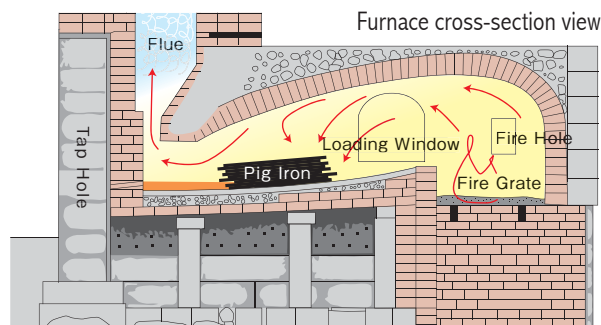
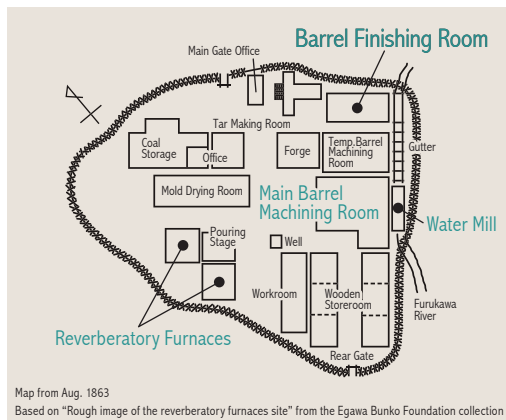


# Construction of the Nirayama Reverberatory Furnaces

A reverberatory furnace is a smelting furnace used for casting cannons and the like by melting down metals. Construction of the Nirayama reverberatory furnaces began toward the end of the Edo period at the suggestion of Nirayama governor Egawa Tarozaemon Hidetatsu (also known as Tannan). As the only remaining example of a reverberatory furnace that actually operated in Japan, the furnaces are a precious piece of industrial modernization heritage. The Nirayama reverberatory furnaces were constructed around 160 years ago at the end of the Edo period - a tumultuous time - and operated as part of a cutting-edge industrial facility at the time. Even today, they are considered a symbolic presence by the residents of Izunokuni City, treasured by all as a source of inspiration.



CG reconstruction of the original facility



## Focusing heat using reverberation

Heat and flame produced by burning fuels such as coal is reverberated off of the ceiling inside of the furnace and focused into a single area in order to achieve the temperatures of 1000 degrees and greater necessary to melt iron. The name "reverberatory furnace" was chosen to reflect this reverberation of heat and flame within.



## Nirayama R.F. as an artillery factory

Coal storage, a forge, barrel machining rooms (where cannon barrels were hollowed out using the water mill as a source of power), a workroom, and several other buildings surrounding the reverberatory furnaces all played a part in producing cannons. A variety of craftsmen such as tile makers and blacksmiths worked at the artillery factory, which implemented a combination of the Japanese craftsmanship and Western techniques of that time.

## Mortars



The Nirayama reverberatory furnaces were used to successfully cast four iron 18-pounder cannons, but mass production was not possible due to a lack of materials. As a result, production came to include a variety of bronze artillery as well. A replica iron cannon is currently on display at the site.

Iron 24-Pounder Cannon (replica, right)  
Bronze 20-Duim Mortar (left)

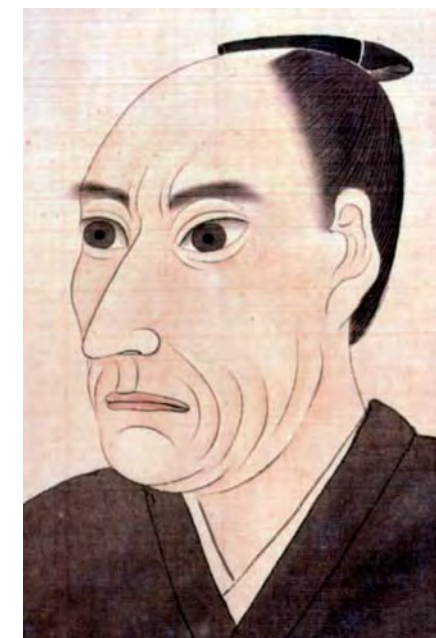


## Father of the Nirayama Reverberatory Furnaces

## Egawa Tarozaemon Hidetatsu (Tannan)

### Late-Edo Governor Egawa Tannan: a visionary who was passionate about ensuring the defense of Japan

Egawa Tarozaemon Hidetatsu was born as the second son of Egawa Hidetake in 1801 at their Nirayama residence, located in Tagata-gun, Izunokuni. He was a true man of culture for his time, having studied practically all of the military arts - including swordsmanship, spear-fighting, equestrian arts, and gunnery - in addition to painting, calligraphy, poetry, and the Chinese classics. He even learned surveying techniques from explorer Rinzo Mamiya. His elder brother Hidetora died of illness in 1821. As the new heir of the Egawa family, Hidetatsu was officially appointed as the governor of Nirayama in 1835, succeeding the name Tarozaemon as a family tradition and adopting the pseudonym Tannan. As governor, Tannan personally took the initiative to adopt a policy of simplicity and frugality in order to improve a tight financial situation, with the residents of his domain affectionately referring to him as "Egawa the great reformer." He also had a clear vision for the future of Japan and put great effort into advancing the country's naval defense policies, while also devoting himself to the construction of the Nirayama reverberatory furnaces and the Shinagawa battery islands.



Self-Portrait (Egawa Bunko Foundation Collection)

### World Events

- First Opium War (1840)
- Shokasonjuku Academy Opened (1842)
- Arrival of Perry's Fleet in Uraga (1853)
- Japan-US Treaty of Peace and Amity (1854)
- Arrival of Putyatin in Shimoda (1854)
- Ansei Tokai Earthquake (1854)
- Yoshida Shoin Inherits Shokasonjuku Academy (1857)

### Egawa Tannan

- 1801 Tannan is born
- 1835 Tannan becomes local governor and succeeds the Tarozaemon title
- 1842 Opens Nirayamajuku Academy  
Permitted to give instruction on Western gunnery  
Begins working on baking bread (first in Japan)  
Tells shogunate that farmer-soldiers are necessary
- 1850 Implements vaccination
- 1853 Builds Shinagawa Battery islands  
Request to build reverberatory furnace approved (Shimoda)
- 1854 Reverberatory furnaces construction site moved to Izu Nirayama; construction begins  
Rescues Russians from ship Diana upon receiving news of its stranding
- 1855 Tannan dies
- 1857 Construction of reverberatory furnaces completed by son Hidetoshi

## Farmer-Soldiers & Commands

Tannan called on the shogunate from early on to implement a system of farmer-soldiers in which farmers would learn about gunnery and military arts so that they might provide assistance during times of emergency. Tannan translated drill commands such as "Attention, forward dress!" and "Right, face!" from Dutch into easy-to-understand Japanese.



(Photo) Nirayama woven hat designed by Tannan (Egawa Bunko Foundation Collection)

## Shinagawa Battery Islands

Near the end of the Edo period, artificial islands outfitted with cannons were built near Shinagawa to protect Edo from attacks by foreign fleets. These islands made up the Shinagawa Battery. Under order of the shogunate, Tannan was responsible for the construction of these batteries. Of the six batteries completed, two remain today. Battery No. 3 is currently maintained as a public park.



Battery No. 3