

Crossbow-making in Venice during the 13th Century

by Alessio Cenni

In Italy during the late twelfth and early thirteenth centuries the crossbow became established as a weapon of strategic importance, not only able to affect the outcome of a single engagement but to alter the balance of power between feudal lords and free cities, cavalry and infantry. What made the crossbow a particularly dangerous weapon (as later with firearms) was its capability of striking with force and accuracy with the need only of a modest amount of training for the crossbowmen. A simple mechanical device (a belt hook) and the fact that it could be kept spanned and ready to shoot allowed the separation of the period of maximum effort (the drawing of the bow) from the time of maximum concentration (the location of the target). The manufacture and trading of crossbows became the subject of rigid control by the authorities of the Italian states and what follows is a description of the contents of a document concerning the regulation of crossbow-making in Venice in the thirteenth century.¹ Though the manuscript does not yield a comprehensive picture of crossbow production it is perhaps the most complete and coherent source for crossbow-making in that period.

The Capitulary

The Venetian *Capitulare de balestaris*, is a manuscript which has not been dated precisely but was probably compiled partly before 22 November 1261 when the public magistracy was divided into two bureaux with different jurisdictions, called 'Old Justice' and 'New Justice'.

The Capitulary is therefore a rewriting, probably with revisions, of a pre-existing statute of the Crossbowmakers Guild in Venice, though no earlier manuscript has been discovered. As was usual in the Italian free cities of the 13th and 14th centuries the language used is Latin. It is, more exactly, a mediaeval form halfway between classical Latin and a north-eastern Italian dialect, written by public officers rather than scholars or men of letters. The language is full of words unknown to, or altered from, the classical forms and quite unlike modern Italian. The greatest difficulty is understanding words which encapsulate the technical knowledge which the writer took for granted and which we now grope to understand.

The Capitulary comprises twenty six paragraphs covering different aspects of the production and sale of crossbows and rules governing the manners and behaviour of the crossbow-makers to their colleagues, customers and the civic authorities.

The Guild

The crossbow-maker was obliged to swear an oath '*... ad evangelia sancta dei ...*', to abide by the guild statutes.² All work was to be executed in good faith and without fraud by the master and his workmen.³ Every crossbow was sold by him, or others for him, with this understanding. The maker was obliged to denounce to the authorities any man of his guild who violated the written regulations or refused to swear on the Capitulary.⁴ The strict internal discipline of the guild provided quality control and the equivalent of the warranties applied to modern industrial production. The crossbowmaker was obliged to reject inferior materials, and to apply his skills to make a weapon which was well finished and complete with all necessary fittings.

Particular attention was paid to establishing the 'paternity' of the crossbows. Every crossbow-maker had his own mark which was registered at the *Cameram Iusticiariorum* (Chamber of Justice) and was obliged to sign both the bow and stock of his crossbows.⁵ If he repaired a crossbow made by another craftsman he was obliged to make his own mark beside that of the original maker and thereby accept responsibility for the performance of the weapon.⁶

Fines were imposed on any man who failed to sign his work and crossbow-making was forbidden to anyone unknown to the Venetian authorities and who had not registered a mark at the *Cameram Iusticiariorum*.⁷

Three master crossbow-makers were elected as *Suprstantes* ('overseers') whose task it was to watch over the observance of the regulations and to be accountable to the civic authority.⁸ They were authorised to fine any craftsman who prevented them inspecting his workshop and were obliged to draw his recalcitrance to the justice bureau.⁹ A short, sharp paragraph forbids any crossbowmaker from repairing a *balista bastarda*.¹⁰ This description probably embraces weapons with no marks, and hence of dubious origin, as well as those with a mixture of marks from different workshops which

had already been damaged and repaired a number of times before. Crossbows with more than two subsequent repairs after the first manufacture were regarded as not retaining a sufficient standard of quality.

The Crossbows

On the technical side the Capitulary treats the various components of the crossbow and their assembly. The bows described are of the composite type, made of horn and sinew, there is no reference to the making of wooden bows. The making of wooden bows was probably treated in a previous document not known to survive, and anyway all the general methods of construction of the tiller, nut and trigger lever would apply to both types.

The complexities of composite bow construction were subject to individual variations according to the maker and when completed the bow was usually completely covered by skin or tree bark as a protection against moisture. An excess of technical innovation and experimentation by the maker as well as downright fraud would be constantly guarded against so as to maintain the good name of the guild.

From the Capitulary we know that goat and ibex horn were used in the bows made at Venice. Ibex was clearly regarded as the superior material and a paragraph of the document specifically says that common goat horn could only be used by the master craftsman who already had a stock of it in his workshop purchased before the drafting of the Capitulary.¹¹

The bow was made from at least two or three laths of ibex horn; the capitulary uses the word *fustum* with the meaning of *stave*. The customer had to be able to ascertain the nature of the bow for himself and it was expressly forbidden for the master to apply the sinew and finishing before it was sold.¹²

Any bows or horn staves which were damaged or spoiled or with splinters raised on the surface were not to be covered with sinew.¹³ The horn staves were bent or straightened as appropriate with the use of soap, apparently moulded them in a hot (boiling?) soapy mixture and not exposed to direct heat.¹⁴ It was forbidden to use water only.

Some bows had a round cross-section and a paragraph states that it was forbidden to bind a bow of round cross-section to the stock without joining to it a *scanellum* (channel) with glue and sinew. The *scanellum* was probably a piece of horn or hard wood with a half round groove used thereby to marry the centre of the bow to the stock.¹⁵ This would prevent the bow turning on itself when subjected to the severe strain of spanning with the hook and belt device.

When an old crossbow was brought for repair the master crossbowmaker had to verify if the horn core of the bow was in good condition. If broken he

had to replace it completely and not just make a repair or the crossbow was designated '*nichil valet*' ('no strength').¹⁶

The strings were made with strong thread purchased from the hemp-spinners guild. A paragraph of the Capitulary specifically says that Venetian crossbow-makers must use thread of good or excellent quality, made of hemp and not flax, under penalty of a small fine for every string not of the required quality.¹⁷

The stock or tiller is treated in various sections but no indication is made of the type of wood to be employed. Again this may well have been treated in an earlier statute of the guild now missing. Again like the bow the stock had to be seen by the customer before any finish was applied. After that it might be coloured or stained.¹⁸

Also the crossbowmaker was not to sell a crossbow stock before it had been provided with a *trafitta*.¹⁹ In Italian this word has the meaning of piercing a body completely through. It probably means the hole near the fore end of the stock through which the cords were passed to bind the bow securely. The customer would need to know that the timber had not been weakened by making this perforation.

The nut and trigger must be set with great care; the trigger placed in the correct position beneath the *foramine nucis* (the hole or cavity for the nut).²⁰ The trigger or *clavem* (literally 'key') and the stirrup were made of iron of course and had to be purchased from the smith's guild. Venetian crossbowmakers were forbidden to use inferior triggers and stirrups, '*de carevana*'.²¹ It seems this word indicated goods of second-rate quality which were made for export to the Balkans. Quality triggers presumably had the sear case-hardened as steel, a process called *saldatura* in the Middle Ages and commonly used to harden the forged heads of crossbow bolts.

There is no indication of the material used for the nut but this was universally of deer antler, a neat cylinder turned on a lathe. The Capitulary specifically refers to the metal reinforcement against which the trigger sear pressed when the bow had been spanned.²² This helped prevent damage to the bone nut from the extreme pressure exerted at the point of the sear.

The authority

The sale of crossbows was subjected to tight regulations both to maintain quality and to prevent these dangerous weapons reaching potential enemies of the state. The public authority of the Venetian Republic had the last word concerning the sale of these weapons.

The maker was forbidden to sell his own finished crossbows in the public market.²³ They were sold in the workshop and were not assembled till a sale was confirmed with a specified customer;

presumably this allowed time for the latter to be checked by the authorities. In addition no more than two crossbows were allowed to each customer unless a licence had been obtained from the civic authorities. A 'go-between' trying to get round the two crossbow rule was also not allowed.²⁴

Of course as with all guilds, no Venetian citizen who had not registered with the crossbow-makers guild was allowed to manufacture these weapons. Any 'foreigner' who arrived in Venice was not allowed to work in the crossbow-maker's shop longer than eight days if they had not presented themselves to the guild and the civic authority and sworn an oath to accept the laws of the Capitulary.²⁵

What follows is a list of fines established in the Capitulary for all those master crossbow-makers whose workshops had committed violations of the regulations. The level of fines is interesting. The biggest penalty is for illegally selling more than two crossbows, showing that control of the spread of the weapon to 'undesirable' persons or rival states was paramount. Fines of 20 Soldi were exacted for not paying appropriate fees to the guild, and not allowing the guild officers to inspect one's workshop. The only construction process which attracted this high level of fine is the preparation of the horn staves with water only, emphasising the need for the bow to be of the highest quality to enable a reliable weapon to be produced.

Violations	Fine
To set in the stock a trigger or stirrup of second-rate quality.	Soldi 5 each
To forget the metal reinforcement in the nut.	Soldi 10 each
To use water only to bend the horn staves.	Soldi 20 each
To stain or colour a stock before selling it.	Soldi 5 each
To make bowstrings of flax and not of hemp.	Soldi 5 each
To have forgotten to place his own mark on the stocks or bows.	Soldi 5 each
To have forgotten the gluing of the <i>Scanellum</i> to a round bow.	Soldi 5 each
To sinewing a horn bow before it was sold.	Soldi 10 each
To sell a stock before the <i>Trafitta</i> was made in it.	Soldi 5 each
To prevent the inspection by the <i>Suprastantes</i> of his workshop.	Soldi 20
To offend with bad words the <i>Suprastantes</i> while conducting a search.	Soldi 10
To allow a foreigner to work on the crossbows for more than eight days.	Soldi 20
To sell more than two crossbows to the same customer without licence.	Soldi 40 each
To sell finished crossbows on a public market.	Soldi 10 each
To work bows with bad quality horn staves.	Soldi 10 each
To work at crossbowmaking without subscribing to the Guild.	Soldi 20

[During the thirteenth century in central and northern Italy the everyday currency was the *denaro*, a small coin of silver alloy issued by the mints of many free cities; 12 *denari* were called 1 *soldo* but this was generally only a coin in name only (money of account). From 1200 a heavier silver *denaro* with the real value of 1 *soldo* was in use in Venice. 20 *soldi* (240 *denari*) were called 1 *libra* (pound), another nominal coin. In 1252 Florence issued the *fiorino* (florin), the first gold coin of mediaeval Europe and in 1284 a similar high quality gold coin, the *ducato* (ducat) was issued in Venice. Gold coinage was chiefly used in large scale transactions and international relations rather than in the market place.]

Comments and discussion

The Capitulary is a precious document which, though it does not reveal all aspects of crossbow-making in the Venetian state of the thirteenth century, provides a major source. The information can be used to verify and enhance other contemporary written sources from the Italian archives, such as the Angevin chancellery of Naples or the Biccherna Registers of Siena.

Not much is said about the sinew-backing of the composite bows and nothing about the method of gluing the sinew. Nor is there a description of the external finishing of the bow, was it leather, raw hide, birch bark or something else. It may seem unlikely that no sinew was applied to the bow until after a purchase had been agreed because the general structure would be visible before applying

any external covering, sufficient one would have thought to determine that it was honestly made.

However the word *innervare*, (nervo is sinew) may be translated 'sinewing' or to 'add on sinew'. In other instances the same verb is used figuratively to mean 'give strength'. Therefore this word in the Capitulary seems to be an allusion to a substantial stage of bow-making and not just a final thin covering. There are no references to a wooden component to the bow which seems to have been made solely from horn and sinew.

Neither is anything said about reinforcements of horn, bone or iron on the stock, or decoration. It is stated that the bow was joined to the stock with binding and this was presumably much like the method found on fourteenth and fifteenth century bows.

The generic word *balista* appears in the Capitulary without specifying the size or type of weapon as used in contemporary military inventories, eg *balista de una pedem* (one foot crossbow), *balista de duos pedes* (two foot crossbow) and *balista a torno* (heavy siege crossbow with winch). The first type was the lighter one, used in both warfare and hunting. The others were for warfare only, mainly from defended positions, such as battlements of fortifications and the 'castles' on board a ship. The large crossbow spanned with a winch was usually on a swivel mount.

The core of the composite bow was made with horn, the preferred material being from the horns of the alpine ibex (*Copra ibex ibex*) a type of goat. Two or three staves (*fustii*) of horn apparently of the same length as the finished bow, were glued together. From personal experimentation the making of a composite bow for a crossbow with a draw weight around 300 lbs. requires a horn core with a length of 70 cm and a central cross-section 4 cm wide and 2 cm thick. It should be possible to make this core with two or three staves from a mature ibex, the horns of which reach a length of 80-90 cm.

Goat horn is very homogeneous and workable, not inferior to Asian buffalo horn when goats with long horns are available and better than that of European long horn cattle. The author has never used Ibex horn for a crossbow but after examining the external appearance I presume the superiority over common goat horn was due mainly to the possibility of cutting longer and / or thicker staves. They would enable the making of bows with fewer internal splices. The use of soap as an aid to bending the horn staves is very interesting. One presumes the horn was dipped into a thick solution of very hot soap, the 'adhesion' of the soap warming the horn more effectively than plain water, until the stave became soft and pliable. Hot water by itself would tend to 'denature' the substance of the horn as well as removing any natural oils or fats. (See APPENDIX I)

Clearly after the procedure the horn remained

strong and homogenous whereas the temptation, when using water alone, would be to boil it hard thus tending to damage the structure of the horn.

The Capitulary gives us some idea of the organisation and rhythm of activity within the crossbowmakers workshop. The whole of the operation was directed by the master and without doubt he undertook the more difficult and crucial tasks but he had one or more assistants or apprentices.

The oft repeated sentence is '*Laborare vel laborari facere ...*'; the master was responsible for all the weapons produced within his workshop including any made by his subordinates. Various components were prepared in the course of the year. The raw horns were sawn into useful staves of different lengths and some of these were assembled into horn bows ready for sinew backing. Selected wood was cut and shaped to make crossbow stocks and yew staves imported from the Alpine mountains and South Eastern Europe, were seasoned for making into wooden bows. 'Stag horn' i.e. antler, which is bone, not horn, and maybe box wood, were turned on a lathe to make nuts. In the workshop at any one time there would be a range of half-worked components and old crossbows in course of repair. The customer was shown the range of materials and crossbows in various stages of manufacture to enable him to make an informed choice. The sinew-backing and its curing required several months at least so if we interpret the text as meaning the backing was not applied till after the purchase had been decided then there was a considerable gap between payment and delivery. Certainly the stock had to be seen in raw condition without colour or stain before a sale was made, or else a fine resulted. Orders would have to be made to the smiths for stirrups and triggers and the hemp-spinners for thread for the strings.

Complete equipment for a crossbowman generally included two shooting strings and a third longer string, called *magistra*, used when fitting the working string without the aid of a spanning bench. (APPENDIX 2)

The references in the records of the Venetian government indicate there was a concentration of crossbowmakers workshops near the Parish of San Giuliano in the district of San Marco.²⁶

Additional notes

In the appendix to the published edition of the Capitulary are references to a number of records of the Venetian government, 1290-1316, concerned with the making, use and trade of crossbows. They serve as an indicator of the strategic worth of such weapons in the Venetian state.

An order for the year 1290 states that every Venetian ship trading with the East which was provided with defensive apparatus (a wooden fore-

castle, and a large top with railing on the mast) should have in the crew a man expert in the maintenance of crossbows and their strings, triggers and nuts. He was responsible for their good repair or the ship was subjected to a heavy fine of 10 *lire* (200 *soldi*).²⁷ A letter of 26 September 1309 orders Viviano Graziado, the Venetian Consul in Segna (now Senj, in Croatia) to give all necessary help and assistance to Pietro the crossbow-maker, who must cut and work yew bow staves for the crossbows of the Venetian government.²⁸ Written at the beginning of the Autumn the letter coincides with the best period to fell trees and split staves for self bows.

Undoubtedly in that period of the Middle Ages crossbows with wooden staves were more common than composite bows. Another record of the year 1316 is a resolution by the *Maggior Consiglio*, the supreme council of the Venetian government, regarding Venetian citizens serving in garrisons in the castles of Corone and Modone in the Peloponnese (S W Greece). They were allowed to have wooden bows for their crossbows because there were no crossbow makers in these places able to make composite bows.²⁹

There are also records of the reprieve from fines inflicted on Venetian citizens who were apprehended trying to export crossbows without a licence. These appear in 1303, 1305, 1310, 1315 and 1316. Each man had tried to export between one and fourteen weapons and the fines were between thirty and one hundred *lira*. Only three destinations are indicated, one is the castle of Venzona, the castle of Gemona near Udine, and the other is the town of Padua, to where an attempt was also made to send tools used to make crossbows; which was therefore an attempt to export the technology of crossbow-making.

The Venetian government demanded the last word on the trade in crossbows since it was essential for the bulk of production of top quality crossbows to be retained so as to equip their own navy and militia. Export was restricted to surplus production and exclusively towards states in friendly relations with Venice.

Venetian ibex horn crossbows (*balista de stambecco*) were certainly sent to the Republic of Siena, Tuscany from at least 1230.³⁰ As late as the 15th century composite crossbows called stambecchine (literally little ibex) were used in Tuscany.³¹

During the Middle Ages the ibex was only found on the higher slopes of the Alps. In 1492 the armoury of the Medici family held at least sixty seven steel crossbows, one old wooden crossbow and thirteen with bows made from ibex horn, probably imported from Northern Italy or Venice.

APPENDIX I

Before becoming acquainted with the Capitulary I had used, when building replica weapons, direct heat from a fire. This works but requires great care to avoid burning and was preferable to boiling in water which tends to damage the fibres of the horn.

Experimenting with soap I prepared a dense 'soap' of water and traditional Marseilles soap (made from olive oil) on a strong fire. The horn stave is dipped in the boiling soap for a short time, 2 minutes, then quickly removed, bent on a wooden form and secured with binding until cool again, 5 – 10 minutes. It is very effective perhaps because the soap solution reaches a higher temperature than water only. There is no observable damage to the horn.

APPENDIX II

The *magistra* ('master') is looped onto the outer pairs of the double nocks usually found on composite crossbows. Harmuth (in *Die Armbrust*) calls this longer string the *hilfssehne* or 'helper string'. The loops of the working string are drawn over the nocks and left unseated then the long string is put on and drawn to the nut so that the bow is now bent enough to engage the shooting string in the inner nocks. The *magistra* is then removed and the weapon is ready for action after a process lasting some 30 seconds. When not in use the crossbow is kept unstrung.

Here follows a complete text of the Capitulary taken from the transcript published in 1896. The manuscript was written by several hands; most of the paragraphs were probably in force before the year 1261. The Capitulary was filed in 1278 and some paragraphs were added some years after on the same paper with an indication of date; the progressive number was then added. Paragraph VII is dated 1304; para. XX, 1306; and para. XXI 1307: -

CAPITULARE DE BALESTARIS

I. Iuro ad evangelia sancta Dei quod omnes ballistas quas laborabo vel laborare fecero, vendam vel vendi faciam cum suo nomine et dicam veritatem si erunt de cornibus stambicorum vel de aliis cornibus, omnes pro suo nomine de quo sunt. Et omnes ballistas quas fecero vel laborare fecero de cornibus stambicorum, non mittam nec mitti faciam in ipsis de aliis, cornibus nisi de stambicis. Et si sciero quod aliquis de ista arte fecerit contra ordinem suprascriptum et non habeat factum hoc sacramentum, quam cicius potero iusticiariis manifestabo.

II. Hec omnia attendam bona fide sine fraude, nisi remaserit per maiorem partem iusticiariorum.

III. Item, ballista veterem non potest conciare si cornum fractum est; si lectum vero mittatur totum, et etiam si aliud lectum non mittatur, illa ballista

nichil valet et non debet concari.

III. Item, nullus magister sit ausus facere et ballista de cornum de beco, sed in tenet mittere potest.

V. Item, nulla ballista bastarda, aliquis magister concare potest.

VI. Item, si aliquis aportaverit ballistam occasione concianum et postea voluerit concare, unusquisque ballistarum facere teneatur signum suum super illud ballistam.

VII. Anno Domini millesimo. CCCIII, indicione tertia, die .XXIII. februarii, tempore dominorum Marini Busenago, Phylipi De Fontana et Andree Marcello iusticiariorum veterum, ordinatum fuit et firmatum per eosdem quod a modo aliquis balisterius non audeat vel presumat ponere vel poni facere aliquo modo vel ingenio aliquam clavem vel stapham de carevana in aliquo balisto, sub pena soldorum .V. pro qualibet stapha et totidem pro clavi posita vel positis in balisto, contrafacienti et nichilominus soluta pena teneatur magister dicti balisti ipsam clavem et stapham remove a balisto, retinendo ipsas in se, et alias bonas ponere ad sua expensas.

VIII. Item, quod aliquis magister balisterius non audeat ponere vel poni facere aliquam nucem in aliquo balisto que non habeat refollum reveditum in vivo nucis de subtus, sub pena soldorum .X. pro quolibet balisto in quo dictus ordo servatus non fuerit et pro qualibet vice contrafacienti. Et nichilominus soluta pena teneatur dictus magister ipsam nucem extrahere et aliam bonam ponere at suas expensas.

VIII. Insuper, quod quilibet predictorum debeat laborare sive plicare omnem fustum de balisto cum sepone et non cum aqua sub pena soldorum .XX. pro quolibet fusto sive arcu et pro qualibet vice contrafacienti.

X. Item, quod aliquis predictorum non debeat colorare aliquem tenerium de balisto sive mutare eum de suo colore proprio antequam ipsum vendat, sub pena soldorum .V. pro quolibet tenerio et pro qualibet vice contrafacienti; verum quod hoc licite facere possit postquam fuerit venditum, ad voluntatem emptoris.

XI. Item, quod non debeat fieri per alioquem predictorum aliqua corda, nec ponere in balisto, nisi fuerit de spago comuni vel de tam bono vel meliori, et de canipo et non de lino, sub pena soldorum .V. pro qualibet corda et pro qualibet vice contrafacienti.

XII. Preterea, quod quilibet magister debeat facere suum signum proprium in balistis, tam in arcu quam in tenerio, prout signatum est ad camaram iusticiariorum, nec aliquis audeat contrafacere signum alicuius, sub pena soldorum .V. pro quolibet arcu et tenerio non signata.

XIII. Item, quod aliquis predictorum non audeat ligare vel ligari facere aliquem arcum rotundum in aliquo tenerio nisi colaverit vel innervaverit ipsi

arcui unum scanellum bene et diligenter, sub pena soldorum .V. pro quolibet arcu et pro qualibet vice contrafacienti.

XIII. Insuper, non audeat aliquis predictorum innervare vel innervari facere aliquem arcum nisi fuerit de duobus vel tribus fustis, nec in testis vel in aliquo alio loco preter scanellum nisi primo ipsum vendiderit, sub pena soldorum .X. pro quolibet arcu et pro qualibet vice contrafacienti; verum quod postquam venditum fuerit, innervari possit ad voluntatem ementis.

XV. Item, quod nullus predictorum audeat vendere vel vendi facere aliquod tenerium sine trafitta posita in ipso tenerio, antequam balistum ligetur, sub pena soldorum .V. pro quolibet et pro qualibet vice contrafacienti. Et quicumque de omnibus et singulis sopradictorum accusaverit, habeat medietatem pene si per eius accusationem veritas conosceretur.

XVI. Insuper, ut omnia et singula predictorum continue observentur, ordinauerunt domini sopradicti quod debeat fieri in arte ista tres supstantes bani et legales omni sancto Michaelae mutandi; qui supstantes sacramento teneantur temptare omnes stationes balisteriorum et balista eorum, tenerius, arcus, claves, staphas, nuces, et cordas, et omnia ad artem predictam pertinencia omni mense semel ad minus, et plus si eis videbitur, et in eo capitulo in quo aliquem contrafecisse invenerint, penam ibi scriptam remota amore et odio accipiant, habentes ipsi supstantes medietatem pene si per eius accusationem veritas conosceretur.

XVII. Item, potestatem habeant ipsi supstantes imponendi penam vel penas soldorum .XX. et inde inferius cuilibet qui non permiserit stationem et laboreria sua ab ipsis supstantibus temptari et eis rebellis fuerit officium suum facientibus, et penam impositam per eosdem a quocumque qui bamnum contempserit aufferratur; et hoc notificare debeant dominis iusticiariis.

XVIII. Item, quod nullus de dicta arte audeat dicere rusticitatem vel iniuriam supstantibus facientibus suum officium, sub pena soldorum .X. medietas camere iusticie et alia medietas ipsis supstantibus.

XVIII. Item, quod nullus tam venetus quam forensis audeat vel presumat facere vellaborare artem balisteriorum in Veneciis nisi primo se presentaverit ad cameram iusticiariorum veterum et iuraverit coram iusticiariis artem et dederit signum suum; et hoc infra .VIII. dies postquam sciverit hoc bamnum, sub pena soldorum .XX. pro quolibet contrafaciente et pro qualibet vice, medietas camere, alia medietas supstantibus.

XX. Anno Domini millesimo .CCCVI. , indicione quarta, die .XIII. iulii, ordinatum fuit et stabilitum per dominos Nicolaum de Fano, Iohannem Mengulo et Cressi Cornarium iusticiarios veteres

quod nullus magister balisterius sive nullus de arte balisteriorum a modo audeat vel presumat ullo modo vel ingenio vendere vel vendi facere alicui persone plus quam duo balista, tam uni soli quam pluribus pro uno, sine licentia dominorum iusticiariorum, sub pena soldorum .XL. parvorum pro quolibet balisto ultra dictum numerum vendito et pro qualibet vice contrafacienti.

XXI. Anno Domini millesimo.CCCVII. indicione .VI. die octavo intrante mense februarii, ordinatum fuit et firmatum per dominos Nicolaum Sanudo, Marcum Dalfino et Marcum Dandulo iusticiarios veteres quod a modo quilibet forensis qui venerit ad terram istam volens artem istam laborare, non audeat artem istam laborare ultra .VIII. dies nisi prius scolam istam intraverit et artem sive capitulare iuraverit et solverit suprastantibus pro intrata soldos .XL. parvorum, de quibus tercia pars camere deveniat, tercia suprastantibus et tercia scole.

XXII. Item, quod quilibet qui didicerit artem istam in terra ista et voluerit effici magister, solvere debeat pro intrata soldos .XX. qui cedant ut supra.

XXIII. Item, quod nullus magister istius artis a modo audeat vel presumat mittere vel portare aliquem balistum in plateam ad vendendum, sub pena soldorum .X. pro quolibet balisto, contrafacienti qualibet vice, que cedat ut supra.

XXIII. Item, quod nullus magister huius artis audeat vel presumat laborare vel laborari facere aliquem arcum bescoratum vel subbullitum vel quod haberet aliaquam scilenciam ellevatam super spallas, sub pena soldorum .X. pro quolibet arcu, contrafacienti qualibet vice.

XXV. Item, quod quilibet magister istius artis teneatur et debeat ita asacare sive coaptare clavim in tenerio quod ita ordinate et polite moretur in tenerio, quod quiescat et tangat tenerium desuper in foramine nucis.

XXVI. Item, quod nulla persona alterius artis audeat artem istam laborare ultra .VIII. dies, nisi artem istam intraverit et iuraverit ut ceteri faciunt, et solverit pro intrata soldos .XX.

RECORDS OF THE VENETIAN GOVERNMENT

1. (March 26,1290)

Ad naves.

Item, quod quilibet navis, tarita et banconus incaibatus teneatur habere unum hominem qui sciat aptare ballistas, silicet cordas, clavem et nucem, in pena librarum .X. patrono. Et teneatur ipse homo aptare omnes ballistas dicte navis, et qualibet edomada teneatur videre et circare eas et ponere ad punctum. Et teneatur iurare quod observabit predicta, sub pena librarum trium quociens contrafacierit; et computetur idem homo pro uno marinari navis.

Item, teneatur patronus et nauclerius per sacramentum facere observare predicta. Et qui

accusabit contrafacientem, si per eius accusationem veritas cognoscetur, habeat quartum pene. Et addatur in capitulari illorum qui sunt et erunt super mercationibus de Levante, quod teneantur excutere dictam penam et accipere predicta sacramenta et facere observari predicta et habeant propter hoc quartum dicte pene, et alie due partes deveniant in comune. Et hoc stridetur publice in Sancto Marco et in Rivoalto.

Item, quodlibet lignum armatum a viginti remis et inde supra teneatur habere unum de predictis hominibus qui teneatur observare predicta, et computetur in nauclerios vel proderios vel alias honorificentias dicti ligni, et habeat soldos .X. in mense plus aliis. Et iungatur illis faciunt armari ligna quod faciant observari predicta et quod exigant penam a contrafacientibus, habendo in se partem penarum et dando partem acuatoribus eo modo et ordine quo dictum est de illis qui sunt super mercationibus de Levante.

2. (October 3,1303)

Item, quod Caninus balistarius Sancti Iuliani absolvatur a pena quam dicitur incurrisse eo quod ferebat .XIII. balistas disolutas et alias res preparatorias ad balistas versus Paduam, propter quod capitanei postarum eum condenatur libris .XXX. soldis .XII. cum sit supplex homo et pauper et ignoraret bannum esse.

3. (April 6,1305)

Item, cum in capitulari capitaneorum postarum contineatur quod si quis invenietur portare balistas et curacias extra Venecias perdat eas et sint inventorum, et aliqui sint inventi portare eas et sunt accepte eis et ipsi se excusent dicentes quod ipsi eas defferebant pro suo salario: capta fuit pars quod sit in discretione dictorum capitaneorum tam ipsi qui eas portaverunt quam qui portabunt de cetera utrum ipsas balistas et curacias portaverunt vel portabunt in fraude vel non, et quod capitanei possint balistas nunc acceptas restituere illis quorum fuerunt si eis apparuerit ipsas non portasse in fraudem. Et si consillium vel capitulare est contra, sit revocatum quantum in hoc.

4. (September 26,1309)

Viviano Graciadio consuli Venetorum in Segna .

Cum mittamus Segnam Petrum ballistarium, latorem presentium, pro faciendo fustes de nasci pro nostro comuni, scribimus et mandamus tibi precipiendo quatenus eidem Petro ad faciendum dictos fustes dare debeas omne quod sibi oportunum fuerit consilium et favorem.

Data die .XXVI. septembris .VIII. indicionis.

5. (July 21,1310)

Item, cum Candi et Raynutius, de Vencone,

mercatores, emissent a quodam magistro Sancti Iuliani quinque balistas, et dum mitterent ipsas domum Sancte Sophye in qua habitant, pueri capitaneorum postarum acceperunt ipsas et ipsas dicti capitanei presentassent, et propterea domini capitanei acceperunt plecariam dictis Candi et Raynucio . C. librarum et adhuc habent dictas balistas: capta fuit pars quod fiat gratia dicto Candi et Raynutio quod absolvatur a penna pro parte comunis in quam per dictos capitaneos postarum dicuntur incurrisse, cum dicti capitanei hoc facere sint contenti.

6. (August 17, 1315)

Item, quod Marcus tragitator absolvatur a pena in quam capitanei postarum dicunt eum incurrisse, et absolvatur a plegiaria in quam dedit de libris .XXX. soldis .XII. occasione unius baliste invente in burcho fratris sui ad ripam Rivoalti.

7. (August 12, 1316)

Cum facta fuerit gratia Gardolino balisterio vendendi balistas .XXXVI. hominibus Glemone, et ut dicit, dicti homines Glemone duxerant Venetias balistas tres a duobus fustibus pro faciendo aptare, quibus aptatis, non credens periculum imminere posse, portavit, ultra illas .XXXVI. et istas .III. balistas, non habendo gratiam de ipsis, quas custodes capitaneorum postarum acceperunt, sed capitanei postarum sunt contenti quod fiat sibi gratia: capta fuit pars quod fiat gratia dicto Gardolino quod restituantur sibi dicte baliste et absolvatur ab omni pena quam propterea incidisset.

8. (August 17, 1316)

Die. XVII. augusti. Cum in commissione castellanorum Coroni et Mothoni et aliorum rectorum contineatur quod portare teneantur ballistas de cornu, et nunc ipse balliste male inveniantur quia non operantur: capta fuit pars quod castellani ceterique rectores de cetero non teneantur dictas ballistas de cornu portare, sed loco ipsarum debeant portare ballistas de ligno. Et si consilium vel capitulare aut commissio, et cetera.

Notes

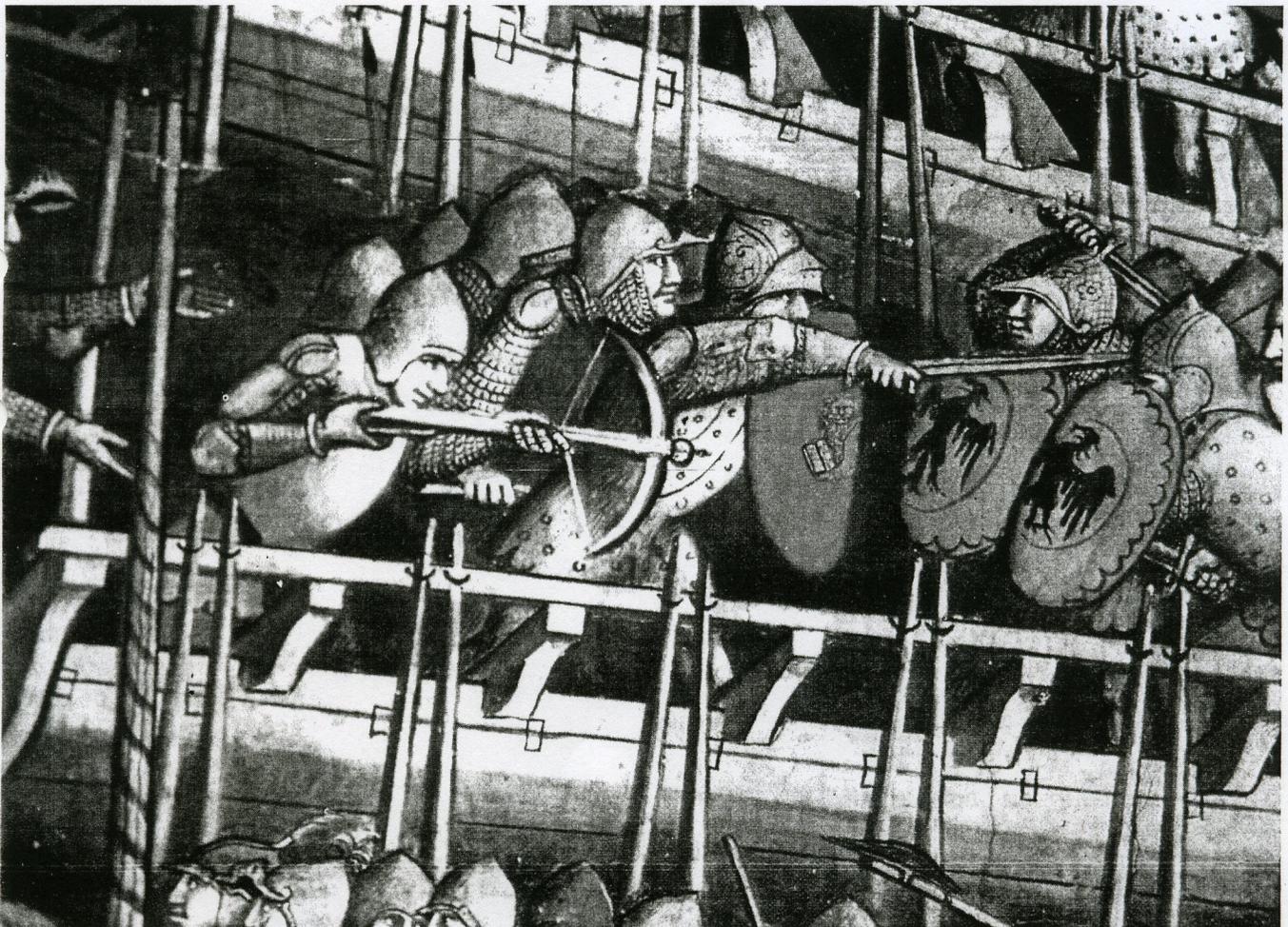
1. The document was published in : *Fonti per la Storia d'Italia*, (published by Istituto Storico Italiano), **Statuti secoli XIII-XIV**, Roma 1896. pp.171-180 and pp.393-398.
- 2 Paragraph I (p.171.)
- 3 Par. II (p.171.)
- 4 Par. I (p.171.)
- 5 Par. XII (p.175.)
- 6 Par. VI (p.172.)
- 7 Par. XVIII (p.177.)
- 8 Par. XVI (p.176.)
- 9 Par. XVII (p.177.)
- 10 Par. V (p.172.)
- 11 Par. III (p.172.)
- 12 Par. XIII (p.176.)
- 13 Par. XXIII (p.178.)
- 14 Par. VIII (p.174.)
- 15 Par. XIII (p.175.)
- 16 Par. III (p.171.)
- 17 Par. XI (p.175.)
- 18 Par. X (p.175.)
- 19 Par. XV (p.176.)
- 20 Par. XXV (p.178.)
- 21 Par. VII (p.172.)
- 22 Par. VIII (p.174.)
- 23 Par. XXIII (p.178.)
- 24 Par. XX (p.177.)
- 25 Par. XXI (p.178.)
- 26 Record 2 p.394 and Record 5 (p.395.)
- 27 Record 1 (p.393.)
- 28 Record 4 (p.395.)
- 29 Record 8 (p.397.)
- 30 Robert Davidsohn, *Storia di Firenze*, Sansoni, Firenze 1973 (an Italian translation from the work: *Geschichte von Florenz*, Berlin 1896-1927), Vol. IV, Parte I, p.455.
- 31 Mario Scalini, 'The Weapons of Lorenzo de'Medici', *Art Arms and Armour*, (edited by Robert Held), Acquafresca Editrice, Chiasso, Switzerland 1979, pp12-29, see page 27.

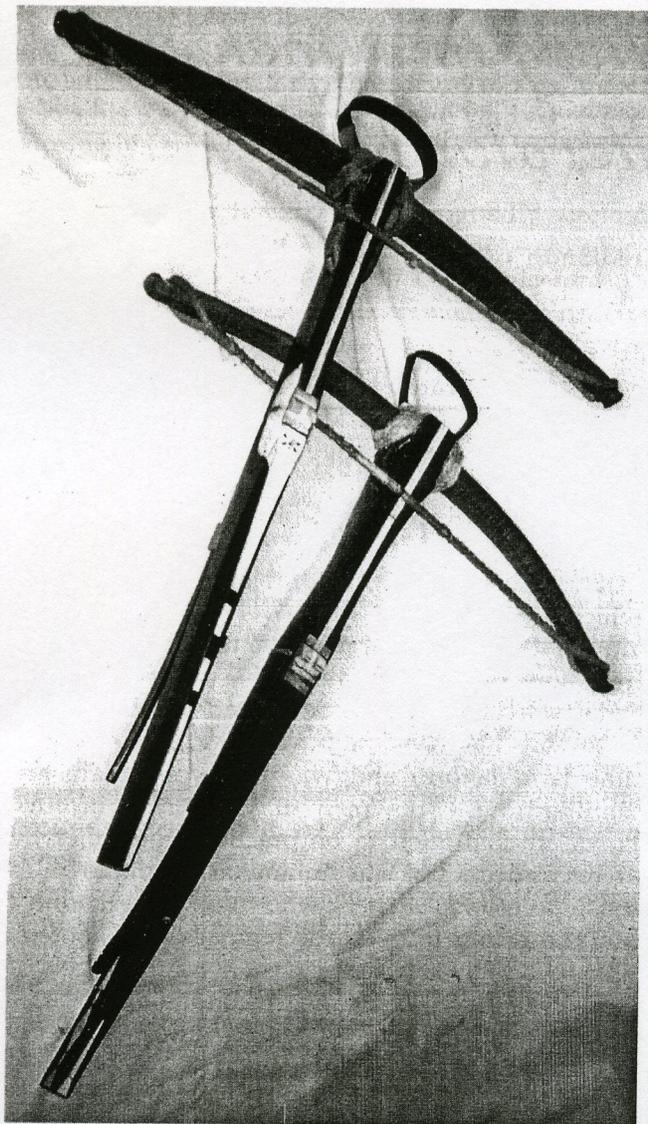
Note concerning the authors reconstructions of 13-14th. Century crossbows.

The reconstruction of 13th. and 14th. century crossbows is not easy due to the lack of original specimens. Useful information may be found in mediaeval written sources already published or at least easily examinable. These are generally incomplete and must be compared with the plentiful Italian art of the period. The best images of the crossbow are illuminations and frescoes of the 14th. and 15th. century when the artist developed a close interest in the particulars of dress, tools and weapons. The resulting hypotheses must then be compared with the later 15th century specimens which do survive in museums and private collections. But only some features of the 15th. century weapons are similar to those of the 13th. century.

The steel bow was introduced in the first half of the 15th. century and it became prevalent in Italy after 1450. In Italy the steel bow was joined to the tiller with a pair of iron bridles and wedges but it is certain that in the older weapons with wooden or horn bows there was a 'binding' similar to that of the later German crossbows. The tiller of the surviving Italian crossbows are generally of square cross section and of geometric design, different from the German type which generally have a more rounded shape. Another typical feature of the Italian crossbows is the long bolt groove, generally inlaid with bone, which is generally absent in the German crossbows or replaced by a little grooved rest at the fore-end of the tiller. Bone or antler finishings and decorations are generally present on the tiller of Italian crossbows but to a smaller extent than in the German ones which are sometimes completely covered with bone. The crossbows illustrated are interpretations, reliable in individual particulars and in the method of construction but for the aforesaid reasons are conjectural in their whole.

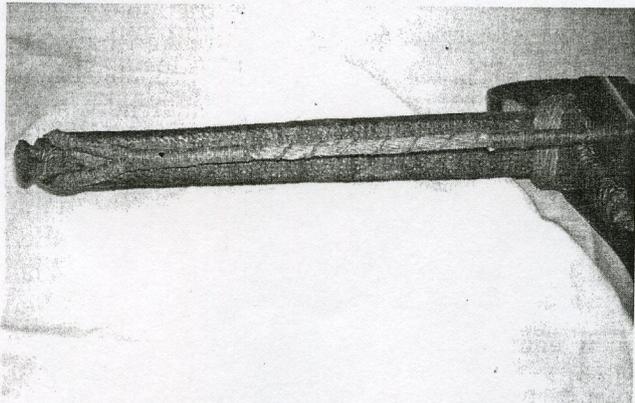
Venetian militamen engaged in naval fighting. Detail of a fresco painted in 1408 by Spinello Aretino; in the Palazzo Publico in Siena.





Composite Cross bows reconstructed by the author. The draw weight is c. 300 pounds. The length of the bow between nocks is 72 and 70 centimeters. Overall weight of the weapons is 2.5 Kilo, and they are drawn with a belt hook.

Limb of the bow. It shows the outer nock for the use of the longer string, called 'Magistra' in mediaeval Italy. The double nock is clearly shown in the famous painting by Paulo Uccello 'The battle of San Romano' Painted probably in 1440.



Side view of the tillers and triggers. The nut area is reinforced by the side plates made from horn or iron. This is not described by the Venetian Capitulare but is a feature present in all the later weapons found in museum collections.

The nut is turned forward to show its steel reinforcement. It is the 'refollum reveditum in vivo nucis de subtus' of the Venetian

