Hot Shot Furnaces

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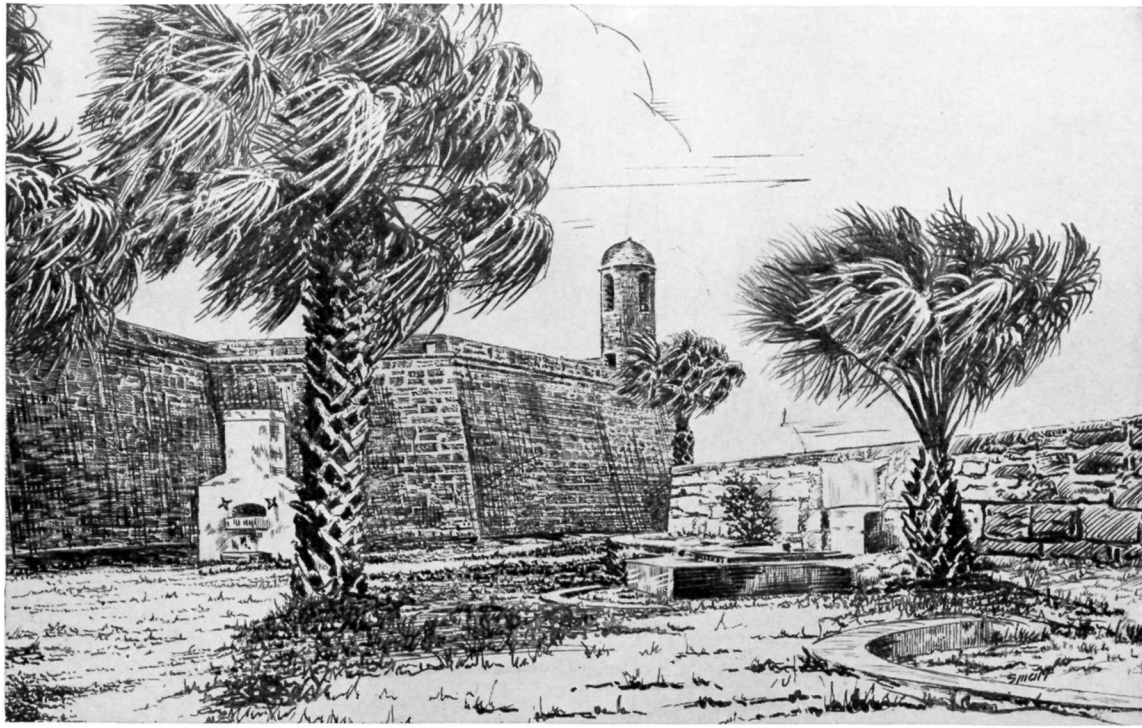

Filled section of the moat at Fort Marion National Monument, St. Augustine, Fla. The hot shot furnace is seen in the left middleground. (From a drawing by Samuel O. Smart.)

Hot Shot Furnaces[1]

By Herbert E. Kahler, Chief, Historic Sites Division, Branch of Historic Sites, and F. Hilton Crowe, Assistant Historical Technician.

NEXT to the dungeon, no other feature at Fort Marion National Monument elicits so many questions as does the hot shot furnace. Visitors are interested in knowing when this old structure was built, and why and how it was used.

Hot shot antedates gunpowder itself. In 54 B. C., the Britons launched heated clay balls into the tents of the invading Romans with great effectiveness. With the advent of gunpowder there was considerable hesitancy in using hot shot because of the great difficulty in controlling the time of the explosion, but experimentation finally developed a clay that separated the hot ball from the powder. In 1579, the King of Poland successfully carried on a siege by employing hot cannon balls in his guns. The use of heated shot became increasingly important in coast defense, especially in the destruction of wooden vessels. During the siege of Gibraltar in 1782 a part of Spain's fleet was set on fire and destroyed by hot shot.

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[1] From *The Regional Review*, National Park Service, Region One, Richmond, Va. Vol. II, No. 2, February 1939, pp. 11–13.

Old hot shot furnace at Fort Morgan, Mobile Point, Ala. The historic fort, a part of the chain of coastal defenses devised in the early nineteenth century by Simon Bernard, has been made accessible to the public through a cooperative program carried out by the National Park Service, the Civilian Conservation Corps, and the Alabama Department of Conservation

The heating of cannon balls first was accomplished on open grates, a slow, wasteful, and dangerous method. A great advance then was made with the development of the hot shot furnace which, in 1794, was used successfully at the mouth of the Rhône River.

The furnace was brought to this country in the early part of the nineteenth century. One of France's outstanding military engineers, Simon Bernard, brigadier general under Napoleon Bonaparte, was employed by the United States to make a survey for coastal fortifications in the Southeast and his recommendations, which included the latest advances in coast-line defenses, were presented to Congress in 1817 and adopted. At Fort Pike and Fort Macomb, in Mississippi; Fort Morgan, in Alabama; and Fort Jefferson and Fort Marion, in Florida, the hot shot furnaces are still in evidence. At Fort Pulaski National Monument, near Savannah, Ga., only the foundation of the furnace remains.

The War Department in 1825 declared Fort Marion useless for defense purposes, but in 1835, after the second Seminole Indian War started, it recognized that the fort still possessed certain military values. It built a water battery, installed a hot shot furnace, and proposed the construction of shallow-draft galleys for additional defense. The Seminoles apparently were expected to attack from the sea.

The hot shot furnaces varied somewhat in size, the largest one being at Fort Jefferson National Monument [on the Florida Keys in the Gulf of Mexico, 70 miles due west of Key West]. If shot were placed in a cold furnace, 1 hour and 15 minutes were required to bring them to a red heat. Once the furnace was hot a 24-pounder shot could be brought to a cherry red color in 25 minutes, the 32- and 42-pounders requiring a few minutes longer. An unusual circumstance was that the balls expanded under the heat but did not return to their normal size after cooling.

Once the balls were cherry red or white hot, they were taken from the furnace with iron forks, scraped carefully with a rasp to remove scale, and carried in ladles to the cannon. The ladles were formed of an iron ring, the interior of which was beveled to fit the ball, with two wooden-handled arms inserted. Other implements were needed at the furnace. There were pokers for stirring the fire, tongs with circular jaws for taking up shot, rasps for scraping, an iron rake for removing cinders from the ash pit, a tub for cooling heated tools, a bucket, and a rammer with head covered by a circular plate of sheet iron of larger diameter than the ball to remove clay from the bore of the cannon when clay wads were used. Many of the implements were furnished in twos so that one set could cool in the tub while the others were in service. When the battery was in action it took three men to serve the furnace and handle the tools.

In preparation for loading the projectile, the gunners elevated the cannon muzzle; next they rammed home the cartridge or powder bag. After the powder was seated, a dry hay wad was rammed against it, then a wet hay or clay wad. The powder bag was pricked open and primed through the vent and a wet sponge passed through the gun. Finally, the hot shot was rolled in, packed with another wet hay or clay wad, a match was applied to the touchhole, and the projectile was launched.

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Laboratories of Our History

The policy of preserving our growing heritage of nationally significant historic sites, buildings, and objects for the inspirational and educational benefit of the American people of today *and of tomorrow,* has been enunciated and reaffirmed by Congress as a prime obligation of our individual citizenship and of our collective nationhood. Instructive examples of this policy of historical conservation are afforded by the National Park Service of the United States Department of the Interior in its protection of five famous coastal fortifications which bear intimate association with vital stages of our national development.

Fort Marion (Castillo de San Marcos) and Fort Matanzas, at St. Augustine, Fla., proclaimed in 1924 as national monuments, are venerable coquina-built strongholds which once were symbolic New World outposts of Spain's Golden Age. Still well preserved, they are the oldest existing fortresses built by white men in the United States. Fort McHenry, a national monument and memorial shrine on the waterfront of Baltimore, Md., withstood a fierce British attack during the War of 1812 and inspired Francis Scott Key's *Star Spangled Banner.* Fort Pulaski, at the mouth of the Savannah River, in Georgia, and Fort Jefferson, situated on an island west of Key West, Fla., are protected survivals of the chain of impressive brick fortifications constructed on the Atlantic and Gulf coasts in the nineteenth century to guard against invasion by sea.

All these proud citadels of the past, although outmoded and abandoned as defensive works, nevertheless provide illuminating pages of America's military record. It is across their drawbridges and along their ramparts, rather than in the yellowing pages of paper books, that yesterday's soldier walks with us most vividly today and recounts the human story of his daily tasks, his nightly vigils, his professional duties, and his private feelings.

Hot shot oven, Fort Marion National Monument

The cartridges (the powder charge minus the ball) for hot shot were little different from those used for ordinary projectiles, being made of cannon cartridge paper or parchment well pasted to prevent the powder's sifting out. Sometimes two bags were used, one within the other. When clay wads were employed they were cylindrical in form, about one caliber long, and well moistened. Wet hay wads were preferable, however, and these were soaked in water for about 15 minutes, then allowed to drip.

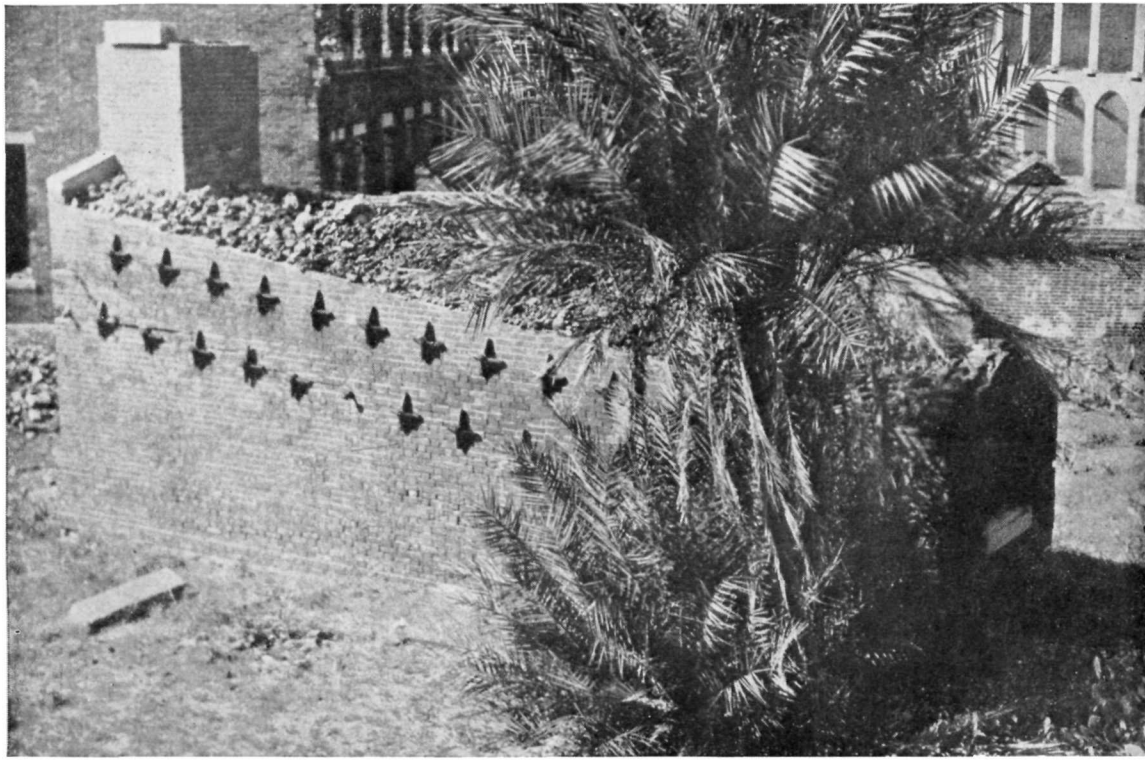
When wet hay was used, steam often issued from the touchhole or vent as soon as the ball was rammed home. This was the effect of the heat of the ball upon the water contained in the wad and no danger resulted from it. It is said that the ball could cool in the gun without firing the charge, but shots usually were fired as quickly as possible to prevent the steam from dampening and injuring the powder.

The statement sometimes is made that the cannon ball cooled in its passage through the air toward its objective. In reality the contrary is true, for the temperature of the shot was increased by friction with the air. According to the *Ordnance Manual* of 1861, a red-hot shot retained sufficient heat to set fire to wood after having struck the water several times.

Penetration of cold and hot shot into wood was found to be equal under the same circumstances. Charges for hot shot were reduced, however, to one-quarter or one-sixth the weight of the shot in order that the ball might remain in the wood and not penetrate it entirely or embed itself too deeply. It was discovered that fire was communicated more rapidly and certainly when the ball did not penetrate more than 10 or 12 inches, because at a greater depth communication with external air was not sufficient for combustion.

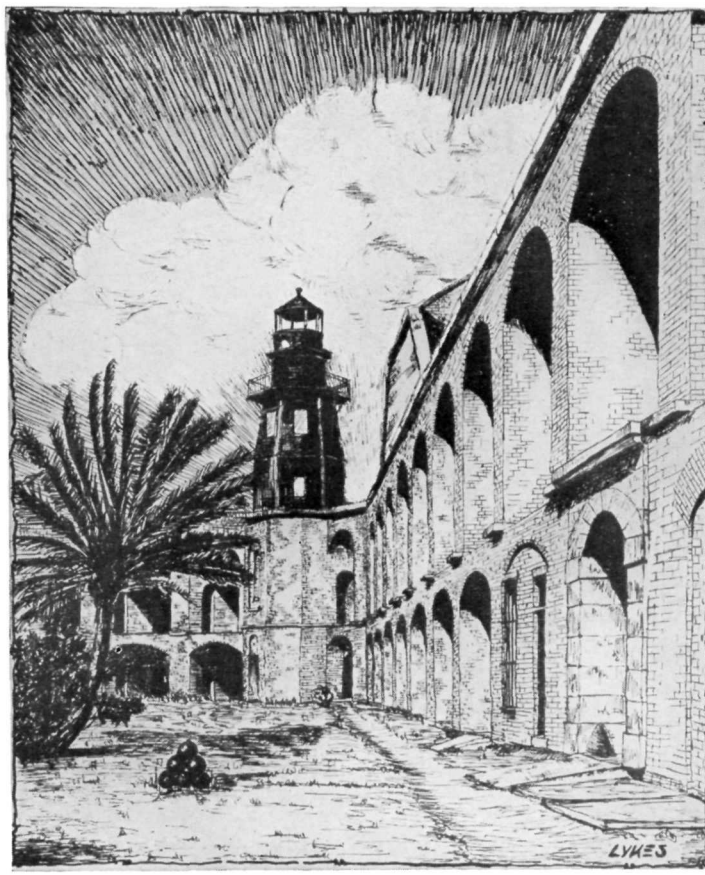
With the invention of the iron-clad *Monitor* and *Merrimac* during the War between the States, the days of wooden

A section of the moat, Fort Marion National Monument



Shot oven at Fort Jefferson National Monument

battleships were numbered and the hot shot oven quickly became obsolete. It is cold and defensively useless today, but it constitutes nevertheless an interesting and suggestive historical object which, like the catapult, the long bow, and the claymore, illustrates the continuous evolution of military arms and equipment.



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