FROST EFFECTS AT NIAGARA.

MR. ORRIN E. DUNLAP, writing from Niagara Falls, sends us some striking photographs of ice formations noticed at Niagara during the past winter. An ice bridge formed in the gorge below the Falls in December last, and thousands of persons crossed from shore to shore on this curious formation. Another remarkable object was an ice mountain composed of a massive collection of frozen spray

Photo. *O. E. Dunlap.*
FIG. 1.—Mass of Frozen Spray at Niagara.

(Fig. 1). Usually this mound rests on the débris slope between the inclined railway building and the falling water, but last winter it bridged the torrent of the American Fall and extended over in front of the Fall. Here a grotto-like effect was caused by the wearing tendencies of the falling water, and the effect was repeated on the outside, or ice bridge side, of the mountain. From the ice bridge the different layers of ice that went to make up the mound could be distinguished.

A part of the face of the cliff over which the American

Photo. *O. E. Dunlap.*
FIG 2.—Prospect Park as viewed rom Prospect Point. The ice in the foreground is 10 feet thick.

Fall usually flows was hidden under huge icicles that hung from the brink to the talus at the foot of the precipice. In Prospect Park the ice that gathered on the trees was very destructive. The ice grew so heavy that the largest trees lost many branches, and some were left with only their trunks.

The grandest sight of all was, says Mr. Dunlap, at Prospect Point in the middle of February. The wind blew from the south-west, and the spray of the American Fall fell upon the Point, where it was frozen with great rapidity. Every hour added to the mass, until finally it was more than 30 feet high from the water as it plunged over the American Fall. The mound extended back into the park, half burying trees that were already weighted with great loads of ice (Fig. 2). One of the accompanying illustrations shows this ice mound. Realising that the mound might damage the lower section of the inclined railway building or cause loss of life among the many who climbed about the ice and mountain below, it was resolved to try to blast it away. To accomplish this holes were drilled along the upper river side, and eight sticks of dynamite placed in them; but their explosion accomplished little, owing to the slight resistance offered by the ice.

A FORMIDABLE ENEMY TO THE COTTON PLANT.

GREAT alarm has been caused in America by the ravages and rapid spread of a new insect pest, the Mexican Boll-weevil (*Anthonomus grandis*, Boheman), which was described from Vera Cruz in 1843, but first attracted serious notice in the region around Monclova, in the State of Coahuila, Mexico, about 1856, and within six years from that time had devastated the cotton crops to such an extent that the cultivation of the plant was actually abandoned in the neighbourhood. Thence the insect extended its ravages north and east until it reached Matamoras, at the mouth of the Rio Grande, the river which forms the boundary between Mexico and Texas.

In 1892 the weevil crossed the river, and by 1894 had spread throughout the cotton region of southern Texas. In 1894 the damage done in many of the infested districts, both in Texas and Mexico, was estimated at no less than from 50 to 90 per cent., and the American Government was strongly urged by the entomologist who prepared the first official report on the subject (Mr. C. H. Tyler Townsend) to take instant and drastic measures to try to stamp out the pest. However, nothing was done, and with some fluctuations the insect continued to spread, and though the American entomologists reported on it from time to time in "farmer's bulletins" and elsewhere, it was not until June, 1902, that funds were allotted for experiments on a large scale. At present the insect is still confined to Texas, but already the infested area is estimated to include about 1/28th of the whole cotton district of the United States, and there is now no reasonable probability of either stamping out the pest or preventing its extension within the next twenty years over the whole cotton-growing region of the southern United States, nor is there any probability that its attacks will become less serious with the lapse of time. The loss in Texas alone in 1903 is variously estimated at from 8 to 25 millions, and though other causes may have contributed to the deficient crop, there is no doubt that it was largely due to the attacks of the weevil. Still, much can be done by early planting and thorough cultivation, and the destruction of all stalks and other refuse by burning, not later than the end of September. Poison and traps are inefficient, but a cold December and January are very destructive to the insect; nor has it attacked the cotton-growing district of Laguna, in Mexico, which lies at an elevation of 3500 feet.

At length the authorities are roused, and the American House of Representatives has lately passed a Bill for the appropriation of a sum of 250,000 dollars for the extermination of the pest. But we fear that it is too late now to do more than to oppose the insect by special methods of cultivation, and to institute stringent measures to try to prevent the invasion of districts not yet attacked.

The weevil itself is a greyish beetle, very similar in shape to our own destructive apple weevil (*Anthonomus pomorum*, L.), which belongs to the same genus, but it is larger, measuring nearly a quarter of an inch in length. The eggs are laid singly in the "squares" or buds, which afterwards fall, or else in the "bolls" or seed-pods, in one of which latter sometimes as many as twelve of the thick whitish grubs may be found. They do not attack the leaves.

The history of this insect is curiously like that of the Colorado potato beetle. In both cases insects previously only known to entomologists, and feeding in comparatively small numbers upon some wild plant (the original food-plant of the Boll-weevil has not yet been determined), have attacked a cultivated plant, and increased enormously with devastating effects, and spread over a large tract of country. One subject which demands immediate attention from Governments (apart from those of countries already infested) is the instant adoption of any precautionary measures which may be necessary to prevent the danger of the insect being carried from Texas or Mexico to other cotton-growing countries, such as Africa or India.

W. F. KIRBY.

GEOLOGICAL STUDIES IN PERU.

THE third number of the *Boletin del Cuerpo de Ingenieros de Minas del Peru* (Lima, 1903), by Francisco Alayza y Paz-Soldán, director of the survey, raises several matters of general interest to geologists. It deals with the districts of Moquegua and Tacna, including some striking volcanic country between the Andes and the coast. The terrific eruption of Huainaputina in 1600 has left its traces in immense deposits of scoriæ across the adjacent country;

FIG. 1.—Ground disturbed by subsidence, Pallata.

the crater of the mountain was completely blown away, and a barrier was formed by the ejected blocks, strong enough to convert the Tambo River for twenty-eight hours into a lake. Part of the devastation was due to the bursting of this barrier, and the phenomena of earthquake and explosion justify the ranking of this catastrophe among the greatest in the human period. Since 1600 the volcano has become completely extinct. Its northern neighbour, Ubinas, on the same line of activity, is, however, looked on with suspicion, and still emits vapours, accompanied by a continuous roaring. These emanations have kaolinised the felspars in the surrounding lavas, and have formed alums, anhydrite, and sulphur near the vent. Though the last eruption, about which little is recorded, took place in 1662, it was of cataclysmic magnitude, and the author points out that repetitions may reasonably be expected.

Disturbances of quite another nature are described from Pallata, where sudden fractures of the volcanic surface have occurred as recently as 1902, leading to both depression and elevation. These are traceable to the absorption of water by the underlying tuffs, much as, according to Arcidiacono, the "earthquake" of Nicosia in 1901 was caused by the swelling up of clays during a rainy season, beneath a series of Miocene sandstones. The four excellent illustrations make us desire more from this little known region of Peru. It is unnecessary to emphasise the importance of the volcanic chain in connection with the Pacific coast-line, and with the suggestion, made by Rey y Bassadre, of a companion chain opening along some hidden fissure out at sea.

G. A. J. C.

RELATION BETWEEN TEMPERATURE AND ELEVATION.

IN a communication to the *Comptes rendus* of January last Prof. Teisserenc de Bort gave a condensed account of the research relating to the decrease of temperature with elevation in the region of Paris. This investigation is, perhaps, the most complete that has been undertaken, for the deductions are made from the discussion of an excellent series of 581 aërial soundings by means of *ballon-sonde* extending over five years. From so many observations the general conclusions are therefore of considerable weight, and the results of great importance. The author divides the observations into two groups, one (A) showing the results of 581 ascents, and the other (B) restricted to 141 ascents when the altitude attained fourteen kilometres. In the tabular statements which accompany the paper the temperature values are given for every 500 metres up to a height of 5000 metres, after which values for each kilometre rise are adopted; the results are also grouped to show the changes between the four seasons of the year. Two sets of values for the air temperature in degrees Centigrade are given here, namely, those obtained during summer and winter, the letters under each heading belonging to the groupings previously referred to:—

Altitude	Summer		Winter	
	A	B	A	B
Ground	+13·5	+13·0	+ 1·7	+ 1·9
500 m.	+13·9	+13·6	+ 1·1	+ 1·4
1,000	+11·8	+11·8	− 0·4	− 0·2
1,500	+ 9·2	+ 9·7	− 1·9	− 0·2
2,000	+ 6·8	+ 7·3	− 3·7	− 1·4
2,500	+ 3·3	+ 5·0	− 5·7	− 3·7
3,000	+ 1·7	+ 2·1	− 8·2	− 6·0
3,500	− 0·4	+ 0·2	−10·9	− 8·7
4,000	− 3·4	− 2·7	−13·6	−10·9
4,500	− 5·9	− 5·3	−16·7	−14·2
5,000	− 9·3	− 8·3	−19·8	−17·0
6,000	−15·3	−14·8	−26·4	−23·7
7,000	−22·3	−21·7	−33·6	−31·5
8,000	−29 9	−29·3	−40·8	−39·0
9,000	−37·9	−38·0	−47·4	−46·9
10,000	−45·2	−45·3	−52·9	−54·0
11,000	—	−50·3	—	−57·9
12,000	—	−52·7	—	−57·9
13,000	—	−51·5	—	−56·9
14,000	—	−51·3	—	−55·5

The author refers in some detail to the peculiarities of the rate of decrease of the temperature, and indicates the "zone isotherme" previously noted by him, which lies at an altitude of about 11 kilometres, in which the temperature ceases to decrease, its altitude being the same for every month throughout the year.

THE RELATION OF MATHEMATICS TO ENGINEERING.[1]

WE may sum up what seem to be the best ideals in secondary school mathematics as follows:—

These ideals come from the engineering professions. They insist upon quality rather than quantity. They insist that the problems shall be largely concrete and shall be worked out to an accurate numerical result. They insist

[1] Abridged from an address delivered by Prof. C. A. Waldo, as president of the section of mechanical science and engineering of the American Association, at the St. Louis meeting.