

unless the sirup be put into the cans in a very watery condition, the formation of a thick layer of crystals at the bottom invariably follows; and I have often seen great difficulty experienced in removing it without breaking the cans. J. EDWARD CHAPPEL.

Warsaw, N.Y., Dec. 14.

International geological congress at Berlin.

On referring to the original notes which I took during the sessions of the International geological congress, I find that Mr. Archibald Geikie moved to strike out all the words after 'Coudroz' except 'l'Old Red,' in the paragraph (l. c., p. 15) of the report of the committee on uniformity of nomenclature, my account of which Dr. Dewalqus criticises in *Science*, Dec. 11. Upon this, M. Renevier asked, 'on principle,' that the whole paragraph be struck out, on the ground that the congress ought not to go into such details. There is no mention in my rough notes that this was done; but in the fair copy, which I submitted to some of the leading members of the congress for their approval or correction, I find a pencil note to the effect that M. Renevier's motion was carried. I cannot recall the authority for this note, which was embodied in the short summary which, with the assistance of Professor Williams, I prepared for *Science*. I should like to state here, that in spite of the employment of the greatest possible care, and the assurances of the accuracy of the account of the meeting, which is about to appear in the *American journal of science and arts*, from some of the most active participants in the discussions, some errors, though I trust none of importance, will probably be found. To those who are aware of the exceedingly inferior acoustic qualities of the hall, and the involved nature of some of the discussions and votes, these will be thought pardonable. PERSIFOR FRAZER.

Philadelphia, Dec. 12.

Earthquake-shocks more violent on the surface than in mines.

It has been sometimes observed that earthquake-shocks are felt more severely in mines than at the surface. This may be accounted for partly by the rapid decrease of the shock-motion (wave-height) which is supposed, to vary inversely as the square of the distance from the focus or radius of the agitated sphere, partly by the quenching of the earth-wave by repeated reflections in passing through media of different elasticities, and by the fracturing of the imperfectly coherent media through which it passes. But the converse phenomenon, viz., the greater severity of shocks on the surface than in mines, is, I believe, far more common. This was very conspicuous in the Inyo earthquake of 1872; for buildings were shattered and the earth was broken in many places, and yet persons working in the mines were scarcely aware of any movement. The same has often been observed in Peru.

There are two ways in which I imagine this may be explained. The more obvious is as follows: As long as the earth-wave is within the earth, the back-and-forth movement (shock-movement) is largely restrained by the work of elastic compression of the earth in front necessary for the progress of the wave. But as soon as it reaches the surface the motion is free or unresisted, and therefore much more rapid, — so rapid as often to break up the surface, and throw

loose lying bodies high into the air. But there is another explanation which is perhaps more doubtful, and which, therefore, I offer with some hesitation as a mere suggestion, in the hope that some one may be able either to follow it up or else to disprove it.

In the *Philosophical magazine* of June, 1849, p. 404, the royal astronomer, Professor Airy, drew attention to the peculiar phenomena of what he calls broken waves, or broken-headed waves. These are retarded, discontinuous waves; in other words, breakers. If a normal wave strike against a sea-wall, it will of course be reflected; but if a breaker, a broken or broken-headed wave, thus strike, the swell or unbroken part is reflected as usual, but the broken part is not. If it strike perpendicularly, the broken part is thrown up and destroyed. If it strike at small angle, then the broken part runs along as a strong wave clinging to the surface of the wall. I have myself observed this behavior of broken waves.

Professor Airy then applies this principle to the explanation of certain phenomena of whispering-galleries. The voice produces normal waves; but a hiss, a buzz, and therefore a whisper, produce broken, discontinuous waves. Now, in these galleries the voice is reflected in the ordinary way; but a whisper runs along, clinging to the surface of the wall and dome, and may be heard, if the ear be applied to the wall, at much greater distance than the much louder voice.

Now, may not this principle be applied also to earthquake-waves? 1°. The surface of the earth must be regarded as a very perfect reflection for waves emerging from below; as much so, in fact, as for sound-waves entering the earth from the air. Therefore normal waves emerging on the surface must be largely reflected back into the earth again. 2°. But earthquakes are pre-eminently broken, retarded, discontinuous waves. Passing, as they do, through an imperfectly elastic and slightly coherent medium, which is fissured and crushed at every step of its progress, the normal continuity of the waves is destroyed, and the waves retarded and their energy dissipated, by change into other forms of force, especially heat. For this reason the velocity of heavy earthquake-waves is always much less than that of normal elastic waves in the same medium. For this reason, too, they are rapidly quenched, and therefore extend much less distance than they otherwise would. 3°. If, then, we assume that earthquake-waves are broken and retarded waves, they ought to follow the law pointed out by Professor Airy. When they strike full on the surface, as at the epicentrum, they simply destroy themselves by the work of breaking the surface, and are not reflected. When they strike at small angle, as at a distance from epicentrum, they must run along as a strong wave clinging to the surface. JOSEPH LE CONTE.

Berkeley, Cal., Dec. 5.

An unreliable treatise on disinfectants.

That 'unreliable treatise on disinfectants' criticised by you Dec. 4, deserves even less mercy than you have shown it. When the publisher declares that there is no indorsement of the essays as scientific, and the one selected as the best is chosen as a standard of the excellence of the work as a whole, all persons in the least familiar with the present position of sanitary science must wonder why the