Violin Strings, Set up, Bows and Performance Techniques

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Introduction

There is a large variety of bowed instruments when they appear in Europe

Heron-Allen in his book “Violin making as it was and is”, proposes that sticks with rosin were used, much before bow with horse hair were invented. We don’t know much more about that, but we do know that without rosin, there would be no grip of the strings. We also know that the thicker the strings, the stickier the colophony needs to be, and double bassists use some thick and soft, sometimes black, blocks of rosin on their bows.

Bowed strings ?

The diversity of the mediaeval bowed instrument that probably goes back to the 9th century when appears the technique of a string bowed with the mean of horse hair tightened on an arched stick that came from eastern asia. 1988 Encyclopedia Britannica, says "bowing can be traced as far back as the Islamic civilization of the 10th century ... it seems likely that the principle of bowing originated among the horse cultures of Central Asia, whence it spread quickly through Islam and the East, so that by 1000 it had almost simultaneously reached China, Java, North Africa, the Near East and Balkans, and Europe."

Bows from Asia

Eric Halfpenny notes that in many Eurasian languages the word for “bridge” etymologically means "horse", and that the Chinese regarded their own bowed instruments as having originated with the "barbarians" of Central Asia. Werner Bachmann, in the New Grove, notes evidence from a tenth century Central Asian wall painting for bowed instruments in what is now the city of Kurbanshaid in Tajikistan. In northern Europe, a Viking bow from 11th-century Dublin, was described in *Archaeologia Musicalis* in 1987 by Ann Buckley (p. 10–11).

Eastern influence through Spain

Spain at the time of **Al-Andalus** (Arabic name given to the by Muslims from 711 to 1492) was a fruitful ground to experiment different ways of playing, with the meeting of Moorish and Spanish musicians playing on their knees and on the chest, bowing or plucking :

Lincoln cathedral 1235

Shah Abbas or Maciejowski Bible, Illustrated in Northern France, c.1250

XIIIe siècle – Pierpont Morgan Library, New York, M 638; & Fragments at Bibliothèque nationale de France, Paris, lat.2294, & J. Paul Getty Museums, Mal

Cantigas di Santa Maria Ms

Commissioned by Alfonso, the Wise, king of Castille and Leon, late 13th century

Ms Cantigas di Santa Maria,

Commissioned by Alfonso, the Wise, king of Castille and Leon, late 13th century

The role of horse hair

In 1989, in the *Strad* magazine, in an article entitled *Splitting hairs : a detailed examination of the bow hair* a microelectronic microscope view of the bow hair showed no trace of year growth or lines on its surface that could explained how it sticks to the strings ([1]). The only visible irregularity on the surface is a lengthways groove where small pearls of rosin can be hosted after the hair has been used for a while. [1]

E.G. Gray, Strad (The), Vol. 100, N° 1186, février 1989

This could give an explanation to the fact every violinist knows : that a slightly used hair is better than an new one.

Keratin has too small irregularities to move the string

The next year, Françoise Rocaboy showed horse hair at greater magnification again and notes that the keratin plates and fibrils are only visible at a 4000 x magnification.

(Notice the black hair, only used by double bassists now)

Aragonese Vihuelas : origin of both bowed *viole* and plucked *guitar*. Valencia, Xàtiva, c.1475

The role of colophany

It is the properties of the rosin that permits the bowed instruments to function, just as it does on the wheels of hurdy-gurdies as well. It grips more or less depending on the heat obtained by the rubbing.

Temperature, bow pressure and speed

In 1992, Norbert Pickering measured the temperature of the string under the bow with an infrared camera, a bowing apparatus and temperature measurer device to study how the rosin plays its role. The Rosin is stickier between 10 and 25 °C . The dynamic of the temperature rise takes place in a matter of milliseconds where the string reaches a stable elevated point depending on bow pressure and velocity.[1] Pickering showed that the bow pressure has a much greater influence on the temperature than the speed, which is relatively negligible.

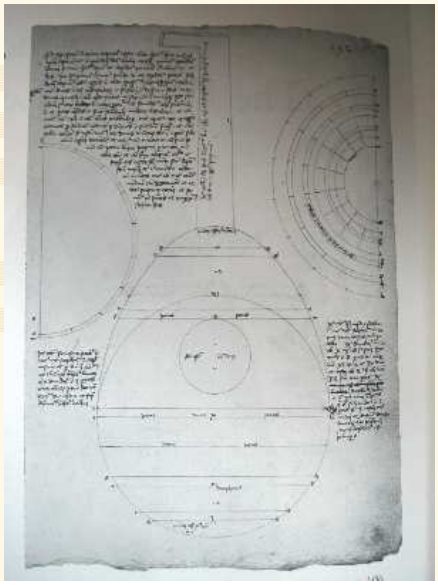
[1] Pickering, N. C.- “A new light on bow action” in *Journal of the Violin Society of Americ*a, N°11b (mai 1991b), p.83-92.

And the strings ?

One understands, then, the influence of the conductivity to heat of the material of the string, and the significant differences of the grip of the bow with string tension, and whether it is gut, silk or metal, for instance.

It also has a great importance in the design of the string instruments, which are drawn accordingly with a definite vibrating length of the strings available at that time.

Influence of the strings lengths on instrument design

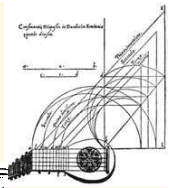


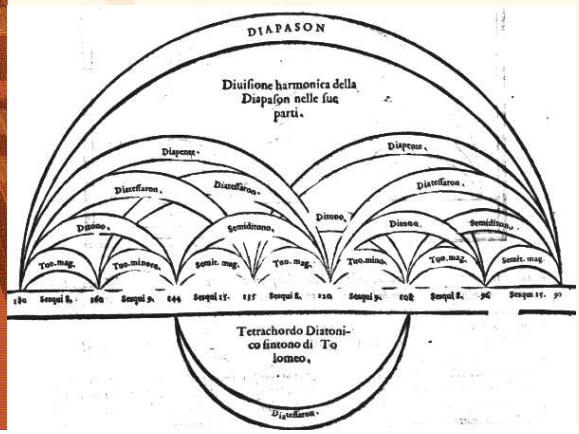
Arnaut de Zwolle design of a lute, 1440

Pinturiccio, Vatican, around 1500

Changes in strings, set up and bows, have participated in the evolution of violin playing. Because from those times no instrument is left in or near original condition, history of techniques are necessary to understand the changes that took place.

Zarlino:
L'nstitutioni Harmoniche
Venise, 1558





Different elements are linked to the characteristics of strings

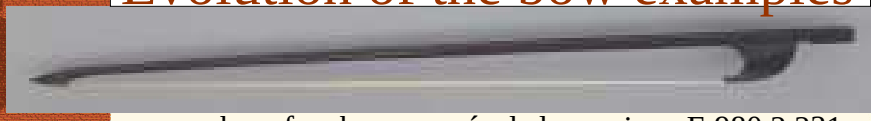
- 1. Sustained notes need bow, hair, rosin and highly tensed strings
- 2. From chords to polyphony : curved bridge and narrow waist sound box
- 3. More pressure on the bow leads to type of arching and stronger bass bars.
- 4. Instrument design is in relation to string lengths : heavier and thinner strings give smaller lengths and lead to more left hand virtuosity.

Shapes of arching examples

A transaxial image through the upper corner blocks of a violin by Nicolo Amati,1654

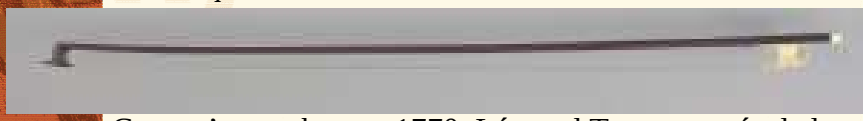
Profile of arch of a Stradivari violin's back, in the C, 1733

Evolution of the bow examples



convex bow fo a bass, musée de la musique E.980.2.231

bow at the time of Leopold Mozart's in 1756, musée de la musique E.980.2.216



Cramer's type bow c. 1770, Léonard Tourte musée de la musique E.980.2.191

François Tourte violin bow c.1790, belonged toYehudi Menuhin, musée de la musique E.999.23.2

Evolution of bass bars examples :

1. Barre de pochette E.76 de Stradivari 1707
2. Barre de violon Nicolo Amati ? 17ème s.
3 Barre de violon 2ème période de Stradivari ? 18ème
4 Barre de violon de Vuillaume 19ème s.

(musée de la musique : E.903 from Vuillaume's worshop)

The making of strings in early texts

The making of silk and gut strings are described in a Persian treatise, *Kanz-al-Tuhaf*, 14th century, translated by Farmer[1]. The cocoons are put to boil, treated with wood ashes and rinse in clear water. The threads are twisted all together, 64 for the lowest 16 for the highest string. Then, a viscous resin coloured in yellow by the saffron, is rubbed on string to impregnate it, it makes it stronger an more elastic, and also enables it to bear a higher tension. To make gut strings, it is recommended to use sheep rather than goats guts, as they are better.

[1] Farmer, Henry George, « The structure of the Arabian and Persian Lute in the Middle Ages », in *Journal of the Royal Asiatic Society of Great Britain and Ireland*, 1939, p.48-49.

Gut strings and archery

The strings for bows in archery and for musical instruments in Turkey[1] are described by Pierre Belon around 1550 : "… made with intestines collected from the butchers the same day and delivered by them to those who make all kind of strings. They know especially well how to make them for bows (for archery) (…) as for the ones for lutes, the make them of all kind and very fine, and very fine ones that tune as high as ours ; …"

[1] Belon, Pierre, *Obseruations de plusieurs singularitez & choses mémorables, trouées en Grèce, Asie, Iudée, Egypte, Arabie & autres pays estranges* , Paris, 1553 (réédité Paris et Antwerpen 1554, 1555, 1588) T.III, ch. 47, publié par FoMRHI comm. n°25 (traduction de l'édition de 1588) et Gug, Rémy, « Travelling in the 16th C. and …Lute strings » (réimpression de l'édition de 1553), in FOMRHI Quarterly , comm.1094, p.39-40.

Turkey

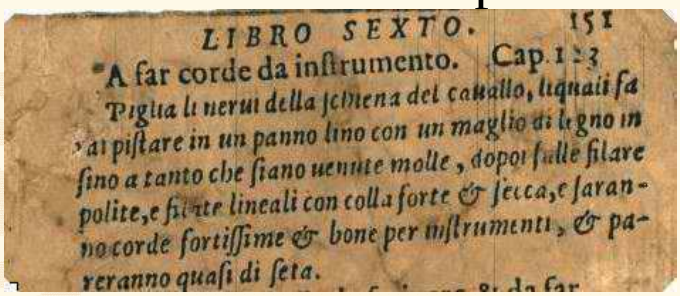
“They are more frequent than in Europe, and I can explain why : Turks have four different sorts of guittern and lutes, and many people know how to make them sound, which doesn’t occur as frequently in France or Italy, because not many people in villages take up to play the lute or the guitern. But in Turkey, many know how to play them as their manner.[2] but they are not as silvery, because they are made of three strips, nevertheless I strung my venetian lute with them having no other. Such top strings are found in different colours : red, blue, green, yellow, white : they are sold in most shops, as well as other strings for the local lutes played everywhere in Turkey. “

The development of artillery

The development of artillery in Europe after a slow beginning increased in speed from 1450, Archery must have decreased as quickly from then. How did the production of musical strings survived after bow becomes obsolete in armies with the development of powder and canons in the 15th century ?

There is evidence that the king of Naples encouraged the musical string making trade to develop in the Abruzzes.

Thimotteo Rossello particolare 1574 libro sexto p.151


LIBRO SEXTO. 151

A far corde da instrumento. Cap. 123

Piglia li nerui della schiena del cauallo, liquali fa
ai pistare in un panno lino con un maglio di legno in
fino a tanto che siano uenute molle, dopoi sulle filare
polite, e fiate lineali con colla forte & secca, e saran-
no corde fortissime & bone per instrumenti, & pa-
reranno quasi di seta.

He describes strings made out of horse hair for "instruments". Are they *musical* instruments ? Was it a common practise or a local recipe ? He compares it with silk strings, showing that they also where in use.

Plain gut strings were in use before 1700 and during most part of the 17th century

SPADA Leonello
LE CONCERT
Italie ;
Bologne first quarter of 17th century
Paris ;
musée du Louvre

Varietie of lute lessons, by Robert Dowland, London, 1610

describes how to chose strings for lutes. He says that strings are better if they are fresh, transparent and not oiled. The trebles must be pale grey or of an ash colour. They must not show curls in front of the light which shows that their twist is badly made and they will never be true. Some strings are coloured, but the lighter colours are better: pale green, pale red or blue. He gives different places where they are made, showing that they are imported to England.
Roma, Livorno, Germany, Monnekin (München ?) Nürnberg , especially for basses, Strasbourg. The best strings, he says , are made in Bologna, and then sent to Venice, where they are sold to the Frankfurt and Leipzig fairs under the name of “Catline of Venice” . The best are sold in September because they are made in the summer.

Detail of a lute
anonymus Dutch painting

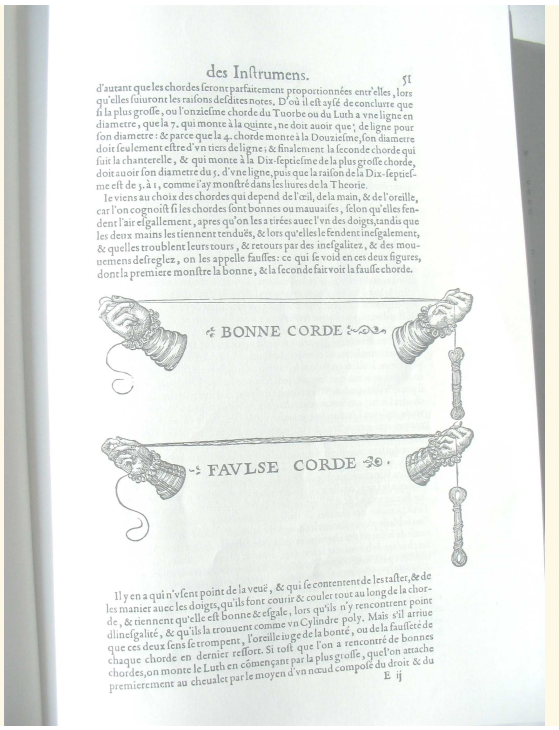
first half of the 17th century

Anonymus dutch painter, detail of a viola da gamba, first half of the seventeenth century

Germanische National Museum, Nürnberg

Detail of a lute
Rutilio Manetti
“Amore trionfante”
Siena, 1624
National Gallery of Ireland,

Mersenne, Marin, *L'Harmonie Universelle*, Paris, 1636, TIII, p.51



des Instrumens. 51

d'autant que les chordes seront parfaitement proportionnées entr'elles, lors qu'elles suiuront les raisons desdites notes. D'où il est aysé de conclurre que si la plus grosse, ou l'onzieſme chorde du Tuorbe ou du Luth a vne ligne en diametre, que la 7. qui monte à la quinte, ne doit auoir que $\frac{4}{7}$ de ligne pour son diametre: & parce que la 4. chorde montée à la Douzieſme, son diametre doit seulement estre d'vn tiers de ligne: & finalement la seconde chorde qui suit la chanterelle, & qui monte à la Dix-septieſme de la plus grosse chorde, doit auoir son diametre du 5. d'vne ligne, puis que la raison de la Dix-septieſme est de 5. à 1, comme i'ay monstré dans les liures de la Theorie.

Ie viens au choix des chordes qui depend de l'œil, de la main, & de l'oreille, car l'on cognoist si les chordes sont bonnes ou mauuaises, selon qu'elles sendent l'air esgallement, apres qu'on les a tirées auec l'vn des doigts, tandis que les deux mains les tiennent tenduës, & lors qu'elles le fendent inesgalement, & que les troublent leurs tours, & retours par des inesgalitez, & des mouuemens desreglez, on les appelle fausses: ce qui se void en ces deux figures, dont la premiere monstre la bonne, & la seconde fait voir la fausse chorde.

BONNE CORDE

FAVLSE CORDE

Il y en a qui n'vsent point de la veuë, & qui se contentent de les taster, & de les manier auec les doigts, qu'ils font courir & couler tout au long de la chorde, & tiennent qu'elle est bonne & esgale, lors qu'ils n'y rencontrent point d'inesgalité, & qu'ils la trouuent comme vn Cylindre poly. Mais s'il arriue que ces deux sens se trompent, l'oreille iuge de la bonté, ou de la fausseté de chaque chorde en dernier ressort. Si tost que l'on a rencontré de bonnes chordes, on monte le Luth en cõmençant par la plus grosse, que l'on attache premierement au cheualet par le moyen d'vn nœud composé du droit & du

E ij

Status of the *Cordari* Roma 1643

Statuto
Dell' Vniver-
sità
De Cordari
Di Roma.

Mace, Thomas, *Musik's Monument*, Londres, 1676,

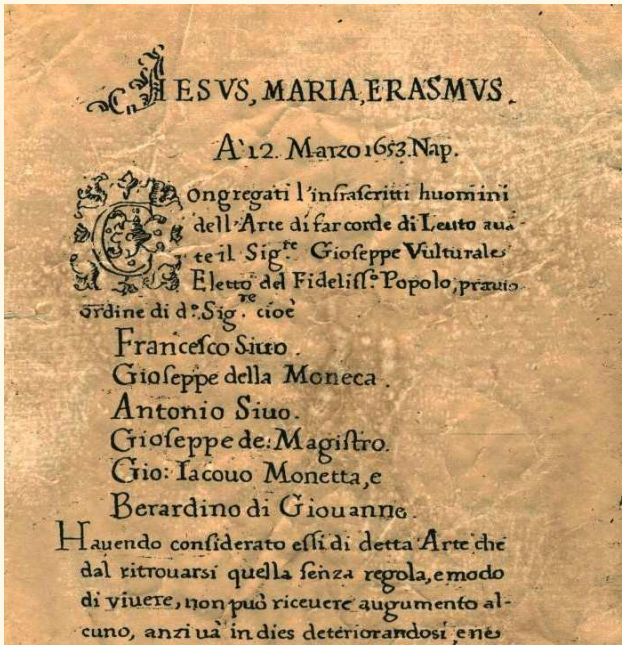
(fac simile ed . CNRS, Paris 1966).

Thomas Mace in 1676 gives the different types of plain gut strings available on the market**:**
- catline from Venice are very thick. (but we saw that earlier, Dowland wrote that they came originally from Bologna)
- Lyons only for basses, but there is only one good one for each lot. He doesn't recommand the trebbles, but that means that they do exist.
- Minikins for the thinnest strings (any resemblance with the Monnekin cited by Dowland ?)
- Pistoy, generally coloured in red, smooth and well twisted, the best for basses. He mentions their appearance, details on their colours and how to chose them, but nothing on their production.

Cordari and Saitenmacher

The *Cordari* in Italy, from Naples, Rome or Padua, export strings in all of Europe since the 15th century trough the large market fairs of Frankfurt and Leipzig, where the travelling salesmen would collect them for sale. Strings are made elsewhere as well, of different qualities. Salesmen take them on long distances and their are seen in catalogues during the 19th century.

Status des *cordari* de Naples 1653



IESVS, MARIA, ERASMVS.

A' 12. Marzo 1653. Nap.

Congregati l'infrascritti huomini dell'Arte di far corde di Leuto auante il Sig.re Gioseppe Vulturale Eletto dal Fidelissimo Popolo, prauio ordine di d.o Sig.re cioè

Francesco Siuo.
Gioseppe della Moneca.
Antonio Siuo.
Gioseppe de Magistro.
Gio: Iacouo Monetta, e
Berardino di Giouanne.

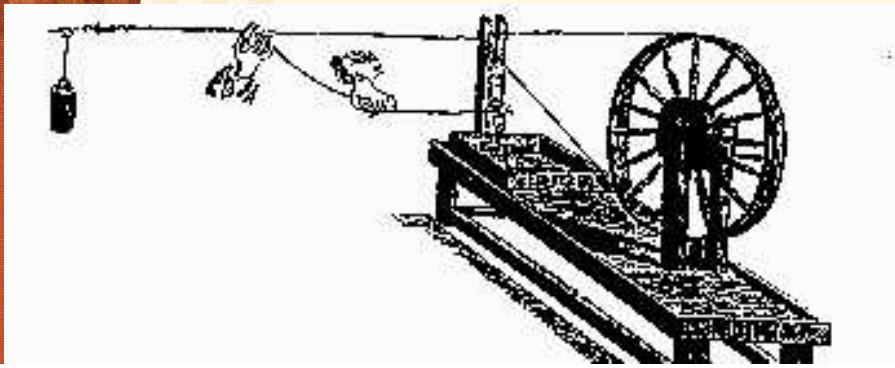
Hauendo considerato essi di detta Arte che dal ritrouarsi quella senza regola, e modo di viuere, non può riceuere augumento alcuno, anzi ua' in dies deteriorandosi, e nes

Christoph Weigel
Der Saitenmacher,
Regensbourg, 1698

Rouet à filer les cordes :

Encyclopédie Diderot et d'Alembert
1751 –1780

The violin makers use it themselves to wound the gut strings they buy.



Italian string makers in England

Susi Jeans discovers a document in[1] the *Society for the Encouragements of Arts, Manufacture and Commerce*[2] , stating that before 1772 in London, so much money was spent for the import of musical gut strings that the society invites a man and a woman who have experience in the making of catgut to open a manufacture outside of town, after the quality of their strings has been checked.

[1] Jeans Susi, « Manufacture of strings in England in the Eighteen century », in *Galpin Society Journal*, N° XIII, July 1960, p. 90.
[2] Bailey, William, *The Advancement of Arts, Manufactures, and Commerce*, London, 1772, Chap.XVII, p.227-228.

… and in Germany

Families of *Cordari* also migrated to Germany : in 1798, Evah Pirazzi established a musical strings manufacture in Offenbach. The business still exists until today, under the Pirastro brand.

Strings of Naples in USA

Originated in the village of Salle, in the mountains Abbruzzes at the east of Naples, families of cordari where only active in that trade as seasonal workers of the Neapolitane proto-industry.[1] At the end of the 19th century, members of the Mari family came from Salle to New York to import musical gut strings from the Abbruzzes [2] . The first world war precipitates the setting of a manufacture in the States in 1916.

[1] Columbro Marta, «I maestri cordari della Napoli sei-settecentesca : una ricognizione storica, tecnica e sociale», comm. du *Nono ConvegnoAnnual, e SIdM,* Padova, 25-26 ottobre 2002.
[2] in Lanciano, see www.labella.com;_E.&O. Mari, Inc.; 256 Broadway, P.O. Box 869, Newburgh, NY 12550-0869.

Quality of Neapolitan gut strings

« the Naples treble strings have kept a peculiar value, not because they are better made, but because the taste of Neapolitans for lamb meat allows the string makers to get guts of small diameters, particularly suited for treble strings. However, they have worsened, and the explanation given is the fact that in old times, when Naples was making all the musical strings, they where only made after Easter, from June to September, and the guts from lambs killed before Easter which had less consistency where used for more ordinary purposes. [1] (…)".

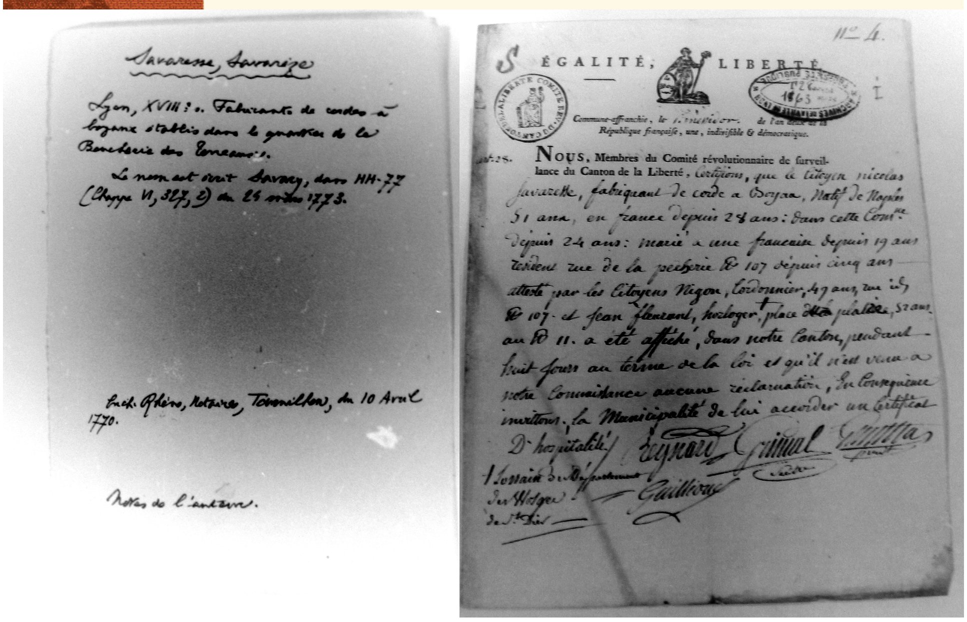
[1] *La Grande Encyclopédie ; Inventaire raisonné des sciences , des lettres et des arts par une société de savants et de gens de lettres, sous la direction de Berthelot*, Paris, 1885-1902, article Corde.

It is possible to follow several generations of string makers.

Jealous of their craft, that transform the most trivial material that comes out of the slaughter houses into the most delicate musical accessory, they seem to keep a link with their original homeland when they emigrate.

La Grande Encyclopédie refers to Savaresse in Lyon without naming him : « the making of musical strings is not very old in France, it was introduced by a Neapolitan craftsman who, around 1766, set up a manufacture in Lyon. The processes where kept as privilege for a long time to the town of Naples, but today, the French production is as good as theirs.”

Nicolas Savaresse, archives de Lyon


Savaresse, Savarese

Lyon, XVIII s. Fabricants de cordes à boyaux établis dans le quartier de la Boucherie des Terreaux.

Le nom est écrit Savary, dans HH-77 (Chappe VI, 327, 2) du 24 [illegible] 1773.

Arch. Rhône, Notaires, Tourvillon, du 10 Avril 1770.

Notes de l'auteur.

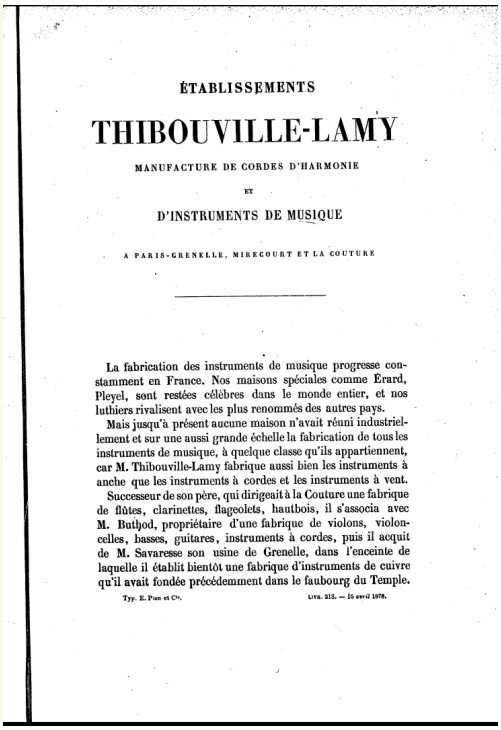
N° 4.

ÉGALITÉ, LIBERTÉ.

Commune-affranchie, le [illegible] de l'an deux de la République française, une, indivisible & démocratique.

NOUS, Membres du Comité révolutionnaire de surveillance du Canton de la Liberté, certifions, que le citoyen nicolas savarette, fabriquant de corde a boyau, Natif de Naples 51 ans, en france depuis 28 ans : dans cette Comne depuis 24 ans : marié à une francaise depuis 19 ans residant rue de la pecherie N° 107 depuis cinq ans attesté par les Citoyens Nigon, Cordonnier, 47 ans, rue id. N° 107. et Jean [illegible], horloger, place [illegible], 52 ans, au N° 11. a été affiché, dans notre Canton, pendant huit jours au terme de la loi et qu'il n'est venu a notre Connaissance aucune reclamation, En Consequence invitons la Municipalité de lui accorder un Certificat D'hospitalité.

In *Les Grandes Usines* by Turgan, Paris,
1878 :
« Etablissements Thibouville-Lamy, manufacture de cordes d'harmonie et d'instruments de musique, à Paris-Grenelle, Mirecourt et La Couture »



ÉTABLISSEMENTS

THIBOUVILLE-LAMY

MANUFACTURE DE CORDES D'HARMONIE

ET

D'INSTRUMENTS DE MUSIQUE

A PARIS-GRENELLE, MIRECOURT ET LA COUTURE

La fabrication des instruments de musique progresse constamment en France. Nos maisons spéciales comme Erard, Pleyel, sont restées célèbres dans le monde entier, et nos luthiers rivalisent avec les plus renommés des autres pays.

Mais jusqu'à présent aucune maison n'avait réuni industriellement et sur une aussi grande échelle la fabrication de tous les instruments de musique, à quelque classe qu'ils appartiennent, car M. Thibouville-Lamy fabrique aussi bien les instruments à anche que les instruments à cordes et les instruments à vent.

Successeur de son père, qui dirigeait à la Couture une fabrique de flûtes, clarinettes, flageolets, hautbois, il s'associa avec M. Buthod, propriétaire d'une fabrique de violons, violoncelles, basses, guitares, instruments à cordes, puis il acquit de M. Savaresse son usine de Grenelle, dans l'enceinte de laquelle il établit bientôt une fabrique d'instruments de cuivre qu'il avait fondée précédemment dans le faubourg du Temple.

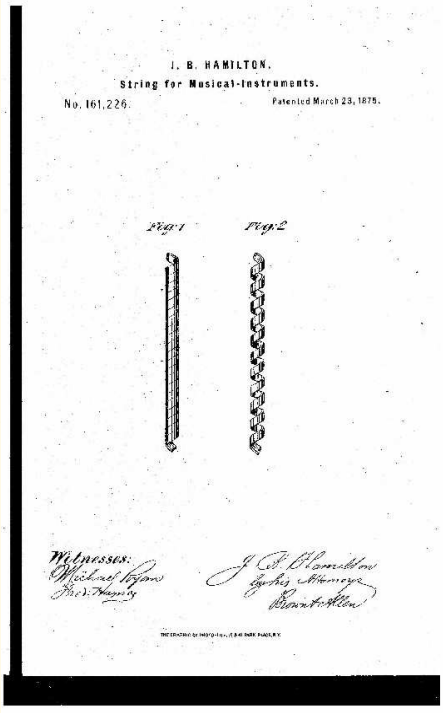
Typ. E. Plon et Cie. Livr. 213. — 15 avril 1878.

Les racleuses de boyaux at Thibouville-Lamy
in *Les Grandes Usines* by Turgan, c.1860

From ropes to cables

- The study of patents in France, Europe and USA show that in the nineteenth and twenty's century the cable industry had a big influence on the use of metal, alloys, wires coils and composite strings.

Brevet US Hamilton 1874



J. B. HAMILTON.

String for Musical-Instruments.

No. 161,226. Patented March 23, 1875.

Fig: 1 Fig: 2

Witnesses:

Michael Ryan

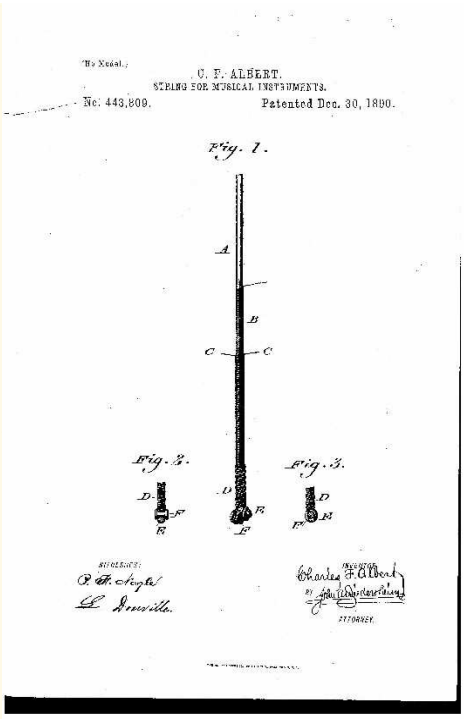
Inventor

J. B. Hamilton

by his Attorneys

Brown & Allen

Brevet US Albert 1890



C. F. ALBERT.
STRING FOR MUSICAL INSTRUMENTS.
No. 443,809. Patented Dec. 30, 1890.

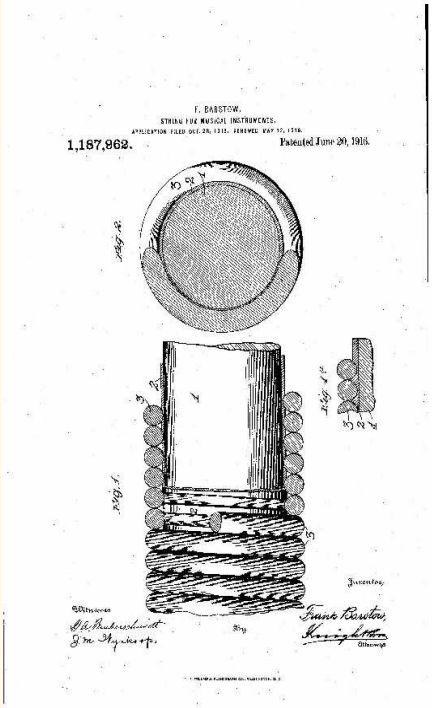
Fig. 1.

Fig. 2.

Fig. 3.

Charles F. Albert

Brevet Barstow 1913



F. BARSTOW.
STRING FOR MUSICAL INSTRUMENTS.
1,187,862. Patented June 20, 1916.

Frank Barstow

Figure 47

In conclusion,

our study on the history of strings making has shown major changes to string making :
Around 1660-1670 when the principle of wound strings was adopted, to make thinner but heavier strings, and allow smaller string length for the same frequency / note.
Around 1880 when industrial lathes permitted to make gut strings out of strip of cattle stomach, rather than platting small guts together.
1878 flat wounding (Hamilton Patent)
Metal strings for violins after the first word war;
The use of tungstene was introduced to get heavier strings
Nylon was spread widely thorough the world

Perspectives : Identifying fragments

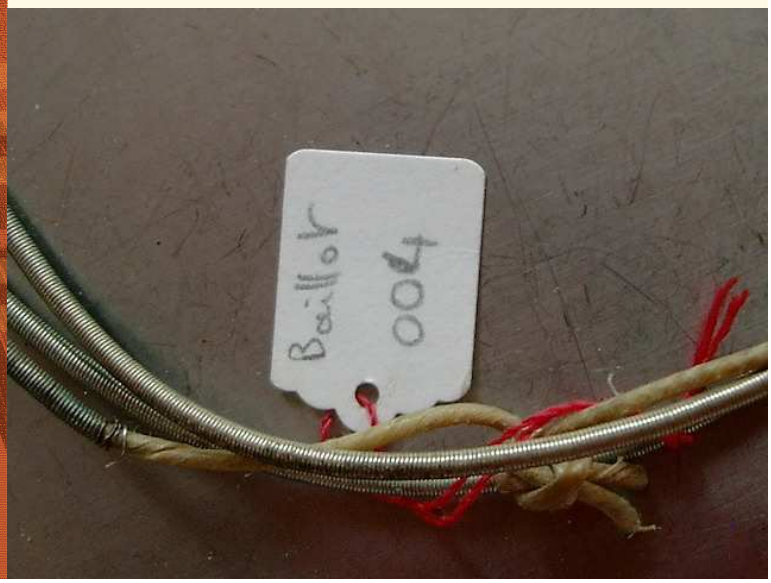
This study will allow to study fragments of strings and place them with more accuracy in the history of string making.

It also shows that we can relate the strings to the set up of the instruments.

String from a lute by J. Tielke,
Francfort Historisches museum

Strings from a lute by Brünne Olmütz, 1769,
National Technology Museum, Prag

Cordes anciennes, dites "de Baillot" déposées au musée de la musique

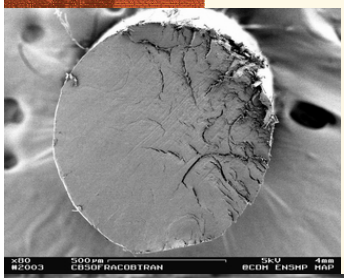


Trebble string from Baillot's violin

Corde « Cello Goldklang » made in Germany c.1960 ?

Electronic Microscope views of gut strings

(Stephane Vaiedelich, laboratoire du musée de la musique)



New string

String from Baillot 19th century ?