and *fixed* oils. The former are those of which essences and extracts are made, and are called volatile because when exposed to the air they will, like ether or alcohol, entirely evaporate. The fixed oils, on the contrary, will not evaporate, hence their name. The latter are divided into two classes, *unctuous*, or *greasy* oils, and *siccative*, or *drying*