

produced when the frequency of the vibrator is equal to the specific vibration of the soil. The same process is also used for comparing the degree of compaction of fills before and after completion.

Dr. von Terzaghi then dealt with the failure of dams due to piping, a subject which is nearly allied, from the point of view of its mechanics, to the stability of slopes subjected to seepage forces. Bligh's empirical rule was faulty in that it was based on the tacit assumption that the critical percolation factor depends only on the grain size of the subsoil. By model dams so constructed that, by Bligh's rule, the critical head should have been the same for all, it was shown by the highly divergent results that the assumption is greatly in error. Dr. von Terzaghi explained how he came to the conclusion that piping can be eliminated by the provision of an inverted filter between the body of the dam and the foundation, and he described such a filter which he has designed for incorporation in a rock-fill dam in Algiers.

The time factor in relation to earth pressures and movements was next discussed. Using a cylinder filled with water and having a perforated piston supported by springs as an illustration, Dr. von Terzaghi pointed to the fact that, when a constant load is applied, the piston can only descend as the water percolates through the interstices in the piston. At first the water pressure supports the load, but it falls off as the descending piston compresses the spring. A similar process occurs in clay when loaded, and the mechanics of it can be expressed, in terms of time, by a partial differential equation of the second degree. This is known as the fundamental equation of the processes of consolidation. The case was quoted of a power-house where, for a supply of water, a well was driven through the clay to water-bearing gravel below. As a result, the time-rate of settlement of the power-house increased alarmingly, and within a few months the corner nearest the well had subsided more than a foot. When the well was closed, the settlement practically ceased. Dr. von Terzaghi pointed to other instances in which the operation of the theory of consolidation is exemplified, and explained that settlements of this nature can now be computed with reasonable accuracy.

University Events

CAMBRIDGE.—Dr. J. D. Cockcroft, lecturer in physics in the University and fellow of St. John's College, has been elected Jacksonian professor of natural philosophy as from October 1 (see also p. 846).

LONDON.—The following representatives have been elected by Convocation to the Senate: *Medicine*, Sir Ernest Graham-Little, M.P.; *Science*, Prof. G. B. Jeffery, Prof. Major Greenwood; *Engineering*, Sir Charles Bressey.

A Keddey Fletcher-Warr studentship, of the value of £300 a year for three years, has been awarded to Dr. Vernon E. Cosslett (Birkbeck College), for research on the application of electron optics to the design of X-ray tubes and to the measurement of X-ray diffraction patterns.

SHEFFIELD.—Alfred Wright, at present research assistant in mining, has been appointed lecturer in mining; J. W. Watson has resigned from his post of assistant lecturer in geography.

Science News a Century Ago

Wells in the London Clay in Essex

In a paper read to the Geological Society on May 22, 1839, Dr. Mitchell dealt with "The Wells in the Gravel and London Clay in Essex". The greater part of Essex, he said, consists of London Clay. The greatest thickness of the clay is not known, but it probably exceeds 400 ft. Extensive districts are covered by gravel, sand and detritus. In the districts composed of London Clay, no land springs occur and the wells generally penetrate to the bed of sand between the Clay and the chalk. The Clay is of various colours, the lower beds being sometimes red, but it is sometimes blue at the bottom. In the districts where it is thickest, it is often interstratified with two or three beds of sand, but near the site of Fairlop Fair, it was found to consist of 398 ft. of solid clay. Dr. Mitchell gave a list of nineteen wells, selected from a very large number, the deepest being in Foulness Island, 460 ft. Artesian wells have been productive of the greatest benefit in Essex.

Photography with the Aid of Incandescent Coke

In the *Athenaeum* of May 25, 1839, it was said under the heading "Photogenic Drawing", that "Mr. Robert Mallet has communicated to the Royal Irish Academy a notice of the discovery of the property of the light emitted by incandescent coke to blacken photogenic paper; and proposed it as a substitute for solar light, or that from the oxy-hydrogen blow pipe with lime. One of the most important applications of the photogenic process, as yet suggested, is its adaptation to the self-registering of long-continued instrumental observations. . . . Few artificial lights emit enough of the chemical rays to act with certainty on the prepared paper; while those which are known to act well, as the oxy-hydrogen light, are expensive and difficult to manage. A considerable time since, the author discovered that the light emitted by incandescent coke at the 'Twyer' (or aperture by which the blast is admitted) of a cupola or furnace for melting cast iron, contained the chemical rays in abundance; and on lately trying the effect of this light on the prepared paper, he found it was intensely blackened in about forty-five seconds.

Robert Mallet (1810-80), engineer and physicist, was a graduate of Trinity College, Dublin, and was a partner with his father. Among his works was the Fastnet Lighthouse. He was well known for his study of volcanoes and earthquakes. He was elected a fellow of the Royal Society in 1834.

A Criticism of Davy's Safety Lamps

THE *Mechanics' Magazine* of May 25, 1839, published a report of a lecture by Faraday at the Royal Institution on May 10, on "Some General Remarks on Flame". Faraday had referred to Davy's safety lamps, and in its comments on the lecture, the *Mechanics' Magazine* said: "We have no disposition whatever to detract from the merit or brilliancy of Sir H. Davy's discovery as a scientific fact, but the lamp is a poor fragile thing. . . . Thus instead of protecting the light in a strong lantern he (Davy) contented himself with merely placing around it a flimsy tissue of wire, which besides numerous other objections, is, by its gloomy effect, ever tempting the miner to remove it, or to use a better but more dangerous light.