

Origin of the Huoqiang [火槍 or 火鎗] (Fire-lance) and its development into Liuxing [流星] (Shooting star) in China

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The origin of the Huoqiang [火槍] (Fire lance) was discussed in this paper. There long have been many uses for bamboo in southern Asia; one of these was in the creation of a new firearm Huoqiang [火槍], made during the Song Dynasty, in the year 1132. This new firearm was very effective for defeating enemies. It seems that this device was the first weapon employing gunpowder. It had as strong an effect as guns and cannons nowadays. Later on, this device was made by rolled paper instead of bamboo tube. When this rolled paper was turned around and attached to a light slender bamboo tube, it was used as a Liuxing [流星] (Shooting star), a pleasure fire works; this is the precursor of today's rockets.

Huoqiang [火槍 or 火鎗] means¹⁾ "flint lock" or "rifle" in modern Chinese. It seems that the name Huoqiang comes²⁾ from Gaiyongkao [該余叢考] (1790) written by Zhao yi [趙翼] (1727~1812) during the Qing Dynasty [清代]. What was the reason for the device being called "Huoqiang"? In addition to the riddle of its name, there are these questions: How was "Huoqiang" first developed in China? How was it first used? The term 'fire-lance' may be seen in the seminal work on the subject of gunpowder written by Dr. Seiho Arima³⁾ and Dr. Joseph Needham⁴⁾; otherwise, there are no references to "Huoqiang" in the scholarly literature which might provide answers to these questions.

In the course of the present author's research, a crucial finding was made, which might prove to be the key to answering the above questions: an account of a battle in Anluxian prefecture [安陸縣], Hubei Province [湖北省] in the year of 1132, containing reference to a weapon called "Huoqiang" using explosive gunpowder.⁵⁾⁶⁾

Proceeding from a careful examination of this battle account, this paper will attempt to shed light on the origins of the first "fire-lance", representing the first use of firearms containing explosive gunpowder in China, and how this fire-lance was first utilized there.

1. Huoqiang[火槍 or 火鎗](Fire-lance) used in China First description of the Huoqiang

When was the Huoqiang [火槍 or 火鎗] first made? There were descriptions regarding new firearms which were produced in the 3rd year of Xianping [咸平], that is, in the year 1000:

(1) In the book Xuzizhitongjianzhangbian⁷⁾ [統資治通鑑長編] (Collected Data for a Continuation of the Comprehensive Mirror for Aid in Government) (1183), written by Li Dao [李燾] (1115~1184):

At that time, captain Tang Fu [唐福] of a naval

force by the name of Shenwei [神衛], presented Huojian [火箭] (fire-arrow), Huoqiu [火毬] (fireball) and Huojili [火蒺藜] (thorny fireball) to the Emperor.

From this, it is understood that the new firearms were presented to the Emperor at that time.

(2) In the book ① Qunshukaosuo⁸⁾ [群書考索] also known as ② Shantangkaosuo [山堂考索], or ③ Shantangqunshukaosuo [山堂群書考索], or ④ Shantangxianshengqunshukaosuo [山堂先生群書考索] (Critical Compilation from all Books by Mr. Shantang) (1210), written by Zhang Ruyu [章如愚]:

In the 3rd year of Xianping [咸平], a captain Tang Fu [唐福] of a naval force called Shenwei [神衛], presented newly made Huojian [火箭] (fire-arrow), Huoqiu [火毬] (fireball) and Huoqiang [火槍]

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(fire-lance) to the Emperor.

From this description, it is clear that the Huoqiang was presented to the Emperor in the year 1000. This record appeared in the Gezhijingyuan⁹⁾ [格致鏡原] (1708) regarded as an encyclopedia, citing the original sentences found in Qunshenkaosuo.

- (3) In the book Songshi¹⁰⁾ [宋史] (1345) (The History of Song), written by Tuo Tuo [脫脫] (1314~1355):

In the 3rd year of Xianping [咸平] in August, a captain named Tang Fu [唐福] of the naval force by the name of Shenwei [神衛], presented newly made Huojian [火箭] (fire-arrow), Huoqiu [火毬] (fireball) and Huojili [火蒺藜] (thorny fireball) to the Emperor.

As for the description of the firearms, this is nearly the same as that in the Xuzizhitongjianzhangbian [續資治通鑑長編].

- (4) In the book Sonhuiyaojigao¹¹⁾ [宋會要輯稿] (Drafts of Documents Pertaining to Matters of State in the Song Dynasty) (1915), compiled by Xu Song [徐松] during the Qing dynasty [清代]:

At the time of Emperor Zhenzong [真宗], in the 3rd year of Xianping [咸平] in August, captain Tang Fu [唐福] at an arsenal called Shenwei [神衛], presented as a gesture of friendship Huojian [火箭] (fire-arrow), Huoqiu [火毬] (fireball) and Huojili [火蒺藜] (thorny fireball) to the Emperor.

It can be seen that (1), (3) and (4) contain nearly the same descriptions aside from the inclusion in (1) of Huojili [火蒺藜] (thorny fireball). Only the book Qunshenkaosuo [群書考索] suggests that the Huoqiang (fire-lance) also existed in the year 1000. However, there were no descriptions of Huoqiang in the military book Wujingzongyao¹²⁾ [武經總要] (1044), an encyclopedia of weapons compiled at that time, so it seems likely that there were no Huoqiang [火槍] at the time Wujingzongyao [武經總要] was compiled. In view of this, and the fact that it was reported by an encyclopedia that the Qunshenkaosuo [群書考索] contains some incorrect descriptions¹³⁾, it is distinctly possible that the other three sources are correct and the Qunshenkaosuo was mistaken.

2. First use of the Huoqiang

Although the above Qunshenkaosuo [群書考索] may have been mistaken regarding the precise time of its first appearance, it is reasonably certain that Huoqiang [火槍 or 火鎗] was developed in China during the Song

Dynasty, and was the first military armament known to use gunpowder. Historians might argue this point; however, two decades of study of the relevant Chinese literature in search of the story of gunpowder lead this author to this conclusion.

Let us step back in time to the year 1132, March 18th, and to Anliuxian prefecture [安陸縣] in Hubei Province [湖北省].

The fierce Li Heng [李橫] and his Jin army [金軍] invaders have swept down from the north east of China, to the city Deanfu [德安府] where the Song army commander Chen Gui [陳規] (1072~1141) and his troops are barricaded in the high-walled castle (Fig. 1, 2). The invaders fight fiercely, but Chen Gui drives them off, and survives to write about his victory in the Shouchenglu¹⁴⁾¹⁵⁾ [守城錄] (~1141). In this work, he says the following regarding the weaponry used:

Twenty fire-lances were made using Hupaoyao [火砲藥] and long bamboo tubes. At the top of the bamboo tube a spear or a sickle was attached. Two men carried each lance and defended the castle against the enemy's

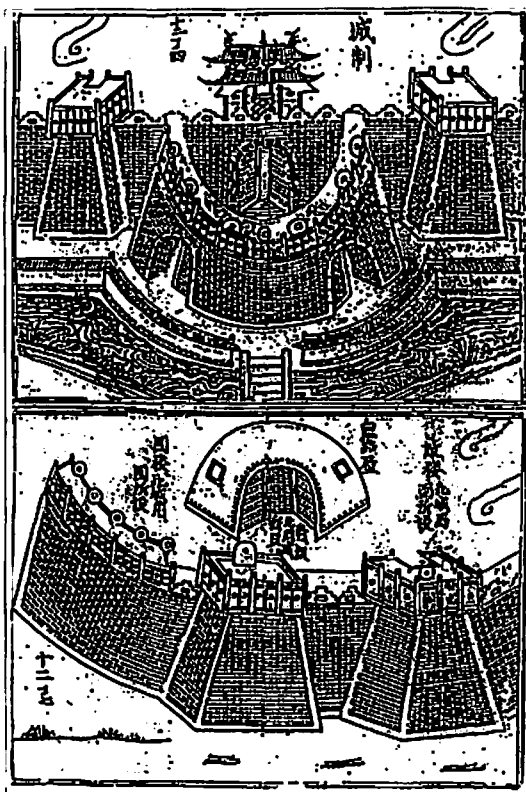


Fig.1 Chinese castle in ancient times. From the book Wujingzongyao [武經總要] (1044). Chinese castles in olden times were surrounded by stone walls several meters high, which were nearly vertical.

incursion. When the enemy came nearer, the fire lances were used here and there in the battle.

It is supposed that Chen Gui ordered these “fire-lances” to be made, and defended the castle with them. From the record of the battle at Deanfu, Chen Gui seems to have been an excellent commander as well as being a distinguished literature specialist, and he happened to write about the fire-lance in this work, the description being preserved until today. So, this record must be an important record of the correct structure of Huoqiang.

A similar description of Huoqiang can be found in the Sanzhaobeimenghuibien¹⁶⁾ [三朝北盟会編] (1194) written by Xu Mengshen [徐夢莘] (1126~1207), which was the record of the compilation of documents related to

the treaties with the North during three reigns. The description reads as follows:

Chen Gui [陳規] commanded 60 members carrying fire-lances; they exited from both gates of the castle and freely attacked the enemies. From the top of the castle walls were thrown Huoniu [火牛], which are dried straw figures shaped like cattle and ignited. And the bridge was burnt, over which enemies intended to invade and enter into the castle.

A similar description (except for the part concerning the castle gate charged by Song's soldiers) can be found in the Jianyanyilaixinianyaolu¹⁷⁾ [建炎以來繫年要錄] (1210), written by Li Xinzhan [李心傳] (1166~1243), which is a record of important affairs since the beginning of the Jianyanyi [建炎] (1127~1130) period:

Chen Gui [陳規] commanded 60 members, carrying fire-lances; they exited from the west gate of the castle. And they burned the bridge over which enemies intended to invade. They did this making use of Huoniu [火牛].

Nearly the same record is found in the Songshi [宋史] (1345) and the Nansongshu [南宋書] (c. 1650); however, it is written in the Sanzhaobeimenghuibien [三朝北盟会編] that the soldiers “charged from both gates of the castle”, while in the Jianyanyilaixinianyaolu [建炎以來繫年要錄], the Songshi¹⁸⁾ [宋史] and the Nansongshu¹⁹⁾ [南宋書] it is written that they “charged from the west gates of the castle”. The actual gate used is unknown. The crucial point, however, remains that the fire-lances were undoubtedly utilized.

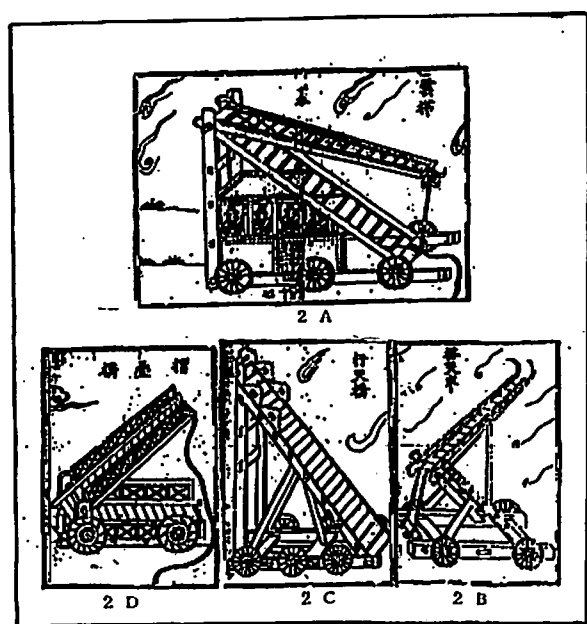


Fig.2 To breach enemy's castles, it is necessary for an army to go over the walls by using ladders called Zhenpeng [戰棚] (shelf of battle) such as ① Yunti [雲梯] (Fig.2A) (the ladder is so high that it reaches to the clouds in the sky), ② Tatianche [塔天車] (Fig.2B) (a car with which men can reach heaven), ③ Xingtianqiao [行天橋] (Fig.2C) (a bridge with which one can go as high as the sky), ④ Qiaozhedie [摺疊橋] (Fig.2D) (a bridge which can be folded in two) etc. These instruments were made of wood, so Chen Gui [陳規] defeated the enemies by throwing Huoniu [火牛] (fire cattle) which were made of dried straw like cattle; these were thrown from the top of the walls, in order to burn all of the ladders and weapons and the enemy's soldiers around there. Chen Gui [陳規] charged from the castle gate, bringing the Huoqiang [火槍] (fire lance) to the enemies trying to invade the castle over the high walls. In this way, the enemies were forced to retreat.

3. Construction and usage of the fire-lance

Regarding the construction of the first fire-lance, we have Chen Gui's own account in Shouchenglu [守城錄], but to know later forms of its construction, we can look at its use by an army captain named Li Quan²⁰⁾ [梨全], who used Lihuoqing [梨花槍] and thereby achieved many military victories.

Li Quan [梨全] made Lihuoqing [梨花槍] (Fig. 3), later known as Lihuoqing [梨花槍] and used them effectively from 1211 to 1231, that is 20 years, so that, according to the Songshi, he had no enemies by the end of that time. This Lihuoqing [梨花槍] was made of rolled paper filled with gunpowder and connected to the upper parts of a lance. The book Jingguoxionglue²¹⁾ [經國雄略] (1525), written by Zheng Daiyu [鄭大郁] during the Ming Dynasty, explains:

A fire-lance called Lihuoqing [梨花槍], named after a

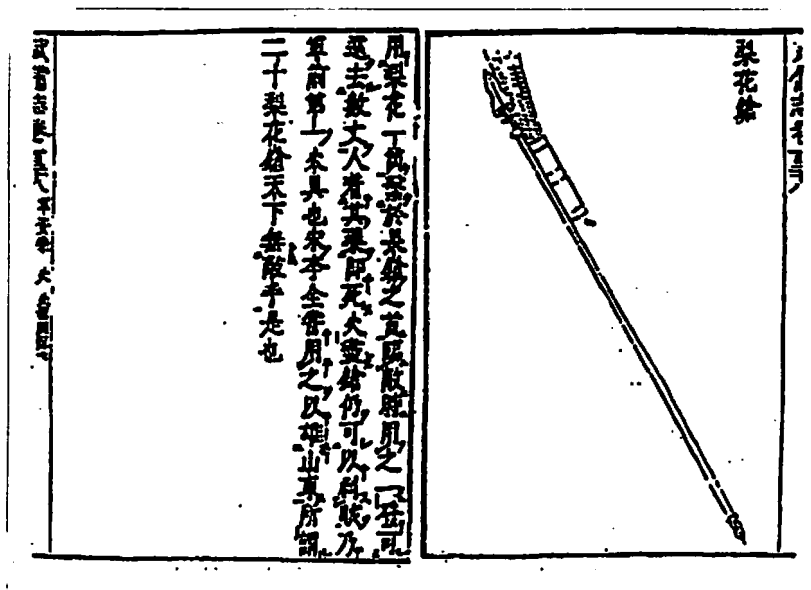


Fig.3 Figure of liuaqing [梨花枪]. From the Book Wubeizhi [武備志] (1621).

captain Li Quan [李全], was made of rolled paper which was called Lihua [梨花]. This tube is made just like the fireworks of New Year's night. This tube is connected to the head of a long lance. When one met an enemy, one could ignite the tube filled with gunpowder, then the flame would flash several meters. When a man and a horse were hit by this flame, they lost their eyesight and motivation to continue fighting. Later one could use the lance as a weapon. It was very useful for night fighting.

Nearly the same description was recorded in the Wubeizhi²²⁾ [武備志] (1621).

It is impossible to know the exact structure of the fire-lance from the Sanzhobeimenghuibien, the Jianyanyilaixinianyaolu, the Songshi or the Nansongshu. However, the Shouchenglu [守城錄] and Jingguoxinglue [經国雄略] suggest that it was made as follows:

A long bamboo tube about 4~6 meters in length and 3~4 cm in diameter has its knots removed up to the 3rd or 4th knot, and then this empty section, which becomes the barrel end of the fire-lance, is filled with Huopaoyao [火砲藥]. To avoid spillage, the powder is covered by paper, and a fuse is attached which can be lit at any time. Then a spear or sickle is attached at the top end. When the army met an enemy in battle, at the time of hand-to-hand combat, they would ignite the powder and burn the enemy with the flame, and after the combustion ceased, the empty fire-lance would be usable as a regular lance.

With the use of this new firearm, Chen Gui [陳規]

defeated the captain of thieves Li Heng [李横] who was forced to retreat and leave behind his war machinery and invasion weapons.

4. Fire-instruments used before the fire-lance

In China many instruments were made using bamboo tubes, not only firearms but also tools for daily life. This is no doubt due to the simplicity of bamboo's structure. Merely by cutting it, it can be readily utilized as a container for all sorts of materials. In what way did these instruments contribute to the invention of the fire-lance?

4. 1 Bamboo-tube and ancient Chinese Alchemy Lianjinshu [鍊金術] or Liandanshu [鍊丹術]

There are many Chinese pictures captioned: "In the high steep mountains, there is a violent torrent without banks, and near the river there is a hermitage. Nearby an old man is sitting or walking slowly." What kind of scene is this? What is the old man doing there?

In China since ancient times a kind of alchemy, Huangbaizhishu [黄白之術], had been practiced. In addition, some Taoist monks tried to find the secret of longevity, Liandanshu [鍊丹術]. Furthermore, some Taoist recluses, hoping to be complete Taoists, mastered the way of Shenxianshu [神仙術], also written as Shenqianshu [神選術]. These Taoists wished to become gods. They believed that one is able to become a god and go to heaven by leading an austere life. The above-mentioned pictures are thought to show such a

situation of Taoist monks. In ancient times they lived deep in the mountains in a hermitage or a cave and engaged earnestly in religious practices to become excellent Taoists (Fig. 4).

Some Taoist monks refrained from eating all kinds of grains and engaged in strict Taoist training. Others made a medicine, Shenxianyao (神仙菜), which when taken reportedly made one young and in some cases was said to have given a person eternal youth. Sometimes it was even reported those who took Shenxianyao became gods and were able to go to heaven. These Taoists did everything in secret and at most they had only one or two apprentices, so their methods were kept completely secret.

Ancient Taoists tried doing many kinds of alchemical experiments in their hermitages, often using bamboo tubes. One youth-prolonging experiment using bamboo tubes was Yuzhudanfa (玉柱丹法), written about in the Baopuzi²³ (抱朴子). Another such experiment conducted by Ge Hong (葛洪) (c. 281~340), is found in the book Baopuzi (抱朴子) (317). The method, called Liuyuandanfa (劉元丹法), is described as follows:

This method involves putting mercury sulfite in acetic acid. After 100 days its color changes to purple. Then mix it well with mica, put it in a bamboo tube, lacquer it, and keep it in a well. After 100 days it changes to red. If one drinks 200 ml of it, one is able to live 100 years; drink more, live still longer.

In other words, according to this method, after producing acetic mercury by mixing mercury sulfite with acetic acid and leaving it for a long time, then mixing it with mica, and keeping it in a bamboo tube immersed in water for a long time, a red substance is produced. If one drinks 200 ml of it, one is able to live a long life, longer than one hundred years, and if one drinks more, one lives much longer.

Mica is silver white in color; after some time it changes to red. It was believed to have the ability to make one younger for this reason: just as one can dye one's white hair to appear younger, white mica which had changed to red seemed to have "become younger" and was therefore an auspicious substance to use for maintaining youth.

As the possibilities for the practical utilization of bamboo became better known, parallel progress in a variety of scientific field was also made. Thus the conditions for the invention of the fire-lance gradually came together.



Fig.4 Ancient Taoist. Taoist experimenting in a cave in the deep mountain area in ancient times. It is supposed that Taoists engaged in experiments similar to those in this scene. Notice: at the right, a bird and tree suggest they are in a cave. From the book Huaxuefazhanjianshi (化学发展简史) published by Kexuechubanshe (科学出版社) (1980).

4. 2 Tuhuo (吐火) (flame-blowing)

Flame-blowing in modern times involves a flammable liquid such as gasoline or alcohol being held in one's mouth, and at the moment of blowing it out, setting it on fire, so that it seems as if one is vomiting fire from the mouth. However, there were no materials such as gasoline or alcohol in ancient times because they can be produced only by modern distillation processes. Even during the Song Dynasty (宋代) the latter technique was not well known.

The ancient method of flame-blowing created the illusion of vomiting fire from one's mouth, and spectators were supposed to believe that the magician actually vomited fire from his mouth. It can be supposed that magicians at that time used tricks which were well concealed from the spectators' eyes. They filled bamboo tubes with the feces of animals such as wolves or cows, and poured in it vegetable or animal oils. After this was ignited, the flame would flash as if it was being breathed from their mouths. Similar use of animal feces to make flames is still common; for example, disk-shaped cattle feces are dried and used as fuel for cooking in districts of rural India. This is because one of their components changes to saltpeter, and is thus very suitable for fuel.

This "magic" flame-blowing was very popular in ancient China, where there were few other leisure

activities. It is supposed that the spectacle of flame-blowing may have inspired the making of the fire-lance, since the latter also uses a burning agent in a bamboo tube.

4. 3 Huotong(火筒)(Fire-tube) — a kind of firearms used during the Tang Dynasty(唐代)

In the book entitled *Shenjizhidaitabajinjing*²⁴⁾²⁵⁾ [神機制敵太白陰經] also known as *Tabajinjing* [太白陰經] (759), written by Li Quan [李筮] during the Tang Dynasty, there is a description of firearms and other weapons used in beacon cabins as follows:

In the beacon cabin, make four holes in every wall facing in each direction, and watch the enemies' movements. And have the following on hand: Huotong, a flag, a drum, two pair of ballistae, stones for the throwing machines, logs to build fortifications, an earthenware container of water, dried foods, vegetables, fruits, pieces of hemp to make fires stronger, Huozuan [火鑽] (an instrument to ignite a fire), fire-arrows, dried hay and straw, and dried feces of wolves and cattle to make fires stronger.

Generally speaking, Huotong is not a kind of firearm but merely a simple bamboo-tube, without knots, 3~4 cm in diameter and 50~60 cm long, through which people blew strongly towards a fire like bellows, when making such things as a bonfire or a kitchen fire called Zao [竈].

On the other hand, the Huotong mentioned here is a kind of fire arms and is supposed to have had the following structure: a bamboo tube, c. 4~6 cm in diameter and 50~70 cm long, with one end opened and filled with dried animal feces and vegetable, or animal oil, which is ignited and turned toward the enemy.

It can be supposed that, by incorporating principles developed through flame-blowing and the experiments incorporating alchemy, such as those of Ge Hong [葛洪], this Huotong is the precursor to the fire-lance of Chen Gui.

4. 4 Other miscellaneous fire instruments using bamboo developed during the Tang Dynasty

From ancient times, petrolcum was widely used in Islamic countries, and in China it was known as Shinaoyou [石腦油], or Huoyou [火油], for example in the Province of Sichuansheng [四川省], where people were accustomed to filling bamboo tubes with it and igniting it to produce²⁶⁾ light.

As with Huotong, the burning agent was put into

bamboo tubes, and was often used as a kind of firearms after the Tang Dynasty. An example of such a weapon being used was in an attack on the army²⁷⁾ of Li Xilie [李希烈] (-786) in 783 by an enemy who reportedly had "magic".

A device similar to Huotong was used for war by king Wusuwang [武肅王] (859~932), formerly known as Qian Liu [錢鏐] who ordered his navy to put crude oil into iron tubes and use them. After these were ignited, his navy threw the tubes onto their enemy's ship and so gained a great victory²⁸⁾ at the battle of Langshanjiang [狼山江] in 919. It is interesting to note that before the army threw the tubes filled with oil, they first threw lime powder, the reason why they did this is that dust from lime powder causes loss of eyesight by the enemy's soldiers.

4. 5 Fire-spear painted on a Banner in Dunhuang²⁹⁾³⁰⁾ [敦煌]

A famous French scholar of Sinology, Dr. Paul Pelliot (1878~1945), found a banner in Dunhuang [敦煌] in the western Province of Gansusheng [甘肅省] which is now in the Musée Guime in Paris. On this flag there is a picture of the Gautama Buddha engaged in meditation, being disturbed by Mara, who is using a fire-spear (Fig. 5, 6).

Madame Nicola Vandier in 1974 and 1976 wrote that

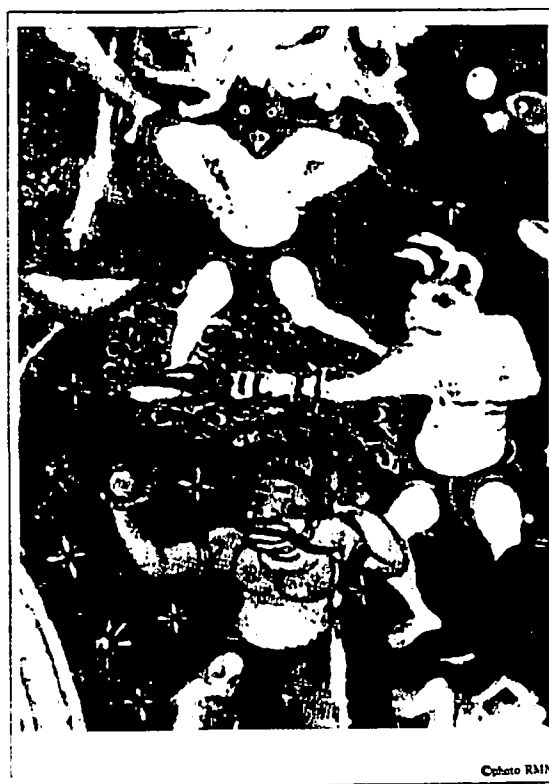


Fig.5 The banner on which a fire-spear is pictured (part of the picture) (before 10th century) (Courtesy of the Musée Guimet)

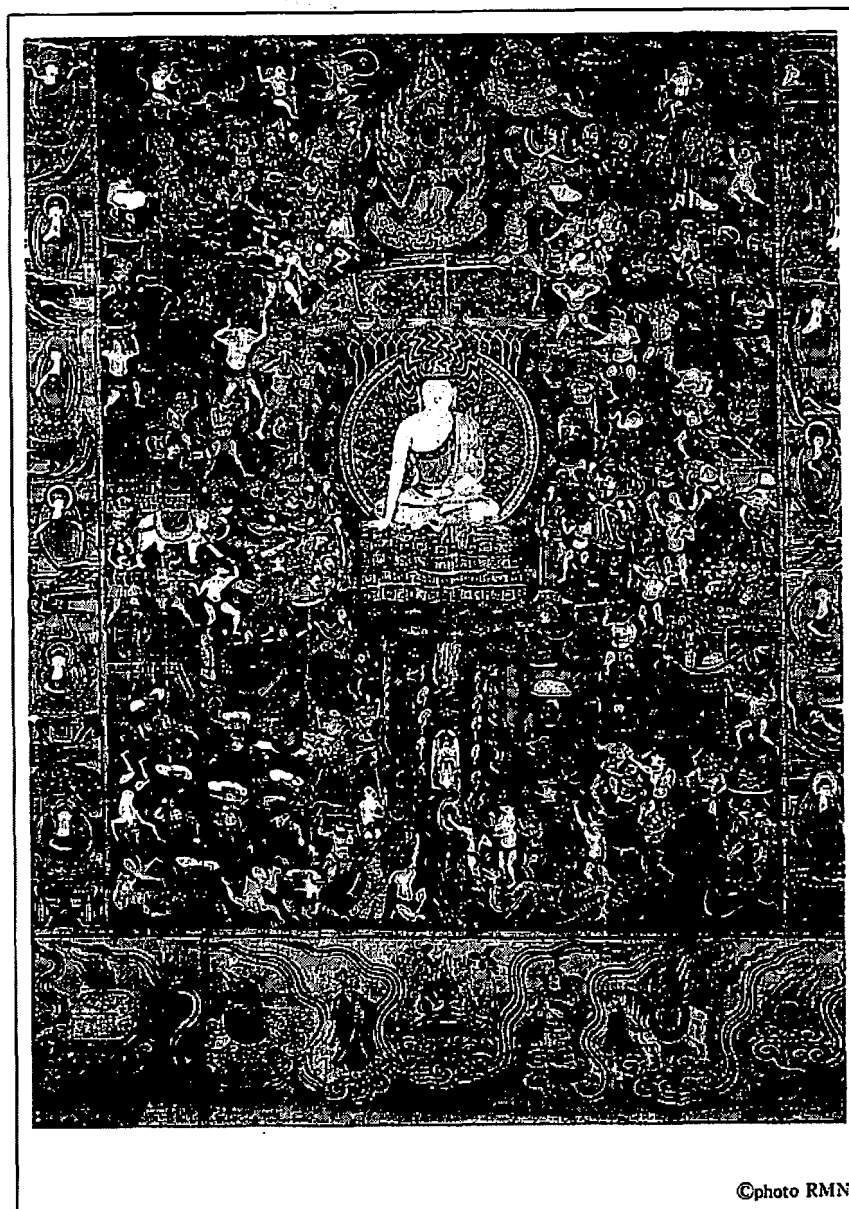


Fig.6 The banner on which a fire-spear is pictured complete picture (before 10th century) (Courtesy of the Musée Guimet)

this flag was completed before the 10th Century. It is described by her as illustrating an assault by Mara. She provides no explanation for the fire spear. On the banner there is a drawing of the Mara and Mandala; it can be interpreted as showing the introduction of the fire-spear from India to China, just as Buddhism came from India to China. The word “Mandala” comes from Sanskrit which means³¹⁾ “Disc” or “Circle” (Oxford English Dictionary) and “it is a symbolic representation of a magic circle, usually with symmetrical divisions and figures of deities, etc. in the center, which is used by Buddhists in meditation and found in many cultures as a religious symbol³²⁾ (Encyclopaedia Britannica).

(It is widely known that the technique of fire-spewing,

the custom of lantern enjoyment and many techniques and materials were transmitted from western countries to China. As these regions are geographically close to India, the role of India in the development of fire-related weaponry in China appears significant.)

4. 6 Pilihuoqiu (霹靂火毬) (thunder-bolt-fire-ball)

A kind of military firearm called Pilihuoqiu³³⁾³⁴⁾ (霹靂火毬) was produced to make a big sound and smoke, and used in much the same way as tear gas is used today. This is mentioned in the Wujingzongyao (武經總要) (1044), compiled by Zeng Gongliang (曾公亮) (999~1078). The description therein can be said to be that of a weapon that uses the earliest known combustible material (Fig. 7):

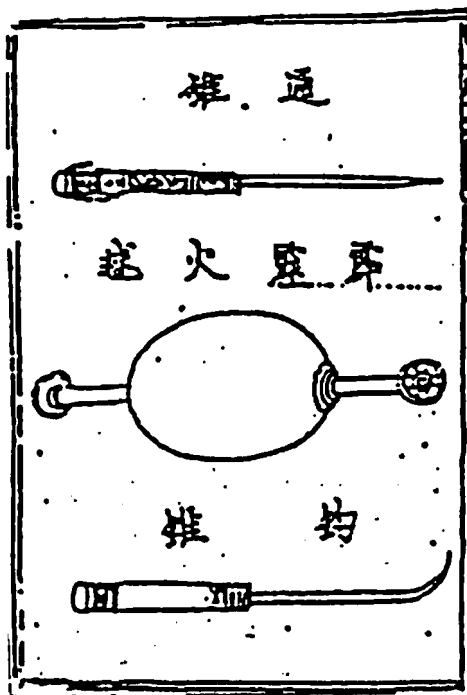


Fig.7 A picture of Pilihuoqi [霹靂火球] (Thunder-bolt-fire ball). From the book Wujiingzongyao [武經總要] (1044).

Pilihuoqi [霹靂火球]

This is made of dry bamboo, which is about 4~5 cm diameter, 50~70 cm long without cracks and with joints. Thirty pieces of thin fragments as big as a coin are mixed with 2 or 3 kg of combustible material and put around the bamboo in a ball shape. The bamboo stem sticks out 4~5 cm at either end. The ball is covered with more combustible material. Then hemp twine is wrapped around the ball on the outside.

In case the enemies attack by digging a tunnel under the castle wall, holes are dug as a means of defense. Fire balls are ignited by heated Huoqian [火鈴] (fire tongs) (Fig.8) and are exploded in the tunnels, producing a sound like thunder. Afterwards, big fans made of bamboo (Fig.9) are used to drive out the enemies with smoke and flame. (Another opinion is that 2 cubic meters of dry mugwort were used, so that the smoke rather than the fireball drove out the enemies.)

This "Thunder-bolt fireball" was attached to the outside of a bamboo tube with a burning agent on it. The knowledge of how to produce this weapon must have been very useful for making the fire-lance, since the burning agent would simply have to be put inside the tube.

These were the beginnings of the development of the fire-lance.

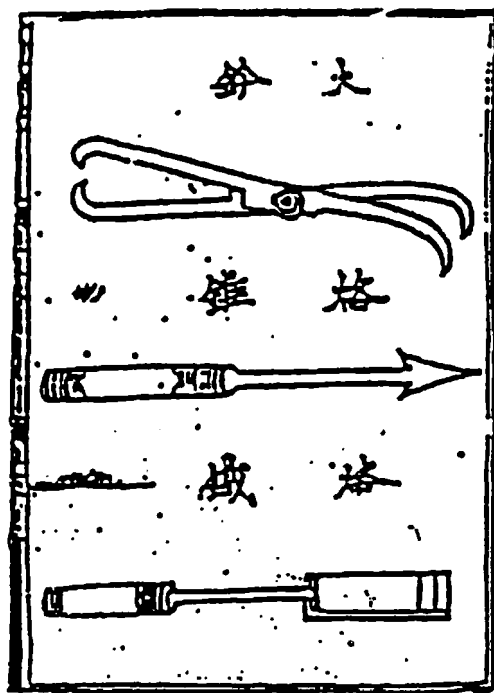


Fig.8 A picture of Huoqian [火鈴] (fire tongs). From the book Wujiingzongyao [武經總要] (1044).

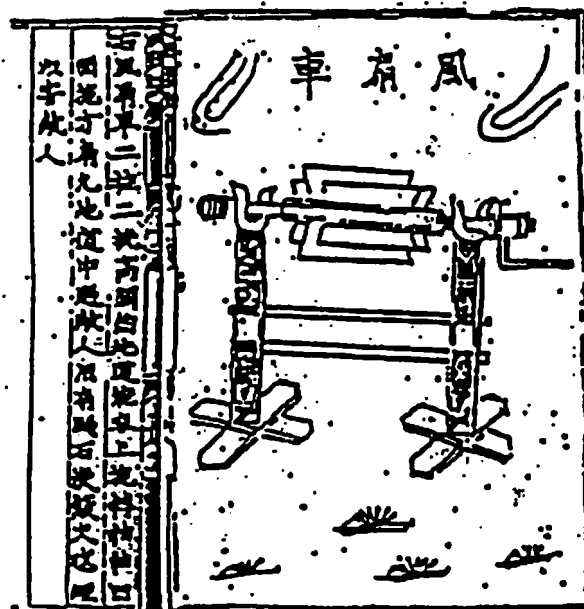


Fig.9 A picture of Shanfengche [扇風車] (The cart of bamboo fan). From the book Wujiingzongyao [武經總要] (1044).

5. Development from Huoqian[火槍]into Liuxing[流星] (shooting star)

Another device of significance in the story of the development of the Huoqian [火槍] was the Liuxing [流星]. There are structural differences between Liuxing and Huoqian, however. As stated previously, when

Huoqiang was ignited the flame belched forward; when soldiers met an enemy and fired it, the flame was directed at the enemy. If the ignition of the tube was carried out at the other end and the lance was light and slender, when ignited its flame was directed backward and the lance was projected into the sky, leaving the soldier's hands. This was Liuxing (Fig.10), the first device that can fly by the force of explosive gunpowder. This was used as a kind of firework (1187) and written of in the book Wulinjiushi³⁵ [武林旧事] (Xihuyoulanzhiyu³⁶ [西湖遊覽志余]); it is known to have been used as a method of military communication³⁷ in the year 1272.

6. Summary and conclusion

At the beginning of the Song Dynasty the Emperor at that time considered it necessary to develop new weapons for his army. Many kinds of new arms were produced as a result, one of which, the Huoqiang [火槍] (fire-lance) is discussed in this paper. Others will be discussed in future papers.

There are descriptions of the Huoqiang [火槍] (fire-lance) in the book Qunshenkaosuo [群書考索] (1210) written by Zhang Ruyu [章如愚]. This fact is recorded in the Gezhijingyuan [格致鏡原] (1708), also providing the original sentences. However, there were no descriptions of the Huoqiang [火槍] (fire-lance) in the book ① Xuzizhitongjianzhangbian [續資治通鑑長編] (1183) written by Li Dao [李燾], ② the Songshi [宋史] (1345) written by Tuo Tuo [脫脫] (except for Chen Gui's [陳規] Huoqiang) or ③ the Sonhuiyaojigao [宋會要輯稿] (1915) compiled by Xu Song [徐松].

Furthermore, at that time, captain Tang Fu [唐福] of a naval force called Shenwei [神衛], presented Huojian [火箭] (fire-arrow), Huoqie [火毬] (fireball) and Huojili [火蒺藜] (thorny fireball) to the Emperor, according the military book Wujingzongyao [武經總要] (1044), compiled at that time. However, there was no mention of Huoqiang [火槍] (fire-lance) in the Wujingzongyao [武經總要]. So it is supposed that the author of the Qunshenkaosuo [群書考索] was mistaken and that the Huoqiang [火槍] was made after the compilation of the military book Wujingzongyao [武經總要].

The beginnings of the fire-lance can be found in the use of bamboo tubes by Taoists conducting alchemical experiments. They were the first to put many kinds of materials in bamboo tubes. This utilization of bamboo led to the development of many kinds of tube-shaped



Fig.10 The shape of Liuxing (流星), or Liuxingpao (流星砲). From the book Wubeizhi [武備志] (1621).

instruments using fire, such as flame-blowing devices and firearms of the Huotong type. Other influences on the development of the fire-lance include the fire-spear (which appeared on a banner in the western part of China), and Pilihuoqiu (thunder-bold fireball), which consisted of a burning agent put around a bamboo-tube.

The first recorded use of Huoqiang was by Chen Gui [陳規] in 1132. By using this new fire-lance, Chen Gui [陳規] defeated his enemy. It must have been an awesome weapon to the enemy: compared with the other arms at that time, this bamboo tube was able to destroy a fighter's eyesight, burn his body, and make him lose his motivation to continue to fight.

It is supposed that the fire-lance was one of the most important precursors of guns and cannons, and the origin of the tube-style firearms. Huoqiang [火槍] later developed into Liuxing [流星], the first device that can fly by the force of explosive gunpowder.

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