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978-1-107-06987-9 — The Qing Empire and the Opium War
Mao Haijian , Translated by Joseph Lawson , Peter Lavelle , Craig Smith , Introduction by Julia Lovell
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1 Qing Military Power

Scholars have defined war in a hundred different ways, but at the most basic level it is a contest between two or more armed forces. To determine whether or not the Qing could have won, we need to examine the relative strength of the empire's military, weighed against that of the British expeditionary force.

1. Munitions and Hardware

The British military belonged to the gunpowder age, while the Qing forces straddled the eras of gunpowder and pre-gunpowder armies. Some Qing soldiers had firearms; others were equipped with knives, spears, bows and countless other cold weapons. The use and effectiveness of the latter is fairly clear and the following discussion concentrates on the Qing gunpowder weapons.[1] These are often called "local" or "native" guns or cannon (*tu qiang tu pao*). If this just referred to their place of origin, or the workmanship involved in making them, there would be no problem with the term, but it gives rise to certain misconceptions.

Gunpowder and firearms were Chinese inventions, but their development in China was constrained by a lack of scientific theory and experimentation. The guns used by the Qing forces in the Opium War were copies of Western weapons that had been introduced to China during the Ming period. There was the "*folangji*" (a term which also referred to people and things French, Portuguese or Spanish), the "Red-*yi* cannon" (*Hong yi pao*), and the "bird musket" (*niao chong*). The Qing weapons were, really, locally made versions of old foreign guns. In design, technology and manufacture, they were about 200 years behind the British weapons.[2]

[1] This chapter's discussion of gunpowder and firearms draws strongly on Wang Zhaochun's outstanding study *Zhongguo huoqi shi* [A History of Chinese Firearms] (Junshi kexue chubanshe, 1991). I have also benefited considerably from Lü Xiaoxian, "Di yi ci Yapian Zhanzheng shiqi Zhong Ying liang jun de wuqi he zuozhan xiaoneng" [British and Chinese Military Equipment During the First Opium War, and its Effectiveness on the Battlefield], *Lishi dang'an*, 3 (1988).

[2] The development of firearms in the West was also relatively slow over these 200 years: the main changes were the improvement of firing mechanisms, and advances in production technology.

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The technology and design of the Qing muskets used in the Opium War can be traced to Portuguese matchlock weapons brought to China in 1548 (the 25th year of the Ming emperor, Jiajing's, reign). These had subsequently undergone several improvements and become the main firearm of Chinese military forces.[3] They were muzzle-loading smoothbore weapons. According to the section on firearms in *Huangchao liqi tushi* (Illustrated Description of Ritual Implements of the Imperial Dynasty), Qing forces had up to 58 variations of this gun, which differed in size. The most common was the "soldiers' (*bing-ding*) musket," which was 2.01m long, made of iron, and shot lead pellets that weighed one *qian* (approximately 3.8g) with three *qian* of gunpowder. It had a range of 100m, and a firing rate of one or two rounds per minute.[4]

The British had some of the most advanced weapons in the world: first, the muzzle-loaded Barker rifle, which had a flintlock firing mechanism. It was 1.16m long, had a caliber of 15.3mm, and used 35g ammunition. It had a range of about 200m and a firing rate of two to three rounds per minute. These rifles were developed around 1800 and became the standard issue weapon in the British armed forces. A second firearm was the muzzle-loading Brunswick rifle, issued from 1838 onwards. The Brunswick had a percussion cap firing mechanism, was about 1.42m long, and had a caliber of 17.5mm. It took 53g ammunition, had a range of about 300m, and a firing rate of three or four rounds per minute.

Thus, the Qing weapons had several disadvantages compared with the British arms. They were too long, which made reloading inconvenient. Their antiquated firing mechanisms functioned poorly, if at all, in bad weather. Their firing rates were slow, and they had a short range. Considering their range and firing rates, two soldiers' muskets were no match for one Baker rifle, while one Brunswick rifle could outperform five muskets. Taking into account the differences in accuracy that resulted from workmanship,[5] the British weapons were perhaps several times better still.

From the outside, however, Western and Chinese weapons did not look radically different. Neither side was completely ignorant of the others' weapons, but there were big differences in their capacity.

[3] In 1548 the Ming Empire battled *wokou* pirates in the Shuangyu Islands, and captured some of the Portuguese and Japanese matchlocks used by the *wokou* (the Japanese gunsmiths had copied, and improved upon, the Portuguese models), and the name "birding musket" dates from this time. The Ming also captured foreign gunsmiths, and the Ming military command immediately sent its own weapons manufacturers to learn from them. The same firearms technology was passed to the Qing military during the Qing conquest.

[4] Qing military equipment was extremely disorganized. See *Qin ding da Qing huidian* [Imperially Commissioned Illustrated Collection of the Great Qing], *juan* 9.

[5] At this time, the British began to use machines to manufacture weapons, which resulted in greater standardization and precision. Lathes, in particular, improved the straightness of gun barrels, resulting in greater accuracy and range, and reduced the gap between the shot and the barrel. The Qing Empire's muskets were still manufactured by hand. Gun barrels were thick, uneven, and had rough patches, which disturbed the trajectory of shot, reducing the weapons' accuracy. Furthermore, calibers were uneven. When the caliber was too small, it was impossible

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There were other differences too. First, the Qing guns were so long that they could not have bayonets attached (which were standard on Western weapons at this time), so they were not only worse in terms of firing rate and range, but were also ineffective in close combat. Moreover, because of financial limitations, Qing armies were not fully equipped with muskets; some soldiers had only swords, spears and bows. Across the empire, the numer of soldiers with guns was equal to the number bearing pre-gunpowder weapons.[6] In the battles of the Opium War, spears and bows were of little use.

Second, again because of the military's limited resources, the Qing forces had no system for the regular repair and replacement of weapons. It was very common for muskets to be several decades old; I have even seen a reference in Qing documents to a firearm that was 166 years old and still in use.[7]

Third, because of the shortage of firearms, new batches were hurriedly produced for distribution among the troops at the beginning of the Opium War. But the quality of these rush-jobs was often poor.[8]

to add sufficient gunpowder; when it was too large, gas from the deflagration of the powder would escape, reducing power and range.

[6] Lü Xiaoxian has examined this. See "Di yi ci Yapian Zhanzheng shiqi Zhong Ying liang jun." Musketeers in the Qing military forces were usually also armed with weapons for hand-to-hand combat.

[7] In 1850, Qingan, a vice lieutenant-general (*fu dutong*) in the Eight Banners in Heilongjiang, wrote a memorial to suggest replacing the firearms of the Eight Banners' forces throughout the empire, just as the *jianrui* brigade (of the Eight Banners) in Beijing had. The Xianfeng emperor ordered all commanders to make a report about their weapons. From 15 responses it is evident that the firearms at many garrisons were very old. Most simply stated that they had been "used a long time" (*shiyong yi jiu*); six gave more precise indications of how long exactly. The oldest firearms were in Heilongjiang, where they had been "commissioned for the Kangxi's campaign against Russia," which would make them at least 166 years old. The next oldest belonged to Fujian, whose guns dated from 1755. The third oldest were in Hangzhou (from 1761), and the next oldest in Jingzhou, which had replaced half its firearms in 1779 (and nobody reported when the other half dated from). The fifth oldest were in Zhapu, whose muskets dated from 1782. Only the weapons in Shanhaiguan were made at the time of the Opium War, in 1840. On the basis of this evidence, we can hypothesize the ages of the muskets at other garrisons (see *Junjichu lu fu zouzhe* [Reference Copies of Memorials of the Grand Council] – all the memorials cited in this book are housed in the First National Historical Archives). Even though weapons this old clearly needed replacing, many garrison commanders made excuses, claiming that the troops had become highly proficient in their use, so that there was no need to replace them. It is most likely that, given the financial system of the time, the government would not have refunded the costs of the replacement weapons, so garrison commanders would have had to raise their own funds. It was not easy for garrisons to raise money, and the commanders would have been expected to make the first donations. Moreover, there was no guarantee that the new guns would actually be better quality than the old. See also note 8, below.

[8] Frontline commanders commented on this a lot, but it is not necessary to cite each instance. In 1851 the general-in-chief of the Hangzhou forces, Wo-shen-na, reported to the throne that most of his brigade's muskets had been lost in 1842 during the battle of Zhapu. After the war new muskets were distributed and used alongside what remained of the old batch, which dated from 1782. "The remaining old muskets are of the same model as those used by the *jianrui* brigade [of the Eight Banners], they are convenient and quick to use, and always fire properly. Now we also have 591 new Green Standard style muskets from the military supply bureau (*jun xu ju*). Compared

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Adding up all these factors, how many soldiers' muskets would have been required to stave off one Baker or Brunswick rifle? How many Qing soldiers did there need to be to defend against one British soldier?

Like the Qing muskets, the design of many of the empire's cannon can be traced to the Ming dynasty, though the Kangxi emperor had also employed the Flemish Jesuit Ferdinand Verbiest to oversee the production of artillery.[9] Hence, although the Qing army catalog had many different models, all were copies of seventeenth- and early eighteenth- century guns. Because there was comparatively little development in artillery technology in the West during the eighteenth century, the Qing and British cannon were still broadly similar in design and technology during the Opium War. The differences between the two stemmed from differences in the quality of the workmanship.

First, the quality of iron used in the Qing cannon was poor. Smelting technology had improved a great deal in Britain as a result of the industrial revolution, and this ensured high-quality material for the casting of artillery pieces. Qing smelting technology was less advanced. Furnaces were cooler, which made it impossible to purify the molten iron. The final product was very rough, and often contained air bubbles. Cannon made of this material were prone to misfiring or blowing up and injuring the artillerymen.[10] Qing manufacturers dealt with the problem in two ways: first by increasing the thickness of the cannon, which meant that they became extremely heavy and therefore difficult to maneuver. A large Qing cannon weighing several thousand kilograms was not equal in firepower to a much lighter Western cannon.

The manufacturers' second method was to make cannon with a copper alloy. But in this era copper was scarce, so these cannon were rare and prized. The

to the *jianrui* muskets, they are longer by about a *chi* (approximately 1ft), which makes them more cumbersome to use. Furthermore, we have used them for nearly ten years, but many are already damaged, and they are not very accurate." (Memorial from Woshenna, 17 April in the First Year of Xianfeng, *Junjichu fulu zouzhe*). The new guns were too long and cumbersome, and after using them for only nine years more were broken than in the older set of muskets that had been used for 69 years. Clearly, the quality of the manufacturing was poor. Another aspect of the problem was that Green Standard weapons and equipment was always of a lower quality than that of the Eight Banners, a problem discussed below.

[9] In 1620 (the first year of Emperor Taichang), the official Xu Guangqi bought Western cannon from the Portuguese authorities in Macao. The following year, the Ming government not only bought more cannon, but also appointed a Portuguese cannon-maker and a missionary to come to Beijing to manufacture them. The type of cannon they produced were called "Red *yi* cannon." This led to a transformation of Chinese artillery technology. In 1626 the Ming army defeated Nurhaci's Jurchen forces during the Battle of Ningyuan, at which Nurhaci was fatally wounded by cannon shot – prompting the Later Jin (soon to be Qing) state to seek to learn the Ming cannon-making technology.

[10] For example, in 1835 Guan Tianpei wrote that six cannon in the Humen battery had exploded in one round of firing. Later, 59 new cannon were made at Foshan, but when they were test-fired ten of them exploded, and three sustained damage when they misfired. Fewer than three-quarters could still be used. See *Chou hai chu ji*, Daoguang 16 (1836), *juan* 3.

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Qing forces adapted to roughly cast and dangerous cannon by using less gunpowder, which further reduced the guns' power and range.

Qing casting technology was also less advanced than that of the British. By now the British were using metal molds and lathes, to smooth the interior of the gun barrel. Qing manufacturers were still using clay molds, which produced cruder pieces, and they did not carry out smoothing work on the interior of the gun barrel, making them less accurate. In Britain, scientists and manufacturers had experimented with almost every aspect of cannon design and use; from the gunpowder ignition, to projectile trajectory and speed, to the measurements and ratios of the cannon parts and the position and size of the touchhole. Qing gunsmiths basically just replicated earlier cannon without paying attention to the barrel-to-caliber ratio, or the significance of the touchhole position for the powder ignition. The result was less effective cannon: on most guns the touchhole was too large and too far toward the muzzle.

Gun carriages and sighting devices, both vital for aiming and determining trajectory, were incomplete or ineffective. The Qing military never paid much attention to this. On the eve of the Opium War, many cannon did not even have a carriage and were fixed in place. Some carriages only allowed the barrel to be moved up and down but not left or right, placing obvious limitations on the guns' target range. The carriages that did exist were often crude; they would shake when the guns were fired, reducing their effectiveness. Surprisingly, many Qing cannon had no sighting devices, or only had *xing dou* (used to determine direction) but no *pao gui* for determining the correct trajectory. Artillerymen basically had to depend on estimation and experience.

The Qing military also had a limited range and quality of projectiles. The British had solid shot, canister shot and explosive shells. The Qing only used the least effective kind of solid shot, which was often crudely manufactured or of too small a caliber.[11]

In addition to these disadvantages, the Qing military lacked a system for the regular repair and replacement of its cannon, just as it had none for muskets. Because they were rarely used, many cannon in open-air emplacements like battlements and batteries were rusty or otherwise damaged by the elements. On the eve of the Opium War, many of the empire's cannon were also very old. Guns that had been manufactured in the early Qing period were common, and there were even some relics from the Ming Empire.[12] Who knew if any of them still worked?

[11] Roughly made cannonballs rubbed on the interior of the barrel as they were fired, reducing the accuracy of the shot. If they were too small, gas from the deflagration of the gunpowder would escape, reducing range and accuracy.

[12] *Chouban yi wu shimo* (Daoguang reign), 1: 375, 461.

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In sum, even though the basic models of the cannon used by the Qing and British forces were similar, differences in the quality of the manufacturing meant that the Qing cannon had a more limited range, a slower firing rate, less power, were less maneuverable, and less accurate: deficiencies that severely limited their effectiveness against the British.

Most of the battles in the Opium War involved Qing coastal batteries engaging with British naval vessels. Normally, guns on land have an advantage because recoil is not a problem and they can be heavier and therefore larger, allowing longer ranges and more power. The Qing cannon were indeed heavier than the British navy's, but they were less powerful. When the smoke cleared from the water, it revealed the astonishing and sad fact that not a single British ship had been sunk, while the Qing batteries had been thoroughly wrecked.

Another important component of gunpowder warfare is the gunpowder itself. During the Opium War, the British and Qing militaries both used the same basic kind of black powder explosive – the ingredients of which were sulfur, charcoal and potassium nitrate (saltpeter). However, differences in the quality of the powder used by the two sides made an even greater difference on the battlefield than the difference in the quality of cannon manufacture.

The equation found by the French chemist Michel Chevreul in 1825 for the reaction that occurs when gunpowder ignites was:

$$2KNO_3+3C+S = K_2S\downarrow+N_2\uparrow+3CO_2\uparrow$$

According to this equation, the theoretical ideal ratio of gunpowder ingredients was 74.84 per cent potassium nitrate, 11.84 per cent sulfur and 11.32 per cent charcoal. On the basis of this formula, the British army used a mixture of 75 per cent potassium nitrate, 10 per cent sulfur and 15 per cent charcoal for rifles; and 78 per cent potassium nitrate, 8 per cent sulfur and 14 per cent charcoal for cannon.[13] This recipe was subsequently adopted as standard in every European country. Apart from this scientific advance, the industrial revolution had also resulted in mechanized production processes; British gunpowder came from cutting-edge factories.[14]

Chinese gunpowder was invented, by accident, by Daoists who were attempting to make potions of immortality. From its beginning, gunpowder

[13] Wang Zhaochun, *Zhongguo huoqi shi*, 204, 291–2.

[14] British gunpowder manufacturing used methods from the developing sciences of physics and chemistry, as well as industrial tools to purify the sulfur and the potassium nitrate; and steam-powered machinery to grind and mix the powder, hydraulic machinery to compress it into pellets so that it would maintain form and density, steam-powered machinery to dry it, and grinding and polishing machinery to polish the pellets' surface and thus remove any small air-bubbles, thereby reducing moisture absorption – which enabled it to be stored for greater lengths of time. These industrial processes were responsible for the excellent quality of British gunpowder.

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was associated with theories of *yin* and *yang* and the five elements – which shrouded it from scientific analysis of its properties. Further improvements in the recipe depended on the gradual accretion of experience, rather than rigorous testing and theoretical explanation. The gunpowder that the Qing forces used during the Opium Wars was produced in workshops by hand, according to the same recipe used in the late Ming military.

Before the war, the commander of the Guangdong water force, Guan Tianpei, had used a mixture of 80 per cent potassium nitrate, ten per cent sulfur, and ten per cent charcoal, which is the only recipe described in the documents of this era.[15] There was too much potassium nitrate in this mixture, which meant that the powder absorbed water too easily, was difficult to store for long periods and had relatively low explosive power.

Moreover, producing gunpowder by hand, Qing workmen could not refine the potassium nitrate and sulfur to remove impurities. Methods of grinding and mixing the powder – and drying, compressing and polishing the pellets – were relatively crude and depended on mortar and pestle, with the result that the powder grain was rough and of uneven size. Very often this meant that the powder did not fully ignite.[16] This low quality had a direct impact on the power of firearms and cannon, further diminishing their effectiveness.

Among all the military differences between the Qing and the British, none was greater than the contrast of their ships. With more than 400 vessels, the British navy was the most powerful in the world. During the Opium War its main warships were still of the wooden sailing variety, but this was about as far as the similarity with Qing vessels went. The most important differences were as follows. The British ships were made of hardwood that was strong enough to withstand heavy winds and high seas, allowing them to sail in deep water. They had at least two levels below the top deck, which made them more resistant to sinking (Chinese people called them "double-decked ships" – *jia ban chuan*). Copper plating protected hulls from rot, fire and insect damage. With two or three masts and two dozen sails or more, they could sail no matter which way the wind blew. They were large ships, with a displacement of up to 1,000 tons, and armed with 10–120 cannon.[17] Towards the end of the industrial revolution, in the 1830s, the navy introduced ironclad paddle steamers. Early paddle

[15] Guan Tianpei, *Chou hai chu ji*, juan 3.

[16] Wei Yuan, *Hai guo tu zhi*, 100 *juan* edition, Xianfeng 2 (1852), *juan* 91; Memorial written by Chen Jieping.

[17] Ba-na-bi, *Yingguo shui shi kao* [Examination of the British Navy], compiled and translated from English into Chinese by Fu-lan-ya and Zhong Tianwei (Jiangnan zhizao zongju, 1886). At this time, Royal Navy warships were divided into seven classes of six "rates," plus an unrated group. First-rate ships had between 100–120 cannon; second-rate ships 80–86, third-rate ships 74–78; fourth-rate ships 50–60; fifth-rate ships 22–48, sixth-rate ships 22–34; and the unrated ships had 10–22. The expeditionary force dispatched to fight the Opium War was comprised mostly of fifth- and sixth-rate ships, unrated ships and a small number of third-rate ships.

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steamers did not occupy an important position in the navy – they had a small tonnage, fewer guns than sailing ships, and made little difference in European naval battles. However, they were fast, maneuverable and suitable for shallow water. Against weak opposition in coastal and riverine China they could have a devastating impact.

Qing naval units were called the "water force" (*shui shi*), and had two main branches – one in Fujian, and the other in Guangdong.[18] Some garrisons in other provinces also had marine capabilities – like the Dinghai regional command in Zhejiang, and the Lüshun brigade in Shengjing. These forces' duties were limited to defensive coastal patrols and they had no deep-water capacity. They were intended to guard against pirates rather than fight wars against foreign states. In modern terms they were more like a coastguard than a navy. Most soldiers in the water force did not serve on warships, or in roles connected to warships, but rather in coastal batteries and forts. Most of the land-based garrisons at strategic locations along the coastal defense network – like Xiamen, Humen and Zhoushan – were the responsibility of the water forces.

In terms of raw numbers, the Qing water forces had dozens of types of warship, and several hundred vessels. But all of them were small. The tonnage of the largest was smaller than the smallest European warship, while the ships with the most cannon had only as many guns as the most lightly-armed British ones. Contemporary Qing commanders clearly recognized many of their other weaknesses. The governor-general of Fujian and Zhejiang, Deng Tingzhen, did not discuss warships' rigging, speed and other sailing technology (probably because he had no sailing experience) but he gave a frank and detailed assessment of the weakness of the ships' hulls, their small number of guns, and the safety of the gunmen. Deng concluded "the warships' cannon are no match for the enemy" and "This is because of the methods set by the Board of Ship Building (*zao chuan bu*). The problems cannot be blamed on malfeasance and the theft of materials alone."[19]

It was not that Chinese shipbuilders were unable to build better vessels – they built larger and stronger deep-water ships for merchant use. As Deng indicated, the water forces were constrained by the regulations set by the Board of Ship Building. Qing warship designs, building methods and expenditure had been fixed during the Qianlong reign in the Board of Works' regulations on military equipment (*gongbu junqi zeli*), and Board of Revenue regulations on

[18] The Fujian water force – led by a provincial military commander (*tidu*) – was established in 1677. At the time of the Opium War the commander had a *biao* of five brigades, and further control over three regional commands (*zhen*) (see below for the structure of the Green Standards), with a total troop strength of nearly 20,000 men. The Guangdong water force was established in 1810. It was also led by a provincial military commander with a *biao* of five brigades and control over a further five, also with a total troop strength of about 20,000 men.

[19] *Chouban yi wu shimo* (Daoguang reign), 1: 375, 461.

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military expenditure (*hubu junxu zeli*). These served as self-imposed restraints on warship development, and neither the water force nor the shipbuilders had any funds to build bigger and better vessels. In order to preserve superiority over other ships, the Qing government stipulated maximum sizes for merchant and fishing boats, limiting the fresh water, provisions, and number of cannon that they could take aboard.[20] This cycle of restrictions seriously inhibited the development of Chinese shipbuilding and seafaring technology.

Moreover, many of the ships that the water force did have were out of service. On the eve of the Opium War the Fujian water force had 242 vessels – but 124 were either under repair or awaiting repair. Just 49 per cent were seaworthy. The Zhejiang Dinghai naval garrison had 77 vessels, of which 30 were damaged and awaiting repair, leaving only 47 ready for action.[21]

The gulf between the British and Qing navies was so large that the Qing forces made little attempt to engage with the British at sea, avoiding naval battles in order to concentrate on land defense. With military strategy constrained by hardware, the Qing lost the power to take the initiative in the war; the British navy was able to determine the time, place and scale of the battles – a crucial advantage, as we shall see.

At all levels it was recognized that the Qing water force was no match for the British navy, so planning focused on the coastal defenses. The empire had two types of coastal defensive infrastructure: fortified towns (*cheng*) and fortified cannon batteries (*pao tai*). Most people are familiar with the sorts of constructions associated with fortified towns: city walls, gates, moats and so on – some of the vestiges of which survive in the present day. But although pre-modern Chinese warfare largely consisted of attacking and defending fortified towns, the British only attacked three towns during the Opium War: Guangzhou, Zhapu and Zhenjiang. Analysis of town fortifications is included with the summary of the fighting later in this book.

The coastal batteries were the most important form of defensive infrastructure during the Opium War, but none remain today and most people do not know much about them.[22] A volume in the First National Historical Archives called *Min Zhe haifang paotai tushuo* (Illustrated Exposition of the Fujian and

[20] For the restrictions that the Qing placed on merchant and other civilian vessels, see *Guangxu Da Qing huidian shili* [Collected Institutes and Precedents of the Qing Dynasty, Guangxu edition], juan 120. These regulations were not rigorously enforced: at Xiamen and other places there were vessels that exceeded the size restrictions stipulated in the regulations.

[21] Qi Sihe (ed.), *Huang Juezi zoushu, Xu Naiji zouyi he kan* [Memorials of Huang Juezi and Xu Naiji, combined edition], (Zhonghua shuju, 1959), 99–101; *Yapian zhanzheng zai Zhoushan shiliao xuanbian* [Zhoushan in the Opium War: Selected Documents] (Zhejiang renmin chubanshe, 1992), 234–5.

[22] The fortified cannon batteries that can be visited today at Dongguan and Humen in Guangdong, and Hulishan in Xiamen (among other places) were built in the Guangxu reign, following Western designs. No Opium War era cannon forts remain.

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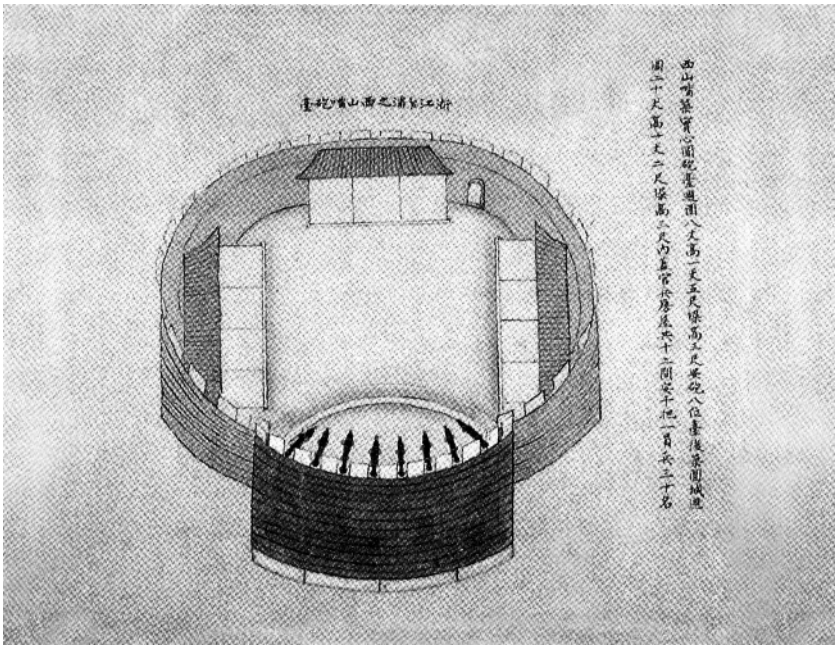

Figure 1.1 Xishanzui fortified battery at Zhapu.

Zhejiang Coastal Batteries) describes these fortifications in detail. Figure 1.1 illustrates the design of the Western Spur (*Xi Shanzui*) battery at Zhapu, which saw action during the Opium War.

The text accompanying the picture explained: "The Western Spur solid circular cannon platform has a circumference of eight *zhang* (one *zhang* is approximately 3.6m), and a height of one *zhang* five *chi* (a total of about 5–6m), with battlements of three *chi*, and space for eight cannon. It is enclosed within a walled compound extending behind it; the wall has a circumference of 20 *zhang* (approximately 72m) and a height of one *zhang* two *chi* (a total of approximately 4.3m). Inside there are 12 buildings for a garrison of 30 soldiers and a company commander." The document also indicates that each of the coastal batteries had between four and ten guns, and between 20–50 soldiers.

The fortified battery of the Western Spur at Zhapu was typical of Qing coastal forts at the time of the Opium War. In 1839 the new Jingyuan battery at Humen was completed, which was much larger, more robust, and had many more cannon. Inspecting it on the orders of the Daoguang emperor, Lin Zexu reported that the gun platform was "63 *zhang* wide [approximately 225m] and one *zhang* four *chi* five *cun* high [a total of approximately 5m]. The walls are made of stone, and the battlements with *sanhetu* [a kind of mortar]. There are

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