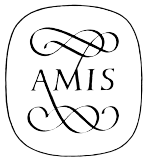
Journal of the American Musical Instrument Society

VOLUME XL • 2014



Guitar Stringing in Late Nineteenth-Century North America: the Emergence of Steel*

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Musical pitch in America throughout the nineteenth century followed European trends, which varied considerably. It is likely that European guitars made in the first quarter of the nineteenth century were designed to be tuned to a pitch of about a'=435 Hz, and although this may have been decreed as a standard in France in 1859, pitch continued to rise. In an attempt to curb this trend, the Walcker Orgelbau Great Organ for the Boston Music Hall, Massachusetts, was tuned to a'=435 Hz when erected in 1863. Only a few years later, a second Walcker was installed in the First Church of Boston, also tuned to *French pitch.* Despite the introduction of this pitch standard into Boston's public schools, instruments used by both American and foreign touring orchestras, opera troupes, and musical organizations remained high.[1] Tuning to a higher pitch, together with developments in the production of steel leading to its use as a stringing material for the guitar, resulted in greater stresses exerted on the instrument that required innovations in guitar design to withstand the new stresses. By examining the types of strings offered in North American musical merchandise catalogs and their representation in periodicals of the Banjo-Mandolin-Guitar movement, the gradual emergence of steel as a string material can be traced, which, in turn, generated contemporaneous patent applications for bridges and tailpieces that indicate rising string tension.

String Manufacture in Mid-Nineteenth-Century North America

The first six-single-string guitars in North America were brought there from Europe at the beginning of the nineteenth century. Evidence of European guitar strings, such as those associated with the Shelley guitar

*The initial research for this article was undertaken during a three-month residency at the Library of Congress on an Arts and Humanities Research Council (AHRC) Kluge scholarship.

1. Charles R. Cross, "Historical Notes Relating to Musical Pitch in the United States," *Proceedings of the American Academy of Arts and Sciences* 35, no. 22 (1900), 453–455.

(ca. 1822) in the Bodleian Library in Oxford and with a guitar made by Pons (1812), owned by Giuliani and deposited in a Coutt's Bank vault in 1816,[2] indicates that plain gut trebles and silk-core basses overwound with a fine metal, usually copper, were normal on the six-string guitar.[3] Pasquale Vinaccia is credited with first using steel for the first and second courses of the Neapolitan mandolin in ca.1835.[4] While the stress of a 13-inch (330 mm) mandolin string tuned to e″ is equal to that of a guitar string of double the length an octave lower, meaning the guitar theoretically could have been stung with steel at that date, there is no evidence of this in Europe or America. Likewise, there is no evidence of the widespread use of the mandolin in America before the debut of the Spanish Students in 1880.[5] However, it does appear that steel was a component in guitar string manufacture there before then.

2. Paul Pleijsier, "Found: A Giuliani Guitar, Kept in a London Bank Vault since 1816," *Soundboard* 29 (2001–2002); Pleijsier, Gary Southwell, and photographer Klaas Fopma examined the guitar on February 2, 1998 at Coutts & Co., London, with the company archivist, Tracey Earl. In 1990, Earl had published the story of the former owner, Christopher de Monte, in Coutts's house journal, *The Three Crowns*, reconstructing his biography from letters and diaries. Pleijsier published shorter versions of the *Soundboard* article in German in *Gitarre & Laute*, vol. 21, nos. 4 & 5 (1999).

3. Whereas previously the strings of the four- and five-course guitar were plain gut, allowing a lowest pitch of *g* and *d* respectively, covered string technology enabled the addition of a sixth string, tuned to *E*. Although pre-nineteenth-century lutes had plain gut strings tuned to lower pitches than nineteenth-century guitars, this was achieved by using highly twisted gut. However, the elasticity of this form of string decreases, becoming stiffer as it is made thicker. The lowest pitch at which a plain gut guitar string, of a low to moderate twist can give an acceptably harmonic tone is around *g* (the pitch of the third string on the guitar). If the mass is increased by using thicker gut in order to allow the pitch of the string to be lowered, the tone quality is progressively compromised by increased inharmonicity. Because of this, the normal practice in guitar stringing from the late eighteenth century onwards was, from at least the fourth string downwards, to over-wind a core of gut (or silk) with a thin, flexible metal wire (usually copper, which was often silver-plated), in order to add mass without appreciably increasing stiffness. In this way, unacceptably increased inharmonicity at the lower pitches was avoided. The use of such an overwound string was an option for the third string also, with the advantage of lesser inharmonicity than with plain gut. As, on the other hand, the plain gut strings of the nineteenth-century guitar were tuned to a higher tension; this was accomplished by making them from a lower twist of gut.

4. James Tyler and Paul Sparks, *The Guitar and Its Music: From the Renaissance to the Classical Era* (Oxford: Oxford University Press, 2002); Konrad Wölki, *History of the Mandolin: The Instrument, Its Exponents, and Its Literature, from the Seventeenth until the Early Twentieth Century* (Arlington, VA: Plucked String, 1984).

5. Jeffrey Noonan, *The Guitar in America: Victorian Era to Jazz Age* (Jackson: University Press of Mississippi, 2008); Paul Ruppa, *The Mandolin in America after 1880 and the History of Mandolin Orchestras in Milwaulkee, Wisconsin.* (Milwaukee: The University of

Although an ad placed by Cooper's Music Store for violin and guitar strings from Naples appears in the American newspaper *The National Intelligencer* on January 31, 1817, it is from the 1850s that American newspaper advertising provides more frequent evidence of guitar string sales. However, around the mid 1830s, Ira Johnson White, one of two respected violinmaking brothers in Boston, was reported to have possessed a string winding machine, and to be the first there making wound violin strings.[6] Even though these are violin and not guitar strings, the brothers' activity demonstrates the emergence of covered string making in America before the mid-nineteenth century, alongside the importation of European strings.

Philip Gura's examination of the accounts and business records of James Ashborn's Connecticut guitar factory shows that in 1851 the three lower strings of the guitar, made of a silk core over-wound with silvered metal, were manufactured in-house.[7] For two decades from the late 1840s, Ashborn and Hungerford were the largest producers of parlor guitars in America.[8] At first the strings supplied with their instruments were purchased from Firth, Pond & Co. or William Hall & Son, but in 1851 Ashborn and Hungerford started producing them in-house, initially for their own use and subsequently, in 1852, supplying to others—including Hall, eventually. This necessitated building and equipping a dedicated workshop as well as further specialized training for members of the workforce. Gura notes the importance of this change from artisanal worker to manufacturer, which divided labor into specialist tasks within the same factory.[9] He continues:

> Once Ashborn and Hungerford decided to manufacture strings on a large scale, they also began to take as credit from the New York firms large amounts of different-gauged silver wire, and of the silk thread around which

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Wisconsin-Milwaukee, 1988). Although The Spanish Students were using the wire-strung bandurria, it was their popularity that prompted the formation of mandolin troupes amongst the Italian immigrant population of New York.

6. Christine Merrick Ayars, *Contributions to the Art of Music in America by the Music Industries of Boston, 1640 to 1936* (New York: The H. W. Wilson Company, 1937), 198, 306. Ira J. White's son, Ira E. White, carried on the business, making and repairing violins, basses, harps, drums, and guitars.

7. Philip F. Gura, "Manufacturing Guitars for the American Parlor: James Ashborn's Wolcottville, Connecticut, Factory, 1851–1856," *The Crossroads of American History and Literature* (University Park: Pennsylvania State University Press, 1996), 209–210.

8. Austin Hungerford was Ashborn's business partner.

9. Gura, *The Crossroads of American History and Literature*, 209.

> the wire was wrapped to make the three lowest strings of the guitar. In September 1851 for example, they paid $4.50 for "16 [presumably a gauge] Silver wire" and $6.75 for "no. 18," and that same month returned to Hall twelve dozen "No. 6 Strings" for $7.80, and the same quantity of "No. 5" for $6.60. They also purchased "no. 13" gauge wire, presumably for the fourth strings. Interestingly, they never recorded the manufacture of the first, second, or third strings, usually made from twisted strands of gut, but only the three larger-gauge strings.[10]

Gura adds in a footnote, "nor do the records show Ashborn and Hungerford purchasing the lighter gauge strings or the materials from which to manufacture them. Presumably, they continued to acquire these from other sources, though the items do not appear in the credits of the New York firms' accounts, nor of anyone else's."[11] It would be extremely unlikely that Ashborn and Hungerford supplied guitars without the trebles fitted, even if their own string manufacture was only of the overwound basses.

Penny, in her *Cyclopaedia* (1863), has an entry for "Musical String Makers":

> The manufacture of strings for musical instruments is carried on as a separate branch. A German violin maker told me that women are employed in Germany in winding wire for guitar strings. I find they are also in a factory in Connecticut, and the manufacturer said they could earn as high as $9 a week. It is rather severe on the fingers, but that can be avoided to some extent by wearing a glove finger. In New York, it is mostly done by Germans and French, who have taken the trade from Americans. The preparing of catgut from the intestines of sheep and goats, and making it into strings, is carried on mostly in Germany, and some women are employed at that. Most metal strings are of steel, and covered with fine wire of other metals. Mrs. Z, whose husband, when living, manufactured covered strings for musical instruments, told me, she and her daughters had often assisted in covering guitar strings and the lighter piano strings. She thinks a person of good abilities could learn it in from two to four weeks, with an attentive instructor. She usually rested against a bench while employed. A good worker will earn from $3 to $5 per week. She has never heard of any but English and German women engaged in it. In some of the uptown shops the machinery is moved by steam, but it does not answer so well, because it is not easily slackened or checked. Harp strings and the larger piano strings cannot be made by women, because of the strength and firmness required.[12]

10. Ibid., 209–210. $7.80 is approximately half the cost a gross of simple, single spun, guitar sixth strings' listed price in Lyon & Healy's 1884 catalog.

11. Ibid., 210.

12. Virginia Penny, *The Employments of Women: A Cyclopaedia of Woman's Work* (Boston: Walker, Wise & Co, 1863), 463–464.

This implies that Mrs. Z's husband made overwound steel-cored guitar strings prior to 1863, with the family helping, and that this was common practice in string winding factories of the period. The entry does not elucidate whether plain steel strings, as used for the first and second trebles of the guitar, were being made there, but if the bass cores were of steel, it is possible that they were. Penny also remarks upon the still sizeable trade in imported gut strings as well as the ethnicity of the workers employed. However, it is not known whether the factory in Connecticut was Ashborn's, and it may have been another venture. The area had established trade in various craft-based activities previously that were in the process of shifting from an artisanal base to newly-developing forms of manufacture, of which musical instrument making was one. It is perhaps no surprise, then, to find evidence of a string-winding factory based in Connecticut, where, as in Penny's descriptive encyclopedia, silvered wire was used to cover wound strings.

To summarize, instrument string winding was already carried out in North America in the years leading up to the time when Ashborn & Hungerford started its string manufacturing division in the 1850s and, as Penny shows, it had become a recognized manufacturing occupation by the 1860s.

Strings Offered in North American Musical Merchandise Catalogs

Lyon & Healy's 1884 catalog of *Musical Merchandise* lists guitar strings of differing compositions.[13] First and second strings were offered in both gut and steel, plain non-wound thirds in gut. The third, fourth, fifth, and sixth strings were available as "wound," either with a silk core, a steel core, or a core of a compound of silk and steel. All of these variants were then over-wound with an outer layer of what is described as either "silvered wire" or "silver-plated wire" (tables 1–2). To complete whole sets of strings, in which, as in its "American Wound" brand, the wound strings have either a silk or compound silk and steel core, the catalog states that gut violin strings *e*, *a*, and *d* must be used for the guitar *e′*, *b*, and *g* strings, respectively.[14] With strings sold both by the dozen and the gross, the listed alternative compositions provided the player with various stringing possibilities.

13. Lyon & Healy, *Catalogue of Musical Merchandise* (Chicago: Lyon & Healy, 1884), 95. This catalog was a revised edition in the company's twenty-first year; making 1863 the first year Lyon & Healy's catalog was published. These catalogs were for trade use.

14. Lyon & Healy, *Catalogue of Musical Merchandise* (1884), 95.

TABLE 1. American Wound guitar strings (1884).

For strings 1 to 3 use	Violin gut strings *e*, *a* and *d*.
For string 4 (*d*) use	String no. 11: white floss silk centre with a silver wire covering;
alternatively use	String no. 14: compound white floss silk and steel wire core, covered in silver-plated wire;
or use	String no. 18: white floss silk covered in silver-plated wire with knotted ends.
For string 5 (*A*), use	String no. 12: white floss silk centre with a silver wire covering;
alternatively use	String no. 15: compound white floss silk and steel wire core, covered in silver-plated wire;
or use	String no. 19: white floss silk covered in silver-plated wire with knotted ends.
For string 6 (*E*) use	String no. 13: white floss silk centre with a silver wire covering;
alternatively use	String no. 16: compound white floss silk and steel wire core, covered in silver-plated wire;
or use	String no. 20: white floss silk covered in silver-plated wire with knotted ends.

TABLE 2. Lyon & Healy Steel guitar strings (1884).

For string 1 [*e'*] use	String no. 5: steel wire or string no.8, silver-plated steel wire.
For string 2 [*b*] use	String no. 6: steel wire or string no.9, silver-plated steel wire.
For string 3 [*g*] use	String no. 7: steel wire covered with silvered wire.

Earlier in the nineteenth century, gut treble strings had been used in combination with covered bass strings consisting of a silk core overwound usually with copper. It seems likely that by offering the combination of gut trebles with basses of silk covered with silver-plated wire as a standard, Lyon & Healy was continuing that stringing tradition, enhanced by the silver plating. The wound bass strings whose core consisted of a compound of silk and steel on the other hand, would, owing to their greater mass, have produced a more powerful sound than those with silk core, as well as a more sustained tone because of the steel core's lower coefficient of internal damping. The catalog recommends this type of string to complement the steel treble strings. While in 1884 Lyon & Healy offered no bass strings made solely with a steel core, the third was available in this composition as steel covered with silvered-wire.

Contemporaneously, Haynes's catalog of 1883–1884 also offered both gut and steel guitar strings. The steel sets are described as "Steel wire, silver-plated" for the first and second strings and "Steel wire core, covered with silk" for the third to the sixth strings. This last is an unlikely composition as described, and although a metal over-winding outside the silk is not mentioned, its presence must be assumed.[15] Alternatively it might have been that the core was silk or silk and steel, and the over-winding was silver-plated wire—as in the Lyon & Healy strings—but this accords less well with the description.

In its 1889 catalog Lyon & Healy listed sets of Steel Guitar Strings for which the lower four strings are given as "steel wire, wound, silver-plated," to be paired with silver-plated steel for the top two.[16] Significantly then, in the five years since the 1884 catalog, wound strings with a purely steel core were newly offered. Although in 1889 for the sets of steel strings Lyon & Healy offered only a wound third, in 1892 Herman Sonntag was listing an unwound silver-plated third also, and it would appear that the plain steel third option became available in the very early 1890s.[17] In its catalog from 1900, Lyon & Healy was listing this option too, suggesting that the thickness of the string was not making it overly stiff (with unacceptable inharmonicity), and that it had enough mass to be tuned to *g* without breaking when the instrument was at concert pitch (tables 3–5).[18]

By 1900, Lyon & Healy was offering even wider choices of both brand and material composition that included superior Russian goat gut and three grades of wound steel, besides compound silk and steel (figs. 1a and 1b).[19] Wound strings with a white floss silk core were the most expensive; followed by those with a Damascus steel core, while "Finest

15. John C. Haynes & Co., *Illustrated Catalogue of Musical Instruments, Strings, and Trimmings of Foreign & American Manufacture*, rev. ed. (Boston: The Company, 1884), 82.

16. Lyon & Healy, *Catalogue of Musical Merchandise* (1889), 187.

17. Lyon & Healy, *Catalogue of Musical Merchandise* (1900), 321–322.

18. Unless concert pitch was dropping (at least for guitars with steel strings), the use of steel as a string material would have been a major factor in increasing string tension. In the last quarter of the nineteenth century, a number of patent applications were made in America for tailpiece improvements, designed to help the guitar withstand this rising tension.

19. Lyon & Healy, *Catalogue of Musical Merchandise* (1900), 321–322. Russian goat gut strings (*Kosie Flaki*, Russian goat gut), strings were expensive compared to silver-plated steel strings. The D string, which could be substituted for the guitar third (g) on the guitar cost $10.00 per thirty strings. The string length was 2.5 times longer than the violin length, but that is only good for one guitar string length. In comparison, a package of wound silver-plated steel guitar thirds was only 55 cents per dozen.

TABLE 3. Lyon & Healy stringing materials, combinations, and year first listed.

	1884	1884	1889
1 [*e'*]	Gut	Steel [plain]	Steel, Silver Plated [plain]
2 [*b*]	Gut	Steel [plain]	Steel, Silver Plated [plain]
3 [*g*]	Gut	Wound Steel	Wound Steel
4 [*d*]	Wound Silk	Wound Silk & Steel	Wound Steel
5 [*A*]	Wound Silk	Wound Silk & Steel	Wound Steel
6 [*E*]	Wound Silk	Wound Silk & Steel	Wound Steel

TABLE 4. Herman Sonntag: Stringing materials, combinations, and year listed.

	1892	1892	1892
1 [*e'*]	Gut	Steel [plain]	Steel, Silver Plated [plain]
2 [*b*]	Gut	Steel [plain]	Steel, Silver Plated [plain]
3 [*g*]	Gut	Wound Silk & Steel	Steel, Silver Plated [plain] or Wound Steel
4 [*d*]	Wound Silk	Wound Silk & Steel	Wound Steel
5 [*A*]	Wound Silk	Wound Silk & Steel	Wound Steel
6 [*E*]	Wound Silk	Wound Silk & Steel	Wound Steel

TABLE 5. Lyon & Healy stringing materials, combinations, and year first listed (1900).

	1900	1900	1900
1 [*e'*]	Gut	Steel, Silver Plated [plain]	Steel, Silver Plated [plain]
2 [*b*]	Gut	Steel, Silver Plated [plain]	Steel, Silver Plated [plain]
3 [*g*]	Wound Silk	Wound Silk & Steel	Steel, Silver Plated [plain]
4 [*d*]	Wound Silk	Wound Silk & Steel	Wound Steel
5 [*A*]	Wound Silk	Wound Silk & Steel	Wound Steel
6 [*E*]	Wound Silk	Wound Silk & Steel	Wound Steel

English Steel" strings were the least costly.[20] The catalog that year also listed "Specially Tested" guitar strings with polished gut for the three trebles, and overwound silk for the basses. As is suggested from the title, these strings were more expensive (tables 6–9).

Lyon & Healy's 1903 catalog listed "Contra Bass Guitar Strings," to be tuned *g, d, B-flat, F, C and* G_1. Violin gut *a* and *d* strings were recommended for the two highest strings, while the third to sixth strings were

20. Lyon & Healy, *Catalogue of Musical Merchandise* (1900), 321–322. The third string was used for comparison of manufacturing type and retail price. Covered fourth, fifth and sixth strings are also offered in these same materials.

(a)

(b)

FIGURE 1. (a) Kozie Flaki Violin String packet. (b) Guitar Strings packet. *Catalogue of Musical Merchandise* (Chicago: Lyon & Healy, 1889).

TABLE 6. Lyon & Healy/Bell Brand comparison (1889).

Lyon & Healy 1889	
English steel core wound with silver-plated wire	30 cents per dozen
Damascus steel core wound with silver-plated wire	80 cents per dozen
American Wound white floss silk core with silvered wire	65 cents per dozen
Bell Brand 1889	
Steel wire core wound with silver-plated wire	60 cents per dozen
Compound silk and steel core wound with silver-plated wire	88 cents per dozen
White floss silk core wound with silver-plated wire	$1.05 per dozen

TABLE 7. Lyon & Healy American Wound/Specially Tested (1900).

Lyon & Healy American Wound fourth string 1900	
White floss silk core wound with silvered wire	70 cents per dozen
White floss silk core wound with silvered wire, fancy colored and knotted ends	80 cents per dozen
White floss silk core wound with silvered wire, Conservatory, extra quality, green silk ends	$1.50 per dozen
Lyon & Healy Specially Tested fourth string 1900	
White floss silk core wound with silver wire, superfine quality	$2.20 per dozen

TABLE 8. Lyon & Healy Specially Tested (1900).

1 [*e'*] Gut, polished, 1 length, superfine quality	$3.18 per dozen
2 [*b*] Gut, polished, 1 length, superfine quality	$3.18 per dozen
3 [*g*] Gut, polished, 1 length, superfine quality	$3.18 per dozen
4 [*d*] White floss silk core wound with silver wire, superfine	$2.20 per dozen
5 [*A*] White floss silk core wound with silver wire, superfine	$2.43 per dozen
6 [*E*] White floss silk core wound with silver wire, superfine	$2.68 per dozen

TABLE 9. Lyon & Healy string sets (1900).

No. 25: Fine quality [presumably American Wound], gut trebles and over-wound silk-core basses	$9.00 per dozen
No. 35: Steel [presumably English], core over-wound with silver-plated wire	$2.70 per dozen
No. 36: Damascus steel core over-wound with silver-plated wire	$5.00 per dozen
No. 535: Bell [brand] steel core over-wound with silver-plated wire	$3.30 per dozen

TABLE 10. Lyon & Healy Contra Bass Guitar Strings (1903).

Third string [*B*-flat]	$1.25
Fourth string [*F*]	$1.25
Fifth string [*C*]	$1.88
Sixth string [G_1]	$2.25

listed as compound silk and steel core, overwound with silver-plated wire (table 10). The tuning given for the contra bass guitar here differs from both that of the ten-to-thirteen-string Austrian *kontragitarre* and the Symphony Harp Guitar (originally designed by Knutsen), indicating a further variant on the instrument.[21]

By 1925 the catalog shows an increase of hundred percent since 1884 in the retail price of strings, and a comparison between gut and silver-plated treble strings, shows that gut was approximately four to six times the price, depending on the brand (tables 11–13).[22] Besides the Bell brand of strings introduced in 1900, the National Musical String Company now appeared as manufacturers, offering its Black Diamond brand. Here, the first and second strings were described as silver-plated steel wire, and the wound strings were available with three different types of central core: steel, silk and steel, and silk. Additionally, listed to these standard strings were Bell Brand Auditorium Strings, for which all the strings are forty-two inches in length, the four covered strings wound on "silver-plated steel," the top two plain "silver-plated steel;" Bell Brand Hawaiian Guitar Strings, for which the top three strings are of silver-plated steel and the bottom three "wound on silver-plated steel," and Lyric Brand Contra Bass Strings, described as "wound on silk and steel," their tuning given as the same as that of the thirteen-string *kontragitarre* and harp guitar (descending chromatically from *E-flat* below the standard guitar sixth string).

Earlier in 1882, J. Howard Foote's catalog of musical instruments and merchandise listed the guitars and strings they supplied but also provided

21. Lyon & Healy, *Catalogue of Musical Merchandise* (1903), 294–295. The four extra sub-bass strings of the mid-nineteenth-century *kontragitarre* were typically tuned diatonically, descending in tones. The sub-basses of the evolved thirteen-string instrument were tuned chromatically, descending in semitones.

22. Lyon & Healy, *Catalogue of Musical Merchandise* (1925), 159. However, it would appear that covered strings, both with a silk, and silk and steel core some 20 cents cheaper in 1889 than in 1884.

TABLE 11. Steel String Price Comparison (1883/4).

Price Comp Steel	**1883/4 strings per gross**	Standard quality Plain steel	Best quality Silver plated
J. W. Foote	*e′* strings	$3.60	$5.40
Lyon & Healy	*e′* strings	£4.00	$5.00
J. W. Foote	*g* steel-core	$6.30	$8.40
Lyon & Healy	*g* steel-core silvered wire	$6.00	n/a

TABLE 12. Price Comparison-Wound Silk (1883/4).

Price Comp Wound Silk	**1883/4 strings per gross**	Standard	Best
J. W. Foote	*d* silk core o/wound silvered wire	$9.60	$11.60
Lyon & Healy	*d* silk core o/wound silvered wire	£9.05	n/a

TABLE 13. Price comparison between guitar gut and steel trebles (1889–1903).

1889	L&H	Russian gut (vln e″) 4 length = 2x guitar *e′*	$8.75 for thirty	approx 30 cts approx 15 cts each
		Russian gut (vln *d′* & *a′*) 2½ length = 1x guitar *b* or *g*		approx 30cts
1889	L&H	"Conservatory" gut	$6.25 for thirty	approx 25 cts each
1901–3	L&H	Best gut	$3.18 per doz	approx 30 cts each
1901–3	L&H	Damascus steel	$0.50 per doz	approx 5 cts each
1901–3	L&H	Bell Brand (steel)	$0.30 per doz	approx 3 cts each
1901	Neverfalse	Gut	$2.25 for thirty	approx 10 cts each
1902	F. O. G.	Special	$0.75 per doz	10 cts each

opinion on their use.[23] Foote's statement, claiming that his instruments were specifically "adapted to the human voice" could be seen as an example of a manufacturer's hyperbolic sales pitch, but perhaps may have been a device to ensure that the large guitars he offered were not over-

23. J. Howard Foote, *J. Howard Foote's Catalogue of Musical Instruments, Strings, Musical Boxes, and General Musical Merchandise. Complete Ed.* (New York: J. Howard Foote, 1882), 56–66.

stressed due to high string tension once sold. In the catalog, Foote disassociated himself from the use of steel as a material with which to string the guitar, but at the same time, because of their popular demand he did not refrain from offering steel strings as a retail item. The following is his printed disclaimer:

> *Wire Strings For Violin, Guitar And Banjo.* The large demand for strings of *wire* is one of the musical absurdities of the period. We do not recommend them in any sense. They are severe on the fingers, wearing to bows, and trimmings of the instruments. Their tone is metallic and unmusical. No artist will ever use them. We quote them only as an article of trade.[24]

Foote offered two qualities of what he describes as "Guitar Treble Strings of Wire, plain steel and best plain steel silver-plated." In both qualities, the third was a wound string. A gross of first strings of "plain steel" cost $3.60, while the same quantity and size of best "steel silver-plated" strings was $5.40.[25] The Lyon & Healy prices, albeit for a year later, were $4.00 for the former and $5.05 for the latter (a smaller difference between the two).[26] The third string with a plain steel core, and described as covered with "silvered wire," cost $6.00 per gross from Lyon & Healy and $6.30 from Foote, who describes the string as being "wound on steel." Foote additionally offered another grade of third, described as "wound on steel, silver plated," for $8.40 per gross.

Foote offered three grades of wound bass strings, emphasizing the qualities of the Genuine Spanish, and the even higher grade Genuine Spanish Artist Strings. Lyon & Healy's American Wound strings were cheaper, with both a wound silk and a wound silk and steel fourth costing $9.05 per gross.[27] Foote's equivalent wound silk retailed at $9.60 per gross and Genuine Spanish at $11.60 per gross, with Genuine Spanish Artist, with fancy silk ends, at $15.00 per gross.

Sets of guitar strings were also available in boxes. Lyon & Healy's catalog from 1889 lists No. 25 as complete sets of professional guitar strings,

24. J. Howard Foote, *J. Howard Foote's Catalogue of Musical Instruments*, 65.

25. Ibid. Foote's catalog prices strings by the gross, while Lyon & Healy's contemporaneous catalog prices by the dozen. The later 1925 Lyon & Healy catalog offers strings sold either by the dozen or gross, where it is apparent that a discount of 33.3% was applied to gross sales. By extrapolating this formula and multiplying by eight—the prices quoted for strings in the Lyon & Healy 1884 catalog—it is possible to compare string prices charged by the two suppliers.

26. Lyon & Healy, *Musical Merchandise Catalogue* (1884), 95.

27. Strings of the same composition from Lyon & Healy, but instead offered fancy colored and knotted ends for fastening, costing more, at $11.05 a gross.

superfine quality at $9.00. The composition of these particular strings is not given, but as the numerical listing follows the same sequence given to that of the American Wound brand of strings, it may be that they are of the same make-up.

Steel wire for strings was also supplied on spools. Herman Sonntag's 1892 catalog offers steel wire, described as tinned (a cheaper alternative to silvered) for the guitar first string at 70 cents per dozen (this same gauge string is also alternatively named as violin *a*), the second at 58 cents per dozen, and the third, presumably also unwound, for 55 cents per dozen.[28] Sonntag's strings appear to be a little cheaper than those offered in this format by Lyon & Healy which, in 1889, was retailing the first at 80 cents per dozen and the second and third at 70 cents per dozen.

August Gemünder & Sons was established in New York in 1846, specializing in the manufacture of violins, and the frontispiece of the 1895 catalog describes the company as an "old reliable violin house."[29] By 1895 it was also offering for sale various models of its own guitars, as well as mandolins and zithers, together with accessories such as strings. Although its string merchandise was geared towards the violin family, no doubt due to its initial success as a violin-making company, it also offered guitar strings. As with other contemporary musical merchandise suppliers, Gemünder directed consumers towards the violin E, A, and D, or E, A, and G strings for the guitar first, second, and third. The composition for the violin E, A, and D strings is not stated in the catalog, but it can be presumed they were of gut, in keeping with both standard stringing practice at the time and with strings offered by competitors. The [violin] G string however, is described as being "covered," and is offered with either "Copper wire, silver plated" or "Highest grade, pure silver wire": a specific reference to the metal used for the over-winding. The company also offered covered strings for the guitar with both a purely silk, and a silk and steel core, and it would seem likely that the same composition of metal for the over-winding was used.[30] Its Wire Guitar Strings for the top

28. Herman Sonntag, *Illustrated Catalogue of Musical Instruments, Strings, Etc.* (New York: H. Sonntag, 1892), 182.

29. Gemünder and August Sons, *Illustrated and Descriptive Catalogue of High-Grade Stringed Instruments Made and Sold by August Gemünder & Sons* (New York: Gemünder, 1895).

30. Ibid., 26. The Gemünder catalog also lists silk violin strings "for summer use" on page 10.

three trebles are described as "finest English wire, plated" and sold in "lengths," with the top two strings also available "on spools."

The mail order company Montgomery Ward offered guitars and their strings, along with other guitar-related accessories. Its 1894 catalog stated that it sold only American-made guitars, claiming:

> We guarantee every Guitar in our stock to be absolutely perfect in scale and have a smooth, musical tone. They are made in the largest factories in this country, the workmanship is the very best, and we warrant each instrument regardless of price (for one year), not to crack or warp.[31]

It then issued the following advice regarding stringing:

> We recommend gut and silk wound strings under all circumstances. If steel strings are to be used, however, we suggest that a tail-piece be put on the instrument, otherwise the sounding board is liable to "spring" at the bridge and in time injure the guitar.[32]

This is a clear indication that guitar string tension was rising because of the increasingly common practice of using steel strings. Although warning against their use, Montgomery Ward nonetheless was ready to sell them, offering the combination of steel trebles and wound silk and steel basses alongside gut and silk guitar strings. In recognition of this obvious demand for steel strings, the seemingly contradictory attitude to their use is tempered with the advice they proffered with the entry for guitar tailpieces: "If steel strings are to be used on a guitar it is essential to the tone and durability of the instrument that they should be attached to a tail piece."[33] Besides its own range of guitars (singling out its Windsor models in particular), which it claimed were manufactured in some of the best American guitar-making factories, Montgomery Ward also offered two models of Washburn guitars. Hubert Pleijsier claims both Montgomery Ward and the contemporary mail order company, Sears & Roebuck, carried cheaper Lyon & Healy-made guitars besides the top-of-the-line Washburn, and points out that their disclaimers for the use of steel guitar strings are almost word for word revisions of the statement made by Charles N. Post, Lyon & Healy's advertising executive, in that

31. Montgomery Ward, *Montgomery Ward & Co. Catalogue and Buyers' Guide 1895* (New York: Skyhorse Pub., 2008), 243.

32. Ibid., 243.

33. Montgomery Ward, *Montgomery Ward & Co. Catalogue and Buyers' Guide 1895*, 244.

company's 1889 catalog. It would appear that Lyon & Healy had a close business arrangement with both companies, and likely also supplied them with their cheaper guitars, some of which, according to Pleijsier, from 1896 were equipped with steel strings.[34] Alongside guitars, the 1897 Sears & Roebuck catalog also listed strings and accessories. Although pointedly stating that all strings were imported, somewhat confusingly it continues by claiming that the steel and covered strings were American-made.[35]

Nineteenth-Century North American Guitar Strings: Journal and Newspaper Advertisements

From the 1850s, evidence of guitar string sales appears in newspaper classified advertising more regularly. On January 6, 1852, *The Daily Scioto Gazette* carried a classified placed by D. A. Schutte offering "a fine assortment of Violin and Guitar strings" alongside a selection of violins "Just Received Direct from Germany" (priced between $1.25 and $12.00) and a "superior" guitar ($30.00).[36] Other classifieds placed by Schutte in the same issue of the paper suggest he also sold all manner of hardware, from carriage trimmings to marbles and pistols. A year later, the same paper carried, amongst ads for sugar, molasses and hymnbooks, a classified simply stating: "Violin and Guitar Strings, for sale by Whittsmore & Saxton."[37] It would appear that guitar strings and other musical merchandise were commonly featured alongside general items of sale. In New England, geographically separated from *The Daily Scioto Gazette* in Ohio, a classified placed in the *Vermont Patriot & State Gazette* (1853) in a section entitled "Boston Cards, March 1853," reads, "Charles Clapp & Co., Sheet Music, Musical Instruments, Umbrellas, Parasols, Canes, Violin, Violoncello, Double Bass, Guitar Strings."[38]

34. Pleijsier, *Washburn, Prewar Instrument Styles, Guitars, Mandolins, Banjos and Ukeleles 1883–1940* (Anaheim Hills: Centerstream, 2008), 55. Before 1915, Washburn models were designed for gut and silk, although Pleijsier claims that some custom Washburns, constructed for the use of steel, "implying they were X-braced, and or, fitted with steel bar reinforced necks," were available as a special order from 1889.

35. Sears, Roebuck and Company, *1897 Sears Roebuck & Co. Catalogue,* reprint (New York, NY: Skyhorse Pub., 2007), 518–535.

36. D. A. Schutte, *The Daily Scioto Gazette,* January 6, 1852. Issue 29. Classified Ads, Col. A.

37. Whittsmore and Saxton, *The National Intelligencer,* April 5, 1811. Issue 107.

38. Charles Clapp and Co, *Vermont Patriot & State Gazette,* 17 March 1853. Issue 13/337. Classified Ads. Col. C.

Advertising for strings in American newspapers from this time appears in three distinct forms: as separately advertised items in the classifieds, as general music-related accessories from musical instrument retailing stores, and also, for sale amongst other non-music related goods that included umbrellas, parasols, canes, tobacco goods, stationery, and watches. This trend continued in the 1860s, with guitar strings and other musical merchandise continuing to be sold alongside general hardware items, but additionally, with major musical merchandise companies such as Firth, Pond & Co in evidence promoting their trade with large and impressive ads.[39] One such ad placed for musical instruments that included Mahogany and Rosewood guitars, together with strings for plucked and bowed string instruments, appears in *The Wisconsin Daily Patriot* (1862) (fig. 2).[40] In some classifieds, such as Barker's & Co.'s in *The Hartford Daily Courant* (1865),[41] guitar and violin strings appear separately from banjo strings, while in others, they appear together, such as Frederick Blame's classified ad in *The New York Daily Tribune* (1865): "Hot Weather violin, guitar and banjo strings, at 25 cts and 35 cts."[42]

In 1866 both specialized and generalized vendors continued to advertise strings: the *Jamestown Journal,*[43] *Lowell's Daily Citizen,*[44] and *The Macon Daily Telegraph*[45] all carried classifieds offering them sold alongside clocks, and in the *Pacific Commercial Advertiser* in Honolulu, H. M. Whitney was selling "Best Guitar and Violin Strings" alongside general stationery and photographic services.[46] On the other hand, Ludlow Barker & Co.'s ad in the *Hartford Daily Courant* was from a musical merchandise store selling guitar and violin strings,[47] and in the *Salt Lake City Daily Telegraph* (1866), David O. Calder stated that he was an importer of "all kinds of Musical Instruments and Musical Merchandise" and had "a fresh supply of the best quality violin and guitar strings, both wholesale and retail."[48] Throughout the rest of the 1860s and 1870s, guitar strings

39. Pond Firth and Co., *The Wisconsin Daily Patriot,* June 21, 1862. Ads, 1.
40. Ibid., 1.
41. Ludlow Barker and Co., *Hartford Daily Courant,* July 18, 1865, 3.
42. Frederick Blume, *The New York Daily Tribune,* July 15, 1865, 2.
43. *Jamestown Journal,* January 12, 1866. Vol. 40.
44. Rugg and Griffith, *Lowell's Daily Citizen and News,* January 1, 1866. Issue 296, 4.
45. E. J. Johnston and Co., *The Macon Daily Telegraph,* January 16, 1866. Issue 212, 4.
46. M. Whitney, *Hartford Daily Courant,* July 18, 1865, 3.
47. Ludlow Barker and Co., *Hartford Daily Courant,* January 24, 1866, 3.
48. David O. Calder, *Salt Lake City Daily Telegraph,* February 9, 1866. Issue 165, Col. A.

FIRTH, POND & CO.,
Manufacturers of
MUSICAL INSTRUMENTS
and Publishers of
SHEET MUSIC,
547 BROADWAY, NEW YORK.

Great Inducements Offered to Purchasers.

NEW AND SPLENDID PIANO FORTES,
as low as $200 for cash, and every instrument warranted. New Pianos rented and the rent applied to the purchase. MELODEONS and HARMONIUMS constantly on hand.

BAND INSTRUMENTS.
We manufacture and import Band Instruments, of all kinds.
A full set of 12 Brass Instruments forwarded for $150 cash. List of prices sent on application by letter.

Every kind of Musical Instrument, and all kinds of Musical Goods can be furnished to our stock. Parties ordering by letter, and enclosing the money, can depend upon prompt attention to their orders.

Our NEW GERMAN SILVER FLUTE, price $1.50 in each, is the best FLUTE ever made.

GUITARS! GUITARS!
The demand for our Guitars is constantly on the increase, because they do not crack or split in any climate.
Every Guitar of our make is fully warranted.

PRICE:

No. 1,	Mahogany Guitar, with patent head, in case, with extra set of strings	$15
No. 2,	Rosewood Guitar, patent head, in case, &c.,	18
No. 3,	" " extra bending, &c.,	22
No. 4,	" " oval back, &c.,	22
No. 5,	" " centrifugal bars, &c.,	25
No. 6,	" " elegantly inlaid, and finished in superior style,	50

We will pack our Guitars, free of charge, on receipt of the price from parties out of the city.
Cheap imported Guitars from $2 and upwards.

BANJOS! BANJOS!
We make the best Banjos in the World!! Our patent Banjos, with extra screws and tuning keys, for Solo Players, has thrice the tone and power of the ordinary Banjo. Price, from $8 to $25, with case, according to finish.
Cheap Banjos, from $1 and upwards.
BUCKLEY'S NEW METHOD FOR THE BANJO.—The best book for learning that instrument. Price $1, copies sent by mail, postage paid.

STRINGS! STRINGS!
Really good Violin Strings are a rarity. We make it a point to keep very superior strings, for good players. Price 75 cents per set. Sent by mail, postage paid. Besides the above we have Italian, German, French and English Strings, for Violin, Violoncello, Double Bass, &c. Jewelers, Dealers in Music, Books, Fancy Goods &c., are invited to give our Strings a trial.

SHEET MUSIC AND MUSICAL BOOKS.
Our Catalogue of Music is very extensive and popular, and we are publishing *New Music Every Day*.
Besides our own publications we have all of the Music published in the country, and can furnish Foreign Music.
Dealers, Teachers of Music, Heads of Seminaries, Book Dealers, and News Agents, can have their orders promptly filled and forwarded by Express or mail.
The postage on Music sent by mail is only about one cent for each piece. This is the cheapest and quickest way to forward small packages. ☞ Send for our Catalogues and Circulars.
Remember the name and number.
FIRTH, POND & CO.,
may 5 1m 547 Broadway, New York.

FIGURE 2. Pond Firth and Co, *The Wisconsin Daily Patriot*, June 21, 1862.

continued to be available from musical instrument dealers, individuals, and general goods vendors.

Strings also appear to have been available from some teachers. In 1870 W. L. Hayden, whose name and ads regularly appear later in the early Banjo-Mandolin-Guitar (BMG) periodicals, offered his services in the *Boston Daily Advertiser* as a teacher of the flute, piano, and guitar, stating that he was an agent for the "celebrated Tilton Guitar" and also a dealer in musical instruments, music, and strings.[49] Later, in 1889, D. A. Bloomey (Manchester, New Hampshire), who was recorded in the town's directory from 1884 and described as a teacher from 1887, was inviting dealers and teachers to send for a wholesale price list of banjo, guitar, violin, and mandolin strings.[50]

While the strings offered for sale through classified ads were specific to one or perhaps two different types of instruments, such as the guitar and banjo for example, ads from larger musical instrument merchandise stores, claimed to stock strings for all types of stringed instruments, bowed and plucked.[51] Throughout the second half of the nineteenth century, the popularity of stringed instruments in the leisure activities of society resulted in a demand for strings that saw them being sold not only in specialist music stores but also in general goods stores, and through mail order.

Beginning in the 1880s, journals were published by leading figures in the BMG movement to promote the culture of these instruments, their use, and sale. These also carried advertising for the instruments and their accessories. The Philadelphia-based *S. S. Stewart's Banjo, Mandolin & Guitar Journal* (April–May, 1884) carried an ad for both steel and gut guitar strings, available from Stewart himself and marketed as "X.L.N.T. [sic]" (fig. 3). Stewart offered gut strings at 80 cents a set, steel at 75 cents, and single strings at 15 cents (a remarkably high price in relation to gut: that same year, Lyon & Healy was offering plain steel trebles at 50 cents a dozen and silver-plated steel at 63 cents a dozen).[52] In the later August–September edition, W. L. Hayden advertised again that as a "Dealer in guitars" he also sold strings, and Wm. I. Peters (Battle Creek,

49. W. L. Hayden, *Boston Daily Advertiser,* April 24, 1870, 3.

50. *Gatcomb's Banjo & Guitar Gazette,* vol. 3, no. 2 (Boston: L.B. Gatcomb & Co, 1889), 8.

51. J. H. Hidley, *Albany Evening Journal* (December 19, 1865), 3.

52. *S. S. Stewart's Banjo, Guitar & Mandolin Journal,* ed. S. S. Stewart, vol. 2, no. 9 (Philadelphia: S. S. Stewart, April–May, 1884), 7.

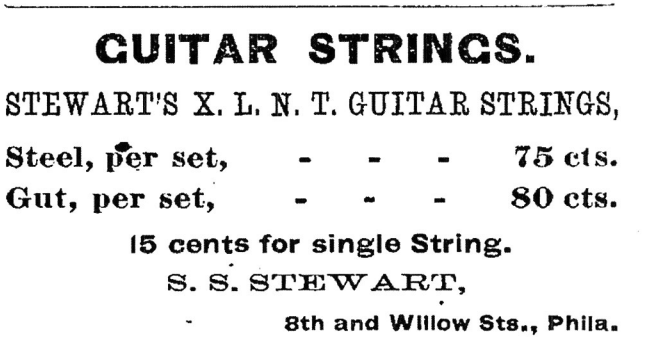

FIGURE 3. Advertisement for guitar strings. S. S. Stewart's Banjo, Mandolin & Guitar Journal, 2/9, 1884.

Michigan) claimed to be importing "Genuine Italian strings, the best for all stringed musical instruments."[53] In 1887, in a rival journal, *Gatcomb's Banjo & Guitar Gazette*, the manufacturer Steadman & Co. (Cambridgeport, Massachusetts) placed ads for "wound strings," "wire strings," and "steel music wire in clamps 1–4," and the John C. Haynes Company advertised strings alongside its Bay State, Excelsior, and Tilton guitars.[54] Ads in *Gatcomb's* show that strings were available directly from specialist distributers as well as being items of general musical merchandise. Brands of strings advertised in *Gatcomb's* between 1887 and 1899 include Opera Strings,[55] Griffith's Strings,[56] and, starting in 1899, Abt Strings.[57]

In 1890 *J.E. Henning's Elite Banjoist and Guitar and Mandolin News* described the sets of strings it supplied as having gut trebles, with basses of

53. *S. S. Stewart's Banjo, Guitar & Mandolin Journal*, ed. S. S. Stewart, vol. 2, no. 11 (Philadelphia: S. S. Stewart, August–September, 1884), 14.

54. *Gatcomb's Banjo & Guitar Gazette*, vol. 1, no. 1 (Boston, MA: L.B. Gatcomb & Co., 1887), 3; The John C. Haynes Company was also selling strings in *Gatcomb's Banjo & Guitar Gazette*, vol. 1, no. 1, 8. Ads in *Gatcomb's* show that strings were available directly from specialist distributers as well as being general items of musical merchandise.

55. *Gatcomb's Banjo & Guitar Gazette*, vol. 1, no. 3 (Boston, MA: L.B. Gatcomb & Co., 1888), 3.

56. *Gatcomb's Banjo & Guitar Gazette*, vol. 5, no. 1 (Boston, MA: L.B. Gatcomb & Co., 1891), 11.

57. *Gatcomb's Banjo & Guitar Gazette*, vol. 12, no. 5 (Boston, MA: L.B. Gatcomb & Co., 1899), 13. Valentine Abt was a highly regarded player in BMG circles.

either a silk center, or a wire and silk compound, and alternatively pairing wire trebles and wire center basses. All of these strings were sold individually as well as in sets, so theoretically it would have been possible to create mixed sets. Gut trebles were all priced at 20 cents each; compound silk and wire basses at 10 cents each; silk center basses at 10 cents each; complete sets of "best strings" (presumably gut trebles with silk, or silk and steel core basses) were 75 cents; wire trebles were all 5 cents each, with complete sets that included wire center basses, at 40 cents.[58] In contrast, *The Cadenza* featured an ad in 1894 from the Legg Brothers (Kansas City) for gut & silk at 50 cents and steel and wound guitar strings at 30 cents a set.[59]

The Cadenza's March–April 1895 issue featured an article on string care, and while its emphasis was on fitting and caring for gut on banjos, it also mentioned the use of covered silk bass strings for both that instrument and the guitar. The author reported that until recently, poor quality English and German gut strings were being imported, but now, higher-grade Italian strings, and those made in Germany from Danish and Russian gut, were available. It continued by stating:

> In regard to the bass or wire wrapped silk strings, the American manufacturers are making a decidedly superior one to those produced, in, France, Germany or England. After much experimenting I find the American strings best in tone, and so strong that I find it necessary to change them before breaking. Three eastern, firms who make strings, now give employment to 147 men.[60]

Only male employees are mentioned here, whereas Penny recounts women also winding strings and it is likely that the article's author overlooked their contribution to the trade. Never the less, this statement highlights the scale to which the string making industry appeared to be growing in North America in 1895.[61]

58. *J. E. Henning's Elite Banjoist and Guitar and Mandolin News*, Oct–Nov 1890, 19. Although the term "covered" or "wound" is not specifically used in the ad, the way it is worded: "Bass, wire and silk compound, E, A and D" and "Bass, silk centre E, A and D," suggests both variants ("wire centre" too) were covered strings. The term "wire" here was used to mean steel.

59. *The Cadenza, a Music Magazine*, vol. 1/2 (Kansas City, MO: C. L. Partee Co., 1894), 12.

60. *The Cadenza*, vol. 1, no. 4 (1895), 4.

61. Penny's *Cyclopaedia* noted women employed in a Connecticut string-winding factory in the 1860s. Her account of female family members assisting the male head of the family finds a European parallel in Jenny Nex's observation, in her research into

The 1897 October–November issue of Henning's later periodical, *The Chicago Trio*, advertised his own model of guitar (patented on July 12, 1892), described as "Concert size" and costing $30. The ad stated:

> A guitar that will never spring or warp with patent Sword Steel Center Neck; a beautiful model. Easy action and most powerful tone. Can use wire strings with perfect safety. The only guitar ever made that absolutely Will Not Spring or Warp.[62]

In the same issue, another Henning ad offered guitar strings only as "Set[s] of best strings, pure wound silk, or compound silk and wire bass," however, as the material of the trebles is not mentioned, it is unclear whether these sets included the wire trebles with which his guitar could be strung safely, or the common alternative, gut.

Valentine Abt (Pittsburgh, Pennsylvania) advertised his BMG strings in the 1899 March–April issue of *The Cadenza*, offering only gut trebles with overwound silk basses for both guitar and banjo, although he supplied silvered wire strings for the mandolin.[63] The November–December issue, under the heading of "Trade Dept., Manufacturing Interests," presented Louis Wright (Winsted, Connecticut) as a "string importer," distributing Peerless Strings wholesale for violin, banjo, guitar, and mandolin, but here as in his own ads, materials are not identified.[64] In the same issue, *The Merrill Aluminum Musical Instrument Company* (New York) advertised its all-aluminum guitars, banjos, mandolins, and lutinas, proclaiming them to be "The Greatest Musical Invention of the Age."[65] Whether they were to have metal strings, in keeping with their all-metal image, is not indicated, but as George D. Reed had previously (December 2, 1873) patented a guitar with an all-metal body designed to be strung with either metal or gut, it is possible that they were.[66]

The 1900 January–February issue of *The Cadenza* carried string ads from both H. E. Brinton (St. Louis, Michigan), and Frank M. Woodrow

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musical string makers in London, that "many of the firms had been family concerns with both women and men running businesses as circumstances dictated." See Jenny Nex, "Gut String Makers in Nineteenth-Century London," *The Galpin Society Journal* 65 (2012), 131–160.

62. *The Chicago Trio. An Educational Banjo, Guitar and Mandolin Journal*, vol. 1, no. 1 (Chicago: The Henning Music Co., 1897), 20.

63. *The Cadenza*, vol. 5, no. 4 (1899), 39.

64. *The Cadenza*, vol. 6, no. 2 (1899), 26.

65. *The Cadenza*, vol. 6, no. 2 (1899), 45.

66. George D. Reed, 1872 Guitars. USPTO, Patent 145,241, filed November 4, 1872, and issued December 2, 1873. Originally applied for on November 4, 1872.

(Newton, Iowa). Brinton's ads give no information on string prices and materials, indicting only that he specialized in violin, mandolin, guitar, and banjo strings. Woodrow's ads, on the other hand, show he was offering guitar strings at 50 cents for "special" grade and 30 cents for "best steel." Although the material of the special grade strings is not mentioned, and while they may simply have been of better quality steel, given their price difference, it seems more likely that they were gut.[67] By 1900, ads placed by Abt in *The Cadenza* listed a greater variety of strings. In that year's July issue he was offering the guitar's three gut trebles at 8 cents each or 80 cents per dozen, with wound silk basses at 5 cents each, 50 cents per dozen, and complete sets at 35 cents. Steel trebles were offered with no individual price, only for sale at 10 cents per dozen. Silk and steel basses sold for 5 cents each or 50 cents per dozen, and "complete sets, [of] steel" at 25 cents.[68]

In November 1900, *The Cadenza* ran an ad from C. Meisel (New York), for the Globe brand of mandolins and guitars, proclaiming their "light action." Globe strings were offered for the same instruments and additionally for the banjo and violin, although as the string material was not mentioned, particular qualities of Meisel's strings contributing to the "light action" of his instruments cannot be judged.[69]

F. O. Gutman used his publication, *The F. O. G. Mandolin Banjo and Guitar Journal* (Cleveland, Ohio), as a vehicle for advertising his goods as well as for promoting the BMG movement as a whole. In 1900 an ad entitled "Poor Strings" saw him appealing to consumers "who have been troubled with them [strings] at fancy prices." He stated, "Our Copper Wound Strings for the Mandolin and Guitar are unequalled for tone production and strength and are reasonably priced."[70] The overwinding of the covered string is described here as copper, whereas often, without defining the main metal of the winding, the term used in newspaper, journal, and musical merchandise catalogs at this time, is "silvered," or "silver-plated wire."

F. J. Bacon (Hartford, Connecticut) advertised his Never False brand of gut strings in the May–June 1901 issue of the *F. O. G. Journal.* He

67. *The Cadenza*, vol. 6/3 (1900), 45.

68. *The Cadenza*, vol. 6, no. 6 (1900), 42.

69. *The Cadenza*, vol. 7, no. 3 (1900), 36. In 1894, C. Meisel was listed in the New York City directory as a musical instrument importer, operating from 343 E. 10th St.

70. *The F. O. G. Mandolin, Banjo and Guitar Journal*, vol. 1/1 (Cleveland: F. O. Gutman, 1900), 21.

targeted both banjoists and guitarists, claiming that "every one (is) guaranteed absolutely true, and non-stretching."[71] The strings were offered at "$2.00 for a bundle of thirty–either 1st, 2d or 3d, or assorted," presumably the price for banjo strings, as the same ad offered a bundle of "Guitar E" and "Violin E" at $2.25. That Bacon does not here supply bass strings of any composition suggests he was catering to players using gut trebles that needed replacing more often than the basses, whether because of wear or breakage.

In Gutman's *F. O. G. Journal* from November 1902, he advertised his "F. O. G. Special Brand" strings as being neither gut nor steel, and although he does not identify their material, he claims they were "not effected [sic] by perspiration."[72] "Artificial Silk," or rayon was first commercially produced in 1891, making it possible that Gutman was using it for his "New String."[73] They were priced at 10 cents each, with quantities of a dozen, for either the guitar or violin at 75 cents, and for the banjo at only 65 cents. In the period between 1889 and 1903 a comparison between Lyon & Healy's prices to dealers and ads in BMG journals shows that the cheapest gut trebles for the guitar were still twice the price of the best steel and that best gut was six times that price. Gutman's Special Brand string (of unidentified composition) was priced in between the average cost of gut and steel.

In 1884, Lyon & Healy offered as standard, three overwound silk basses to be used in combination with three gut trebles to make complete sets of guitar strings. Later in its 1900 catalog it introduced the option of a wound third string made with a silk core overwound with silvered wire, Although in catalogs from 1884 and 1889 Lyon & Healy offered only a wound steel third (described as "Steel wire, covered with silvered wire" in 1884 and "Steel wire, Wound, Silver Plated" in 1889), presumably intended to be used in combination with steel trebles, in 1900 it was also listing an unwound silver-plated steel third. This would suggest that the thickness of this plain steel third was not making it overly stiff (with unacceptable inharmonicity), and that it had enough mass to be tuned to *g* without breaking when the instrument was at concert pitch. Unless concert pitch for guitars with steel strings was dropping, the use of steel as a string material would have been a major factor

71. *The F. O. G. Mandolin, Banjo and Guitar Journal*, vol. 1/4 (1901), 39.

72. *The F. O. G. Mandolin, Banjo and Guitar Journal*, vol. 3, no. 1 (1902), 15.

73. Joseph Foltzer and Thomas Woodhouse, *Artificial Silk and its Manufacture* (London: Sir I. Pitman & Sons, 1921), 244.

in increasing string tension. In the last quarter of the nineteenth century, along with improvements to strengthen the neck and the use of internal compression rods running from neck to end block intended to relieve stress on the soundboard, a number of American patent applications were made for tailpiece improvements designed to help the guitar withstand this rising tension.

String Tension and Tailpieces

In his patent of January 3, 1854 (fig. 4), Tilton claims a new design that "precludes the necessity of the bracing usually required under the sounding board [ed: presumably in the area where the bridge is located], which always has a tendency to injure the tone."[74] Tilton's improvement fixes the strings to a tailpiece fitted at the foot of the guitar. The strings then pass over the bridge and saddle, but where in other similar designs they have a tendency to slide laterally over the saddle when plucked, Tilton uses a pin device to hold them in place. He considered that this would provide the requisite tension on the bridge to allow it to act as a fulcrum, imparting energy to the soundboard, which, together with the "beneficial effects of fastening the strings to the foot," would at the same time prevent "discordant twanging" caused by the strings loosely sliding laterally over the saddle. He states:

> By my invention I give the requisite tension to the usual length of string, upon which every note is made, and by the additional length of string between the pins and the foot, together with the relief of the soundboard from obstruction, produce a vibration which gives a fullness and richness of tone not obtained on any instrument of this character.[75]

In the patent Tilton goes on to refer to his earlier patented (1851) strengthening dowel design, suggesting its use in conjunction with this lightly-braced soundboard design to further help withstand the increased tension caused by the strings being extended to the tailpiece. In his additional patent of March 4, 1856, Tilton refers to a series of experiments since 1854 that further improve the functioning of the soundboard.[76] In this case, his design features a metal tailpiece that is screwed to the base of the guitar and attached to the rear edge of the bridge,

74. William B. Tilton, January 3, 1854. Patent No. 10380.
75. Ibid.
76. William B. Tilton, March 4, 1856. Patent No. 14378.

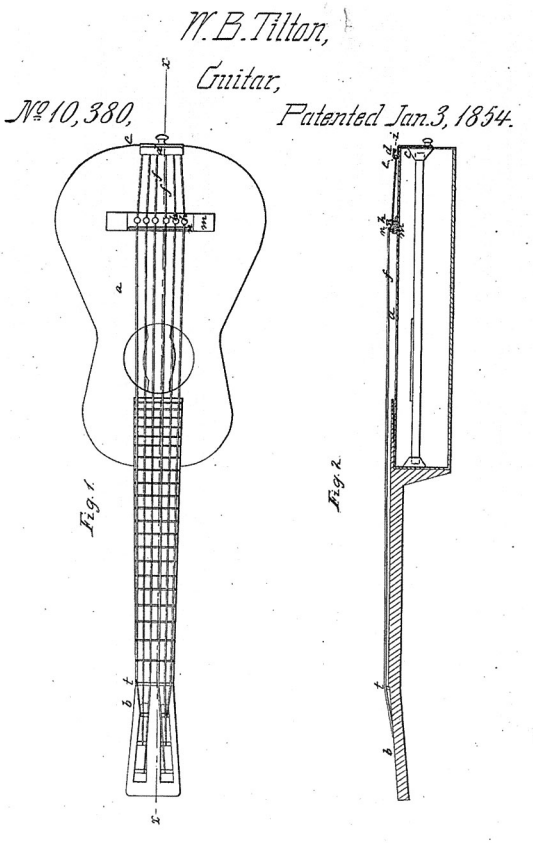

FIGURE 4. Patent for guitar improvement, William B. Tilton, January 3, 1854. No. 10380.

which, without touching the soundboard, then connects to the rim of the guitar. The plate of the tailpiece has six openings through which the ends of the strings are attached. He reasons that "as the strings have no need of pins to secure them to the wooden bridge, it can be made much

smaller," and further suggests "that with strain of the strings taken up by the tailpiece, along with the reduction in the size of the bridge, the tone of the instrument is improved." He states that while he recognizes a tailpiece is not a new invention, the interplay of bridge size, string tension, and soundboard vibration is central to his particular design of combination bridge-tail piece. In 1854, gut was still predominantly used for the trebles of the guitar, even if a transition to the use of steel was in the wings. Although it might be considered only circumstantial for this design to be taken as evidence of the suggested use of steel strings as a device for dealing with the guitar's inherent mechanical stresses, it can be seen, however, as a precursor to the tailpiece designs that became advisory optional extras for those wishing, later in the century, to string their instruments with higher-tensioned steel.

From as early as the late 1860s, evidence points to increasing guitar string tension. On August 11, 1868, Gustav Schleicher of Mount Vernon, New York, received a patent, *Improvement in Stringed Musical Instruments*, that outlined an internal tongue-like device fitted within a guitar for improving the "power and brilliancy of tone," together with a double system, consisting of both a floating bridge and a pin bridge, to which the strings were secured:

> The invention consists, further, in the arrangement of a series of ribs on the inner or under surface of the sounding-board of a guitar, or other similar instrument, in such a manner that said sounding-board is materially strengthened, and enabled to sustain the strength of the strings.[77]

While the composition of the strings is not mentioned, that the device is intended for strengthening the soundboard to be better "enabled to sustain the strength of the strings" suggests an increase in string tension, which Schleicher claimed, would also give a more brilliant tone (fig. 5).

George D. Reed's patent of December 2, 1873 mentions metal strings (fig. 6).[78] This invention is for an all-metal guitar body, with either a wooden or metal neck, to be used with either gut or metal strings. Reed does not elucidate as to whether he is referring to metal as the overwindings of the bass strings, as a core material, or for plain, unwound, trebles.

77. Gustav Schleicher, 1868 Improvement in Stringed Musical Instruments. US Patent 81,012, 1868, issued August 11, 1868. Schleicher also had a patent (202668) awarded in 1878 for improvements to circular saws and appears in the New York City directory of 1889 as the head of Schleicher and Sons, manufacturing and dealing in pianos and organs.

78. Reed, Guitars patent.

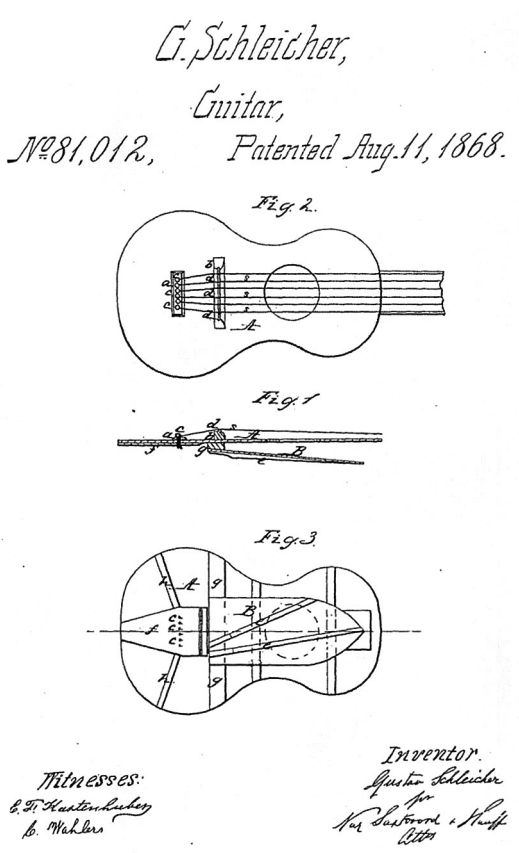

FIGURE 5. Patent for guitar device, G. Schleicher, August 11, 1868. US Patent 81,012.

However, as gut trebles and copper-wound silk basses had been in use since the early nineteenth century, the mention of metal does suggest a departure from these types of strings, suggesting its early use for guitar stringing in 1872. Reed declares that a guitar constructed of metal, following his design, "will be found to have great power and brilliancy of tone, and be particularly free from the twanging sound characteristic of

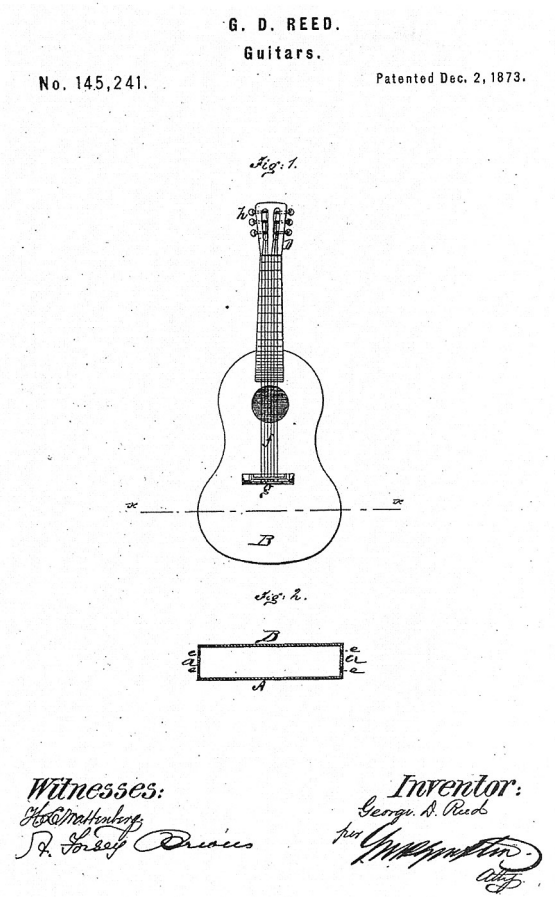
G. D. REED.
Guitars.
No. 145,241. Patented Dec. 2, 1873.
Fig. 1.
Fig. 2.
Witnesses:
Inventor:
George D. Reed
per

FIGURE 6. Patent for metal body guitar, G. D. Reed, filed November 4, 1872, and issued December 2, 1873. US Patent 145,241.

guitars with a wooden body." He goes on to claim that his "guitar can be constructed at a less cost than guitars ordinarily made," and that as a toy would be indestructible. This design should not be confused with the National steel-bodied guitar, pioneered by John Dopyera and George

Beauchamp in 1927, which had a fundamentally different approach to amplifying the string vibrations by utilizing a system of internal resonating cones.

Within ten years, further patents show the start of experiments to improve tailpieces and bridge design. Jacob Abraham of Silver City, New Mexico, received a patent of December 25, 1877 for *Improvement to Tail-Pieces for Guitars* (fig. 7).[79] The main feature of this improvement was a metal tailpiece whose leading edge acted as a bridge to which the strings were also attached. To help relieve the forces exerted by the strings on the front of the instrument, the whole device was screwed to the guitar's base, coming into contact with the soundboard only at the end block.

On July 31, 1883, Erland Anderberg of Mount Vernon, New York, was awarded a patent entitled *String-Bridge for Guitars* (fig. 8).[80] Erland claims for his height-adjustable bridge that: "The object of my invention is to provide an efficient and inexpensive means of adjusting the elevation of the strings above the soundboard of a guitar. . . ." He describes his "bridge-block, which contains an adjustable saddle mechanism, as being fixed to the soundboard by glue or other means," perhaps suggesting the use of screws to withstand the force exerted by the strings. While this in itself is not direct evidence of the use of steel strings—whose use would have increased the force exerted on the soundboard—it does suggest that higher-tension strings may have been in use, which could have distorted the soundboard and bent the neck forward, resulting in an unacceptably high action.

A little later, on March 2, 1886, John Klueber of Sandusky, Ohio, received a patent for a combined bridge and string-holder that also served as a hand-rest (fig. 9).[81] The string-holder is in fact a metal tailpiece with an attached crosspiece of wood or metal, situated where the bridge

79. Jacob Abraham, 1877 Improvement to Tail-Pieces for Guitars. US Patent 198,556, 1877, and issued December 25, 1877.

80. Erland Anderberg, 1883 String-Bridge for Guitars. US Patent 282,147, 1883, issued July 31, 1883. Anderberg was born in 1851 in Malmo, Sweden and immigrated to the US in 1873 (naturalized in the US in 1880). He was listed in Mount Vernon (NY) city directories as a guitar manufacturer, and later as an instrument maker, from 1889 until 1918. It is plausible that Ernest Anderberg, who also made guitars, was his son. In 1892, Ernest Anderberg was registered at the same address in Chelsea, Massachusetts as Pehr Anderberg, both as guitar makers. Pehr Anderberg, according to Groce, also originated in Malmo, coming to the US around the time of the Civil War, first working for Bruno in New York, then moving to Mount Vernon, and later to Boston (Chelsea). It seems likely that there was a familial or business association between them.

81. John Klueber, 1886 Guitar. US Patent 337,337, 1886, issued March 2, 1886.

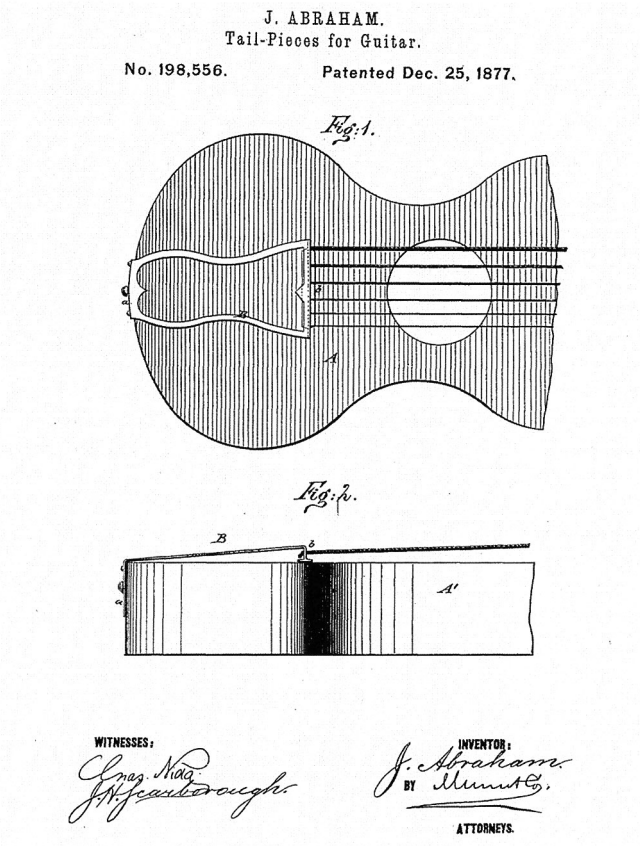

FIGURE 7. Patent for tailpiece, J. Abraham, December 25, 1877. US Patent 198,556.

would normally be. The crosspiece rests on the soundboard, and the strings pass over a ridge, fashioned as part of the tailpiece, that acts as a saddle. The force of the strings is transmitted via the tailpiece to a large end block, to which it is screwed.

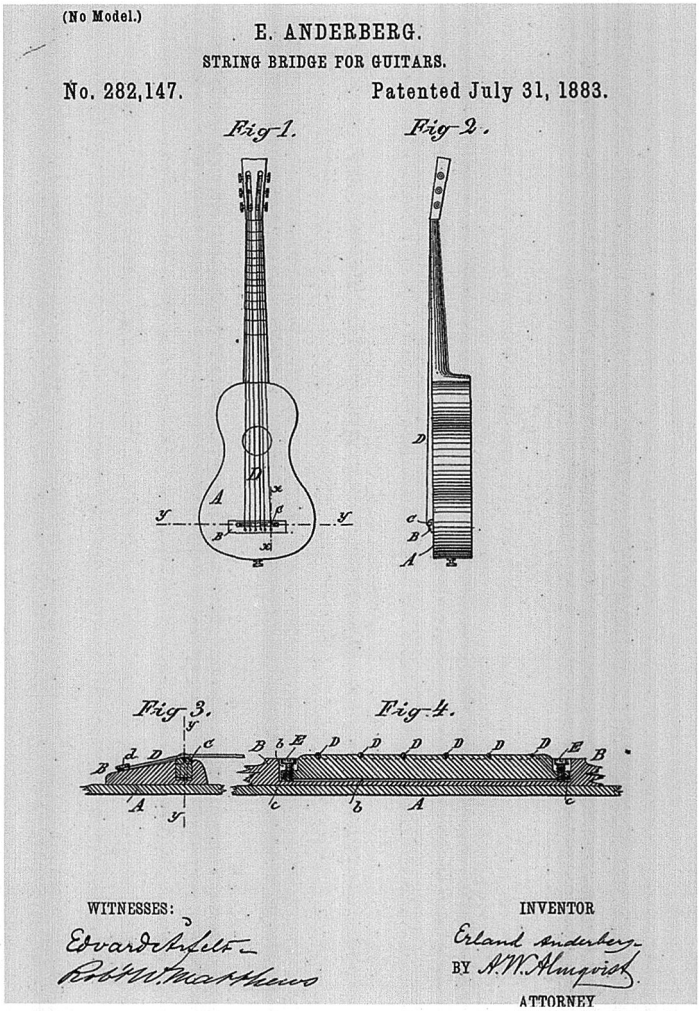

FIGURE 8. Patent for Guitar Bridge, E. Anderberg, July 31, 1883. US Patent 282,147.

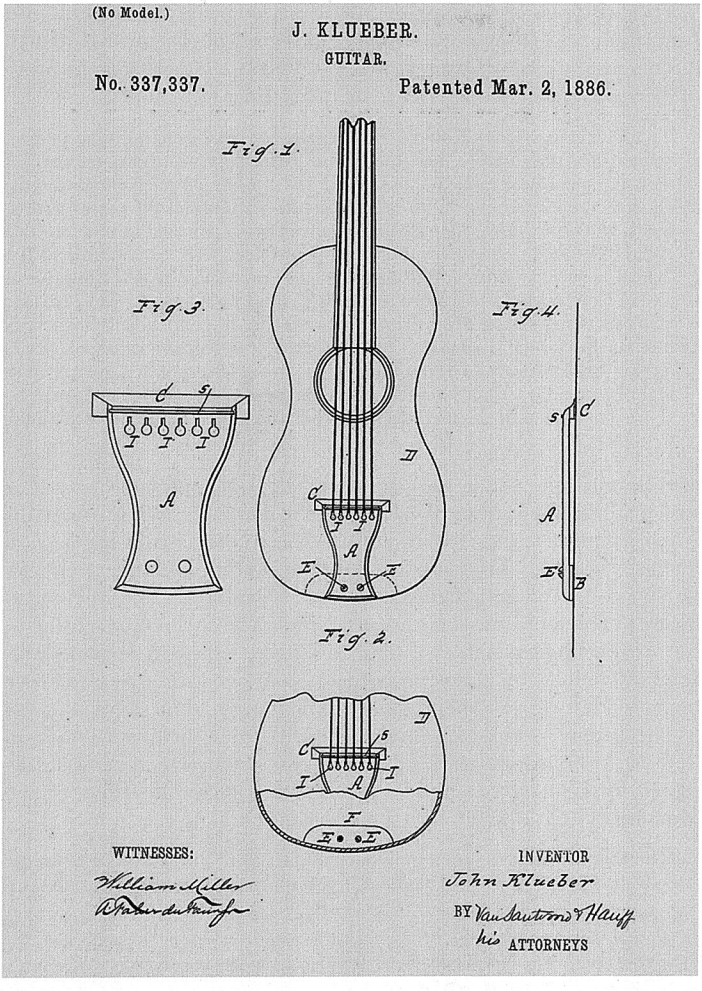

FIGURE 9. Patent for guitar tailpiece, J. Kleuber, March 2, 1886. US Patent 337,337.

The first years of the next decade witnessed a flurry of patents also concerned with bridge and tailpiece design. The patent awarded to Rudolph Lorang of Chicago on June 30, 1891,[82] entitled *Bridge for Musical Instruments*, makes reference to metallic strings in particular:

> In all such instruments that I have named (guitars, mandolins, banjos, zithers) it is desirable to have the strings lie as close to the finger-board as they may without coming in contact therewith while under vibration, in order that the movement required to close may be minimized. Cheap instruments when they leave the factory are of course so adjusted as to attain this end; but in such instruments the finger-board may warp, or the strain of the strings may cause the neck to bend, or the sounding-board to sink just at and in front of the place where the bridge is attached. Either of these causes and others may bring the strings so close to the finger-board that when vibrating they touch it, and thereby prevent the production of a clear tone. Again, the amplitude of vibration of a gut string is very much greater than that of a metallic string, so much so that on a guitar gut strings require to be about an eighth of an inch farther from the finger-board than metallic strings.[83]

Significantly here, while the patent is designed to be appropriate for stringed instruments such as the mandolin and zither, which commonly employed metal strings, it also stipulates the difference in desired action for a guitar strung with gut from that of one strung with metal. Besides Lorang's observation that gut strings need to be further from the fingerboard to accommodate their greater "amplitude of vibration," is the issue of the greater stiffness of metal strings, which in keeping with Young's Modulus on elastic properties, would need to be nearer to the fingerboard to prevent them from becoming sharp when stopped.

The patent received by Charles F. Geiger of Cincinnati, Ohio, on June 30, 1891, is for a tailpiece extension to the bridge, specifically designed to counteract the effect of the forces of metal strings on the soundboard (fig. 10).[84] In the patent Geiger states:

> When the strings of a guitar are attached directly to the bridge-piece on the sounding-board, there is a tendency to lift the piece from its seat or to warp

82. Rudolph Lorang, 1891 Bridge for Musical Instruments. US Patent 455,221, filed January 17, 1891, issued June 30, 1891.

83. Ibid.

84. Charles F. Geiger, 1891 Guitar. US Patent 454,905, filed January 17, 1891, issued June 30, 1891. The patent gives Geiger as assignor to The John Church Company, of the same town. Chas F. Geiger is recorded in the Cincinnati city directory between 1885 and 1895 as being a salesman or clerk for the John Church Company.

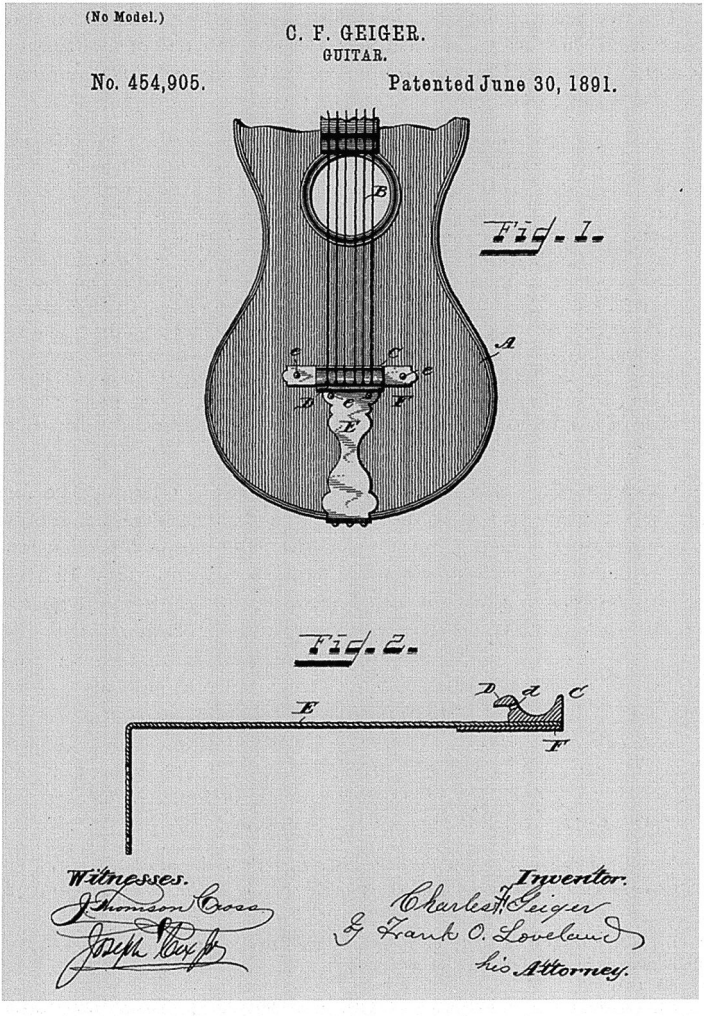

FIGURE 10(a). Patent for tailpiece extension, C. F. Geiger, June 30, 1891. US Patent 454,905.

UNITED STATES PATENT OFFICE.

CHARLES F. GEIGER, OF CINCINNATI, OHIO, ASSIGNOR TO THE JOHN CHURCH COMPANY, OF SAME PLACE.

GUITAR.

SPECIFICATION forming part of Letters Patent No. 454,905, dated June 30, 1891.

Application filed February 9, 1891. Serial No. 380,831. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. GEIGER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Guitars, of which the following is a specification.

When the strings of a guitar are attached directly to the bridge-piece on the sounding-board, there is a tendency to lift the piece from its seat or to warp the sounding-board when the strings are made taut. This is especially true when steel strings are used, as the strain of metal strings is much greater than that of gut strings. It is therefore desirable to have the strain of taut strings on some other part of the instrument than the middle of the sounding-board, and a better tone is produced when the strings are attached to the bridge-piece near the bridge.

By employing my invention all of the advantages derived from attaching the strings near the bridge and relieving the bridge-piece from the strain of taut strings by removing it to the sides of the guitar are obtained.

My invention consists in a combined bridge and tail-piece for guitars and other instruments, hereinafter described and claimed.

Referring to the drawings, Figure 1 is a top view of a portion of a guitar provided with my improved bridge and tail-piece. Fig. 2 is a longitudinal section of the bridge and tail-piece.

A is a sounding-board of a guitar; B B, the strings; C, a bridge, preferably of metal, having a lip D, provided with eyelets *d d*, in which one end of the strings is fastened by knots or otherwise. The lip is curved over to conceal the knots from view, as shown in Fig. 2. I prefer to make this lip and bridge in one solid piece.

E is a tail-piece of any desired pattern rigidly secured to the bridge and extending in the opposite direction from the strings and taking over the end of the sounding-board. The strain of the strings, although attached immediately behind the bridge, is from the end of the guitar, and therefore does not tend to lift the bridge from its seat or warp the sounding-board.

F is a metal plate rigidly secured to the bridge, and by means of which the bridge is attached to the sounding-board by screws *e e* taking through it into the sounding-board. A block or stay may be placed under the sounding-board to receive these screws when a very thin board is used. This plate, being underneath one end of the tail-piece, raises the tail-piece out of contact with the sounding-board and permits a full, clear, and pure tone of the instrument without rattling. I prefer to make the bridge, tail-piece, and plate in separate pieces and rigidly secure them together by soldering or riveting afterward, and any two or all of them may be made in one piece, if desired. In attaching the tail-piece and bridge to a guitar the bridge is placed in its proper position on the sounding-board and the tail-piece then bent over the end of the sounding-board. Thus it is evident that any tail-piece may be readily adjusted to any guitar.

I claim—

1. The combination, in a guitar, of a sounding-board, strings, a lip for fastening one end of the strings, a bridge, and a tail-piece rigidly secured thereto and taking over the end of the sounding-board, substantially as and for the purpose specified.

2. The combination, in a guitar, of a sounding-board, strings, a bridge provided with a lip adapted to secure one end of the strings, a bridge, a tail-piece secured thereto and taking over the end of the sounding-board, and a plate, substantially as and for the purpose specified.

3. The combination, in a guitar, of a sounding-board A, strings B, a bridge C, having a curved lip D, provided with eyelets *d d*, a tail-piece E, rigidly attached to said bridge and taking over the end of the sounding-board, and a plate F between said tail-piece and the sounding-board, substantially as and for the purpose described.

CHAS. F. GEIGER.

Witnesses:
LOUIS COOK,
GEO. B. JENNINGS.

FIGURE 10(b). Patent for tailpiece extension, C. F. Geiger, June 30, 1891. US Patent 454,905.

> the sounding-board when the strings are made taut. This is especially true when steel strings are used, as the strain of metal strings is much greater than that of gut strings. It is therefore desirable to have the strain of taut strings on some other part of the instrument than the middle of the sounding-board, and a better tone is produced when the strings are attached to the bridge-piece near the bridge.[85]

Geiger's invention goes on to describe how the strings are attached to the bridge-piece (the rear part of a preferably metal bridge), screwed into the soundboard and extended through a tailpiece, itself screwed in to the base of the instrument, thereby relieving the soundboard of the strain exerted by the strings. Geiger does not say whether making the bridge-piece and bridge fabricated from metal makes for the better tone of the strings or whether this material was simply a personal preference. Between 1885 and 1895 Geiger was listed in the Cincinnati city directories as either a clerk or a salesman for The John Church Company, musical instrument manufacturers and suppliers originally part of the Oliver Ditson Company.[86] In the 1891 patent application, Geiger is described as "assignor to the John Church Company" who, from that time, installed the tailpiece on its Imperial brand of guitars, claiming that the instruments could be strung equally safely with either gut or steel strings. David Bradford suggests that this may have been the first guitar advertised as being built specifically for steel strings.[87] According to Bradford and Hubert Pleijsier, Lyon & Healy started to ship its Jupiter, Columbus, Marquette, Lakeside and Arion models equipped with factory installed steel strings only in 1896,[88] however, the firm was offering plain steel first and second, and wound steel third strings for sale in the 1884 catalog, as was its contemporary, the J. Howard Foote Company, earlier in 1882–3.[89]

85. Geiger, Guitar patent (1891).

86. Tom Wheeler, *American Guitars: An Illustrated History* (New York: Harper and Row, 1982), 25. Oliver Ditson set up the John Church Company (Cincinnati) as a musical instrument manufacturer and branch of the parent company in 1860, Lyon & Healy (Chicago) in 1864, and John C. Haynes (Boston) in 1865.

87. David K. Bradford, "The First Steel String Guitars," *The Unstrung History of the American Guitar: The Guitar and Nineteenth-Century American Music* (2009), http://www.19thcenturyguitar.com. Accessed, May 1, 2011. Ditson sold the John Church Company to its founder, John Church, in 1871.

88. Pleijsier, *Washburn, Prewar Instrument Styles, Guitars, Mandolins, Banjos and Ukeleles 1883–1940*, 42; David K. Bradford, "The First Steel String Guitars," (2009), accessed July 29, 2012. http://www.19thcenturyguitar.com.

89. The Columbus, Marquette, Lakeside, and Arion models of guitar, equipped with factory-installed steel strings, are advertised in the Lyon & Healy 1900–1901 catalog. The Jupiter makes an appearance later in 1903.

Two more patents, awarded respectively to August H. Hines of New Orleans, Louisiana, on November 3, 1891[90] and Charles E. Mendenhall, together with Frank Ellis Pugh of Vermont, Illinois, on November 10, 1891,[91] were also concerned with bridge and tailpiece improvements for the guitar. While neither patent specifies the use of steel strings, both include sizeable tailpieces that are fastened to the base of the instrument in keeping with a changing trend in design that was proving to be beneficial in counteracting the damage caused by the use of higher-tensioned strings.

The patent awarded to Marzell Kersten of Savanna, Illinois, dated November 24, 1891,[92] also featured a substantial tailpiece fixed to the base of the guitar (fig. 11). In this case, the device was conceived so that, to relieve overall tension, the strings could be easily slackened off when the instrument was not in use and then quickly brought back up to pitch when necessary. This evidently was not simply an aid for changing strings quickly, but rather a device to relieve string stresses, suggesting that the level of the tension of strings at the time was having a detrimental effect on instruments.

Although no further records of US patents specifically related to the guitar have emerged yet for the year 1892,[93] patent applications for improvements to guitar-bridge and tail-piece designs did not diminish, for in 1893 four patents were awarded, three of which had been applied for earlier in 1892: William Penn and Carl Lewis Eggert Jr. of Joplin, Missouri, together received a patent for *Combined Bridge and Tail-Piece for Musical Instruments*, dated January 17, 1893;[94] George Wooster of Fort Apache, Arizona, received a patent for an *Adjustable Bridge for Stringed Musical Instruments*, dated January 24, 1893, in which the strings

90. August H. Hines, 1891 Combined Bridge and Tail Piece for Guitars. US Patent 462,554, 1891, and issued November 3, 1891.

91. Charles E. Mendenhall and Frank Ellis Pugh, 1891 Bridge for Guitars Etc. US Patent 462,869, filed August 24, 1891, issued November 10, 1891. Originally filed for August 24, 1891 as Patent No. 403610.

92. Marzell Kersten, 1891 Tail Piece for Guitars. US Patent 463631, filed September 7, 1891, issued November 24, 1891. Originally applied for September 7, 1891 as Patent No. 405025.

93. A patent was, however, awarded to Charles J. Cook of Montreal on May 24, 1892 for *Tailpiece for Stringed Musical Instruments* that included the guitar but is illustrated for the banjo. US Patent 475,674.

94. William Penn and Carl Lewis Eggert, Jr., 1892 Combined Bridge and Tail-Piece for Musical Instruments. US Patent 490,213, filed June 17, 1892, and issued January 17, 1893. Originally applied for June 17, 1892 as Patent No. 437034.

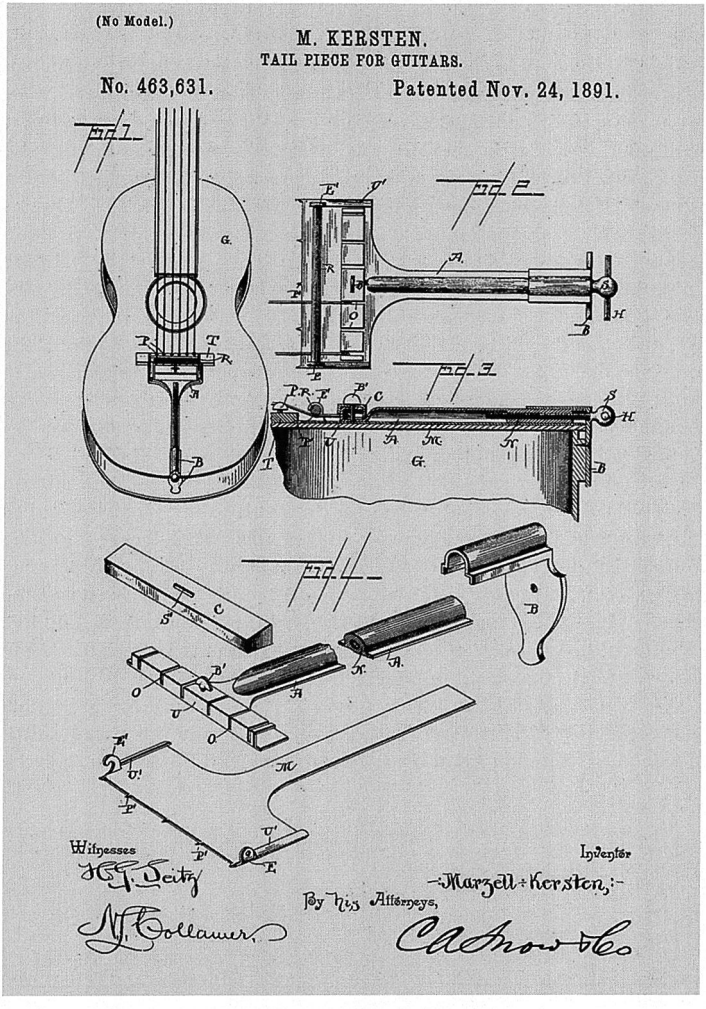

FIGURE 11. Patent for tailpiece extension, M. Kersten, November 24, 1891. US Patent 463,631.

rest on individually adjustable saddles to regulate string length (fig. 12);[95] Frank A. Ingersoll of New York received a patent for *Adjustable Tail-Piece for Guitars*, dated July 4, 1893, in which the bridge bar, acting as a string saddle, may be adjusted laterally towards or away from the end of the fingerboard, and the tailpiece, horizontally,[96] and William P. Owen of Joplin, Missouri (assignor to Jessie C. Owen of the same place) received a patent for a *Bridge and Tail-Piece*, applied for on January 23,1893 but not granted until November 21, 1893.[97] Owen's patent declares that although an adjustable bridge and tailpiece is not a new idea, his design is unique in that the two parts are separate, with the bridge being adjustable vertically and the tailpiece horizontally. By this, Owen means that the tailpiece would be adjustable toward or away from the bridge in the horizontal plane. Of these four, Wooster's patent is the only one that refers directly to string composition, mentioning the use of both silk and gut, and steel strings. The others, as with the previous patented designs from 1891, feature substantially built tailpieces together with their method of fixing.

The patent awarded to Pehr Anderberg of Chelsea, Massachusetts, on March 20, 1894[98] detailed three improvements to the guitar related to the stringing: a strengthened neck and truss rod design, a type of locking tuning peg, and a combination bridge and tailpiece in which the bridge is elevated from the top of the soundboard, supported on a metal frame that is part of the tailpiece itself fixed to the soundboard (fig. 13). Although this is not stated explicitly, all three appear to be intended to help withstand the effects of higher string tension.

On May 8, 1894, R. L. Turner was awarded a patent for a guitar tailpiece (fig. 14).[99] This design is for a substantial interior metal device attached to the guitar's end bock. Two arms extend upward through the

95. George Wooster, 1892 Adjustable Bridge for Stringed Musical Instruments. US Patent 490,528, filed October 17, 1892, issued January 24, 1893. Originally applied for October 17, 1892 as Patent No. 449140.

96. Frank A. Ingersoll, 1892 Adjustable Tail-Piece for Guitars. US Patent 500,581, filed December 28, 1892, issued July 4, 1893. Originally applied for December 28, 1892 as Patent No. 456581.

97. William P. Owen, 1893 Bridge and Tail-Piece. US Patent 509,240, filed January 23, 1893, issued November 21, 1893. Originally applied for January 23, 1893 as Patent No. 459348.

98. Pehr Anderberg, 1894 Guitar. US Patent 515,717 filed July 26, 1894, issued March 20, 1894.

99. Originally filed for February 6, 1894 as Patent No. 499,248.

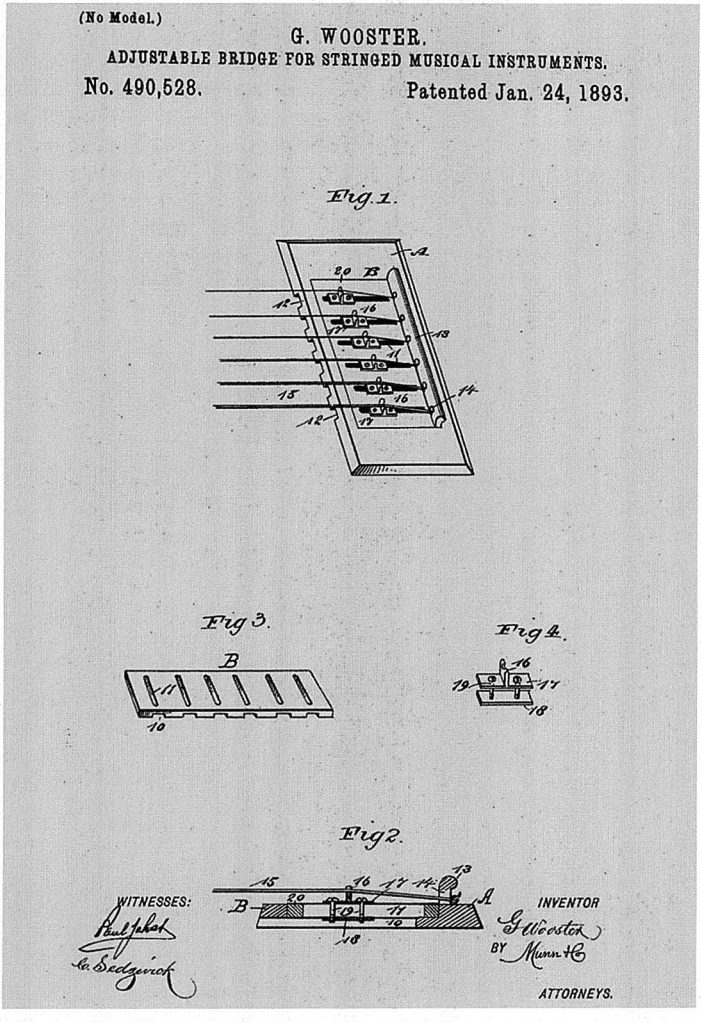

FIGURE 12. "Adjustable Bridge for Stringed Musical Instruments" by George Wooster, January 24, 1893. US Patent 490,528.

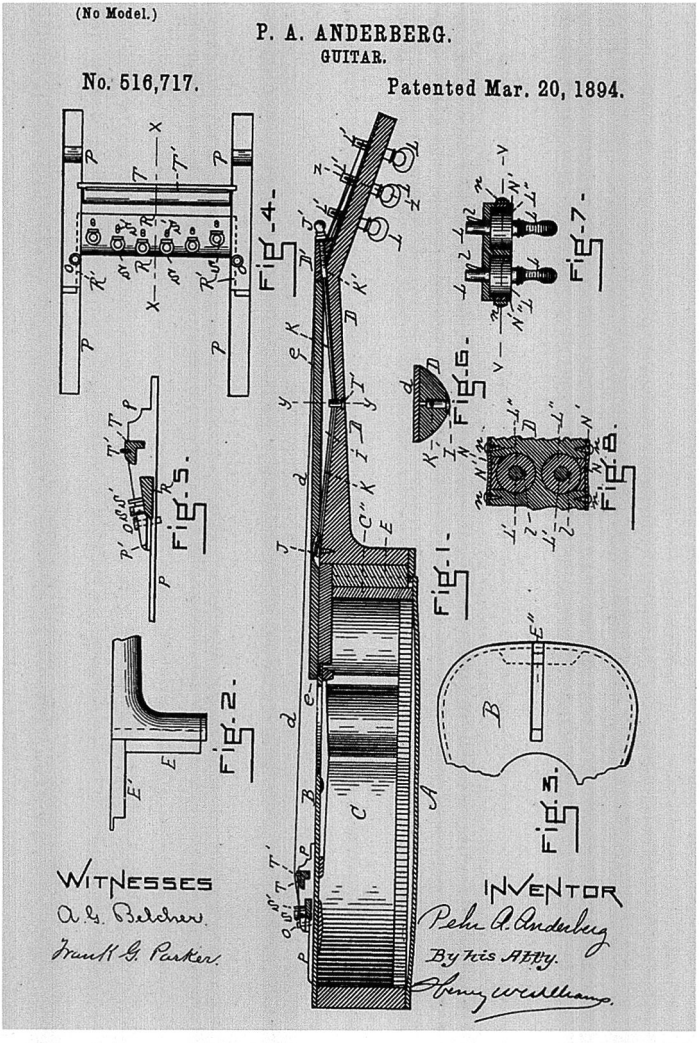

FIGURE 13. "Guitar" by Pehr Anderberg, March 20, 1894. US Patent 516717.

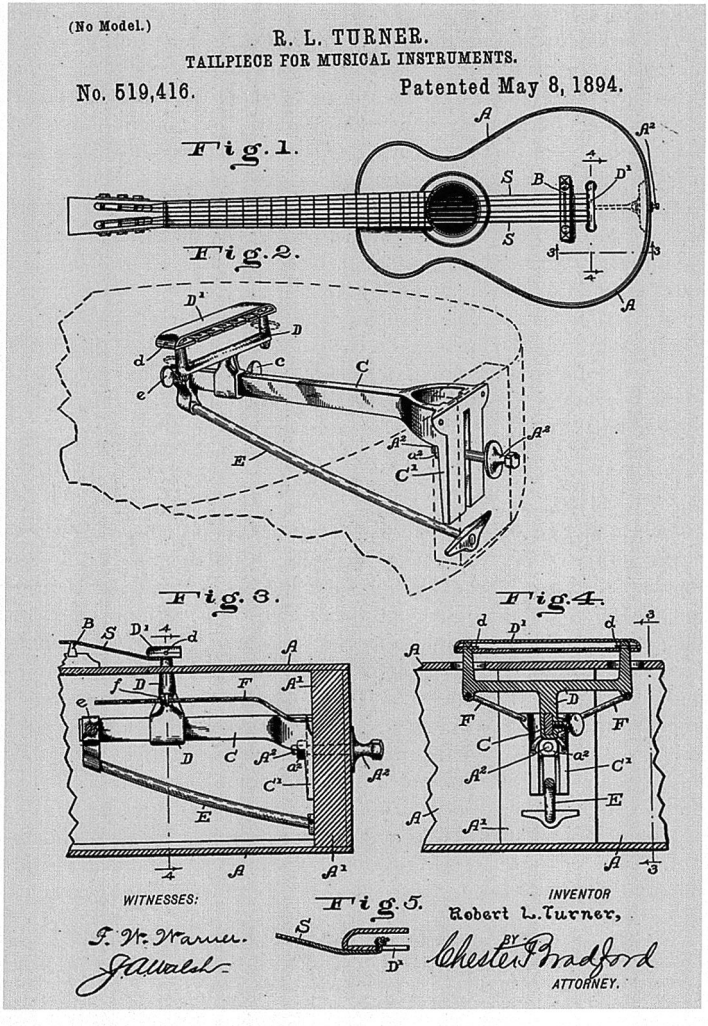

FIGURE 14. Patent for Guitar Tailpiece, R. L. Turner, May 8, 1894. US Patent 519416.

guitar's soundboard to support a tailpiece that is suspended to the rear of the bridge anchoring the strings, while at the same time isolating them from the soundboard. Turner again appears to be addressing instruments that could have been strung at a higher tension by incorporating a diagonal brace in his design that runs from the bottom of the end block to the front part of the internal device to add rigidity to the tailpiece. Its use is optional, depending on the size of the instrument.

Patents for tailpiece and bridge improvements, ranging from simple metal plates attached to the end block to bridges with adjustable saddles, continued to be awarded throughout the second half of the 1890s and into the 1900s. While the manner of securing the bridges to the instrument often appears to be substantial, their main design characteristic is a move away from the fixing and terminating of the strings at the bridge itself—with the associated rotational force exerted on to the soundboard in that area—to extending the strings into sturdy tailpieces attached to the end block and so relieving their strain on the soundboard.

Conclusions

Guitars with factory-installed steel strings did not become available until the middle of the 1890s—Lyon & Healy, for instance, started to ship Jupiter, Columbus, Marquette, Lakeside, and Arion models strung with steel in 1896.[100] However, steel for plain trebles and in combination with silk for the core of overwound basses had appeared in J. Howard Foote's musical merchandise catalog (1882–3) and in Penny's account of winding guitar strings in Connecticut (1863). Combined with the reference to metal strings in Reed's patent of 1872, this evidence suggests that steel strings were used by some North American guitarists from much earlier in the second half of the nineteenth century, some three decades before they became a factory option on commercially manufactured guitars.

Roger Siminoff's references to the Gibson Company's early twentieth-century use of trebles of silver-plated copper wire in combination with silk-cored basses overwound with silver-plated copper,[101] appear to be er-

100. Pleijsier, *Washburn, Prewar Instrument Styles, Guitars, Mandolins, Banjos and Ukeleles 1883–1940,* 42; David K. Bradford, "The First Steel String Guitars," *The Unstrung History of the American Guitar* (2009), accessed 7/29/2012.

101. Roger H Siminoff, "Gibson Strings," *Gibson Guitars: 100 Years of an American Icon,* ed. Walter Carter (Los Angeles: General Publishing Group, 1994), 138–139. While Siminoff here states that silver-plated copper wire was used for the high strings, in *Gibson's Authorative Guide to Guitar Strings,* he mentions only copper wire as a string

roneous: copper, with or without plating, lacks the tensile strength necessary to reach even the *g* of the third string. According to Siminoff, Gibson's own brand of metal strings first appeared as an accessory product in the 1909 *Catalog H*, although he claims strings had been available from the company (presumably out-sourced) before that date.[102]

C. F. Martin, on the other hand, did not enter the commercial steel-string guitar market until 1916, although some guitars strung with steel do sporadically appear as special orders in company ledgers from as early as 1900. Martin had initially provided guitars for both Ditson and the Southern California Music Company, and then, from 1918, directly marketed its own models equipped with steel strings. According to Johnston, it was not uncommon for Martin to substitute steel for the first string in a gut set, and in the early 1920s Martin shipped many guitars with steel trebles together with wound basses from an otherwise gut string set, which he describes as "not having a steel core" (presumably they were overwound silk, but perhaps silk and steel).[103] As the Martin Company had made a name with prominent American performers playing gut-strung instruments even before the emergence of a distinctive BMG community and was also supplying this type of guitar to the American parlor, it is not surprising that its move to equipping guitars with steel trebles was cautious at first. However, by including steel-strung guitars in its range, the company reacted to public demand, and it is evident from the amount of advertising in musical instrument merchandising catalogs, newspapers, and BMG journals that steel strings, whether plain or overwound, had been readily available since at least the early 1880s and that steel as a string material was already emerging earlier. Johnston's statement regarding the shipping of Martin guitars with mixed string materials suggests there may also have been a practice of stringing the top two treble strings of the guitar with differing materials in combination.

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material. Peruffo, when explaining the highest pitch a particular type of string can be tuned without breaking, cites Remy Gug, who observed that copper alloy strings had a breaking frequency of 125 Hz per metre. On a guitar with a string length of 635 mm, the highest frequency to which this type of string could be stretched would be 196.85 Hz, or *g*. A copper alloy string is usually made with between 5% and 30% of another metal (typically brass), making it stronger than a pure copper string, which would have an even lower breaking frequency, making it unsuitable for guitar trebles.

102. Ibid., 138–139.

103. Richard Johnston, *Martin Guitars: A Technical Reference*, 1st ed. (New York: Hal Leonard Books, 2009), 47.

The attraction of plain steel strings was compounded by the greater expense of gut in addition to its shorter playing life. However, aesthetic considerations of tone and volume must have had an influence on string material usage. When the guitar was to be used in a domestic or other intimate setting, gut would have been loud enough, and its timbral characteristics were likely to have been preferred for the repertoire of the early nineteenth-century European guitar pedagogues. This would have been true in a professional concert setting, too, even with the limitation of the instrument's volume. On the other hand, when the instrument was used for vocal accompaniment or in small musical ensembles gathering informally in the parlor to play dance tunes, the practice of substituting steel for the first or first and second strings may have developed, and the resulting timbral mixture may have been acceptable–or even desired. When using the guitar alongside other instruments such as the violin or piano (now a louder instrument than the early nineteenth-century-Viennese fortepiano with which the guitar had been paired), or for dances outdoors, the increased volume resulting from substituting steel for gut may have been preferred. In combination with the more powerful gut-strung banjo, silk and steel basses would have given the guitar a balancing strength of sound, and when, from the 1890s, the guitar was used as part of the popular mandolin orchestras, steel trebles in conjunction with either steel-core or silk and steel-core basses would have given both the necessary increased volume needed and the compatible timbre.

By the end of the nineteenth century, treble strings for the guitar were available in gut, plain steel, and silver-plated steel, while basses were available with a silk core, a steel core, or a silk and steel core overwound with silver-plated copper wire. Significantly, the transition from gut and silk to steel reflected a move away from the solo, duet, and accompanimental use of the guitar in the American parlor to its inclusion in ensemble and dance music played in bars, halls, and larger outdoors settings.