Ironmaking Tools

The tools displayed here were used to operate a *tatara* furnace. Most of them were made of wood, which is lighter than metal and thus less tiring to use during the exhausting multiday operation. Wooden tools also conduct less heat and are therefore safer. The tools here include a fire board for lighting the furnace, a flat shovel for adding iron sand, and a narrow hook for clearing away slag.

Breaking Apart the Kera

The *kera* produced in the direct smelting method is a porous mass of high- and low-grade iron and steel. When the smelting process is complete, the furnace is demolished before the flames are extinguished, and the still-glowing *kera* is dragged out to cool.

Once the heat has subsided, workers move the *kera* to a workshop, where it is smashed apart with a drop hammer. This process is repeated with smaller hammers until the chunks of *kera* are small enough to be handled and sorted by a single worker.

Sorting the Iron and Steel

The most valuable material of the *kera* is *tamahagane* steel, which can be sold without any additional processing. Less valuable metals, such as pig iron and impure steel, must be refined before they can be sold.

Tamahagane produced by Nittōho Tatara is typically graded into three levels, with an additional category for exceptionally high-grade steel. The highest-quality steel has a carbon content of between 1.0 and 1.5 percent, the ideal amount for making sharp, flexible swords.