

the suggestion we have made. But the boys will, if they have half a chance. And we would urge upon parents the propriety of allowing their sons to vary their watery sports in the way we have described. They cannot put their old clothes to better use. We can say from personal experience that the boys will like the fun, and that they will never regret the saving knowledge they will gain by it.

Of course we would not exclude the girls from such knowledge, if circumstances are at all favorable. At least let them learn to make the most of the temporary advantage their clothing offers for buoyancy, and also how to relieve themselves of entangling skirts in case of emergency.

PROFESSOR HUXLEY AND HARVARD.

The rumor that the Faculty of Harvard University are endeavoring to secure Professor Huxley as the successor of Agassiz is making, it appears, quite a breeze among the English scholars. The *Academy*, one of the ablest literary periodicals, hopes there is no truth in the statement, and asks, "are the English universities so rich in really eminent professors, and so poor in money, that they can or must allow Professor Huxley to go to America to find leisure to work? . . . The universities are so rich that they could beggar the whole world. Will they allow themselves to be beggared by Harvard?"

We don't agree with our contemporary in its intimation that money would be the mainspring of Professor Huxley's action, should he consent to occupy Agassiz' vacant chair. The work of such men is not to be measured in pecuniary compensation, nor does it belong to any country, but to the entire world. We greatly mistake the spirit of our great modern investigators if, should they determine that they could accomplish greater ends and achieve greater triumphs in the cause of Science by changing their abodes to the remotest corner of the earth, either a feeling of patriotism or a desire to make money would deter them from accepting the duty. Professor Huxley's decision, we venture to say, will be based on the question of where he can do the most good, not on the matter of pecuniary gains.

DISASTROUS FLOODS.

The two heavy floods which have recently occurred at Eureka, Nev., and Pittsburgh, Pa., have been so terribly destructive to life and property that they may be fairly classed among the extraordinary calamities of the year. They are besides phenomenal in their nature, one being due to a greatly overcharged cloud breaking against a lofty range of mountains, and the other to the meeting of two vast masses of vapor which united in a deluge which is described as resembling the descent of a torrent. Both storms appear to have been local in destructive effect, although heavy rains and freshets have taken place over Ohio, Indiana, and Kentucky, and have everywhere caused damage.

The report of the Nevada deluge states that, within ten minutes after the beginning of the rain, Eureka was flooded. The water poured through the streets for half an hour, tearing up houses and uprooting trees, damaging property in the end to the extent of \$100,000, and killing twenty people.

In Pittsburgh, the destruction was much more extensive. From the descriptions given of the rising of the storm, two great black clouds appeared at opposite points of the compass and slowly approached each other. Blinding flashes of lightning shot between them as they neared, until the gradually narrowing space appeared a mass of fire. The meeting was heralded by a terrible thunderclap, followed by a few heavy rain drops, and then down poured the deluge with fearful fury. Pittsburgh lies at the junction of two rivers, and its suburbs, built on the hillsides and valleys adjoining the streams, are traversed by gulches and natural water courses, which form channels for the rain to run off. Several ravines empty into Butcher's Run Valley, about two miles north of the center of Alleghany City, along which numbers of houses had been erected. Here the damage began, and the flood rushed down the bed provided for it by Nature, sweeping away everything in its path. In other valleys deluges appeared, working like disaster, and small streams suddenly became roaring torrents. Over one run, two new iron bridges and five wooden ones were carried off. Large salt works, refineries, and factories were destroyed, and barges and vessels in the rivers were torn from their fastenings and swept away. The total loss of life is placed at 219 persons, and a rough estimate places the pecuniary loss at \$3,000,000.

Both floods, besides being owing to the phenomenal circumstances mentioned, were also greatly due to the situation of the towns, Eureka, at the foot of the mountains, receiving the deluge pouring down their sides; and Pittsburgh, also in a valley surrounded by high land, lay in the path of the torrents which naturally sought to empty into the rivers.

TIDES IN THE GULF OF MEXICO.

A correspondent asks us whether it be true that at Pensacola, Florida, there is but one daily tide, and inquires whether, if such be the fact, how it is that at Havana, Key West, and other points in proximity, the tides take place twice a day in the ordinary manner.

Professor Bache, in his coast survey reports, mentions that the tides of the United States are divisible into three distinct classes. Those on the Atlantic coast are of the ordinary type, ebbing and flowing twice in twenty-four hours, and having but moderate differences in height between two successive high or low waters, one occurring before and the other after noon. Those on the Pacific coast also ebb and flow twice in twenty-four hours, but the morning and

evening tides vary considerably in height. The intervals also between successive high and low waters may be very unequal. The irregularities are due to the moon's declination, as, when the moon travels to the north of the equator, the vertex of the tide wave follows her, giving the highest point of one tide in the northern, and the highest point of the opposite tide in the southern, hemisphere. Hence, when the moon is in northern declination, the tide at any place in the northern hemisphere caused by her upper transit will be higher than that caused by her lower transit. This variation in the heights is called the diurnal irregularity, and has a period of one lunar day.

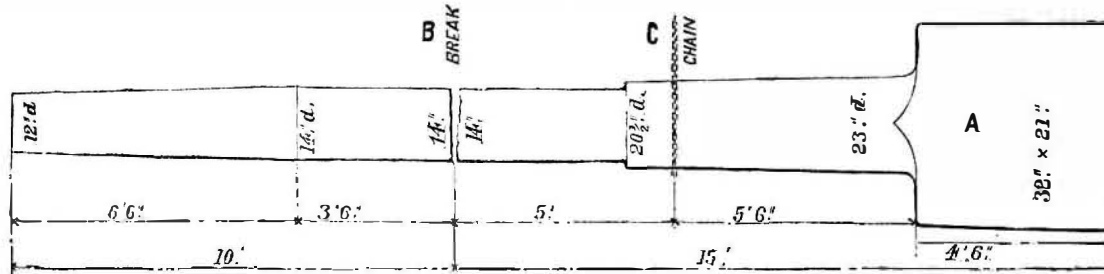
The effect of this phenomenon is to materially modify the tides, more especially on the Pacific coast and in the Gulf of Mexico. In the latter, however, the tides vary greatly according to locality. On the coast of Florida, from Cape Florida around to St. George's Island, near Cape San Blas, the tides are of the ordinary kind, with a large diurnal inequality. From St. George's Island, in Apalachicola Bay, to Dernière Island, they happen but once a day, that is ebbing and flowing once in 24 hours. At Calcasieu entrance, the double tides reappear, and exist for some days about the period of the moon's greatest declination. The tides are double at Galveston. At Aransas and Brazos Santiago, the single day tides are at perfectly marked as at Pensacola. The probable cause of these discrepancies is the formation of the islands and entrances. If the tides arrive at the same place by two different channels, and one of them is retarded six hours behind the other by traveling a longer route or through shallower water, the semi diurnal tides will be destroyed through interference of the waves, the high water of one being opposed to the low water of the other; the diurnal inequality will, however, not be destroyed, but merely modified in height and time, leaving a single tide in the lunar day outstanding, which is small in amount. This is doubtless the case at Pensacola, where the mean tide is but one foot, and the extremes of rise and fall one and a half feet and four tenths of a foot.

In this connection, we may add that to the difference in tides of the Atlantic and Pacific oceans is due the erroneous idea that the level of the latter body of water is the higher. At Panama the tides rise over twenty feet, while at Aspinwall about as many inches is the limit. The mean tide, however, of both oceans is the same.

FRACTURE BY LONG-CONTINUED JARRING.

In one of the articles recently published in the *SCIENTIFIC AMERICAN*, the well known fact, that a long continued succession of even moderate shocks, or jarring, sometimes produces rupture in even large masses of iron, was illustrated by the account of the breaking of one end of a very large shaft at the Morgan Iron Works, while the other end was under the hammer. We are now indebted to the same authority for the account of a similar incident, which occurred at the West Point Foundry some months ago.

In forging masses of iron of such shape that they are difficult to handle, it is usual to weld to them a porter bar, by which they can be moved about conveniently until they are nearly finished, when the bar is cut off and laid aside until again required for a similar purpose. The same bar is often kept in use many years.



The above sketch represents a porter bar thus used at the West Point Foundry, as nearly as can be ascertained, about twenty years. The large mass of iron, A, measuring, in section, two feet eight inches by one foot nine inches, and four feet and a half long, weighing over four tons, could not well be handled on account of its weight and its awkward shape. This porter bar was therefore welded on it, as shown in the sketch. The whole mass was then slung by the chain, in which it was nearly balanced when the point of support came at C, ten feet from the larger end and fifteen feet from the smaller end. While the hammer was at work upon the forging, the bar suddenly broke at a point ten feet from the smaller end, B.

The appearance of the fracture is described as highly crystalline and a clean break. The piece thus broken off weighed, probably, a ton and a half. The force which, applied at the extremity, would have been required to break it off by a steady pressure, would have been at least twelve tons. The cause of this remarkable accident is, as has already been explained, the gradual separation of particles by successive shocks, each of which forces them a minute distance beyond the limit of elasticity. This action continually repeated must, sooner or later, produce rupture, although the effect of each shock is quite imperceptible to the senses. The most singular and least understood phenomenon is the structure of the metal at the surface of fracture. It is by no means well established that what are described as crystals are true crystals, or even that wrought iron can have a crystalline structure under any circumstances, as a crystal has usually, if not invariably, definite axes and facets, making fixed angles with each other, and the crystal, as a whole, is without a semblance of ductility. This phe-

nomenon is not an uncommon one; but it is not yet well understood, and demands careful investigation by the use of the best known appliances and the application of scientific methods. The subject is one of great importance. The breakage of railroad axles in this manner has probably sacrificed many lives and much valuable property.

Could it be definitely ascertained what amount of deformation carries those particles which are most strained beyond their limit of elasticity, and could rules and formulæ be obtained which should express the existing relation in such cases, between the resisting power of the material and the forces of impact and inertia which thus attack it, a most valuable addition to our knowledge would be made. At present we can only adopt, as a general principle, the rule to make parts, exposed to shock, of such form as will distribute resistance as uniformly as possible throughout the piece, and to adopt every practical method of reducing the violence and frequency of shocks and jars. The most elastic materials are best fitted to withstand this kind of stress.

ENGLISH FOOD ADULTERATION.

The English Adulteration Act imposes a fine for the selling of any adulterated article as pure; and also provides that any mixed materials, such as mustard, cocoa, etc., shall be designated by a label setting forth the fact. A large number of dealers have attacked this law, stigmatizing it as unfair and coercive, and a parliamentary committee is now inquiring into its workings. The evidence thus far adduced is not only interesting in itself, as showing the many falsifications of the commonest articles of food, but is of especial importance to American dealers, inasmuch as it is stated that it is a common practice for the owner of a spurious article on the other side of the Atlantic, on finding that it is in danger of seizure under the law, to lose no time in getting it aboard a steamer for New York. In this way, it appears, from the statements of the New York *Herald's* London correspondent, that shipments of spurious teas, adulterated wines and spirits, and fraudulent packages of Roman cements, together with a number of other commodities, all more or less adulterated, find their way to our markets.

Tea is doctored in order to improve its appearance, increase its bulk, and add to its weight. For the two last mentioned purposes, finely ground quartz and iron or steel filings are employed. Catechu gum, an astringent substance, is also used, but the favorite ingredient seems to be "lie" tea, or old tea leaves once used and then worked over. This is mixed with low grades of new tea, and placed in cylinders under steam, together with a quantity of carbonate of magnesia, Dutch pink, and Prussian blue. The adulteration with "lie" tea is usually done in China before export, but the "facing," as the coloring is termed, is performed by people in England who become skilled in the fraud as a business. The dealers face the tea to render it back or green, according to the desires of customers. Out of 170,000,000 pounds of the commodity annually consumed in England, it is asserted that one fifth, or about 35,000,000 pounds, is open to suspicion.

British wines, according to the testimony of several analysts, are largely adulterated with potato spirit; sherry is doctored with sulphuric ether, and to other liquors fusel oil and French treacle or brandy, which is often nothing more

than beet root spirit colored and flavored. Beer is now comparatively pure, and the main adulteration is simply water.

In butter, often as much as forty per cent of water is found; patents have recently been obtained for a compound called "butterine;" and two other artificial mixtures, known as "Australian" and "Dutch" butter, have appeared in the markets. The Australian stuff is bone fat extracted by steaming refuse bones. It sells for fifteen cents per pound, and smells horribly. Dutch butter is a mixture of genuine butter and American lard. There is, beside, a French butter, compounded of drippings and kitchen stuff colored with annatto.

Corn flour, a material largely used for food for children, is described as generally worthless and unhealthy. Thirty-three out of seven thousand grains, a pound, one analyst states as the proportion of nutritious matter contained, where there should be at least eight or nine hundred grains. The article is nothing more than starch, a fact proved by the circumstance that a dog fed upon it died of starvation.

Other well known adulterations in bread and milk are noted; but as these commodities do not come under the head of possible exports, allusion to them is unnecessary.

J. H. says: "Please call the attention of your numerous readers to the great danger of buying cheap cans, for fruit, vegetables, etc., as a mixture of lead and tin is used for their manufacture (instead of the bright tin), by unprincipled manufacturers."

It is only by the thorough study of details and their mastery, that one can hope to attain eminence or position in any profession.—*Graham Smith.*