

THE ENTRANCE-TUNNELS.

The entrance-tunnels of the ambrosia-beetles pass directly through the bark and more or less deeply into the wood. There they give off side tunnels, along which the greater number of the egg-niches are cut, or in which the eggs are deposited free, according to the habit of the species.

The entrance-tunnels of the True Bark-beetles either pass directly through the bark, or in most cases traverse it more or less obliquely, to open into the nuptial-chamber or directly into the egg-tunnel within. The length of the entrance-tunnel is never great, and varies with the thickness of the bark in which the beetles are working. In the thick bark of large pine trunks, thinner places, the bark fissures, are frequently chosen for the location of the entrance-holes. Some species of ambrosia-beetles prefer to start their tunnels on freshly cut or broken surfaces. The entrance-tunnels are always perfectly cylindric, a result of the shape of the beetles and their constant revolution during the excavation. Certain species usually cut their entrance-tunnels obliquely upward, so that it is possible to tell whether the tunnels have been cut before or after the trunk has fallen.

THE EGG-TUNNELS PROPER.

The egg-tunnels of the True Bark-beetles are usually cut between the wood surface and the bark, engraving both. Certain species cut the egg-tunnel entirely within the bark. *Orthotomicus cælatus* Eichh. has this habit when working in the thick bark of mature white pine, although on branches and trunks of smaller trees its egg-tunnels engrave the wood surface more or less distinctly. The egg-tunnels of many species are almost entirely within the bark, only scoring the wood slightly; such are those of *Phlaeosinus canadensis* Sw. in cedar. On the other hand the tunnels of *Chramesus icoriae* Lec., *Leperisus aculeatus* Say, *Pityophthorus canadensis* Sw., and many others, score the wood very deeply, and those of a few species, such as *Pityophthorus ramiperda* Sw. and *Lymanitor decipiens* Lec., are almost entirely or quite below and parallel with the wood surface. Certain species of *Hypothenemus*, *Stephanoderes*, *Micracis*, and *Pityophthorus* cut their primary tunnels within the pith of twigs, and have, on this account, been termed "twig beetles." Some species of *Pityophthorus* cut their egg-tunnels usually upon the wood surface of twigs, while their larvæ frequently bore to the centre and pupate in the pith.

The egg-tunnels of the ambrosia beetles branch from the entrance tunnels in various ways, to be described in more detail under the several species in later papers. The species of *Gnathotrichus*, *Pterocyclon*, *Trypodendron*, and *Corthylus* cut their egg-tunnels at a greater or less depth below the wood surface, according to the species and particular conditions of the wood, and vary somewhat in individual habits. All the species in these genera cut egg-niches above and below along the walls of the egg-tunnels, and later even along the entrance tunnels. These niches are similar to those cut by most True Bark-beetles, and the eggs are usually packed in with boring-dust and excrement. The niches are widened and lengthened by the larvæ to form short side tunnels or "larval cradles," usually at right angles to the egg-tunnel, and only slightly longer than the larva itself (Pl. 3, fig. 8); *compound*. The egg-tunnels of *Anisandrus* and *Xyleborus* are usually merely side tunnels arising from the sides or the distal end of the entrance tunnel. The eggs, in these two genera, are deposited free in the tunnels and the larvæ live therein without cutting cradles; *simple*. The tunnels of *Xyleborus saxescens* Ratz. are peculiar in that the larvæ excavate cavities in congress (Pl. 2, fig. 13).

It is interesting to note that certain species of the genus *Platypus* (formerly included in the Family *Ipidæ*), which occur in the southern and western portions of the continent, lay their eggs, according to Hubbard and others, free in the