Lindl. sp., and P. Reinii Geyl. The fresh-water or brackish character of these deposits is proved by the occurrence of true and undoubted Cyrena sp. and Estheria.

The cretaceous fossils of Yesso are carefully examined by Naumann (*Mitth. deutsch. ostasiat. gesellsch.*, heft 21), and partly (thirteen species) identified with Indian types, partly with shells described by Schmidt, from Sachalin. His result is, that the Ammonite-beds of Yesso are upper-cretaceous, and correspond especially to the Ootatoor-group of India.

During the last vacation, I got, from Shikoku, sandstones which are also upper cretaceous. They are quite filled with a Trigonia of the scabra-group, probably T. aliformis Park. Two other Trigoniae, which I cannot determine with the literature at hand, fragments of Natica and Hamites, accompany it. The said sandstones have been met with at Oruno, district of Itanagori, province of Awa; Tannomura, district of Katsuragori, province of Awa; Yassudamura, district of Akigori, province of Tosa, — on the island of Shikoku.

The tertiary strata are rather thick. Those which have been studied by Dr. Brauns (*Mem. Tokio univ.*, no. 4, 1881) and A. Nathorst (*Svensk. akad. handl.*, 1882) are pliocene, most of the shells and plants described being identical with living ones. Miocene, or older strata, are not yet recognized with certainty.

Glacial phenomena have not left any traces in Japan.[1] I conclude here with the remark that the list of your *Explication* contains some volcanoes (nos. 8 and 9, p. 114; nos. 4 and 10, p. 115) which I cannot make out. More complete are the lists of Naumann (Yokohama, 1878) and Milne (*Trans. seismol. soc. Japan*, iv. 1882): but even these are not complete; for a recent revision I made gave forty-eight volcanoes which are active now, or have been active within historical time, or are still in the solfatara state. Besides that, I know about forty cones which are probably prior to human record, and date back as far as the pliocene series, which is very often tufaceous or filled with pumice-fragments.

PERFECT INTERFERENCE OF SOUND BY TELEPHONE.

SUPPOSE we have two telephones having the poles of their magnets similarly placed, and so connected with a circuit that a current will traverse their coils in the same direction. It is evident that any electric current passing will cause a simultaneous movement in the same direction in the diaphragms of both telephones. Now, if we conceive the current reversed in one of the telephones, the motions will have opposite signs. It follows, then, that the currents due to the vibration of the diaphragm of a third telephone in the circuit will produce in the two telephones vibrations of *opposite phases;* the sounds produced, therefore, will differ by a half-wave length. The same current which in one telephone produces a condensation will in the other produce a rarefaction.

The experiment, as successfully tried in the physical laboratory of Dartmouth college by Professor Emerson and myself, was arranged as follows: the mouths of two similar telephones were placed before the extremities of a Y-shaped tube, and the sound from both telephones conducted to the ear by rubber tubing. A reversing-switch was placed in the circuit, by means of which the direction of the current in one of the telephones could be changed; in this way could be produced at will coincidence or interference of sound. Each branch of the Y-tube was of rubber, so that either arm could be closed by pinching. Organ-pipes of various lengths were sounded near a telephone in a neighboring building. It was found, that, when arranged for interference, the pinching of either of the branch-pipes produced a very decided increase in the intensity of the sound; when reversed, an equally decided decrease. The inequality in the intensity of the sounds due to the two telephones was found to be the chief difficulty in producing complete interference; but by partly closing one branch, so as to weaken the stronger sound, the effect was much improved. In several trials the interference was complete, no sound whatever being audible. The rapid reversal by the switch gave a sharp contrast between the strengthening and the weakening effect.

This method of demonstrating the phenomenon of interference has obviously the advantage of applicability to sounds of any pitch. With singing, the interference was very satisfactory, especially with the lower notes; in conversation, however, the sound is not so much weakened, but the quality is perceptibly changed. The vowels seemed to suffer much more than the consonants. C. S. COOK.

[1] The writer ignores the discovery of Prof. J. Milne of the engineering school of Tokio, at the large mountain of Gwassan, northern part of Nipon, where are large bowlders and *roches moutonnées*, — the product of glacial action. — J. M.

RAILWAY-ACCIDENTS IN 1882.

THE statistics of railroad operation in this country are far too incomplete and unreliable to admit of drawing any very general conclusions. Certain facts, however, appear with sufficient distinctness to show some very grave defects in the system under which our roads are worked. The *Railroad gazette* publishes monthly and annually a list of accidents to trains while in motion. This, however, does not include over twelve per cent of the whole number of casualties. Again, accidents not resulting in loss of life or in serious damage to property are rarely recorded; though in many cases the blame is not less great, and the lesson conveyed not less important. The total number of train-accidents for the past ten years is returned as below; the second horizontal column showing the actual number, and the third column the number per thousand miles of road in operation: —

1873	1874	1875	1876	1877	1878	1879	1880	1881	1882
1,283	980	1,201	982	891	740	910	1,078	1,458	1,365
18.3	13.6	16.2	12.8	11.3	9.0	10.6	11.6	13.9	12.4

If we regard the second line alone, the figures would seem to be sufficiently discouraging, as there is a steady increase in the number of accidents from 1878 to 1881. We must, however, take into account the growth of the railroad-system. This is done in the third line; and here, again, while we find a somewhat less rate of increase, the fact still remains, that our roads are not growing safer as they expand in extent.

If we examine in detail the causes of accidents, we shall see that they are less dependent upon the total length of roads in operation, than upon the density of the traffic; in accordance with the law, that failures of track and bridges are approximately in proportion to the length of road, while the number of collisions is in proportion to the square of the number of trains.