

*Irregular Elongate Tunnels.*—The egg-tunnels of *Dendroctonus*, *Hylastes*, and *Hylurgops* are elongate, longitudinal, variably irregular, branched or winding, and frequently anastomosed.

*Irregular Short Tunnels.*—Several species of *Dryocates*, and others, cut short irregular tunnels.

*Simple Longitudinal Tunnels.*—These are simple tunnels lengthwise of the grain, moderately short and straight. They may or may not have a nuptial-chamber or turning-niche at the base of the entrance-tunnel, but they have no ventilation tunnels or turning-niches along the sides. *Phlaeosinus dentatus* Say cuts a rather elongate egg-tunnel with a distinct nuptial-chamber. *Eccoptogaster rugulosus* Ratz., and *E. 4-spinosus* Say, cut shorter, simple tunnels without a distinct nuptial chamber. *Eccoptogaster piceæ* Sw., cuts an entirely different one; here the entrance-tunnel opens into a large nuptial-chamber, which gives off, above and below, but not opposite to each other, a longer or shorter egg-tunnel. *E. unispinosus* Lec., of the Pacific Coast, has tunnels very similar to those of *piceæ*; these are properly of the forked type. *Chramesus icoriæ* Lec. cuts short longitudinal egg-tunnels with a distinct turning-niche at the base of the entrance-hole. Individual tunnels are frequently more or less oblique.

*Simple Transverse Tunnels.*—These are cut by very few of our species, except as individual variations from a different type.

*Forked Tunnels.*—In this type, as here defined, the entrance-tunnel opens into two egg-tunnels, usually somewhat curved, and diverging at a very wide angle, or nearly in line. Apparently this type has been developed by the extension of a turning-niche, such as is now cut by *C. icoriæ* Lec., into a second egg-tunnel. The tunnels of *Phthorophloeus piceæ* Sw. (Pl. 4, fig. 7), illustrate well the transition from the simple egg-tunnel with a turning-niche into a regular forked type. In this species an egg-tunnel is cut from the base of the entrance-tunnel, usually nearly transverse, though frequently oblique, and a second much shorter egg-tunnel is cut from the base of the entrance-tunnel at a varying, though usually wide angle with the first; or in other words, the turning-niche has been extended somewhat and a few egg-niches cut on either side. The tunnels of *Phthorophloeus liminaris* Harris (Pl. 5, fig. 7) are usually well-developed, with two egg-tunnels, one often somewhat longer than the other, nearly in line, and slightly incurved to meet at the base of the entrance-tunnel. The latter is oblique and its base slightly engraves the wood at its junction with the two egg-tunnels. In the process of their development the tunnels of *liminaris* have probably passed through the stage in which we find those of *piceæ* to-day. *Leperisinus aculeatus* Say cuts somewhat similar egg-tunnels in ash, but the two branches are rather more distinctly arched from their junction with the entrance-tunnel. The tunnels of *Hylurgopinus rufipes* Eichh., in elm, are of the same type (Pl. 5, fig. 6). The species cutting the tunnels thus far described are usually monogamous.

The tunnels of *Pseudopityophthorus minutissimus* Zimm. are peculiar, straight and transverse, but crossed near the middle of their length by a short vertical tunnel. They may be included under the simple transverse tunnels (Pl. 4, fig. 2).

*Radiate, or Star-shaped Tunnels.*—These are cut by the genera *Ips*, *Pityophthorus* (in part), *Pityogenes*, *Pityokteines*, *Polygraphus*, and others. The entrance-tunnel opens below into a flat nuptial-chamber lying between the bark and the wood, or often chiefly in the former. From the sides of this cavity the egg-tunnels radiate in varying number, according to species and individuals, from three or four to eight or nine. The species cutting these tunnels are polygamous and each egg-tunnel is cut, usually, by a separate female, while a single male cuts and occupies the nuptial-chamber. The tunnels of *Orthotomicus cælatus* Eichh. are roughly star-shaped, with the nuptial-chamber entirely in the bark