

## LETTERS TO THE EDITOR.

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**Elasticity and Entomology.**

WHILE Euler's problem of the buckling of elastic rods and shafts under end thrust has received much attention both from mathematicians and from engineers, the importance of the results does not appear to have been appreciated in the entomological world.

I have been recently attempting to rearrange an old butterfly collection mounted in the so-called "Continental" fashion, high up on entomological pins about 1.5 in. long, and I find that except in the case of the thickest pins elastic instability invariably occurs when it is attempted to insert the specimens in the cabinet. This effect causes great trouble and inconvenience even with pins of thickness suitable for mounting average-sized Lyceænidæ. The drawers of my cabinet are lined with peat, coated with a thin layer of cork, and are specially constructed for the purpose, so the resistance is not great.

In the case of brass pins "made in Germany" it is impossible to insert them from above without permanently bending, and often doubling them up. In this case the flexure due to buckling causes permanent "set." Steel pins, on the other hand, are not usually bent beyond the elastic limits, but the result of the buckling is to cause the end of the pin to take a wrong direction when it is driven into the box; consequently, when the forceps is removed, the insect springs back into a position different from that originally intended, not only causing the collection to look very unsightly, but often resulting in the antennæ breaking off in consequence of the momentum generated in them by the vibration. The effect of excessive strain in the case of steel would probably be to break the pin in two.

It is curious that when studying these problems in elasticity nearly thirty years ago the idea never occurred to me to apply the results to account for the incessant troubles and misfortunes which in later years resulted in my abandoning entomology as a hobby. The present experiences, affording as they do a theoretical explanation of the difficulties, prove conclusively that the Continental system of setting butterflies and other insects high up on long German pins is fundamentally wrong in principle, and entomologists would do well to take account of the phenomena of elastic instability in deciding the style in which they mount their future collections.

It would be the easiest thing in the world to calculate the maximum length of pin of a given thickness that could be driven without buckling into a cabinet drawer or store-box offering a given resistance, but the question is so easily decided by trial that a mathematical investigation appears scarcely necessary.

G. H. BRYAN.

**Babylon's Sacred Way.**

THE discovery of the Sacred Way, or Procession Street, of Babylon is one of the results of excavations carried out by Dr. Robert Koldewey on the site of this ancient city. This Sacred Street extended approximately north and south through Babylon so far

as the south-east corner of a level quadrangular enclosure wherein was situated the famous Tower of Babylon. Here the Sacred Way turned sharply westward towards the Euphrates, where the stone piers of the bridge which spanned the river have been found. All the temples of Babylon, including those of the goddess Ishtar and of Marduk, the lord of Babylon, have been found in the vicinity of this Sacred Way on either side. The street was extended slightly west of north and east of south, and the temples were similarly oriented, the southward aspect being approximately S.S.E. Apparently no attempt has been made to ascertain the azimuth of any of the temples, or of the Procession Street. Prof. Leonard W. King, in his recently published "History of Babylon," states that "Nebuchadnezzar boasts that he paved the street of Babylon for the procession of the great lord Marduk, to whom he prays for eternal life" (p. 59).

The foundation of the Sacred Way was laid with burnt bricks. The pavement throughout its entire length was constructed of square slabs, those in the middle being "a fine hard limestone," those along each side being of "red breccia veined with white"; but along that part of the Sacred Way between the royal palace and the main entrance to the enclosure of the Tower of Babylon the pavement was formed entirely with slabs of breccia. A plate facing p. 60 of the "History," showing part of the Procession Street uncovered, makes it appear that the slabs were about 18 in. square. They were held firmly in position by being laid on bitumen, which also filled the interstices between the slabs.

Dr. R. Koldewey thinks the limestone may have been obtained from Hit, on the Euphrates. Prof. L. W. King has informed me, in reply to an inquiry, that "it is not yet known whence the breccia for the Sacred Way was obtained, though at the time of its discovery Dr. Koldewey consulted more than one geologist on the subject."

Inscriptions on the edges of the slabs record that the pavement was constructed by Nebuchadnezzar (604-561 B.C.); but it is recorded on many of the slabs of breccia that they had formed part of an earlier pavement which had been the work of the great Sennacherib (688-681 B.C.) during the Assyrian domination. It would be interesting to know from what quarries the breccia and the limestone were obtained.

By his extremely valuable "History of Babylon," Prof. L. W. King has placed archæologists and all interested in ancient civilisations under a heavy debt of obligation. The long chapter dealing with the most recent discoveries, with numerous plans and illustrations, is a treatise in itself of thrilling interest.

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P.S.—Since the foregoing letter was in type I have made a closer examination of the plans of the city and of its temples, published in Dr. King's "History of Babylon."

The plans on pp. 74 and 83 show that the part of the Sacred Way leading to the Euphrates branched from the main street at an angle of about 87°. This part of the street was oriented about 10° to 12° N. of E. and S. of W. The street passed alongside the eastern and southern wall of the peribolos of the Temple Tower, and in this latter part of its course towards the river it had the tower on the right (N.) and the Temple of Marduk on the left (S.). Prof. King states that the main street doubtless also continued southwards to a gate in the southern wall of the city.