rate of a fork caused by changes in temperature, in the amplitude of vibration, and by the pressure of the style against the paper on which the vibrations are recorded.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

An early prediction of the decay of the obelisk.

I GIVE below a translation of a portion of a letter from Dr. Alfred Stelzner of St. Petersburg.

"At first I wanted to add to my remarks a comparison between the New York Needle and the Alexander column in St. Petersburg; for the rock of both is very much alike: it agrees even down to the occurrence of handsome little zircon crystals. This comparison would have been made but that it would have been a mournful and unpleasant croak in the triumphant report of Mr. Gorringe, and therefore it had to be abandoned; but privately let it at least be put on record. You know, perhaps, that the Alexander column in St. Petersburg was transported from Finland to St. Petersburg in the thirties of this century at a senseless cost, and, with the assistance of thousands of men, was erected, — a monument for eternal ages, which should remind the beholder of a Russian monarch. But even in a few years the granite did sad honor to its Finnish name of 'Rappakivi,' i.e., the lazy-stone. The granite commenced to weather, and weathered merrily on in spite of all technical and scientific commissions; and one can well say that the years of the proud monument are numbered. It is possible that they chose unsound stone, and that they shook it about too much; so that, in quarrying and transporting it, it became filled with little clefts, and thus gave free play to its disintegration. But General Helmersen explains the affair differently. The granite, he says, contains many large felspar crystals. But the felspar is triclinic, and therefore expands, under the great differences of temperature between the St. Petersburg summer and winter, differently in the directions of its three axes: hence comes the crumbling, owing to the unequal molecular movement throughout the entire mass of the monolith. If this explanation is correct, then from the similarity of the rocks from Finland and Syene, and the great differences between the summer and winter temperature which exist also in New York, an unsuspected danger threatens the old Egyptian monolith, which has always hitherto stood in a mild and equable climate. Perhaps, also, it will succumb to the weakness of old age, for the London Needle of Cleopatra is said to be beginning already to crumble in its new home. You may regard this statement as pessimistic, but a knowledge of the experiences made elsewhere will not injure the New-Yorkers. Perhaps it will lead them to cover up the Needle there with bad conductors of heat during the winter, and thus preserve the venerable old stone monument. In any case, you will agree with me that this comparison should be taken into consideration; but it will not do to insert it into Mr. Gorringe's book, where it would produce a discordant tone. But it is worthy of consideration. . . . Thus I wrote in 1882, and I regret that I was not mistaken. But the children of the tropics, be they palms or granite columns, will not stand a northern winter in the open air. For the rest, one will interest himself now more than formerly in the observations which have been made in other places. I take the liberty, therefore, of calling your attention to the memoir by Struve: 'The Alexander monument and the Rappakivi. A contribution to the better knowledge of the Finnish granites. St. Petersburg, 1863–64.'"

F. R.

Sea-level and ocean-currents.

The recent important determination of the coast and geodetic survey, by levelling up the Mississippi valley and across to the Atlantic coast, that the mean level of the Gulf of Mexico at the mouth of the Mississippi is about one metre higher than that of New York harbor; and the similar result obtained by Bourdalone, by levelling across France, namely, that the mean level of the harbor of Brest is 1.02 metres higher than that of the Mediterranean at Marseilles, — furnish an interesting subject for study, and important facts for explanation by physical geographers. If, as it seems, the surface of the ocean is not level and at rest, what are the forces which cause it to deviate from a perfect level, and to have ascending and descending gradients in different parts, and currents running in various directions?

There are two principal causes for this disturbance of sea-level, — the one, the difference of level between the equatorial and polar regions, arising from a difference of temperature of the sea in the two regions; and the other, the deflecting force depending upon the earth's rotation. The first is the real cause of disturbance, the latter being simply a modifying influence of the effects of the former, which changes, or tends to change, the directions of motion, but does not give any addition of real force.

According to Mr. Croll (*Climate and time*), as deduced from the soundings of the Challenger expedition, if the water of the upper strata were prevented from flowing away toward the poles, the level of the ocean at the equator, on account of its greater temperature, would be 4.5 feet higher than the level at the parallel of greatest diversity of sea-water, a little beyond the polar circle. This greater upward expansion in the equatorial region, however, does not change the pressure at the bottom of the sea; and its initial effect is to give rise in the upper strata to gradients of pressure decreasing from the equator toward the poles. This causes a flow of the water of these strata from the equatorial to the polar regions, and this decreases a little the pressure at sea-bottom in the former, and increases it in the latter, and consequently gives rise to a gradient of decreasing pressure, and an under-current, from the polar regions toward the equator. Hence there is now an interchanging circulation, a motion of the water of the upper strata from the equatorial region toward the poles, a very gradual settling-down of the water in the higher latitudes, a return toward the equator in the lower strata, and a very gradual rising-up again in the lower latitudes.

If the earth had no motion of rotation on its axis, this would be simply a vertical circulation without any motion either east or west. But, in consequence of the deflecting force of the earth's rotation, the water of the upper strata, in flowing from the lower latitudes toward the poles, is deflected eastward; and it retains this eastward motion until it has settled down in the higher latitudes into the lower strata, and has returned, perhaps, to the parallel of 35° or 30°,