THE VIOLIN.

THE VIOLIN:

A CONCISE EXPOSITION

OF THE

GENERAL PRINCIPLES OF CONSTRUCTION THEORETICALLY AND PRACTICALLY TREATED;

INCLUDING

THE IMPORTANT RESEARCHES OF SAVART,

AN EPITOME OF THE

LIVES OF THE MOST EMINENT ARTISTS,

AND AN

ALPHABETICAL LIST OF VIOLIN MAKERS.

BY

P. DAVIDSON.

ILLUSTRATED WITH LITHOGRAPHIC VIGNETTE AND NUMEROUS WOODCUTS.

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pp. v. – viii. are misplaced

PREFACE.

In writing upon such a subject as the present, wherein so much variety of matter is embraced, an author must, of necessity, have recourse to the works of others for reference; where this is the case, such writings have been specified either in the body of the work or in the foot-notes.

My object is simply this:—To furnish for those violin-amateurs who may be unacquainted with the subject, such information,—however imperfect,—in a plain and intelligible form, as shall enable them not only to avoid some of the spurious rubbish which are too often palmed upon the unwary by disrespectable dealers, but also to assist those who may be mechanically inclined in a knowledge of the construction of the instrument.

To the subscribers, and those gentlemen who have so kindly contributed to my violin-queries, by their obliging and candid replies, I return my sincere thanks; and, although care has been taken to avoid actual errors in the present treatise, I am fully aware that sundry omissions, or imperfections of a minor nature, may still occur, and should esteem it a particular favour were the critical reader to call my attention to such.

Trusting that my little work may at least be the means of enabling the inexperienced mechanical amateur and violin dilettanti to understand the construction of the instrument in a general sense, and that it may also afford details sufficient to stimulate them to further researches in this laudable art, is the earnest wish of

THE AUTHOR.

ERRATA.

Page 58, line 4, *for* "and to facilitate," *read* "viz., to facilitate."

Page 72, line 8, ,, "and *c* the sound-post," *read* "and *d* the sound-post."

Page	73,	line	15,	*for*	"dimensions or,"	*read*	"dimensions of."
,,	82,	,,	2,	,,	"harhness,"	,,	"harshness."
,,	97,	,,	7,	,,	"$2\frac{8}{4}$ inches,"	,,	"$2\frac{3}{4}$ inches."
,,	105,	,,	*illustration*,		"Fig. 16,"	,,	"Fig. 19."
,,	127,	,,	5,	*for*	"each are made,"	,,	"they are made."
,,	172,	,,	15,	,,	"arn ish,"	,,	"varnish."
,,	183,	,,	42,	,,	"reschian school,"	,,	"Breschian school,"

THE VIOLIN.

CHAPTER I.

THE EARLY HISTORY OF THE INSTRUMENT.

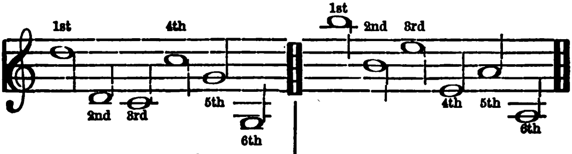
BOW instruments exist from a very early date, some of which approximate closely in form to our modern Violin, whilst others are of the rudest description, but still possess one important distinction from other stringed instruments, viz., that of being played upon by a bow. Amongst such instruments may be ranked the following, although a great many more might be enumerated:—The Ravanastron of India and Ceylon; the Rouana of the same countries; the Urh-heen, or Fiddle of China; the Omerti and Kemangeh a gous of Arabia and Persia; the Rebab, also an Arabian instrument; the Goudok of Russia; the Soorunga and Tarau, or Thro of the Burmese Empire; the Koba of Tartary; the single stringed Violin, or Monochord of Egypt; the Fidla, Langspel, and Sumphion of the Icelanders; the Gue of the Shetlanders; the Guhue of Africa; the Crouther, Crywth, or Croud of Scotland, Ireland, and Wales; the Linterculus, and lastly, the Viol species, which bear the nearest resemblance to the violin proper. Let us rapidly glance over some of the foregoing instruments, whereby we may trace a slight similitude to that of the Violin. The Ravanastron and Rouana are constructed almost precisely similar, both being formed of a wooden cylinder, over one end of which a piece of skin or thin wood is fixed, serving as a sounding board, upon which is placed a small bridge, whilst attached crossways to the wooden tube is a handle containing two pegs for retaining the two strings of this primitive instrument. The Urh-heen, or Chinese Fiddle, is constructed with a cylindrical body, over which is stretched a piece of snake's skin, upon which rests a bridge, over which four strings are stretched, terminating in the pegs which are inserted in a line in the longitudinal and cylindrical hand of the instrument. The Omerti is a somewhat similarly constructed instrument; but having a body formed from the shell of the cocoa-nut, part of which is removed and replaced by skin or wood to form the belly of the instrument, whilst holes of fantastic shape are cut through the body of the shell, forming a communication with the internal air. This also is a two stringed instrument, as well as the Kemangeh a gous of the Arabs, which is of the same form and construction. The Rebab and Goudok are somewhat similar, but each having four sides upon the under and upper edges of which pieces of skin are stretched to form the back and breast. The Goudok is of a more advanced construction than the Rebab, possessing a curved head, tail-piece, finger-board, and sounding holes in the breast, whilst the body of this instrument is better adapted for volume of tone. The Soorunga is a three stringed instrument, having the body and neck formed from a solid block of wood. The back of this instrument is very convex, being almost a semicircle, and is exquisitely hollowed out, whilst the neck is of a somewhat similar pattern to that of the violin, but instead of a scroll there are generally carvings of birds, &c., below, which are the pegs. The front of this instrument is entirely hollow, except near to the extreme end, where a small piece of parchment is stretched which forms the belly, upon which is placed the bridge sustaining the three strings which are united to a tail-piece as in the ordinary violin. Part of the convex sides are cut away in graceful curves, whilst upon the surface of the back a few variegated figures are carved. The Tarau or Thro of the same country is of an elongated form, somewhat resembling the common violin, having three strings and a finger-board carved in wood or ivory. The Koba is an instrument somewhat analogous to the former, and having two horse hair strings. The Monochord, or single stringed violin, is common throughout Egypt, but the ancient Egyptians appear to have been acquainted with a two stringed instrument at a very early date, as Graham, in his account of the first Edinburgh Musical Festival relates, that upon an Egyptian obelisk brought to Rome by Augustus, and which was supposed to have been originally erected at Heliopolis by Sesostris, four centuries previous to the Trojan war, is a representation of an instrument twenty-one inches in length, having a neck and two strings, and an outline resembling a guitar, but which may certainly be excluded from the violin species, as there is every probability for supposing that no bow instrument was known in Egypt at such an early period. The Fidla of the Icelanders was a rudely fashioned instrument, having six wires or strings of brass or copper, whilst the Langspel and Sumphion were of a similar construction, the former having four and sometimes five brass or copper strings, with a fretted finger-board beneath. All those instruments were in use in Iceland from an early date, but are now almost extinct. The Gue was an early musical instrument in use amongst the Shetlanders, along with another species of violin having two horse hair strings, which probably was derived from Iceland or Norway, and which was performed upon in a manner resembling that of the violoncello. The Guhue is an instrument of rude construction used in Africa, having five hair strings. This instrument is sometimes used as a guitar, at other times played upon by a bow, as custom or fancy may dictate. Another instrument, somewhat similar in form to the Guhue, is also used in some parts of Africa, having a large single string formed from a number of twisted hairs, and having two holes cut in the breast, which is a piece of skin stretched over part of the instrument. Such are a few of the earliest bow instruments, some of which are supposed to have been in use from a very remote period, as the Ravanastron of India has been traditionally ascribed to have been known there several thousands of years anterior to the birth of Christ.

We now arrive at what is supposed to be a more modern European instrument, although certainly very old—the Crwth or Crowd. Some learned authors are of opinion that those two names do not imply a synonymous instrument, but this must be left to those deeply versed in antiquarian lore. This instrument at an early date was very common throughout Wales and the Scottish Highlands, as well as in other parts of Europe. The earliest mention made of the Crwth is in the poems of Venantius Fortunatus (Book V.), who was Bishop of Poitou, where, in an address to Lupus, Duke of Champagne, he states—

> "Plaudat tibi Barbarus harpa,
> Chrotta Britanna canat."
>
> "Let the barbarian praise thee with the harp,
> Let the British Crwth sing."

This reverend poet wrote about the year 560, but it is generally supposed the Crwth is of a much anterior date to this; but at the same time it must be particularly observed that this writer who thus mentions the *British* Crwth was an Italian, as also, that one essential and important distinguishing feature used by him to designate the style of music belonging to the Crwth, is in using the word *canat*, sing, thereby implying a quality in the instrument somewhat synonymous to the human voice. The word appears to be of Celtic origin, although we find a remarkable resemblance between the word Crwth and the ancient and modern Irish term *cruit*, signifying a harp. The distinction between those ancient musical instruments is one of the utmost difficulty, as most of the sculptured representations are much defaced, and little care bestowed sometimes in the cutting of them. From decayed relics, monumental sculptures, ancient manuscripts, and other documents, we learn the form and construction of the ancient Crwth. In the writings of Montfauçon, a picture is given of a five stringed violin, which is represented in the hands of a player, this drawing having been copied from a monumental statue upon the Church of Notre Dame in Paris. This statue is supposed to have been sculptured about the same period as that in which Venantius Fortunatus wrote, but this is doubtful. Of the Crwth there have been different kinds, the most ancient having had three strings, whilst the number subsequently was increased to six. One distinguishing feature between the Crwth and Viol, is in the almost equal prolongation of that part of the instrument through which the openings are cut for the admission of the fingers whilst playing. It will be seen from the following that this instrument, although of the same class, is widely different from the violin, but is nevertheless an early though primitive type of the same family. From dimensions taken from several specimens of the British Crwth, the following measurements may be taken as a mean:—Length, 20½ to 22½ inches; breadth at bottom, 9½ to 10; breadth at top, 8; depth, 2; length of finger board, 10 to 10½ inches. The back and breast were generally made of maple, the breast sometimes containing only two circular sound holes at the bottom, about 1¼ inches in diameter, but some other instruments of the same type had two additional round holes cut through the lower or opposite end. The bridge was made of a peculiar form, having one foot much longer than the other, which passed through one of the sounding holes, and rested on the inner surface of the back, whilst the shorter foot rested upon the breast as in the violin, being placed near to one of the circular openings. Two elongated openings were cut through the narrow end of the instrument parallel with the sides, to allow the thumb and fingers of the player to pass, whilst the solid piece left in the centre served as a hand, upon which was placed a finger-board. Six vertical holes were cut for the pegs near to the extremity of the instrument, and in a line with the outer edge, whilst the tail-piece was often made of different patterns, and attached in various ways to the breast. The bridge supporting the six strings was placed diagonally across the breast, four strings passing over the finger-board, whilst the remaining two were placed at some distance from the others, to the left of the finger board, and were intended to be played by the thumb. There were several methods of tuning the instrument, amongst which the two following may be mentioned:—

STRINGS.



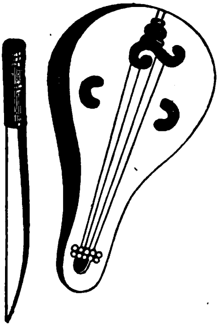
EARLY METHOD. LATER METHOD.

The Honorable Daines Barrington, in an interesting paper on the Crwth, presented to the London Antiquarian Society, states that he heard the instrument played upon by John Morgan in Anglesea, about 1770, and even at that period, he observes, the instrument was almost extinct; but we learn from another authority, who had frequently heard the instrument, that it was in use at a period thirty years later amongst some of the old Welsh peasantry.* The Crwth is stated by some authors to be of British origin, whilst others fancy it belongs originally to France, and from thence passed to Britain; but in all likelihood the real origin of this rudimentary instrument, as well as that of the true violin, will for ever remain in obscurity.

The next instrument claiming attention is the Viol, which was also known at a very early date, and was in common use throughout Britain during the fifteenth and sixteenth centuries. Its origin is attributed to one Alcuin or Albinus, who lived in the eighth century. The earliest viols appear to have had three strings, but the number was changed at later periods to four, five, and six. Viols were made of all sizes and shapes, from the diminutive three stringed favourite, to the voluminous violone, and were a highly esteemed class of instruments, inasmuch as in every household of the wealthier classes a chest of viols formed an indispensable requisite. The accompanying illustration of the viol, as used in Scotland in the fifteenth century, will convey to the mind of the reader a better idea of

* W. Bingley.

the appearance of this instrument, than the most detailed written description. The chest or quartett of viols bore a similar analogy to our quartett of violins, viz., two treble, two tenor, and two bass viols, which important combination arose from forming a set of instruments approaching in harmony to the various grades of the human voice, viz., soprano, contralto, tenor, and bass. At a period subsequent to this, the bass variety was distinguished by the name of Viol di gamba, from



its position between the legs when played upon, whilst finally the terms Violone or Contre Basso, Violoncello, Viola, and Violin, comprised the distinctive titles of the Viol family in its perfected state. The finger-board of the viol was fretted for the proper stopping of the strings, as in the guitar, whilst various methods of tuning were adopted, but the most prevalent system in Britain at least, appears to have been that by Fourths.

So great was the supremacy of this instrument amongst our ancestors, that for several years after the violin had been introduced, the Viol always held the preference, until the former became more widely known, and its qualities truly appreciated. The viol, although a pleasing, was a soft instrument, the sounds possessing little loudness or intensity. For a period of many years after the violin began to be first introduced, and thus to supplant the viol, we learn from a contemporary writer the struggles it had to encounter ere it attained priority. In allusion to a concert of various instruments, the author remarks—

"The scoulding violins will out-top them all;"

and whilst he is willing to admit a couple of violins amongst the other instruments adapted for a "merry-making," he takes the precaution to have also "*a pair of lusty well-sized theorboes*"—the reason being that the violins "*may not outcry the rest of the musick, the basses especially.*"* Violers, or performers on the viol, were quite numerous throughout Britain during the sixteenth and seventeenth centuries, and even formed a part of the Royal Household. They wore red bonnets and were clothed in livery, and received a small gratuity. The terms, *Fiddle* and *Fiddler*, so frequently mentioned by some of the early authors, sometimes certainly refer to the viol and violer, as well as to the violin and violinist, as those words have been, by many ancient historians and poets, used without any due regard to proper distinction. The viol was in universal use throughout Scotland in the seventeenth century; but at this period it must not be supposed that the violin was unknown, as frequent reference is made to it several centuries earlier. From ancient documents we learn that four violers played at the Cross in Edinburgh on the day of the Coronation of Charles II., 1660; and many more quotations might be cited, verifying the common use of the viol in Edinburgh and other Scottish towns. In concluding the few preceding remarks upon the viol, it may not be out

* Mace, Musick's Monument, 1676.

of place here to include, also, a species of viol which ranked as a particular favourite throughout Britain, about the commencement of the eighteenth century, and which was known under the name of the Viol di amour. It was a delicate and sweet-toned instrument, and had five strings formed of wire, although latterly a good many modifications in the form of the instrument took place. It appears, also, to have erroneously passed under the name of the Psalter, to which it certainly bore no resemblance, and was publicly used in London about 1720; and in Edinburgh, mention is made of it in 1750. In 1752, Passerini, a teacher of music in Edinburgh, is mentioned as having been an excellent player upon the Viol di amour; and a few years later, another Italian performer, Pasquali, gave a concert, in which this instrument took a prominent position. About 1800 it was totally disused, as no reference is made to it in public concerts after this time, neither is there mention made of any celebrated performer.

We now arrive at the most perfect instrument of all, and which has aptly been denominated "the king of instruments"—the Violin. At what time this elegant instrument came first into use, or emerged from the workshop, it is impossible to mention; but it is now generally admitted that Italy gave birth to it, about the middle of the sixteenth century. The different sizes of this type, violin, viola, violoncello, and double bass, have supplanted the whole host of viols, whilst, from an identity of form, along with perfect intonation, a similarity of quality has been attained which renders this class of instruments to approximate closer to the human voice than any other. This excellency in the violin arises chiefly from its power, quality, and flexibility, due chiefly to its outline, material, and proportions, greater thickness, with smaller number and increased tension of the strings, as well as to the improved form and greater strength of the bow used with the instrument. Rude approximations to the violin are to be found decorating monumental tablets and illuminated manuscripts throughout Britain and the Continent at an early date, but those illustrations chiefly represent the rebec with one, two, and three strings, although some representations certainly possess a close analogy of parts, as incurvatures of sides, bridge, tail-piece, finger-board, and extended hand. The earliest representation known of any instrument truly approximating to the fiddle or violin, is contained in the "De Cantu et Musica Sacra" of the Abbot Gerbert, and is assigned to the eighth century. In this figure the instrument has but one string, but possesses a bridge and tail-piece, two sound-holes, and something like a finger-board, whilst a bow rests on the string, and the portion of the right hand shows that it was held as the violin.

A somewhat similar instrument, having four strings, with two circular sounding holes near the top, illustrates an ancient illuminated manuscript—"Liber Psalmorum"—assigned to the Anglo Saxons of the the tenth century. This illustration represents David with a harp upon his knee, a dove descending, whilst upon each side is a figure; one an ancient juggler performing a favourite feat of tossing up knives, whilst the other is playing upon this rudimentary violin. In "Strutt's Sports and Pastimes" is to be found a somewhat similar illustration.

Upon the cover of an ancient manuscript Bible is a picture containing three figures, the centre one being an acrobat, standing head downwards—one upon the left is represented as playing upon a two-stringed fiddle or rebec; the other figure, upon the right, appears to be performing on a tambourine. This copy is ascribed to the thirteenth century, and is supposed to have originally belonged to the Abbey of Dunfermline. Amongst the ornamental *bas reliefs* upon the Abbey of Melrose, there is a representation of an instrument supposed by some to be of the true violin type, by others, the crwth. This venerable structure was the work of a Parisian architect, and was founded in 1136. Dauney in his work, "Ancient Scotish Melodies," concludes that no such instruments as the violin prevailed in Scotland about this time, as Giraldus Cambrensis, who wrote in 1187, only speaks of the harp; the tabour, and the bagpipe, in use amongst the Scots, but from other sources, we are inclined to think different—but this is a matter more suitable to the researches of the antiquarian than to the general reading of the violin amateur.

Many other ancient representations of the violin species might be enumerated, of which the following must suffice for the present:—Upon one of the stained glass windows of Dronfield Church, Derbyshire; of Staple Church, Kent; St. Denis, near Paris; also upon the carved seats of the choir in Worcester Cathedral; in the Musurgia of Lucinius; on the façade of Amiens Cathedral;—all the foregoing being ascribed to a pretty early period. As previously remarked, the term "Fiddler" cannot be accepted to signify "Violinist" at all times, although it was evidently used by many ancient writers to designate a player on the violin; yet in numerous cases, where early mention is made of the word, it is impossible that it can be classed as violinist. In the song of the Nibelungen, which is considered the most ancient of all the Teutonic poetical romances which have been preserved entire, we find the following:—

> "Folker knight of courage, bold by his side sat he;
> A sharp and mighty *fiddle-stick* held the hero free;"

again,

> "Raging like a savage bear; a *fiddler* mad is he;
> Praised be my luck that from the fiend safely I could flee"—

where thus the fiddle-stick is made to represent the sword of the warrior. This poem is ascribed to the eleventh century; and again, in the following century, in the life of St. Christopher, mention is made of "*the fithele* and of song." Fiddlers also formed a part of the Royal Household in the fifteenth century,—their number about this time having been limited to three, and in the same century mention is made of several throughout Scotland, as "the *fidelar* of Dunbar," "the brokin-bakkit *fithelar* in Sanct Androws," whilst at the commencement of the following century every Scottish town possessed a "*fithelar*," as various ancient documents testify. In 1505 a "hielan *fithelar*" is spoken of as having received gratuities in Perth. The violin appears to have been one of the many instruments used about this time in accompanying the marriage guests to the church, as from a work in 1543 we read, "Such folks also do come to the church with all manner of pompe and pride, and gorgiousness of rayment and jewels. They come with a great noise of harpes, lutes, *kyttes*, basens and drommes, wherwyth they trouble the whole church, &c."* Upon the return of Queen Mary to Scotland in 1560, violins and rebecs were used in Edinburgh to celebrate her arrival; and in the following year we have mention of violins being used to accompany the plays in the Court of Queen Elizabeth, and a few years later a violin is described belonging to this Queen, with a hole cut through the hand for admitting the thumb of the player. In a rare tract, written during the reign of this sovereign,† the author, referring to the ancient Morris-dancers, observes, "Footing the Morris about the May-pole, and he not hearing the minstrelsie for the *fidling*, the tune for the sound, nor the pipe for the noise of the tabor, bluntly demanded if they were not all beside themselves, that they so lip'd and skip'd without any occasion," from which it may be presumed that the "fiddlers" in those ancient times sometimes combined to render their playing a work of "*strength.*"

In the records of Orkney is a passage referring to the execution of a murderer in 1616, who had killed one "David Sandie, *fidler*, with ane durk;" and about this time the violin was also well known in the Shetland

* Christen State of Matrimony.

† Plaine Percevall the Peacemaker of England.

Islands. From a quaint author in 1634,* we cite the following referring to country wakes—"They hate the laurell, which is the reason they have no poets amongst them, so as if there be any that seeme to have a smatch in that generous science, he arrives no higher than the style of a ballet, wherein they have a reasonable facultie, especially at a wake, when they assemble themselves together at a towne green, for then they sing their ballets and lay out such throats as the country *fidlers* cannot be heard." A contemporary author† relates the following on marriage feasts:—"Some cannot be merrie without the noise of *fiddlers*, who scrape acquaintance at the first sight; nor sing, unless the divell himself come in for a part," &c. And from another author, about the same date,‡ we learn the following:—"Next morning come the *fidlers*, and scrape him a wicked reveillez. The drums rattle, the shaumers tote, the trumpets sound tan ta ra, ra, ra, and the whole street rings with the benedictions and good wishes of *fidlers*, pipers, and trumpetters."

Shirley, in his Lady of Pleasure, written about 1635, makes one of the characters say:—

"The case is alter'd since we lived i' the country;
We do not now invite the poor o' the parish
To dinner, keep a table for the tenants;
Our kitchen does not smell of beef; the cellar
Defies the price of malt and hops; the footmen

* A strange Metamorphosis of Man transformed into a Wildernesse deciphered in Characters. 1634.

† Griffith's Bethel, or a Forme of Families. 1634.

‡ Comforts of Wooing.

> And coach-drivers may be drunk, like gentlemen,
> With wine; nor will *three fiddlers* upon holidays,
> With aid of bagpipes, that called in the country
> To dance and plough the hall up with their hobnails,
> Now make my lady merry."

The violin about this time was used as a military musical instrument in France, Spain, and several other parts of the Continent, as well as in Britain. In the Memoirs of Count Grammont, a description is given of the siege of Lerida in 1647, by the Prince de Condé, who "ordered the trenches to be mounted at noonday by his own regiment, at the head of which marched *four and twenty fiddlers.* Night approaching, we were all in high spirits, our violins were playing soft airs, and we were comfortably regaling ourselves," he thus pleasantly goes on; whilst in the British army there was also a complement of violinists, and who at this time were spoken of as being anything but a "teetotal society." Twenty-four was the number employed in the royal household of King Charles II., as well as in that of Henry IV. of France. In a letter of King Charles to his aunt, the Queen of Bohemia, written at Cologne, he complains of "the want of *good fiddlers*, and of some capable of teaching new dances;" and this Sovereign, adopting the French fashion, "would have twenty-four violins playing before him while he was at meals, as being more airie and brisk than viols." In France, almost every one of the wealthier classes had violinists attached to their household, and from an authoress who wrote about this time, we learn the following particulars relative to King Charles:—"At his second visit, he begged of me to let him hear my band of violinists which was reckoned particularly good."* The violin about this period must have been quite common throughout Britain, as even *toy fiddles* formed a part of the wares disposed of in the fairs, as in a pamphlet dated 1641,† the author, after describing several of the characters, states, "Amongst these, you shall see a gray goose-cap (as wise as the rest) with a 'what do ye lacke' in his mouth, stand in his boothe, shaking a rattle, or scraping *on a fiddle*, with which children are so taken, that they presentlie cry out for these fopperies." The few following remarks from the amusing Pepys relative to the Coronation day may prove somewhat interesting:—"A great pleasure it was to see the Abbey raised in the middle, all covered with red, and a throne (that is a chair) and footstool on the top of it, and all the officers of all kinds, so much as the very *fiddlers* in red vests. . . . I took a great deal of pleasure to go up and down, and look upon the ladies, and to hear the music of all sorts, but above all, the *twenty-four violins.*" And in reference to the improvements of the stage a few years later, 1666, the same author observes, "Now wax candles and many of them; then not above three lbs. of tallow; now all things civil, no rudeness anywhere; then as in a bear garden; then *two or three fiddlers;* now *nine or ten* of the best; then nothing but rushes upon the ground, and everything else mean, now all otherwise. 'Hermitt Poore' and 'Chevy Chase' was

* Autobiography of Mademoiselle de Montpensier.
† Bartholomew Faire.

all the music we had; and yet no ordinary fiddlers get so much money as ours do here, which speaks our rudeness still. That he hath gathered our Italians from several courts in Christendom, to come to make a concert for the King, which he do give £200 a-year a piece to." Amongst the common customs prevalent previous to, and during the reign of this merry monarch, may be mentioned the following one from an author in 1659,* where, speaking of taverns, he says, "Your L. will not believe me that the ladies of the greatest quality suffer themselves to be treated in one of these taverns, but you will be more astonisht when I assure you, that they drink their crowned cups roundly, strain healths through their smocks, dance after *the fiddle*, kiss freely, and term it an honourable treat;" and amongst the numerous odd devices used on tavern signboards, the violin formed one, as in a work in 1665,† treating of "fanatic reformers," the author observes, "Such ridiculous work they make of their reformation, and so zealous are they against all mirth and jollity, as they would pluck down the sign of the *Cat and Fiddle* too, if it durst but play so loud as they must hear it." The art of playing by the different shifts appears to have been introduced into Britain during the reign of this Sovereign, by Thomas Baltzar, a native of Lubeck, and leader of the royal band of violinists, whose performances are graphically depicted in the amusing works of Anthony Wood. We may now consider the violin as a standard and common

* Character of England, p. 31.

† Richard Flecknoe's Ænigmatical Characters.

instrument throughout Britain about this period, and a few years afterwards, mention is made of it as being used in the Highlands of Scotland at the lyke-wakes, where a melancholy ball, attended with dancing and greeting, preceded the wails and ejaculations of the mourning women in attendance. About the commencement of the following century, the supreme merits of the Cremona violin were appreciated in our northern metropolis, for in 1708 mention is made of "*two Cremona violins*, along with a parcel of fine music books," to be sold; and a few years later, several other *Cremonas* were advertised for sale in the same city. Numerous have been the various so-called improvements in the violin by some of our modern makers and repairers, but in reality few of them are of any essential importance, as assuredly no artist, by means of any different proportions or combination of parts dissimilar to those used by the chief Cremona makers, has reached anything like the same perfection. Doubtless violins have been made closely approximating in character to our Cremonas, but those have been formed upon a similar system, without any extra additions or peculiar changes of construction. A few of those fantastic and diversified changes may be herein enumerated.

The first, and perhaps the most ridiculous of all, is the following, as related of J. J. Hawkins, the inventor of the Claviol, or Keyed Violin. In 1800 this gentleman patented an invention applicable to pianofortes and other stringed instruments, including the violin, whereby the belly of the violin was exposed on both sides, the instrument having no back, but a firm wooden rib or bar placed under the breast, and a spring underneath the sound post, for the purpose of resisting the tension of the strings. Such was the enthusiasm of the inventor, that he actually carried this process into execution upon a Stradivarius violin, by removing the back and substituting the foregoing contrivances, and with what result may be easily imagined, as the instrument was rendered utterly worthless so far as quality of tone was concerned, although the mere loudness was little diminished. For the particulars of his invention, see Patent No. 2446, Nov. 13, 1800. Another invention for keeping the strings of the violin and other musical instruments always in tune, was patented during the same year by Peter Litherland; for description, see No. 2430, July 31; whilst an invention for a somewhat analogous purpose was patented by Jubb in 1805, No. 2838, April 5. In 1788, C. Claggat patents an invention, whereby the tail piece of the violin may be brought to any desired angle, and as a consequence, a diminished pressure on the breast of the instrument may be produced, with greater facility of fixing and altering the sound post, No. 1664, August 15.

In 1835, T. Howell claims certain improvements in the construction of the violin, violoncello, and double-bass, by increasing the length of the neck for greater facility of fingering, whilst the upper ends of the instruments are proportionally shortened, No. 6964, Dec. 21; and two years afterwards an invention is patented by J. F. Grosjean, consisting in the application of vitreous or crystallised substances to the surfaces of stringed instruments, including the violin, No. 7450, October 20, 1837. In 1852, R. H. Brooman patents an improvement in the violin and other similar instruments, by a contrivance for lengthening or shortening the strings, by a double finger board and keys, No. 567, October 29; whilst in 1854, W. E. Newton claims an improvement of tone in the violin, by the insertion of a horn or trumpet into the body of the instrument, No. 186, January 25; whilst an invention for attaining a similar effect is claimed by G. Jacque in 1856, by placing a box, containing a number of strings, in the interior of the violin, No. 1684, July 17. A violin, in which a small frame is inserted between the back and breast, as a substitute for a sound post, by which means the sound of the instrument can be modified, was invented and claimed provisional protection in 1857, by De Laphaleqûe, No. 2373, September 12; whilst an improvement for increasing the volume and richness of tone, by grooving the back and breast, was patented in 1858 by John Robertson, No. 2587, November 17; and on December 9, H. Bell has a specification for the improvement of the violin, by the insertion of a glass elliptical chamber into the body of the instrument, No. 2823; and a modification of the above by the same gentleman is specified in 1866, No. 207, August 13. Improvements respecting the finger board and other parts of the instrument may be seen by obtaining the following descriptions of patents:—1776, December 7, No. 1140, by Charles Claggett; 1802, March 24, No. 2594, by Peter Litherland; 1811, April 24, No. 3436, by William Bundy; 1827, August 1, No. 5533, by Eugene du Mesnil; 1845, June 12, No. 10,719, by Robert Brooks; 1854, January 11, No. 65, by Daniel Semple; and on August 8, No. 1738, by Antoine Corvi; in 1856, September 19, No. 2195, by William John Bisseker; in 1858, May 16, No. 1217, by John Jones; and in 1867, January 25, No. 198, by William Pain.

About the commencement of the present century, a violin maker in the south of Scotland (Sinclair), exhibited a number of violins, or rather boxes, of his own production, having extraordinary peculiarities of construction. Some were of the ordinary size, but the outline almost triangular, others of smaller dimensions; one had twelve vibrating wires stretched across it, and tuned to correspond to the tones and semitones of the scale; in addition to the ordinary strings for the purpose of augmenting the tone of the bowed strings by vibration, whilst another had two bridges, one being so much higher than the other, as to allow a free passage for the bow to pass, and play upon either set of strings. Other fanciful artists have doubled each string, and tuned in unison, or in octaves, purposing thereby to augment and enrich the tone.

Another Scottish maker, a few years later, formed another fantastic "double breasted" instrument with common sides and two necks, separated by an opening for the hand of the player, with a duplicate set of strings, but having only a single enlarged back, which corresponded with both breasts, somewhat resembling a double violin. This violin, as might be expected, produced *loudness* of tone, consequent from its increased area and number of strings. An eminent Scottish amateur purchased a fine Stradivarius violin for *one hundred guineas*, but considering it of too large a pattern, he purposed diminishing its dimensions, and, at the suggestion of the celebrated performer, J. P. Salomon (who died in 1815), he practically carried out this experiment, and as a result, the instrument was irrecoverably injured, and was sold a few years afterwards for *fifty-six pounds*, a sum which was given perhaps more for the mere purpose of obtaining a STRADIVARIUS, than from the changed and deteriorated quality of the instrument.

CHAPTER II.

THEORETICAL PRINCIPLES OF CONSTRUCTION.

IN the violin the theory of construction, according to acoustical laws, is understood in a less degree than in any other musical instrument. In a purely elementary work like the present, space will not permit of entering into all the scientific details which have been at various times set forth, as tending to clear up this difficulty, neither would some of them be of much benefit; but those experiments of a leading character, and which are now known to be of the most advantage, those alone will the reader find the most generally useful.

Ranking foremost amongst all the learned men who thus investigated the theoretical construction of the violin, and who also combined his theory with practice, was the learned French philosopher, M. Savart, born in 1791, who, for a period of 20 years, ardently and thoughtfully studied those laws of construction, from which laws have been attained the most preeminent practical results. To avoid the parrot repetitions or stereotyped teachings of books upon this subject, I merely refer the reader to the rough translation of Savart's lectures, as given at the latter part of this chapter, for therein will the student find much valuable matter, both interesting and instructive. For the present, I shall merely rapidly glance over a few other particulars, several of which are not included in the lectures above referred to. The violins of Stradivarius were chiefly those which Savart experimented upon; but ere he made those important discoveries, afterwards detailed, he had recourse to almost innumerable trials, in every manner which his keen and learned mind suggested.

Taking the violin as a whole, we find, from Savart's researches, that every element of the instrument was beautifully and skilfully made in a proportionate degree, to maintain the necessary sonority and vibration. In a few, but indeed very few, of the violins of the Cremonese makers, we find some of those rules have been a little departed from; but assuredly, the more they deviate from those well-known facts, the worse they are in quality, and even in those few which have been found dissimilar, it has been always to attain some required peculiarity of tone, which the maker wished his instrument to possess.

Referring to the woods chiefly used in the formation of the instrument, we find that if we make two equal-sized rods, one of pine and the other of maple, with the grain running similar in each, and nip one end of each in a vice, by drawing a well-rosined violin bow across the upper end, we put each in vibration alternately,—we will find that the pine rod gives a more acute sound than the maple one, and consequently possesses the highest normal tone. The number of vibrations given by a vibrating plate is in direct proportion to its thickness—thus, a plate twice the thickness of another, other conditions being similar, will give twice the number of vibrations. Previous to the commencement of forming a back or breast, a rod ought always to be cut from them of standard size, as a sample, and its tone found, when the woods giving the highest tone are always the finest for violin-making.

This method may be adopted:—Cut an elongated, rectangular piece of the wood, having two sides parallel to the fibres, with the edges cut perpendicular to them, and find its centre; after which obtain a small piece of cork, and place it near to the edge of a bench or table, to allow the violin bow to freely pass the cork; then place the wooden plate exactly at its centre, upon the cork, and press with the finger to keep it firm, and draw the violin bow across the edge of the wood at any of the angles, when the sound thus obtained is the lowest that the plate can produce, and is consequently its normal tone;—or we may obtain the same result by a simpler method, viz.:—Merely hold the centre of the plate between the finger and thumb, and draw the bow across one of the corners of the plate edgeways, when it will give the same sound. We may obtain various sounds from the same plate, by changing the position of the damping, and place of bow, but the foregoing is quite sufficient for our purpose. If the reader wishes for information upon the sounds of plates, I refer him to either Chladni or Professor Tyndall's works upon sound, the latter being a recent work of much interest.

We can easily observe for ourselves that the old makers made a difference in the sound of back and breast. If I hold with my fingers the back of the violin at the part where the sound-post would be, and strike it as a bell, it will give forth a tone; if I do the same with the belly, it will also give forth a tone—but a tone different. Now, this is as it should be; the portion first conveying the vibration has the initiatory advantage, and rules the next portion, compelling it to accept its vibrations, and deliver faithfully the message, merely modifying the quality of tone in which it is uttered.

I would remark that perfect octaves in unison, always swallow one another up. In organs, if we make two pipes precisely similar, and place them together, one could not tell whether one or both were sounding, except that, if anything, two would not sound so powerful, and carry so far as one; consequently, the scale of every rank of pipes is varied, and as the quality varies, so the combining sounds become a more perceptible amalgamation, and reinforce the waves of vibration.

It is all in vain for us to be mere copyists, for were we to gauge every thickness of a reputed perfect instrument with the exactitude of the micrometer, and make one of precisely the same measurements, the result would be but very mediocre in quality, and in no way to be compared with the original instrument; for as no two faces are fully alike, or two trees exact counterparts of one another, so no two pieces of wood are innately the same. Thus we must modify the thickness according to the quality of the wood, its resonant properties, &c.

We again may ask ourselves, why is the wood of the back and belly cut so as to have the grain parallel, and perpendicular to its position on the instrument? If we take a small cube of pine, place it upon a table, and try its conducting power by placing on it a vibrating tuning fork, we find its resonant powers vary with the three different positions in which we may place it, proving to us the three different velocities of sound through it—1st, quickest along the fibres; 2nd, slower across the fibres, and across the layers which mark the growth of the tree; and, 3rd, slowest of all across the fibres and along the layers; and in acoustics we have a law of the transmission of vibrations at right angles, perhaps analogous to the law of magnetic currents crossing at right angles to the currents of electricity; or of the undulations of the waves which produce light, and which are so constituted that the vibrations happen at right angles to the rays.

Some may object to the preceding remarks, as certainly we find some of the old violins with the back cut slabways, with the grain running from side to side, parallel to the centre of the tree, and those made, too, by Magini, as well as several of the Amati family, but let us take into due consideration their properties, fine, mellow, and silvery tone, but of no great power or intensity; and a few years afterwards, we find the illustrious Stradivarius changing his method of working, by cutting the backs and sides with the grain vertical, the plate of wood being a section cut from the centre to the outside of the tree, with the woody fibre running in straight lines from end to end, as seen on the surface. We find his violins thus changed in quality, still possessing their former ethereal purity and sweetness of tone, but now having also the required brilliancy and intensity of sound, which seems to penetrate into every corner of the largest music-hall. Such are the valuable acquisitions which the violins of Stradivarius possess—power along with brilliancy of tone.

When the air is put into a state of sonorous vibration by any means, as by a note sounded on the violin, by drawing the bow across a string, a series of concussions are produced causing vibration of the string, which accumulate at the part resting on the bridge, these become transmuted, sending down vibrations through the bridge to the surface of the violin, thence slightly through the sound post, and more so through the sides, which, acting like so many tuning forks, transmit them to the back, and the whole body of air within increases the sound, by taking up the simultaneous vibrations; thus the original note is thereby strengthened in intensity. As subsequently stated we find in the best instruments of the Cremonese makers, the contained mass of air equal to C of 512 vibrations, the back and breast being formed to correspond, so as to produce the tone of difference. According as the wood is thick or thin, so must the mass of air be ordered for reaction in simultaneous vibration. If we have got too much air, it will be slow in resonance, weakening the notes on the bass side of the instrument, whilst the treble notes will be thin; if too little air, the quickness will be detrimental, and mingle dissonantly successive sounds, causing a coarseness in the lower notes of the instrument, whilst the sounds of the first string lose all brilliancy.

The air should be absolutely and implicitly obedient—it has merely to carry out commands, not to join in executing a given task; but the wood is active, and both portions are engaged in completing one act.

Yet there is a vast difference in violins, and this difference we call quality; pitch may be unerring, but one will give harsh quality, another dull, another mellow, another bright. Evidently the quality is referable to the construction, and to that nicety of regulation, which is analogous to the voicing of wind instruments. What is that ethereal quality that makes us prize the violins of the great makers, a quality that seems to us as if each tone was tinted with other colours, rich in blended beauty as a sea-shell with its rainbow hues; lovely as summer eves with their soft and balmy breezes? Merely from the exact relationship of all the parts of construction, whilst the finest woods were employed in the formation of those cherished instruments. The artist devoted his lifetime to his labours; he found the shape and thickness he designed in ripened experience gave him the desired excellence, and thus the beauty he sought he won. If we hold a vibrating tuning fork over the *f* holes of the violin, as we pass it over the hole, we will hear the tone swell louder from the resonance of the mass of air within; and if we use three forks, as C, G, A, one or other will be more reinforced, it ought to be C of course, next to that G strongest and A least, and so on with the other notes, or if we use pitch pipes, we merely have to blow across or into the holes. The violoncello responds best to F, so that from the instrument the tones nearest related to the F, as tonic, would always sound the fullest, same with all instruments, certain notes have a predominance of brightness or of sonority. In testing the resonant mass of air in the violin, we may either adopt the method employed by Savart, viz., the conical tube, or by the following method:—Professor Helmholtz has invented a series of glass tubes which are made to correspond to every note of the scale. They consist of glass globes, or very wide glass tubes, with an opening at each end, one being smaller than the other. The smaller opening is to be covered with heated wax, and an impression of the ear taken whilst the wax is soft, when by this means the tube will be found to fit the ear very accurately. They possess the property of intensifying and resounding the same sounds as are derived by blowing across the widest opening, being the note to which they correspond. When one of these instruments, say answering to C (512), is applied to the ear, and the other ear closed, then if the air contained in the violin thus to be experimented upon gives C, we have merely to blow with the mouth over one of the *f* holes, when the resonant sound will strike loudly upon the ear wherein we have placed the instrument. By having a scale of those tubes, we can easily ascertain what tone the air in our violin will give; they are sold under the name of "Helmholtz's Resonators."

In the instruments of the ancient masters, it is surprising how carefully every element of the instrument had been studied, from which arose their vast superiority. In reference to the breast of the violin, I shall detail the following experiment, which will be found worthy of the amateur's notice. Having procured a piece of well seasoned and sonorous pine, a breast was formed out of it in the usual manner, adopting the plan of thickness according to the method used by Stradivarius. This plate, when thus finished—the *f* holes not as yet being cut—gave the note C. Subsequently the *f* holes were cut of the usual size and pattern, when the sound was found to be lowered a tone, being now B. A bass-bar having afterwards been glued on of a somewhat larger size than commonly employed, the plate gave the note D, but the bar having been reduced to its proper dimensions, the sound was lowered, and now the breast gave the same tone as originally, viz., C. We can now easily perceive that the bar perfectly compensates for the difference of tone arising from the cutting of the *f* holes, but at the same time we can raise or lower the tone very considerably, by altering the dimensions of the bar; for the stronger the bar the higher the tone, the sound lowering as the bar is decreased in dimensions, but the breast, when properly reduced, will originally give the note C♯; and if the other parts, as the *f* holes and bar have been proportionally and correctly formed, then will the breast give forth the same tone as previously, and those combined elements will thus harmoniously act as a whole.

CHAPTER III.

EXPERIMENTAL RESEARCHES UPON THE THEORY OF VIOLIN CONSTRUCTION, BY THE ILLUSTRIOUS SAVART, AS GIVEN IN THE FRENCH PAPER "L'INSTITUT."

THE most beautiful of all instruments is the violin; it has been termed the king of instruments. It is composed of two plates or tables, the upper one of those is always of deal, strengthened by a longitudinal bar, the lower one always composed of a different wood from the upper is called the back. They are united round their edges by thin plates called the sides, strengthened by thin strips of wood termed the linings. There are also in the angles formed by the different parts of the sides small pieces of wood, destined to give solidity to the instrument, called corner-blocks. To the body of the instrument is attached, as every one is aware, a neck, at the end of which are placed the pegs, upon which the strings are wound. The form and dimensions of the neck are of great importance in the construction of violins. Lastly, between the two tables, and near the piece which supports the strings, and which is called the bridge, is found a small cylinder of wood, which puts the two tables in communication, and is called the sound-post. This small moveable piece plays a very remarkable part in a violin, for without this piece it gives only feeble and poor sounds. It is to its influence upon the intensity of the sounds that this piece owes its name—l'âme or soul. We can hardly admit that it serves only to propagate the movements of vibration from one table to the other, since they are in communication by the sides and corner-blocks. The sound-post has functions far more important, which we shall examine with care.

Maupertuis has given a theory of the violin, which is nothing more than a grave error, and which at present we must reject. He assumed that all stringed musical instruments ought to be composed of fibres of different lengths, in order that the number of vibrations given by the strings might be reproduced by some one of these fibres vibrating in unison with the string, and would thus reinforce the sound. Arguing thus, he maintained the idea (which has become a prejudice still existing), that by breaking a violin and mending it again, the instrument was improved, for in doing this the number of fibres of different lengths was greatly increased. But it is easy to see that this explanation of the reinforcement of the strings produced by the body of the instrument is false. The two tables vibrate in the whole of their length, which can be proved by sprinklings and over their surfaces, and a body which has been broken and reglued, vibrates before and after its rupture in precisely the same manner; it produces still the same nodal figures with the sand, as one can prove with discs of wood, metal, or rock-crystal, &c. It is also a natural result of the laws of the propagation of vibratory movements. A violin presents upon both its upper and lower surfaces, nodes and ventral segments where we see the sand strongly agitated. The tables then are composed as plates, and not of fibres vibrating separately.

A violin is composed of a great number of elements, each having its proper function, and which we shall now enumerate successively.

Let us first examine the part played by the sound-post. If we take away this piece the sound loses its intensity and quality, and becomes poor. It regains its strength and purity as soon as we restore this important element. We cannot suppose that the sound-post acts as a conductor of the sound, or serves only to propagate the movement, for we can place this piece, not in the violin itself but upon it, and its action remains the same, its influence is not changed.

We place upon the violin a kind of arch of wood, glued upon the corner blocks, and we place the sound-post between this arch and the belly of the instrument; the effect produced is the same as in ordinary circumstances, when the post is in its place inside the violin. The arch is formed of two uprights glued over the corner-blocks and supporting bar at right angles to them. Instead of the post, a screw is fitted to this bar, which can be made to press more or less upon the belly. The effect of the sound-post is strongly produced when we apply the pressure of this screw. We now place a similar arch between the violin, and pierce a small hole in the back, to allow the screw to pass, so as to impinge upon the belly without touching the back at all. On applying the pressure of the screw the same result will be obtained, as if the post were in its place. Still more, if we simply place upon a violin, without a post, a heavy body, the violin resounds as though the post were there, provided the weight surpasses a certain limit. The exact proper weight can be found by means of a small cup containing a greater or lesser quantity of mercury. The effect of the sound-post is *above all relative to the belly* of the instrument, for the effect can be produced in a violin without a back, by causing a screw to press upon the single table of the instrument. The post does not play a part similar to that of the bridge in the marine-trumpet, for if we glue it in its place the effect is not altered. We arrive at the same results either by pressing the post against the belly by means of the arch already described, or by pressing the table upon it in a clamp.

The function of the post is to render the vibrations of the two tables normal. To prove this, let us take a disc upon which reposes a bridge destined to sustain a string. When we cause this string to vibrate in a direction parallel to the disc, the sound has little intensity, but it gains considerable power when the vibrations of the string are normal to the disc. We take a violin, of which the tables are pierced so as to allow the passage of a bow, and we remove the post. If we now excite the strings parallel to the surface of the tables the sound is very weak, but if, passing the bow through the violin, we cause the strings to vibrate perpendicularly to the tables, the sound is considerably strengthened, and as good as with a post. Let us now replace the post, and we shall find that there is no change in whatever way we cause the strings to vibrate. Again, let us take a violin having the form of a trapezoid, and instead of having the strings upon the top, let them be placed upon the side. The strings will now vibrate perpendicularly to the belly, and we find that a post makes no difference in such an instrument.

It is evident that the rôle of the post is to render the vibrations normal to the belly, and that it does not produce an effect of beatings as is the case with the left foot of the trompette-marine bridge, nor an effect of communication between the two tables.

We can prove by a decisive experiment that the rôle of the post is to render the vibrations of the tables normal. We have made a cylindrical violin, containing very nearly the same mass of air, as ordinary violins. Now we know that a cylindrical vase always divides itself into several vibrating parts, which vibrate normally, and in the case of the cylindrical violin we have the same conditions. If in such an instrument we place a post the sound is stifled, and has less intensity than without, the post in this case only tending to check the vibration.

But how is it that the post renders normal a movement which in appearance ought to be tangential? To explain this, let us revert to an experiment already cited. Taking a rod vibrating longitudinally, we touch it with another rod at right angles. Now, under certain circumstances, this second rod will vibrate longitudinally also, instead of normally as it should, in conformity with the general laws of the communication of vibrations already stated. We have shown, in fact, that in a rod which is the seat of longitudinal vibrations, there are contractions and dilations which give rise to semi-transversal vibrations, having the same duration as the longitudinal vibrations. Consequently, if we touch with another rod a vibrating segment of the rod which vibrates tangentially, the contractions and dilations will be communicated to the perpendicular rod, which will also become the seat of longitudinal vibrations. The same phenomenon is produced in the violin. The transversal oscillations of the tables produce in the post a longitudinal movement, which, reacting upon the movements of the tables, determines in them a normal movement. It is an exception, as we have seen, to the general laws of the communication of vibrations. The post acts as a kind of bow with regard to the tables. If the original exciting cause was only instantaneous, as in the guitar, the effect of the post would be to stifle the sound; but in the violin the originating cause is continuous, and it is the sum of very small movements which produces in the end an effect very intense and pronounced. The post acts like the bow, and produces a shock corresponding to each vibration produced by the latter. It is to be noted that the nature of the deal renders the transverse flexions of the belly more easy. In fact, if care is taken to place all the fibres of the wood parallel to the greatest length of the instrument, vibrations, whose direction is at right angles to these fibres, will produce more decided flexions than if it were in any other direction, for in this direction the elasticity of the wood is the smallest. It is necessary, therefore, that the fibres of the deal should be placed parallel to the length of the instrument. The post has other properties besides that we have just attributed to it. It is not placed inside the violin to sustain the belly, since we can place it outside the instrument; besides, so slender a rod of dry wood would be of little use for strengthening purposes. It plays a very important part, which proves the necessity of giving to the bridge a certain definite form. It is always placed behind the right foot of the bridge, which has the effect of sustaining this foot in a state *of almost perfect rest*, in order that the left foot may, as in the marine-trumpet, communicate its movements to the bar of the instrument. In all violins there is beneath the belly a bar intended to give the belly resistance, at the same time that it determines in the whole length of the instrument the movement communicated to it. This bar is to the left of the instrument, and ought to receive the shocks produced by the left foot of the bridge.

We proceed to cite experiments in support of what we advance. We take a violin, and pierce the belly at the point directly over the extremity of the post, so that the right foot of the bridge rests on this extremity without touching the belly at all; the sound is a little dull, but the effect of the post is produced. In another violin we isolate the left foot of the bridge, the bar being in the middle, the effect of the post is still manifested. To do this, we cut out a piece of the belly, and without allowing it to touch the belly of the instrument, maintain it in its place by a special contrivance; it supports the left foot of the bridge, which communicates in no manner with the belly. The effect of the bar is to produce throughout the violin the movement communicated to it by the bridge. It vibrates as a whole; there is no division in its length, nor in that of the belly. Thus to resume, we see that the post has three functions, 1st, It communicates the movement from table to table; 2nd, It renders the vibrations of the tables normal; 3rd, It renders the right foot of the bridge immovable. The post vibrates the belly as a whole, and whatever the original direction of the vibration is, it renders it normal in the two tables.

Let us examine now the part played by the body of the instrument, which is composed of the belly, the back, the sides, and the corner-blocks. The back is always composed of beech or maple, as well as the sides; the belly of deal. Maple is preferable to beech for the back.

We will now consider the body first in its simplest form. Let us suppose it to be rectangular, and we will then examine the rôle of each piece as we build them up. If we take a thin plate of wood by itself, it will render a certain sound—*fa*[3] for example; to its two extremities we now glue, at right angles, two small blocks. If we now cause the first plate to vibrate again, we shall find that the sound is lower than before for the same nodal division—say, *si*[4]; next glueing another rod or plate to the blocks, of the same dimensions as the first, and parallel to it, we find the sound given by the system to be—say, *sol*[4]; the nodal divisions presented by both plates being the same as when the first vibrated alone. We have chosen the two parallel plates so as to be perfectly in unison, that they may produce exactly the same mode of division, and being united, whichever one we excite, both will produce the same nodal figure. If now we diminish the thickness of one of the plates, the nodal lines will be displaced—they will no longer correspond upon the two plates; the nodes on the thinner one will approach nearer together, but nevertheless the sound of the two plates will still be the same, whichever one be excited. We can understand easily that, the thinner plate being compelled to vibrate in unison with the other, the nodes must be nearer together, since the ventral segments must be smaller to give the same number of vibrations. We perceive the same phenomenon in the body of a violin. Separately, the back and belly will not give the same number of vibrations; *united, they render the same sound.* To prove this, let us operate with closed rectangular cases, pierced in the centre of their larger surfaces with a circular hole, to allow the passage of some rosined horsehair, and also with apertures corresponding with the *f* holes of a violin, to give the air contained in the case freedom to vibrate. If now we cause the case to vibrate, by means of the horsehair, a nodal line will be produced round its edges, and the sound will be the same whichever surface of the case we vibrate.

If the two plates are of the same thickness, and identical in form, the nodal lines are the same in each and this is a method of proving the equality of the two plates. If they are not of the same thickness, the sound of both will still agree, but the nodal division will no longer agree in each. In the thicker one, the nodal lines will retreat from one another, while in the thinner one they will approach more closely together.

It is evident from this that the back and belly of a violin *vibrate always in unison.* Let us examine now the part played by the air contained in the case of the instrument. We take a case formed of two plates, rectangular in shape, of the same wood, the same thickness, and giving the same sound for the same mode of division. They are united by sides also rectangular, pierced with two holes, analogous to the *f* holes of stringed instruments. The tables are pierced with holes to allow the passage of a skein of horsehair to put them in vibration. To make the column of air resound, we employ a slightly conical brass tube, flattened at the larger end, so as to present only a narrow rectangular orifice for the passage of the air.

This apparatus is very convenient for the purpose of vibrating any column of air. In the present case, we place the flat end upon one edge of one of the lateral openings, so as to blow upon the other edge, and, after a few trials, we shall soon obtain the required sound. Then we remark a very important fact, viz., that the sound of the contained air is exactly the same as that rendered by the instrument when we vibrate either *one or the other* of the tables. If we reduce the thickness of one of the tables, the sound given by the air will be changed, as well as the sound rendered by the tables, but the two sounds will still be the same. The air and the two tables then form a vibrating system, and vibrate as a whole. This is true, however, within certain limits; for if we reduce the thickness of one of the tables, so as to make it render a sound an octave below the other, the two will no longer vibrate in unison, nor will the air any longer give the same sound as either of the tables. If we close one of the lateral openings, the sound of the air will be lowered at the same time, and the sounds will still be in unison. This reaction of the air upon the tables is a very curious and instructive phenomenon—a reaction which determines the number of vibrations in both. The two tables of a violin give the same results, that is to say, the sound given by them is exactly that of the mass of air contained by the instrument, as one can prove by means of the brass tube described above. To prove this phenomenon, and vibrate the tables in a direct manner, we attach perpendicularly to the back and belly with a little sealing-wax, rods of glass, which we cause to vibrate longitudinally, the tables will enter into vibration, and will give the same sound as that produced by means of the tube applied to one of the *f* holes. Whatever be the size or form of the instrument, this result is always the same. We have tried with violins with flat surfaces and of rectangular shape, with excellent Stradivarius and Guarnerius, and resulting always in a confirmation of this principle; that the air and the tables always vibrate in unison, and as a system, of which all the parts react one upon another.

There is, as we have seen, a great difference between a violin which possesses a post and one without. In the first case the sound of the air is higher than in the second. It is the same with the sound of the tables. There is always a complete identity between the two sounds. Take a violin and vibrate the air and the tables, you will have a certain sound; take away the post, and the sound will be lower both for the air and for the tables. One fact is to be noticed from this of moment,—it is that, in the instruments of Stradivarius we have tried, the sound of the air is invariably the same. We will give the value of this fact presently.

The intensity of the sounds rendered by a violin depends upon the mass of air which it encloses, and which ought always to be in a certain proportion with the other elements of the instrument. It is easy to determine it. To prove this relation, we have made a flat rectangular violin, beneath which was fitted a rectangular case, furnished with a piston, which permitted the mass of air to be augmented or diminished at pleasure. If we cause the strings of this instrument to vibrate, while we adjust the mass of air by raising or depressing the piston, we find that in a certain position of this piston the sound has the greatest intensity and sweetness. If the volume is too great, the lower sounds are feeble and hollow, and the higher sounds bad and poor; if it is too small, the lower sounds are thin, and the higher sounds less pure.

If we determine the sound of the air (by the means already described) when we find the sound of the strings to be at their best, we find that it rests within certain limits, which depend upon the form and other elements of the instrument. In experimenting thus with instruments of Stradivarius, we have found that the air always gave the *do* ♮ of natural philosophers, corresponding to 512 vibrations per second, that is 512 single vibrations, or 256 double vibrations —the French philosophers always count single vibrations; the English and Germans, double vibrations, or the *do* ♭ of the present scale. Now, it is to be noted that at the beginning of the eighteenth century, when Stradivarius constructed his instruments, the pitch was half a note lower than at present.

All the instruments, therefore, of this great master were in *do*. Several musicians have found that in tuning their instruments in *do* ♭, the tone was better. In examining a great number of excellent violins of Stradivarius, we have always found this condition to be fulfilled.

Here then is a fact acquired by industry and science; without this condition, a violin leaves much to be desired. If the air gives the sound *do* ♯, the low sounds are bad; if it gives the *si* or *la* below, the high sounds lose their power, and are more difficult of emission, while the grave sounds resemble those of the tenor. In many Stradivarius violins the air gives exactly 512 vibrations per second. It is easy to assure oneself if this condition is fulfilled, without which a violin has little value; it suffices to put the air in vibration by means of the conical tube described previously. Although one of the most important points in the construction of the violin is that which we have just examined, there are others to which we must have regard, and which we shall proceed to point out, persuaded that, by operating according to the conditions indicated, we shall be sure of obtaining in all cases, and at once, good instruments.

What relation ought there to exist between the sounds of the two tables before being united? Ought they to give sounds in unison, or an octave apart, or what? We have constructed a violin of which both plates were of deal, and perfectly in unison when made to vibrate separately. The sound of this instrument was feeble, and of very ordinary quality. A back of maple was substituted for the deal one, but still in unison with the belly; the instrument was bad, and very feeble. Thus we see already that the two tables ought not to be in unison. And besides, if they were perfectly in unison at first, they would soon differ a little, and then we should have beats, and a very bad effect would be produced. It is necessary, therefore, to avoid the unison, and even to be a certain distance from it, so as to avoid the possibility of beats occurring.

To determine the exact distance between the sounds of back and belly there was only one means, and that was to have recourse to direct experiment. It was necessary to study the best violins, to dissect them, and examine all their parts. We have dissected several Stradivarius and Guarnerius violins of great value, and we have determined directly the sounds of the two tables. To obtain these sounds, we clamp the tables at a point where two nodal lines cross one another, the one transversal and the other longitudinal, so that the elasticity of the wood in both directions, is called into play. The nodal system being the same on each plate, we find *a tone* difference; nearer to the unison we shall have beats, more than a tone difference, the difficulty the plates have in vibrating in unison increases.

Thus we must consider as positive that a good violin must satisfy these two conditions, to have the tables such that they give sounds a tone apart, and a mass of air giving, by blowing in at one of the *f* holes the *do* ♭, or the *do* of the fourth string, 512 vibrations per second, in round and exact numbers, *the other dimensions* being the same as those of Stradivarius. For the nodal division indicated, we find that in the good violins the sound varied between *do* $\sharp^3$ and *re*^{3}, for the belly and for the back between *re*^{3} and *re* $\sharp^3$, so that there is always a semitone, or a tone difference between the two.*

* A strange but very vital error appears to have crept into the work of Fetis upon Stradivarius, translated by Mr. Bishop, where speaking of the experiments made conjointly by Savart and Vuillaume upon the instruments of Stradivarius and Guarnerius, he states that the *back* was a tone *lower* than the *belly*, whereas we find, from his own lectures, that the contrary is the case.—*See* Anthony Stradivari. By F. J. Fetis. P. 83.—(*Author.*)

Why is deal preferred for the construction of musical instruments to any other description of wood? The nature of deal, its feeble density, and, above all, its elasticity, causes it to be preferred to any other substance. Its resistance to flexion is greater than that of any other wood, and also than a great number of other substances, even metallic; it is equal to that of glass and steel. Thus, with a very feeble mass, we possess in deal, a substance having elasticity as great as that of glass or steel.

Sound is propagated in deal with the same velocity as in these substances. If we take three rods of glass, steel, and deal, cut in the direction of the fibres, all three having the same dimensions, and cause them to vibrate longitudinally or transversely, so as to produce the same nodal division in each, we shall see that the sounds given by the three sensibly approximate. Thus, the velocity of sound in deal is as great as in glass, or steel, or as great as in any solid substance. The deal then offers the incontestable advantage of presenting a large surface with little mass, and possesses a great elasticity. A violin with tables of glass or steel, would be worth nothing, on account of its great mass, and the difficulty that would be experienced in causing it to vibrate. Violins have been constructed in glass, steel, brass, silver, &c. The sounds of such instruments were always found to be feeble and bad. In maple, the propagation of sound is much less rapid than in deal; it varies between 10 and 12 in the direction of the fibres, that in air being 1. Perpendicularly (to the fibres) it is between 4 and 5. In deal, the rapidity of propagation is 15 to 16½ times as great as in air, transversely it is much less, between 2 and 4, according as the fibres are wide or narrow; it never reaches 5. This difference of elasticity in two directions, at right angles, is again an advantage not found in homogeneous substances like glass and metals. This feeble power of propagation in a direction perpendicular to the fibres, determines greater contractions, dilations, and transversal deflections, which act upon the post with great energy, which would not be the case except for the fibrous nature of the substance.

The deal owes to its fibrous structure other advantages which it is important to note. We have stated previously that the tables of a violin vibrated in the same manner as plates, and caused the formation of nodal lines exactly as surfaces put into vibration, so that the fibres appeared to play no particular part; nevertheless, it is not to be doubted that the fibres facilitate their being put into a state of vibration. We may conceive that, being disposed to vibrate in unison with the sounds produced, they enter immediately into vibration, and communicate the movement to the tables, just as the strings of a guitar, in unison with sounds produced in the same apartment, enter into vibration, and communicate their movement to the entire mass of the instrument. The fibrous nature of the deal appears then to play a very important part in the structure of the violin, and becomes a powerful motive to prefer it to any other substance. One can find in these facts the explanation of several phenomena connected with the human ear.

The disposition of the drum, its fibrous nature, which has already given rise to several theories of audition, would play the same rôle in the ear as we have attributed to the fibres of the deal, and to facilitate the vibration of several parts of this organ. Here is an experiment among several others which we could cite, to justify our assertion. We take several parallel rods of unequal length forming a surface, upon which we glue some parchment. By producing sounds varying in pitch beneath this body, we shall see that the vibratory movement always commences in the rod nearest in unison with the sound produced, and then communicates itself to the whole system, causing the parchment to vibrate as a plate.

The violin is then an instrument consisting of strings, plates, and a mass of air; all these elements vibrate in unison, and the mass of air ought to give the sound *do* = 512 vibrations for the construction generally admitted. The position of the bridge, the place occupied by the post, and its pressure upon the tables of the instrument, have great influence upon the sound. The player ought to pay great attention to the relative position of the various parts of his instrument. The fundamental sound of the air can be influenced by a bad disposition of the post, and render more or less bad an instrument otherwise having all the qualities essential to a good instrument. The pressure of the post upon the tables can modify the sound of the air and of the tables by rendering them lower or higher; if it is too short the sound will be too low, and the lower sounds of the violin will be favoured; if it is too long the pressure upon the tables will be too great, and the acute sounds of the instrument, those of the E string, will gain in brilliancy, to the detriment of the low sounds of the fourth string. In a word, if the pressure is too feeble, it is equivalent to decreasing the thickness of the tables; if the post is too long, the same effect is produced as if the tables were increased in thickness. It is necessary, then, to calculate the dimensions of the post, the position of the bridge, and above all, to try at every change if the sound of the air contained in the case corresponds with the fundamental sound we have already indicated, supposing all the other conditions fulfilled in the instruments. As the makers of instruments must necessarily try their tables before glueing them, it will be useful to enter into some details as to the method of determining the sounds they give.

If we take a square plate of deal, having two of its sides parallel to the fibres, and if we make it vibrate normally so as to produce two nodal lines parallel to the direction of the fibres, we shall produce a certain sound; if we now turn it and cause it to vibrate so as to produce two parallel nodal lines at right angles to the fibres, the sound will be different, although the mode of division is the same. In one case the plate is deflected in the direction of the fibres, and in the other perpendicularly, or rather at right angles to this direction. The resistance to flexion being different in these two directions, the sound must change. But we can make the plate produce a nodal figure, consisting of two nodal lines at right angles to one another, and in this case the sound is always the same, as the elasticity in both directions is called into play simultaneously. To obtain this division, it is necessary to clamp the plate where the lines cross one another. In the tables of a violin we can obtain one longitudinal line in the direction of the fibres, and two at right angles to it. If we produce the longitudinal lines, or the transverse ones separately, we shall have different sounds, because the flexions of the tables will be either parallel or at right angles to the fibres. By clamping the table at a point where one of the transverse lines crosses the longitudinal one, we shall divide the belly or back into six vibrating segments, which will oscillate synchronously, and produce the sound it is necessary to determine. The maker who wishes to try his tables will take a wooden clamp, and between two corks, cone-shaped, or two wooden cones covered with leather, will clamp the table and make it vibrate by means of the bow, after having spread over its surface a little of the sand used in offices for drying ink. He will see the nodal lines form, and after a few trials will be able to press the table where two lines at right angles cross one another, and he will then have the required sound. It is necessary to use great care in choosing the wood. It should be dry, the fibres exactly parallel to the length of the instrument, and perfectly symmetrical in shape. He will be able to assure himself of the good construction of his tables by means of the nodal lines, which ought to be perfectly symmetrical, and divide the two halves of the tables in exactly the same manner. He will be sure of producing a good instrument by these means, and science, in conducing to this result, will have rendered an immense service to industry.

As all the different kinds of deal are not equally good, we must give a simple method of determining the sorts we should prefer, on account of their greater elasticity. We have said that deal and maple present great differences in the velocities with which sound is propagated in them longitudinally and transversely. To discover if two substances offer the same resistance to flexion, we cut rods of the same dimensions from each substance, and cause those rods to vibrate longitudinally. In the case of wood it is necessary to cut these rods parallel to the fibres or transversely, according to the direction in which we wish to test the velocity of propagation. Care must be taken to cause the rods to give the same nodal division. The velocity of the propagation will be in proportion to the acuteness of the sounds produced. The higher the sound produced by a rod the greater the velocity of propagation in that rod. By these means we shall be enabled to keep rods serving as types, and test the quality of the woods we use, by comparing it with these rods.

The Bridge.—The Bridge plays a far more important part than is generally attributed to it. Its incisions and form have a great influence upon the quality of the instrument. It merits therefore all our attention. If we take a piece of wood, cut like a bridge, and glue it upon a violin, the instrument nearly loses its sound. It gets a little better if we form feet to the bridge; if we make lateral incisions in it the sound improves, which improvement increases gradually until the bridge assumes the ordinary form. It is an astonishing thing that by trial we gradually arrive at the form of bridge usually adopted, and which appears to be better than any other. A multitude of trials have been made before this important piece arrived at perfection. Everything has led to this result, that we cannot depart from the established form without detracting greatly from the quality of the instrument. Bridges have been made of deal with their fibres perpendicular and parallel to the belly, but the sound was found to be altered. The size and shape of the openings have been altered, but the beauty of the instrument has always been impaired. Let us examine the movement of the molecules of the bridge. If we take a plain bridge with two feet and a single string, the movement is tangential, parallel to the face of the bridge. If we make two incisions in it, the nature of the movement changes, and the sand is seen to move in several directions at once, while the bridge itself experiences movements of oscillation, and its molecules appear to execute vibrations in a direction normal to the belly. The effect appears to be to confirm the normal movements of the tables. The bar to which these oscillations are imparted, produces in the belly a similar movement over its entire surface, and prevents it from dividing into ventral segments by transversal nodal lines. All the parts of the instrument enter at once into vibration. Let us see how we can modify the effects of the bridge, by interfering a little with its oscillations. By placing a mute on the bridge the sound is almost null, and the bridge seems no longer to vibrate. It even appears to arrest the vibrations of the other parts of the instrument. The mute arrests its oscillations, and no longer produces the vibration of the belly. If we clamp the right foot of the bridge the sound is weakened, but not to so great an extent as with a mute. On the other hand, if we repeat the experiment with the left foot, which ought to communicate its movement to the *bar*, the sound is incomparably weaker. It is evident that the left foot of the bridge produces the shocks which occasion the movement of the bar and of the belly. The right foot, as we have seen, is rendered immovable by the post.

Neck.—The form of the neck and the nature of the wood employed have great influence upon the quality of a violin. If the wood is too hard or too soft, the quality of the sounds is considerably changed. Perrot states in his treatise on singing, that if the strings of a lute are attached to a support, the sounds lose greatly in power. We must remark, however, that this would have less influence in the violin, where the action of the bow is constant, and not instantaneous, as in lutes and guitars. Nevertheless, let us examine the species of modification that the sound of a violin will undergo if the neck is detached, and rendered independent of the body of the instrument. A violin is fixed in a vice, and the neck is separated from it as well as the part to which the strings are attached; the bridge rests on the body of the instrument, but the points to which the strings are attached have no communication with it. The apparatus is now put into vibration, and the sound is still found to have considerable intensity;

but if we put the neck again in communication with the case, the intensity will be greatly increased. It is easy, then, to see from the preceding, the part played by the neck in a stringed instrument played on by a bow. In fact, in exciting the strings with the bow, at a short distance from the bridge, we cause the string to be deflected at the point where the bow is applied, and the curve thus produced is not symmetrical in the two halves of the length of the string, but the greatest deflection is at the point where the bow is applied, and this deflection is propagated as a wave along the string, and is reflected on arriving at the nut, returning to the bridge upon the opposite side of the axis of the string. These waves are continued without cessation at each oscillation of the string, and impinging upon the bridge cause therein a transversal movement. We can easily be assured of this fact, by using a long monochord, having a plate disposed as a bridge upon which sand is strewed.

There are then three different sorts of movements in a violin; one in the direction of the length of the strings, one normal to the belly, and the third tangential; these three movements force the instrument to execute the greatest possible amount of oscillation.

An experiment of M. Cagniard Latour confirms the explanation we have given of the movement propagated from end to end of the strings. We take a small rectangular piece of paper; by making two parallel cuts with a penknife in this paper, we can pass it along one of the strings. If we place this paper near the bridge, it will follow the direction of the bow, but if we place it near the nut, its motion will be contrary to that of the bow. This phenomenon proves that the curve in the half of the string nearest the nut makes an angle in the opposite direction to that produced by the bow at the point of attack.

The weight necessary to stretch a violin string is as nearly as possible 20 lbs. The first string often requires 22 lbs. to bring it up to pitch; for the second 20 lbs. are required, and a little less for the third and fourth. Let us take a first string, having exactly the length given to it on a violin, and making it sound E, by stretching it by the appropriate weight. We will now see what part of the weight is supported by the belly when the whole tension of the four strings amounts to 80 lbs. To this E string, stretched horizontally, we will suspend a weight, at the exact point where the bridge would be, sufficient to cause the string to make at that point the same angle it makes when stretched over the bridge, which angle is about 155°; the string will then give the sound F. If we examine the weight we find it to be 6 lbs. 2 oz. Thus the table would support about 24 lbs. for the four strings. After establishing the conditions in which the best violins of Guarnerius and Stradivarius were constructed, and having proved that they contain a mass of air giving *do* = 512 vibrations, and having also stated that musicians should adopt this diapason in order to get the best possible tone from their instruments, we shall finish by saying, that we shall be able to construct excellent violins on any other tone, by constructing them precisely similar to those of Stradivarius, and being careful to have all the parts in inverse proportion to those of Stradivarius, as the tone we take as the basis bears to *do* = 512 vibrations. Thus, if we construct a violin in *do* ♭, the dimensions must be to the dimensions of a Stradivarius, as 512 is to the number of vibrations given by the mass of air in the violin.

After having studied the violins of the best masters, and determined the rôle of each part, we have indicated the means of constructing excellent instruments, resembling in everything the most perfect ones of Stradivarius. The principles we have deduced from numerous experiments permit us to state the question in a general sense, and not as a particular case. The construction of violins is a problem susceptible of several solutions. Several of these being unknown, they are so related the one to the other, that one being determined it is easy to determine the others. We can, for example, vary the form and dimensions of the tables, but we must at the same time vary their thicknesses and the height of the sides, so that the air shall still give the sound *do* = 512 vibrations. The dimensions of the *f* holes have great influence upon the sound of the mass of air. We have already said, that if we cover one of these with paper the sound of the air is lowered. Consequently, if they are too large, the sound of the air is too high, and *vice versa.* This is the reason why we often find violins of large pattern giving a higher sound than *do* = 512 vibrations, while from their size it should be lower. Such are the violins of Maggini, at least those which we have examined, the sound of the air being *re* instead of *do*, on account of the *f* holes of these instruments being larger than those of Stradivarius.

It is possible, then, to construct violins of any form and thickness, provided we keep within the conditions indicated. The problem being indeterminate admits, as we have seen, of an infinity of solutions. It must be noted, however, that if we substitute flat tables for arched ones, or tables more or less arched, the *timbre* of the sound will be modified. We shall obtain greater purity as the tables approach being flat, but at the same time the sound will lose in brilliancy.

Violoncello.—What we have said with regard to the violin leaves little to be added regarding this instrument. The violoncellos now made are generally good, and we can always arrive at good results by following the same principles as those enumerated with regard to the violin, and by taking the dimensions in proportion to the sound taken as a basis, with the exception that we must give the instrument greater proportional depth, otherwise they would be too long and very unwieldy. If exactly proportional to a violin in all parts, the length of a bass would be 35 in. by 20 in breadth, instead of which they are constructed of 26 to 27 in. in length, by 15 or 16 in breadth, but instead of being only 3 in. in depth they are made 4 in. The sounds of the violoncello being an octave and a fifth below those of the violin, the sound of the mass of air should be lower in the same proportion, that is to say, *fa* = 170·66 vibrations. This sound is arrived at by diminishing the surface of the tables, and increasing the depth of the instrument as stated above. To determine the sound of the air in the body of a violoncello, it is only necessary to produce a succession of low notes near one of the *f* holes. Among these sounds one will be found to be reinforced to a greater extent than any of the others, and this will be the note required, or we may make use of the brass tube previously described in speaking of the violin. We frequently observe the *fa*, *fa* ♯ or *fa* ♭ on the fourth string of a violoncello to have a hollow rumbling sound, and can scarcely be obtained with purity. This remarkable peculiarity has never been properly explained. It is evident from what we have just said, that the sound of the mass of air is in most cases somewhere in the neighbourhood of this *fa*, and this effect is produced from the mass of air not being exactly in unison with the *fa* of the fourth string, and beats are the result; or if the *fa* itself is exactly in unison with the air, the neighbouring sounds *fa* ♭ or *fa* ♯ will suffer instead.

The Tenor.—The mass of air in a tenor should render a sound a fifth below that of the violin, and consequently an octave above that of the violoncello, say *fa* = 341·33. Instead, however, of producing this note, most of the tenors made now give the sound *do* = 512 vibrations like the violins. The result of this is, that the low sounds are feeble, hollow, and difficult of production, and the instrument has not the quality it ought to have. Formerly tenors were made of large pattern, and approached more nearly to the veritable conditions of the theory. It is much to be desired that the makers should give their attention to the matter, so as to place the construction of these instruments in harmony with the violins and basses.

Contre Bass.—The foregoing observations will apply also to the contre-bass, the construction of which has hitherto been altogether arbitrary. The contre-bass gives sounds an octave below those of the violoncello, and the mass of air should therefore be the *fa* below that of the 'cello. But as the instrument carries only three strings, the lowest being *sol* instead of *do*, perhaps the sound of the air should not be so low. It is a point, however, to be settled only by experience.

CHAPTER IV.

REMARKS UPON THE FOREGOING THEORIES OF SAVART RELATIVE TO THE VIOLIN.

THE reader having carefully perused the preceding pages, let us examine how much positive instruction is to be derived from them. We must carefully take into account, however, that the papers in the "L'Institut" are merely reports of what Savart stated verbally in his lectures, and it must be understood that the matter would have been stated far more clearly had the papers received his revision, or proceeded from the pen of the philosopher himself. For my own part I cannot regard the universally received idea, that the sound-post is intended as a means of communication between back and belly otherwise than a popular error, and the more I think of it the more it seems to me that the points of the back and belly touched by the sound-post, are the points of *least* vibration. In the rendering of the vibrations of back and belly normal by the sound-post, we must clearly understand in what sense Savart uses the term *normal*, for Bishop, the translator of Otto's work, was evidently not aware of Savart's meaning.

In his paper upon "The Vibrations of Solid Bodies considered in general," he defined the terms he should afterwards make use of in speaking of various modes of vibration. By normal he means vibrations executed perpendicularly to the surface of the vibrating body, or what in English acoustics is termed transverse vibrations; by tangential vibrations he means movements parallel to the surface. From the series of interesting experiments upon the sound-post, he deduces the following results:—

1st. That the deflections of the belly produce in the post a longitudinal movement, which, reacting upon the movements of the belly, determines therein a normal movement instead of an oblique one.

2nd. That the post holds the right foot of the bridge in a state of complete rigidity.

3rd. That the post communicates the vibration from belly to back.

Now, as regards the first of these deductions, it is true that the general law ruling the communication of vibrations is, that all the vibrations of a vibrating system are executed in the same direction as the exciting cause. For example, suppose *a b*, in the accompanying Fig., to be a rod of wood, and *c* another rod glued to it perpendicularly at *g*. Now, if *c* be made to vibrate transversely in the direction

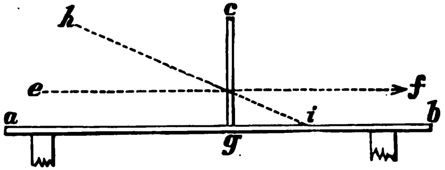


Fig. 2.

e f, *a b* will vibrate longitudinally, provided they are rigidly connected at *g*. But if this joint is imperfect, the same result will not follow. Again, by exciting *c* at an angle of about 40° with the original direction, as *h i*, the second rod, *a b*, will vibrate transversely instead of longitudinally. It is obviously unnecessary, therefore, to make the case of the violin post an exception to this general law, since neither the post nor the bridge are rigidly connected with the belly. Again, in his "Mémoire sur les Communications des vibrations," Savart himself states the following case amongst many others:—"If a rod falls perpendicularly upon another rod at a point in this latter, held in a state of rest by a rigid obstacle, the first being caused to vibrate transversely, the second will also vibrate transversely," as in the following Fig.

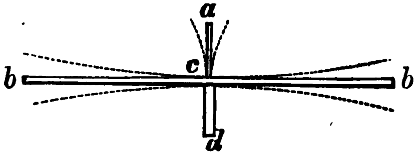


Fig. 3.

Let *a* be the first rod falling perpendicularly upon the second rod *b b*, at a point *c* in this latter, held immovable by the obstacle *d*. If *a* be made to vibrate transversely, *b* will also vibrate transversely, as indicated by the dotted lines. This appears to be the real state of the case in the violin, where *a* would represent the right foot of the bridge vibrating under the influence of the strings from right to left, *b* the belly and *c* the sound-post.

Again, Savart in the same Mémoire stated that it was found impossible to cause a rod to vibrate longitudinally when one of its ends was rigidly fixed. How, then, can the post be the seat of longitudinal vibrations if one end of it is employed in maintaining the right foot of the bridge in a state of rest?

The second deduction of Savart's, then, seems to be the true one, and is in perfect accordance with the remarks I have made above. A noticeable fact, deduced from Savart's experiments on the sound-post which seems to confirm this, is, that the pressure of the post is only required to be exerted on the belly. The third deduction of Savart's seems to be of little importance, for, if the second be true, the communication between the tables must be principally effected by the sides. Savart then proceeds to examine the mutual reaction that the tables and the contained mass of air exert the one upon the other. This section contains the cream of the matter, and the experiments cited are of the greatest interest. Let us briefly recapitulate what Savart puts forward in this section.

He proves by experiments that the tables and air, within certain limits, always vibrate synchronously, that the sounds of an instrument are at their best, when the air contained by the case has a certain volume, which volume depends upon the other elements of the instrument, that the sound of this mass of air in the violins of Stradivarius was always found to be the *do* of 512 vibrations, and that the sounds of the bellies and backs of the good violins were found to give about the sounds *do*♯³ * and *re*♯³ respectively, when caused to vibrate independently, and in such a manner as to form one nodal line in the direction of their length cut by two other lines at right angles to the first. In other words, the sound of the belly vibrating under such conditions, gave a tone equal to the mass of air in the completed instrument, and the back a note higher.

But to these data he adds that the dimensions or the instrument should be the same as in Stradivarius instruments, and this is the weak point in the theory, for without knowing the exact dimensions in question, it is obvious that we could satisfy all the conditions of Savart in a multitude of different ways by varying these dimensions.

For instance, suppose we had an instrument satisfying all the conditions required by Savart—that is to say, the belly giving the sound *do*, the back *re* vibrating independently, and the mass of air in the complete instrument *do*=512 vibrations. Now, by increasing the area of the tables, and at the same time their thick-

* This small index number ³, printed over the notes in this and the preceding chapter, is meant to indicate the position of the sound above the lowest, or "32 feet" C of the organists, —thus *do* ♯³ represents 4 feet or middle C.

ness in proper proportions, it is very easy to see that we could preserve the same sounds while the dimensions would vary considerably. At the same time, we could preserve the sound of the mass of air constant by decreasing the height of the sides, and the result would be a violin of entirely different dimensions, and yet satisfying all the conditions Savart insists upon. Again, without varying the area of the tables, we could obtain the required tones for back and belly in a variety of ways by simply adjusting the thicknesses.

For instance, let the accompanying Fig. represent one of the tables, and let *a a*, *b b b b*, be the nodal lines obtained in testing the tone. Let it, in the first instance, be supposed to give the required tone and be of equal thickness throughout. Now, by increasing the thickness along the nodal lines, and also,

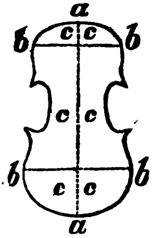


Fig. 4.

gradually, and to a greater extent outwards towards the rim of the table, so that the rim or edge would become thicker than the centre, the same sound could be preserved, for we should be increasing the elasticity along the nodal lines, the effect of which would be to increase the number of vibrations; but this effect would be neutralised by the increased weight of the ventral segments *c c c c*. The same result would be produced by the reverse of this proceeding—that is, by diminishing the thickness along the nodal lines, and also to a greater extent that of the flanks, so that the greatest thickness would then be in the centre. Now, not only according to Lupot, but actual experience, all these three systems of thicknesses were applied to the bellies of the Cremona instruments of various makers, the first by Stradivarius; the second by Joseph Guarnerius; and the third by the Amatis; but all agreed in having the backs thickest in the centre, the respective qualities of the three classes of instruments being, power and mellowness, great power and brilliance with less mellowness, and sweetness but little power. Now, which is right? Tradition and prejudice is in favour of the last, the Amati style; but eventually will the student find his favorite method to be equal thickness throughout the belly.

Is it not remarkable that there should be so close a parallel between the respective qualities of the three classes of instruments and the three systems of thicknesses. The Joseph Guarnerius, on the one hand, with the greatest thickness round the edge, have the greatest power; while, on the other hand, the Amatis with the greatest thickness in the centre, have comparatively little power, but great sweetness. Against these two extremes we have the Stradivarius instruments, with equal thickness throughout, combining the good qualities of both. In an article of Savart's, published in the "Annales de Chimie," entitled, "Recherches sur les Vibrations de l'Air," he states certain facts which throw considerable light upon what ought to be the form of the mass of air contained in a Violin. If we take a long, narrow vibrating column of air, as an organ pipe for instance, it will give a certain sound, which, with its harmonics, are the only sounds that can be derived from the pipe, and it will resound to no other vibrating body except such as may be in perfect unison with one of its sounds. Thus, if we have an organ pipe giving the sound C, and a tuning-fork exactly in unison with it, the pipe can be made to sound by simply holding the vibrating fork near its mouth, but no such effect is observed if the fork gives any other sound than that of the pipe itself. This phenomenon is called resonance. Now, Savart states in the article referred to above, that if the vibrating column of air is gradually reduced in length and increased in diameter, this power of resonance is no longer confined to sounds exactly in unison with the mass of air itself; but if the diameter be considerable in comparison with the length of the column, almost any sound within certain limits will be reinforced to a greater or lesser extent.

This power of reinforcing a number of sounds, increases as the diameter increases in proportion to the length, and the mass of air in a Violin may be regarded as such a column whose diameter greatly exceeds its length. There appears, therefore, to be good reason for obtaining the requisite mass of air in an instrument by lateral expansion rather than by increasing the height of sides or the arching of the back and belly, and a scientific explanation is at once given of the causes that led Stradivarius to extend his model at the same time that he reduced the arching of his instruments. Savart's explanation why there should be a tone of difference between the two tables appears somewhat doubtful. He alleges that a nearer approach to unison would cause beats, but this accords very imperfectly with his previous statement, that within certain limits, whatever be the sound of the two tables when vibrating independently, they always vibrate synchronously when united. The limit is a very narrow one when anything more or less than a tone destroys their power of vibrating in unison. It appears certain that the sounds of a Violin proceed principally from the mass of air contained in the instrument, as no sounds of so great an intensity could be produced from vibrating plates equal in area to the tables of a violin, while there are other musical instruments whose sounds we know are produced by aerial vibrations, which, although containing a mass of air much less than that of a violin, produce sounds of equal intensity, such, for instance, as the flute, clarionet, or the reed pipe of an organ. The last is a very instructive example, and may tend to an explanation of the point in question. A reed pipe consists of a free reed in communication with a column of air above it. Now, it is not absolutely necessary that the free reed should be perfectly in unison with the mass of air above, within certain limits they will accommodate themselves the one to the other; but one remarkable fact is to be noticed, viz., the stiffer the reed the greater power it will have in forcing the air above to vibrate in unison with it. This appears to be the rôle of the tables of a violin, that is to force the vibrations of the air to accommodate themselves to the vibrations of the tables, and the ratios given by Savart as existing between the back, belly, and contained mass of air in the good violins he experimented upon, are no doubt such as to give the two tables sufficient stiffness to bring the mass of air into complete subjection. If this stiffness be decreased the air will have a tendency to vibrate after its own mode—that is, to sound its fundamental note or its harmonics; but, on the other hand, if the stiffness of the tables be too great, greater difficulty will be experienced in putting the instrument into vibration.

When we consider that the sound given by a vibrating solid is an exact index to its elasticity or stiffness, this explanation appears extremely probable. Savart's remarks upon the bridge and the neck seem perfectly just. Unfortunately he bestows but little attention to the bar which is perhaps the least understood element of the instrument.

Upon the paragraphs relating to the other instruments of the class, tenor 'cello and double bass, I make no remark, considering it sufficient for the present to confine my attention to the violin, for let the true principle of the perfect construction of this instrument be once clearly laid down and the rest will become very easy.

CHAPTER V.

THE CONSTRUCTION OF THE INSTRUMENT.

MANY a one may think what need or use in describing the construction of an instrument which one can purchase at the most trifling amount, yes, verily, can adorn our chambers with a Violin and bow to match for the insignificant sum of three or four shillings. True, a full-sized Violin, stained with its rainbow hues, and shining in its lustrous coat of turpentine varnish, with a coloured bow of beechwood, aptly waiting for an attack upon the strings of its feeble and deformed neighbour, which, when such takes place, certainly does not charm the true and favoured sons of Apollo by its melodious tones.

The following must, however, forcibly strike the minds of such persons. Violins appear to possess the widest range of prices, perhaps over any other article of such original cost, as whilst we can obtain the one for two or three shillings, we find we cannot possess some of the finest of the Cremonese instruments for several hundreds of pounds; and when such is the case, curiosity must impress the most careless and superficial reader as to the cause of such apparently mad expenditure.

In former times when Stradivarius, Amati, and Guarnerius flourished, along with many other celebrated makers, the making of such musical instruments was purely an art, for truly such makers were genuine artists; whilst at the present time violin makers, generally speaking, are only traders in it, and instruments, as a consequence, are now ostensibly made for the furtherance of this art, and are thus sent wholesale into the world, faulty and careless in construction; crude, immature, and harsh in quality. The Violin is a favorite, and ever will be, and in view of this alone we shall try to investigate, to the best of our frail ability, its mechanical structure, its workmanship, and its known acoustical principles. The Violin is, as a general rule composed of seventy different parts, but this is not essential, as many of the Cremona instruments had no such number, the back being sometimes whole, corner blocks omitted, &c., but those were rather exceptions to the common rule.

The following table will show distinctly those different parts, along with those which are sometimes omitted :—

NAMES OF THE DIFFERENT PARTS.	PIECES USED.	
	Generally.	Sometimes.
Belly or Breast, ...	2	1
Back, ...	2	1
Sides, ...	6	4
Neck or Hand, ...	1	1
Pegs, ...	4	4
Finger-board, ...	1	1
Nut,...........................	1	1
Bridge, ...	1	1
Tail-piece, ...	1	1
Button for do.,...............	1	1
String for do., ...	1	1
Guard for Tail-piece String,	1	1
Side Linings,*..............	12	8
End-blocks,..................	2	2
Corner do.,*	4	0
Sound-post,..................	1	1
Bass Bar,.....................	1	1
Indenting or Purfling,* ...	24	12
Strings, ...	4	4
Total,...............	70	46

* Sometimes omitted.

Some instruments have a series of rectangular thin pieces of wood glued across the joints of the back and breast, inside the instrument, to keep the joint secure, as well as to give greater rigidity to the plates.

Violins are made of the following woods:—Breast, bass-bar, sound-post, and side-linings, of Swiss pine; back, sides, and neck, of curled or bird's-eye maple; blocks of sallow or pine; finger-board and tail-piece of ebony. Those are the woods which have been usually employed by the best makers, but in the common Violin we find beech used for back, neck, and sides; whilst in others we find the back made of pear or cherry-tree, the side-linings of sallow, blocks of lime-tree, &c.; but, from the true construction of the instrument, it is evident maple and pine ought alone to be used for the formation of back and breast.

Stradivarius made several violoncellos and tenors with the backs formed of poplar and pear-tree, but his best instruments have always had backs made from maple.

A species of wood—the Azarol—common in the Tyrol, is believed to have been used by some of the Cremonese makers in preference to the Swiss pine, and that only the south side of the tree was used.

The wood of which the instrument is formed is a matter of pre-eminent importance, as it must be thoroughly seasoned, and possess good resonant properties. If the wood of back and breast is perfectly baked by exposing it for a length of time near a fire, the instrument made from it certainly acquires a crispness and intensity of tone. Many modern makers adopt this method, but along with intensity there is always a harhness in the sound of the instrument, as the form of the wood cells is changed by the heat, and after a few months the tone of the instrument gradually deteriorates. The firmness and sonority of wood is somewhat improved by steam drying, and we find many of the pieces for violin backs and breasts sold by the musical instrument dealers have gone through this process, whilst others again have undergone an acetous purification. The following method of wood drying is adopted by several of the Continental firms who supply prepared wood for the fabrication of musical instruments. The wood is kept for some hours under boiling water, whereby all its soluble parts are withdrawn. It is next left to dry, and then boiled for some time in a solution of borax, which causes the albumen to become soluble, and to escape from the pores. After this proceeding, the wood is placed in stoves heated by steam, and in three days after the commencement of this series of operations, it has become quite dry, and to all appearance well seasoned.* About 1835,

* In a recent report by Monsieur Violette upon some experiments in which he has lately been engaged, he states that steam of a temperature of 480° Fahr. is capable of taking up a considerable quantity of water. In his experiments he exposed several kinds of wood for two hours to the action of a current of steam at 7½ lbs. pressure per square inch, and having a temperature of 482°. The wood having been weighed before and after exposure to the steam, it was found that oak and elm decreased in weight ½, walnut and ash ⅖, and pine ⅓, the wood having also become stronger, with an increased power of resisting fracture. The increase of strength in oak was ⅝, walnut ½, pine ⅜, and elm .

Mackintosh of Dublin it is said discovered a process by which he cleansed the wood of its resinous particles, &c., without deteriorating the fibre, but his secret he never made known. There can be no doubt that a lengthened seasoning is the most efficient method for the present purpose, as it gives greater toughness, elasticity, and resonance to the wood than by any artificial means that can be adopted.

The celebrated Parisian maker, Vuillaume, even went personally through Italy and Switzerland in order to obtain his time-worn wood. In many cottages of the peasantry and others the furniture and woodwork of the house are composed of pine of a very fine quality, which has perhaps been standing there for hundreds of years, and which consequently possesses the necessary resonant properties. This valuable material was what Vuillaume purchased, and as a result, some of the instruments produced from it, by a few months' usage, equal the old Cremonas. Wood which grows in rocky and exposed situations possesses much sonority. No wood, under at least four or five years' seasoning, ought to be used for violin making, and not even then, unless it has been known that the tree was ripe when cut.

The wood of the entire tree previous to maturity may be divided into two portions, the outer called sapwood, which is soft, weak, and less compact than the inner

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By this process the fibres of the wood were drawn closer together, the colour became darker, and maple and pine treated by steam at a temperature of 487°, were rendered far more valuable for musical instruments than by any process heretofore known.

portion called heartwood, which is the most solid. It is through this outer portion or sapwood that the sap chiefly ascends, and from its thus abounding more in saccharine and other matter, it is more perishable and sooner decays. In trees which have arrived at maturity, there is no distinction between the sap and heartwood, the wood being of the same texture throughout and almost uniform. The proper period for cutting trees is when the sap ceases to flow, and experience has proved the month of December to be the best time for this purpose, as the wood which has been cut during this month has been found to have always been of superior quality to any cut during the other months of the year. The ages of trees are generally known from the number of their concentric rings, but this is not an infallible index in every case. Some pines are known to contain 1200 of those circles, thus indicating an age of 1200 years, but the mean age of the pine, when it has reached maturity, is about 80 years. Maples are known which have reached the age of 600 years. If the wood to be used is in the original state, as a log transversely cut from the tree, we have merely to cut the wood to the centre, from the outer or bark side, and the pieces when so cut must be at least a quarter of an inch thick at centre of tree, and about an inch and quarter at the bark or outside, when the grain of the wood will be found to run in the requisite direction. Again, if the wood is in plank, it must be so sawn as that the required plate will have the concentric circles of the fibre of the tree passing at right angles to its surface, but a few minutes' explanation from any intelligent cabinetmaker in his workshop upon this point, would make the matter clearer to the uninformed reader than the writing of a whole chapter upon the subject. When such pieces have been obtained, and free from knots, warps, and fissures, they may be cut into the following dimensions:—Length 16 inches, breadth 6 inches, ¼ inch thick towards heart of tree, and 1⅛ inches towards the outside. The pieces of maple for the neck are to be cut into lengths of 12 inches, depth 2¼ inches, with the grain running on this part, breadth 1¾ inches, this surface being slab-ways. They may now be stacked on each other in an airy and dry place, with openings between the layers to admit a free circulation of the air, whilst rain, as well as excessive sunshine, must be excluded. Wood seasoned in this manner will be less liable to twist or warp or contain fissures, and will gradually pass to a dry and solid state.

When the wood for back and breast has been thus seasoned, the two thickest edges being the bark side of the tree, are to be neatly and carefully joined in such a manner, that one side of the joined plate will run perfectly level, whilst the other side will be highest in the middle, slanting to the edges, as seen endways in Fig. 5. For the operation of joining the two halves, the plane iron must be very keenly sharpened with the back iron pretty close down, so that the thin shavings are perfectly cut and not torn. It will thus be seen that the centre of this joined plate contains the

Fig. 5.

external wood of the tree, whilst the edges contain the interior or heartwood. The joint is thus made plain, but as fine and close as possible on both sides, that both pieces may thus act as one afterwards, and it must also be cut so as to have the fibres of the wood running as nearly parallel to it as possible. It is assumed that the resonant property of the wood has been tried and found satisfactory; also, that the maple is of full figure and finely marked, thus conducing to the beauty of the instrument, and that the grain of both back and breast runs straight and nearly equidistant. In the wood for the breast the grain ought to be close, fine, and well marked, and perfectly straight from end to end.

Presuming a tolerably good joint has now been obtained the next process is to glue it. Carpenter's common glue will not answer the purpose well, as it is by far too coarse. It tends also to leave an unseemly black line where the pieces are joined. Isinglass is often employed for uniting the parts of the Violin, but its proper manipulation is very difficult, as it sets so soon; and there are so many bad samples of it in the market, that there is much difficulty in obtaining it of excellent quality. A very pure and refined glue is to be had, which is almost transparent, and which possesses great tenacity. It is always in pieces about 9 in. long, 2 in. broad, and barely $\frac{1}{16}$ in. thick, and is almost as transparent as glass. This glue is generally sold at one shilling per lb., and will be found of admirable quality for violin making, as well as any other purpose where neatness combined with strength is required. For the Violin it is quite essential that the finest glue must be employed, as the instrument has to withstand so many vicissitudes of temperature, vibration, &c.; and it is certainly not very gratifying to have it constantly requiring repairs from the cause of bad glueing.

A small glue pot of copper or cast iron, with a tinned interior vessel, may be obtained for a trifling sum, and will be found quite suitable for the various operations of Violin making. The glue is first broken into small pieces, and steeped for an hour or two in cold water after which it will be found to dissolve more readily in the subsequent operation. Pour off the water, and place the now swelled glue into the interior vessel of the glue pot, along with a small quantity of water; fill up the outer vessel with water, and insert the one containing the glue, allowing the superfluous water to escape, then place on the fire until the glue thoroughly dissolves, and gradually fill up with water until the liquid is about the consistency of olive oil. A small brush and thin piece of pinewood are all that is required for spreading it upon the surfaces of the articles to be united.

If this species of glue is used, care should be taken not to overheat it. A small quantity of spirits along with a few drops of creosote, may be advantageously added to the solution, as this tends to strengthen it; and by this method it will also keep from mould.

The two halves of the back being now properly jointed, place one in the bench vice, joint side upwards; hold the other half with jointed surface running along the former, and resting on it edgeways, cover both surfaces with hot glue of a somewhat thin consistency; and place the now glued surface of the detached half upon the surface of the fixed one; slide the upper surface upon the under, longitudinally and evenly, forcing out the interposed glue, when, after a short time, the glue will set, as will be shewn by the intense binding of the plates together. When such happens, have them in proper positions, as ends and sides square; let them remain in the vice for a short time, until the joint firms somewhat, after which, carefully place them in some dry part, until the glue dries, which, in the summer time, will be in from eight to ten hours, according to quality of glue. The breast is glued in a precisely similar manner. Some makers cramp the two plates together; but by this method the joining is never so firm, neither does the joint remain so firm as it appears when newly taken from cramp, but almost invariably slightly opens afterwards. If the weather is cold the two plates may be slightly warmed, previous to glueing; but the planed surfaces must be kept as clean as possible, and free from fingering, as the glue will not adhere properly if the joined surfaces have been greased by the warm hand or fingers. In warming the plates, the maple especially, avoid all excessive heating, or it will be found, that what was originally an almost *invisible* joint, will be found, after glueing, to be but of a too visible nature, as the even surfaces have been injured from the contractions arising from overheating. When such is the case there is no remedy but to take the back to pieces and rejoint again.

When the back is thus glued and thoroughly dry, the level or under surfaces may now be dressed perfectly straight and level, with a plane; for upon this surface is the outline of the instrument traced. The model of the intended instrument must now be decided upon, whether a copy of a Stradivarius, Guarnerius, or Amati, is contemplated; but if the amateur has no model of his own, he may easily make himself one from any of the illustrations in Vignette, as he cannot do better than follow those of the old masters. For this purpose let him procure a sheet of tracing paper, and place upon any of the outlines he may wish to make his Violin from, then copy off the model from the engraving with pen and ink, and cut the tracing paper evenly through at the centre line. A thick veneer of mahogany or hardwood of the requisite size may now be obtained. Strip one edge straight with the plane; place traced design upon the veneer, with the centre edge close and even upon the straight edge of veneer; paste down, and when dry, cut the curved part to inked outline with knife, and finish carefully with a file. This simple and easy prepared model will be found to answer every desired purpose quite efficiently. If, on the other hand, the amateur maker has a cherished instrument which he wishes to copy, dissimilar to any of the foregoing patterns, he must model an outline from his favorite instrument. This is a simple matter if he has had the instrument to pieces, as he has only to trace the outline of the breast; but when the instrument is whole, the following method may be adopted. In a piece of thin hardwood of proper dimensions, cut out an elongated opening of a guitar shape, sufficiently large to allow the higher parts of the arching of the back of the Violin to pass through, and the edges to rest upon the surface; then trace the outline with a small drawpoint or tracer. Upon the dressed level surface of the back, place the model, and trace off the design carefully with drawpoint. If the first form of model is chosen, trace off one half by placing model close and even with the line of the joint, then turn over model upon the other side of the surface, and complete the tracing of outline. It will save trouble in re-measurements hereafter if the joint is thus kept running exactly through the centre of the back, and if the back is to be made from a whole pattern, then it must be placed so as to have this line passing through its centre. After the design of the back is thus marked, the plate is to be fixed in vice, and with a bow-saw, shewn in Fig. 6, the design is to be cut out by sawing pretty close to traced line. The saw should be kept as square as possible, by doing so it will save the trouble of after-paring, but the traced line should be left quite clear. When this is accomplished, the edges may be completed by paring with gouge and chisel, and finally finished to the line with file.

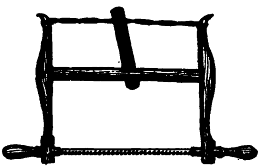

Fig. 6.

The models for the arching of the back may now be prepared, as in the early part of the after operations they are required. Many makers use no models for this purpose, merely working by eyesight alone; but if the amateur has any regard for the internal volume of air to correspond harmoniously as a whole, he will find the benefit of making and working to models taken from an excellent instrument. Four of those models are required for the back, which may be made in the following manner. In a piece of mahogany about 15 inches long, 1¼ in. broad, and $\frac{1}{10}$ in. thick, cut an elongated curve, place this perpendicular and lengthways upon the centre of the back of violin, then with a small scribing tool trace off upon the surface of mahogany the arching of the back. A shifting-legged compass will answer the purpose equally well, if the amateur does not choose to make a small scribing instrument.

Place a pencil in the compass, and pass the point of the other leg into a small piece of cork, to prevent the compass from scratching the varnish, open the legs about ¼ or ⅜ of an inch, let the point with cork rest close to the surface of violin and mahogany, keep the model perpendicular to back, and draw compass along the arching from end to end, when the pencil will trace the line of arching upon the mahogany. Mark the model at the purfling of the back, cut one end square to purfling, and have a notch cut in the other, so as to fit the edge of the extremity, then with a knife cut out the underwood to the pencil line, and place model upon the back, when, if any slight discrepancies occur, adjust with a file, until the model fits accurately upon the curvature of back from end to end. A representation of this model, along with the other three, are shown in Fig. 7. The three transverse models are made in a similar manner, and are taken from the archings at the places on the violin marked respectively 2, 3, and 4—Fig. 8.

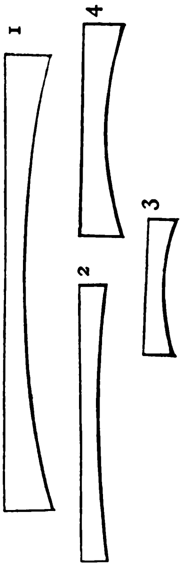

Fig. 7.

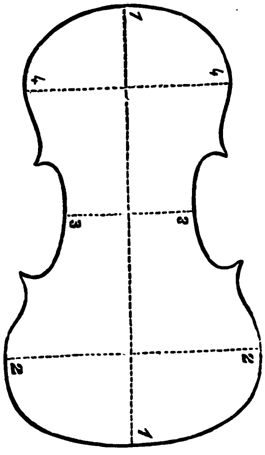

Fig. 8.

It will now be evident there are the same number of patterns required for the arching of the breast, and which are formed in the same manner as those already described for the back, in all eight, which models complete the outlines for the archings of the instrument. To return to the back, the outline of which has been now finished, the thickness of the edges must now be made equal. With a small gauge, set the tracer to mark a line $\frac{3}{16}$ or $\frac{1}{4}$ in. thick, according to the copy of violin to be made, as this first thickness must be somewhat fuller to allow for indenting, finishing, &c. When gauge is thus set to desired thickness, run a line round the edges from under or flat surface, when the upper wood must be removed with plane and paring chisel, until the edges are all of an equal thickness. Some makers have a piece of deal about the same size as back, upon which the flat surface of back or breast is placed; an iron screw, with large threads, is screwed partly through the under surface of either, and passes through the deal, having a binding nut at lower end of iron rod, by which the back or breast is firmly fixed to deal. Others again cramp the back or breast, flat side downwards, to the deal plate with small iron cramps—either of which methods retain the back or breast in position until the outer surface or arching of the instrument is completed; but the generality of makers merely hold the plate on bench or knees until this portion of the work, as well as the succeeding, viz., the hollowing out, are finished. I anticipate the amateur will choose no such appliances, but adopt the latter method of working. If such is the case, two thin rectangular pieces of pine may now be glued across the plain surface, one at each end, crossing the joint, which will prevent the joint from opening at the ends, as it sometimes does from the heat and perspiration of the hand.

The gauge is now set to a distance a little farther from the edge than where the indenting or purfling is to be placed, and a line traced round the edge on the upper surface, where the scooped out part is formed with gouge, leaving the surface between line and edge flat, until the other part of the raised surface is completed. If the purfling or indenting tool used has a moveable slide containing the cutter, this may be used instead of the gauge, to mark the line of edge slope, by taking out the cutter and subtituting a small-pointed piece of steel as a tracer.

The upper or outside surface must now be gradually sloped with gouge, plane, and paring chisel, until it approaches in curvature to correspond with the different models, after which the wavings or tool marks are obliterated with a file, and the surface finished with fine sand or glass paper.

If the curvatures have been carefully wrought, the models will now fit upon the respective surfaces equally, and the archings will bear no important dissimilarity from those of the model violin chosen. In cutting off the superfluous wood, the tools must be kept very sharp, as there is difficulty in working cleanly some specimens of plane which are highly marked, unless the edge is keen, and the run of the wood must also be observed—in short, the tool must always cut, and never tear the woody fibres.

This, as well as the other parts of violin making, will be found to take time, patience, and application, but when the work is accomplished in a creditable manner, there is the more pleasure attached to it afterwards, and whatever is worth doing, is worth doing well. When the arched surface of the back has been completed accurately according to models, and no prominent marks or irregularities left on the surface, as may be seen by holding it on a level with the eye to the light, but all beautifully even and symmetrical, the next proceeding will be that of hollowing it out and graduating it to the proper thickness. For this purpose a double callipers made of either iron or hard-wood, having the ends polished, is necessary, as also

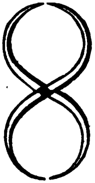

Fig. 9.

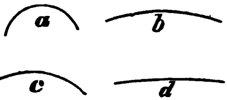

Fig. 10.

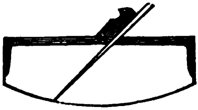

Fig. 11.

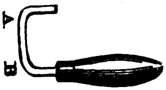

Fig. 12.

Fig. 13.

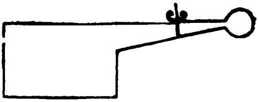

Fig. 14.

a gouge or two, and a small plane. Fig. 9 represents the callipers; Fig. 10, *a*, *b*, *c*, *d*, the shapes of the curves of edges of gouges; and Fig. 11, the form of plane. Some makers use a tool represented in Fig. 12, about two inches long from A to B, $\frac{3}{8}$ of an in. broad, and about $\frac{1}{16}$ of an in. thick at back. This tool is used in a similar manner to a draw knife, and is only intended for excavating the rougher portions of the wood, and must be worked rather lightly. A small knuckle-bent gouge, Fig. 13, will be found extremely useful in hollowing out the part of the exterior surface adjoining the indenting. In Fig. 14 is represented another form of callipers, which will be found very useful in taking the thicknesses of the breast of any whole violin; two different sizes of this callipers will prove serviceable, one leg is inserted through the *f* hole, as will be understood from the illustration.

No invariable standard thicknesses can, as a rule, be adopted in the construction of the various instruments, as this depends upon the quality of the wood and the model chosen, as Amati adopted one method, whilst Guarnerius and Stradivarius wrought each upon entirely different principles. The reader, by referring to Chapters II., III., and IV., will easily perceive this, as well as the various reasons for departure from a fixed rule. The following thicknesses, as a mean standard, may be successfully chosen for the back, whilst the other parts of the instrument must be built in a proportionately harmonious manner as regards volume or capacity and toning of breast. Dress three small pieces of hardwood about 1 inch long and $\frac{3}{8}$ inch broad to the following thicknesses exactly:—No. 1, $\frac{1}{8}$ of an inch; No. 2, $1\frac{2}{3}$ lines; and No. 3, $1\frac{1}{4}$ lines.

Those various sizes are the mean thicknesses for the back (the breast being always slightly thinner throughout), and are used by placing them between the points of one end of the callipers whilst the other end gauges the thickness of the plate.

At the distance of 6¼ inches from the upper or wide end of the back upon the centre line, make a mark with tracer, and from this, as a starting-point, measure off 2¾ inches towards the upper end, and 2 inches towards lower end upon centre line of back; set a small compass to ¾ in., and set off this from the extreme or end marks on each side, thus forming a rectangular figure 4¾ in. long and 1½ in. wide.

The thickness within this figure must be reduced until it is the same as No. 1 or ⅛ of an inch thick throughout, gradually but accurately decreasing in thickness outwards to 1⅜ lines midways between this and the edges where the sides are placed, this part being 1¼ lines thick in the back. The back may be hollowed out with gouge or draw-knife described, until the thickness is nearly arrived at, after which the small plane may be used until the precise thicknesses are obtained. A line should be run round the inside margin of the back with gauge at the place whereon the side linings will run, and the thickness truly reduced to the standard at this part.

The graduating of the thicknesses must be wrought very accurately, and the interior surface finished with the same care as the already finished outer arched surface—no ridges or irregularities being left, but all smooth and finished.

The final finishing must be done with No. 0 sand or glass paper. It must be observed that the outer surface of the edge of back from the gauge line must be left thicker for the present to allow of the indenting afterwards. The normal tone of back may now be tested, which, if the wood has been of rich sonorous quality, will be found to answer very closely to that of the backs of Stradivarius if the same model has been adopted.

For the belly or breast the same models are required, which may be made in the same manner as those already described for the back, and in addition to those a model of one of the *f* holes must also be taken. This may be traced on paper or parchment and transferred to zinc or thin wood, after which the pattern may be cut out. As the breast is made in a similar manner to the back it would only entail unnecessary repetition to describe that part of it preceding the cutting of the *f* holes. The same starting point is taken for the breast as that of the back and the rectangular surface of equal thickness the same dimensions, but the thickness throughout the entire plate ought to be half a line less than that of the back. The former starting point, viz. 6¼ inches from the upper or wide end, corresponds with the inner or bridge notches of the *f* holes; a line passing through this point to the centre line will pass through those notches. The sizes of *f* holes vary according to the model of the violin and are formed, to correspond with the internal capacity; when large they make the tone more free and shrill, and when small they cause the tone to be more round and mellow. The model of *f* hole being obtained it is to be placed in the proper position upon the surface of the breast, and the shape traced upon the breast with a fine-pointed pencil. A thin narrow and pointed penknife may be used for cutting out the *f* holes, which must be cut by small portions, and the knife kept very sharp. When cut, the circular parts may be rounded with a fine rat-tail file, after which the *f* holes must be finished with fine glass paper. The model is now reversed to the other side, and the other *f* hole cut in like manner to the preceding. The bass-bar may now be made and carefully fitted to the interior surface of the breast. For this no particular scale of dimensions can, as a rule, be adopted, as much depends on the height of arching and quality of wood used in the construction of the breast, whether close or open in the grain, and the height of bridge to be chosen afterwards. For mean sizes, the following may be advantageously chosen; length, 10 inches; depth at centre, $\frac{1}{3}$ inch, gradually tapering to about $\frac{1}{12}$ inch at the ends, and thickness about $\frac{1}{6}$ of an inch. For forming the above, the piece of pine may be about 11 inches long, having a line crossing the centre dividing the length into two equal parts, whilst the depth or breadth may be about $1\frac{1}{4}$ inches; then, by placing the piece upon a line traced upon the proper part of the interior surface, where the bar is to be glued, a line may be scribed with a compass upon the bar, and the spare wood cut away with a knife, &c., until the bar accurately fits to the intended part of the surface. A common but very erroneous idea prevails amongst many violin makers regarding what ought to be the proper depth of the bar at the centre. The method alluded to is this: a straight-edge is passed across the two inner edges of the breast, where the centre of the bass-bar ought to be, the depth is then measured from the bottom of the hollow or curve to the under surface of straight-edge, which determines the required depth of the bar; in other words, the top surface of the centre of the bass-bar runs level with the two edges of the breast. It is necessary that the wood from which the bass-bar is formed possesses resonant qualities in an equal degree to that of the breast, and ought to be tested previous to commencing. The proper place for the bass-bar is about $\frac{1}{16}$ inch inwards from the inner edge of the lower circle of the bass *f* hole. In the Guarnerius copies by Vuillaume, the length of the bass-bar is such as to extend to $1\frac{5}{8}$ inches from either end of the breast, as measured on an imaginary line passing through the middle of the bar. When the bar has been accurately fitted, it may now be glued in its proper position upon the interior surface. The next object claiming attention is the bending of the sides to the proper curvatures, and the insertion of the blocks and side-linings. Numerous methods are used for this purpose by the violin makers, some bending them over a hot iron, whilst others bend them by having previously soaked them in boiling water. The generality of makers use a mould for this purpose, whereby much trouble is saved, although a few adhere to the plan of bending to curvature on a hot iron, and glueing on to violin back separately, after which they fit in the blocks. There are various patterns of moulds used by the makers, some preferring a half-mould, whilst others adopt a whole one. A form of whole-mould is represented in Fig. 15. This mould may be formed

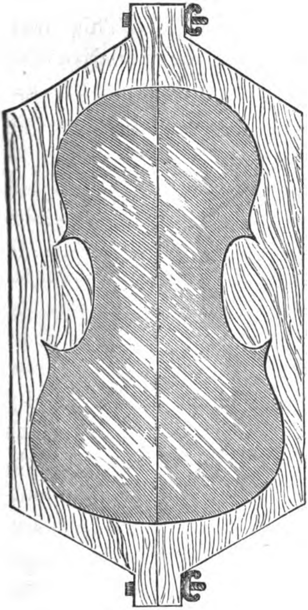

Fig. 15

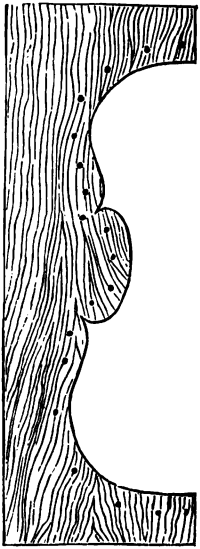

Fig. 16.

from a piece of clean plane or beech, about 17 or 18 inches long, and 1½ inches thick. The inner part is neatly cut out from pattern, whilst two iron screws pass through the extremities, one at each end, and bind the inner plates together. The sides or ribs, after being dipped in boiling water, and slightly bent to shape upon a hot iron, are placed in mould, after which the two inner halves are inserted, and the whole clamped together by the two iron screws. The blocks are added after the sides are thoroughly dry, and retain their permanent shape. Fig. 16 represents another and better description of mould. This form of mould is made from one half of the model of the intended violin, as will be observed in the illustration.

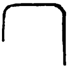
Fig. 17.

About a quarter of an inch from the edge of the outline, are placed a few bent pieces of strong wire, as represented in Fig. 17, by which the linings are kept in position upon the sides, whilst at the distance of about an inch from the edge are fixed several iron cramps, one end being turned as in Fig. 18, which passes into a hole pierced in mould, whilst the other has a screw attached, which cramps corner-blocks and sides, by which a neat and close joint is obtained. This mould may be made from a piece of clean beech, about 16 inches long and 1½ in. thick. The outline of the violin from a half model must be carefully drawn on beech, whilst a line must be traced neatly within the outline at the place where the outer surface of the sides would be, and the whole inner portion carefully sawn out to this inner line. The sides of the curved inner part must be cut truly perpendicular, and all the saw marks removed with a file. The sides are bent nearly to the shape upon a hot iron, after which they are placed into the mould and cramped into position by the iron screws and wires, until they fit closely to the mould, and are left


Fig. 18.

to set for several hours, after which the corner-blocks and side-linings are fitted and glued in, and cramped as before. The thin veneers for sides, as well as the small pieces for the indenting, can be obtained at the musical instrument dealers' for a trifling sum. The sides must be carefully dressed with a small or hand plane. One end may be glued or tacked to a flat and level piece of board, whilst the other lies free, as from the thinness of the side it would warp and break if placed against a rest. If the amateur wishes to cut the sides from wood he may have, he can dress one side of his plank, and then saw out the veneer such a size as may enable him to have all his sides from the one piece; then, after dressing the other surface, he may cut them into pieces about 15 or 16 inches long, by $1\frac{1}{2}$ broad. The grain of the wood must run parallel with the length, and the veneers may be cut out to sizes with a knife. It will be observed that the depth of the sides of the generality of good instruments varies, the least being at the neck or hand, gradually increasing towards the button of the tail-piece, where the depth is the greatest. In the violins of Nicolas Amati, the average depth of the sides at the neck will be found to be $1\frac{8}{20}$ inches, increased to $1\frac{1}{4}$ inches at the button end.

The side pieces being now properly dressed, are to be carefully bent to nearly the required shape upon a hot iron. Two iron or brass tubes of different sizes will be found advantageous for the variety of curvature of the sides, the smallest one answering to the acute curves of the corners. The tubes are to be heated either in a clear fire or by the introduction of a heated iron rod, but the heat must not be so great as would char the wood. They are to be bent gradually, moistening the upper surface slightly with water, which will tend to prevent them from breaking. After they are bent to shape, introduce them into mould, and cramp in with the wire and screw-cramps, until they are close to the edges of the mould all round.

The next operation will be that of making the side-linings, which are formed of pieces of pine or sallow, about $\frac{3}{16}$ of an inch broad and fully $\frac{1}{16}$ in. thick at one edge, the other being only about $\frac{1}{32}$ of an inch thick, one side being thus level whilst the other or outer side is sloped. They are glued to the inside of the upper and lower edges of the sides, and may be bent into shape upon the hot tubes, or by dipping them into boiling water.

The corner and end-blocks are also made of pine or sallow, and must be neatly fitted to their respective places.

The corner-blocks are from $\frac{7}{8}$ to 1 inch in length across the upper surface, the end-block at the button about $\frac{3}{4}$ inch at thickest part, and of a semi-elliptical outline, whilst the neck block is made similar to the former, but of a somewhat larger size. All the above pieces require to be neatly fitted to the sides, being quite close all round, whilst the under and upper surfaces of blocks must fit evenly against the back and breast. The side-linings and corner-blocks being prepared, they are glued to the sides and corners, and cramped all round into position, the former being placed with the level surface upon the sides with the thick edge outermost, after which they are left in the mould for several hours to dry. If the whole model is adopted, the side-linings can be kept in position by the American clips, such as photographers use, and which are sold at 1s. per dozen; a representation of which is shown in Fig. 19.

The end-blocks are not attached until the other half of the sides, corner-blocks, and linings are finished, which is merely a repetition in manipulation of the preceding described first half. The blocks are made slightly deeper at first than required, that they may be truly fitted to the back and breast afterwards, and the length of that part of the sides and linings which would run upon the centre line is kept full, that a neat joint may be obtained when the end-blocks are attached. The first half being dry in the mould may now be finished by removing all traces of superfluous glue from the joinings, and cleaning the whole with fine glass-paper, but the glass-paper must be very fine, so as not to leave the slightest roughness of surface.

Fig. 16.

The two-end blocks having been made, two lines may be traced down the outside centre of each, after which the blocks are to be fitted to their places upon the ends of the back, with the bisecting lines running exactly upon the centre line of the back of the violin. They are to be firmly glued on the end surfaces, and cramped down until the joints are thoroughly dry. The two halves of the instrument comprising sides, corner-blocks, and linings, having been prepared as described, are to be accurately fitted upon the back. For this purpose one half may be adjusted first and cramped down upon the back with the wooden cramps,

Fig. 20.

as shewn in Fig. 20, the ends being cut the exact length, which will be square from the centre line of the back, after which the whole may be glued by unscrewing a few of the cramps, by which means the glue can be traced in the joint little by little, then re-screwing the cramps as before, until the whole of the joining of the sides with the back and half of the end blocks is completed. When this portion is thoroughly set and dry, the other half may be attached in a similar manner, but instead of glueing on the whole of the sides, a portion of each end may be left unglued for the present, and allowed to project over the two glued ends of the other half, as by this means the joinings can be easily and accurately fitted afterwards. When the whole is dry, the two ends of the sides may be cut to the proper length, and glued to the end blocks and back. The side-linings should also fit closely to the surfaces of sides, blocks, and back, and no openings or crevices be found, as all should be neatly joined, that the whole may act as a single piece afterwards. The French method of uniting the sides is by having blocks and corner-pieces attached round a mould, glueing on the back, and then cutting the blocks free from the mould.

The neck or hand of the instrument next claims attention. If the amateur wishes to form the hand and scroll from any favorite violin, he must make himself a pattern from such. This he can readily accomplish by tracing such model upon a thin veneer of hardwood, or a thin plate of sheet zinc, carefully observing the copying of the curves of the scroll, as well as the angle which the neck makes with the body of the violin. Having selected a piece of maple with the fibres running properly, as mentioned in the early part of this chapter, he must square it up, and upon the grained surface trace the design, leaving the wood longer than actually required hereafter, in order to accomplish the joining of the extremity of the neck to the body of the instrument. He must carefully trace the scroll with draw-point and compass, having the centres exactly opposite. The peg-box must be neatly mortised out with a small chisel, the spirals of the scroll cut gradually into shape with small gouges, the marks obliterated with a round file, and the whole finished with glass-paper. The proper places for the peg-holes are to be marked out and pierced with a bradawl or small bit, then a tapered bit of the form of Fig. 21 may be used to cut them to the conical form. The young amateur will no doubt find some difficulty in his first attempt at this operation—the making of the hand—but the manipulation will prove easier to him after a few trials. Finished hands are now sold by the musical-instrument dealers at prices ranging from 6d. to 2s., according to quality and finish—thus, if the

Fig. 21.

amateur gets baffled in his first attempt, his wants will be met at a small outlay. The neck must be adjusted very accurately to the body of the instrument, not only as regards angular position, but also that it may be in a line with the centre of the violin. The proper angle for the neck is such that the centre of the scroll lies in a line with the edge of the back of the instrument, as seen from the opposite extremity; but the young amateur must observe, in the adjustment of the neck, that the finger-board be afterwards at the proper height from the breast. The degree of elevation of the finger-board depends upon the model of the violin chosen; but as a mean, the height from the extreme end of the finger-board to the surface of the breast in the centre, may be taken as $\frac{7}{10}$ in.; but no definite elevation can, as a rule, be laid down. The amateur must decide upon this from the intended height of his bridge. The belly may be cramped down on the sides with a few of the wooden screw-cramps, and the hand lightly fixed to the instrument with a cramp, such as shown in Fig. 22, when the following simple method will suffice for the adjustment of the neck. Take a piece of thin wood about 17 in. long and $\frac{1}{4}$ in. broad, having one edge perfectly straight, lightly tack this veneer to the upper surface of the neck in such a manner as to have the straight edge running in a line exactly through the centre of its length, by this it will be readily perceived that the neck will be in its proper position when the

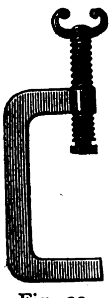

Fig. 22.

joint is such that the edge of the veneer is exactly in a line with the centre line of the belly, and its lower surface will coincide with that of the finger-board, from which the proper height may be easily arrived at. The neck being properly adjusted, and a joint obtained to meet the required demands, it must be firmly glued into its proper position, and cramped for several hours, until the joining gets thoroughly dry. It is to be understood that the preceding description is applicable to a plain joint, where the neck is merely glued to the outside of the body of the violin, but in numerous cases a part of the neck is let into the body, having a saw-kerf near to the extremity, through which part of the sides are inserted; but by the first method, if the joint is well fitted and glued, it will be found quite efficient to withstand all tension and pressure to which the instrument is necessarily subjected. If this plan is had recourse to, the joining will be much simplified by observing to place the end-block and sides quite square upon the back; then, when the proper angle for the fitting of the neck is once obtained, cut the model to the same angle, which will greatly facilitate the amateur in the joining of this part to the instrument in subsequent operations, if the same model is chosen. After the hand has been properly attached, the belly may be glued upon the instrument. Previous to this, the edges of the sides and blocks, as well as the interior of the instrument, must be quite clean and finished, and every trace of superfluous glue removed. The belly may now be cramped down upon the sides, and care be taken that a uniform distance is maintained between the sides and the outer edge all around the instrument. If the sides have been attached to the back slanting or off the perpendicular, those unseemly faults will now appear very glaringly, as the distance between the edge of the belly and the sides will vary with almost every curve. The belly being cramped down with a sufficient number of the wooden screws, one side may be loosened, and a covering of hot thin glue traced all round the inner surfaces to be attached; this is now to be firmly cramped until every part of the joint is close; the screws from the other half are then to be removed, after which it is to be attached in a similar manner. The last work having well dried, the next step is the indenting or purfling of the instrument—although some makers do this part of the work immediately after they have formed the back and breast, but this is a matter of no great importance, unless bad work has been displayed in attaching the sides.

The edges are to be rounded and finished previous to running the indenting along the surfaces. For the purfling many forms of tools are used, but the one represented in Fig. 23, although *original*, will be found to answer the purpose thoroughly. By this instrument, it will be perceived we can vary the distances from the edges to imitate any model chosen. The two cutters are thin pieces of steel, sharpened at an angle, with a shoulder left of the necessary thickness, so that the groove cut may fit the indenting strips. The cutters are kept in position by the screw *a*. 24 *a* represents one of the cutters, seen edgeways; 24 *b* shows the form of blade and point. Fig. 23 *b* is a small screw for adjusting the shoulder-piece to any required distance the purfling may be intended to be placed. This tool may be made from iron—with the

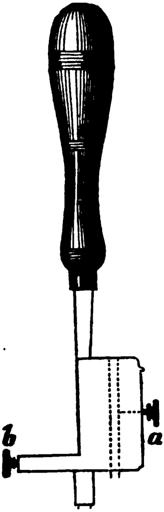

Fig. 23.

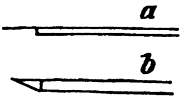

Fig. 24.


Fig. 25.

exception of the cutters, of course—and fixed in an ordinary tool-handle. Another purfling tool, but much simplified, is shown in Fig. 25. The body of this tool may be formed from a piece of beech, having two cutters the same as the preceding fixed by a binding-screw. This simple tool answers admirably, and may be easily made by any amateur. The angular parts of the blades must be made thin, and the edges kept very keen. Either of those two tools are to be held quite steady, and a double cut of the proper depth run round the margin of the back and breast, the interior wood is afterwards to be cleanly cut out with a chisel-sharpened awl, as in Fig. 26. The indenting groove must be cut gradually and carefully, never allowing the tool to tear the wood or slip from the proper place. At the parts of the back and breast opposite to the extremities of the neck where the indenting tool does not reach, two pencil lines may be drawn through the spaces, and the groove cut to lines with a thin pointed penknife, and the wood cut out as previously. The small strips of indenting are to be had at the shop of the musical-instrument dealer, and may be obtained at a trifling cost. They are to be fitted and glued into the grooves with thin glue, and, when dry, cut down to the surface of the violin—the scooped out part is now finished, and the edges reduced to their proper thickness. At this stage of the work the violin is usually cleaned and varnished, but, for the present, we shall complete the mechanical part of the work, viz., the finger-board, nut, &c. The finger-board is formed of ebony, and a model of such—as shewn in Fig. 27—should be made from that of some well made instrument. A piece of ebony being obtained of the proper dimensions, the outside parts are to be dressed with the plane, the hollow surfaces scooped out with gouges, and the whole finished with glass-paper and glued upon the neck of the instrument. The following dimensions of the finger-board may serve as a mean :—Length, 10 in.; breadth at lower end, $\frac{17}{20}$ in.; and at the upper

Fig. 26

Fig. 27.

end, $1\frac{15}{20}$ in. The nut, or small piece of ebony which projects at the end of the finger-board, is now to be formed and glued into its place, the whole is then finished with file, and cleaned with glass-paper. A small hole is then to be cut through the tail-block for the admission of the button-peg, upon which the tail-piece is fastened, whilst a small strip of ebony is glued into that part of the breast over which the cords of the tail-piece pass. The tail-peg may be fitted in without glueing in the meantime, in order that the sound-post may be properly adjusted afterwards. The holes for the pegs are now to be formed of the proper size with the bit shown in Fig. 21, and the pegs roughly fitted with file and glass-paper to their respective places. The small holes for containing the ends of the strings may be pierced with a small drill. When the foregoing operations have been finished, the surface of the whole instrument is to be thoroughly cleaned with glass-paper and prepared to receive the varnish. A wetted sponge is now to be passed lightly over the whole surface, and, when dry, the roughness is to be cleaned off with glass-paper, and the preceding operations to be repeated until the surface is perfectly smooth and brilliant when wet. The instrument being dry, is now ready for varnishing, details of which may be found in Chapter X. Many makers, previous to this operation, coat the surface with a wash of thin size, which, when dry, is rubbed off with glass-paper, and is then ready to receive a coating of varnish. When the varnishing is completed and the instrument dry, the peg-holes may be cleaned with a rat-tail file and glass-paper, and the pegs are afterwards accurately fitted to their proper places. The tail-piece may now be put on along with the strings, and the bridge being cut to the proper size and form, must be fitted very truly to the surface of the belly of the instrument. The arching of the bridge ought to correspond to that of the surface of the finger-board if properly made. The sound-post is now made, and is formed from a piece of straight and well-grained pine having the fibres running longitudinally. It may be rounded with file and glass-paper, and must be neatly fitted at the extremities, so as to rest closely upon the inner surfaces of the two tables of the violin. To place it in the instrument, a small draw-point may be used, or the sound-post-setter, which is a long metallic plate of a rather peculiar form, shown in Fig. 28.


Fig. 28.

The proper place for the sound-post varies according to the qualities of the instruments; but in good violins it may be placed, as a mean, in such a position as to be about a quarter of an inch behind the right foot of the bridge, but when once the proper place is obtained—by repeated trials—it should be marked, so that, in cases of accidents, it may be replaced again in its proper position; but the amateur will find the necessary information regarding this, as well as the bridge, in the other parts of this manual more directly appertaining to the subject.

CHAPTER VI.

MATHEMATICAL METHOD OF MODELLING AND CONSTRUCTING THE VIOLIN.

BY drawing and constructing the instrument according to the following method, as given by Antonius Bagatella of Padua, very passable Violins may be produced. *Exact* work must be displayed in the divisions of the length as well as in the graduations to scale subsequently set forth. Draw a perpendicular line 14 inches long, and divide this carefully into 72 equal parts, as in Fig. 29. Through the following numbers of the graduated perpendicular, draw 20 horizontal lines, as in illustration:—

1st	Line through the point 8, and marked	AA.
2nd	14,	BB.
3rd	16,	CC.
4th	20,	DD.
5th	21½,	EE.
6th	22,	FF.
7th	23,	GG.
8th	27,	HH.
9th	28,	II.
10th	31,	KK.
11th	33,	LL.
12th	34,	MM.
13th	37,	NN.
14th	39,	OO.
15th	40,	PP.
16th	44½,	QQ.
17th	48,	RR.
18th	55,	SS.
19th	56,	TT.
20th	65,	VV.

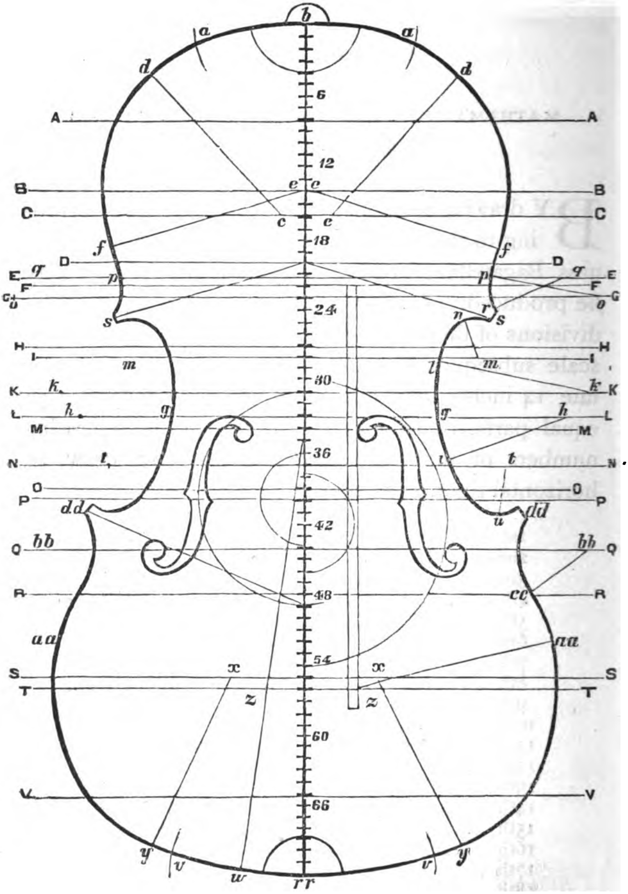
b
a a
d d
6
A A
12
B e e B
C c c C
f f
18
D D
E q p p q E
F F
G o G
24
s r s
n
H H
I I
m m
l
30
K k k K
L h g g h L
M M
36
N t t N
O O
P P
dd dd
u
42
Q bb bb Q
48
R cc R
aa aa
54
S x x S
T T
z z
60
V V
66
y y
v v
w
rr

Fig. 29.

Now open the compass to 9 parts, place one leg on *b*, and trace the two arcs *a a*, then open the compass to 24, and placing one leg on 24, from *b* draw the curve *a b a*, open the compass 2 parts, and set off this upon both sides of the perpendicular, upon the line C, as marked *c c*, and from those points as centres, with radii *c d*, describe the two arcs from *a* to the first parallel A. Now set off 1 part as formerly on the line B marked *e e*, and from those points as centres prolong the curves through *f* from the line A to D. Set off 11½ parts upon line L to *g*, and 11 from *g* to *h*, from *h* as a centre, draw the curve *i* from L to P. On K set off 23¾ parts *k*, from this point with a radius from the part of the curve crossing M, draw the curve *l* from M to H. Open the compass 11 parts, and from *r r* as a centre trace the two arcs *v v*, and from 35 as a centre, with radius *r r*, trace the curve *v*, *w*, *r r*, *v*. Again, upon the line S mark off 6 parts *x x*, and from those as centres, with *v v* as radii, prolong the curves from *v* through *y* to the line V. On T mark off 4 parts *z z*, with those as centres, and radii to where the curves touch V, prolong the curves through *a a* from V to R. On G mark off 24½ parts on either side of the perpendicular *o o*, with those as centres, and radii to the parts of D where the curves *f* touch, prolong the curves *f* through *p* to F, and on I mark off 14⅜ parts as *m m*, with those as centres, extend the curves from *l* through *n*, from H to S. Set off 22 parts *g g* on E, and with those as centres, with radii to where the curve *p* touches E, trace the curve through *r r* to *s s*. Now place the compass upon 20, open it 16½

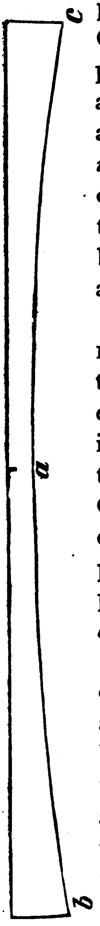

Fig. 30.

parts, and trace the corners *s s*. Again, upon Q mark off 24 parts *b b*, with those as centres prolong the curves from R through *c c* to *d d*, and upon N mark off 16½ parts *t t*, with those as centres, and radii to the parts where P joins *i*, trace the curve *u* to *d d*. Finally open the compass 19¾ parts from the point 49, and trace the corners *d d*. The angles of the curves between L L and M M must be formed into a proper shape by a file.

The Proper Elevation for the Archings of Back and Belly.—For the longitudinal model of the arching, dress a piece of wood to the following dimensions:—15 inches long, 2 inches broad, and about ⅛ inch thick; divide it in the middle as at Fig. 30. Open the compass to three times the length of the perpendicular *b*, *r r*, Fig. 29, or 216 parts, and with this as a radius, from a perpendicular drawn through *a*, trace the curve *b*, *a*, *c*.

Thickness of the Back.—From 42 as a centre, set off 4½ parts as a radius, and trace a circle; all the wood within this circle must be reduced very carefully to one part in thickness; then from the same centre 42, trace another circle with a radius of 12 parts, the thickness of the wood from the inner circle to the edge of this second circle must diminish very gradually to two-thirds of a part, and from the latter circle to the parts whereon the sides are attached, the thickness must gradually decrease to one-half of a part.

THICKNESS OF THE BELLY.—With 40 as a centre open the compass 4 parts, and trace a circle, within which the wood must be reduced to two-thirds of a part in thickness. Now open the compass 9 parts (8½ according to Wettengel), and from 40 trace another circle; the wood from the inner circle to the edge of this second circle is to be reduced to half of a part in thickness, and from this latter circle to the parts which meet the sides, the thickness must gradually diminish to one-third of a part. In Fig. 29, the two half-circles on the right of the instrument are those of the back, the semicircles on the left represent the graduations of the belly of the violin.

THE SIDES.—The sides are to be 6½ parts wide at the button, decreasing gradually to 6 parts at the neck.

SIDE-LININGS.—The side-linings must be 1½ parts broad, and half of a part thick.

END-BLOCKS.—The upper block should be 10 parts broad and 4 parts thick, the lower of the same thickness, but only 8 parts broad.

NECK.—The length of the neck from the sides to the nut should be 27 parts.

THE *f* HOLES.—The length of the *f* holes is 15 parts, extending from the point 32½ to 47½. The diameter of their upper circular holes should be 1½ parts, that of the under circles 1¾ parts. The distance between the edges of the upper holes should be 9 parts, that of the interior notches 15 parts, and the space between the edges of the lower circles 24 parts.

THE BASS-BAR.—The bass-bar is 36 parts long, 1 in breadth, and 2 parts thick in the centre, and this thickness must gradually diminish to two-thirds of a part at the ends. The bar should run parallel with the joint, having its centre opposite the point 40. Its proper place is exactly on the margin of the interior circle.

THE SOUND-POST.—The sound-post must be 1 part in diameter, its place should be two parts behind the right foot of the bridge.

THE BRIDGE.—The bridge should be 8 parts wide and 6½ parts in height. The present description answers equally to the violoncello and double-bass, if we assume the sides of those to be 12 parts broad at the button, diminishing to 11¼ at the neck, and the bridge to be 12 parts in height.

CHAPTER VII.

DESCRIPTION OF SAVART'S BOX FIDDLE.

IN describing this instrument, it may be as well to follow some of the illustrious Savart's experiments, by which he was led to adopt the following form and construction of the instrument:—It must not be supposed that M. Savart, subsequently to the formation of this style of instrument, considered it as of a superior quality from its form and change of construction to those of the old makers; on the contrary, a few years after this, the renowned skill and pre-eminent adjust-ments displayed in the instruments of Stradivarius, &c., by their harmonious relationship of parts, unfolded themselves gradually to his master mind, and thus unhesitatingly compelled him to acknowledge that their proportions, &c., were the true standard for a perfect instrument, as they will ever continue to be.

When fine dry sand is sprinkled upon a vibrating surface, it is thrown into various symmetrical forms, being collected always in the largest quantities upon the parts of the surface where there is the least vibration, and being thrown off those portions where the vibration is the strongest. Thus, if we sprinkle upon the surface of a violin some fine dry sand, we will find that, by playing on the instrument, some of it will remain undisturbed, and this will always happen to be upon the places where there is little or no vibration, and consequently those are the parts least capable of producing sound. We may readily discover the vibrating and non-vibrating parts by the following simple method:—Place upon the surface of the violin any small concave substance, a percussion-cap or button will be found to answer, sound one of the strings, when the cap or button will be seen to be violently agitated, and thrown up from the surface; and if, whilst making the experiment, we hold the instrument level with the face between us and the light, we can estimate the distance thrown, and thus we can vary the position on the surface, until the cap or button, being placed upon certain parts, will remain stationary, which of course are the portions of non-vibration.

Thus reason and experience lead us to suppose that the curvature of the surface tends to be a detriment rather than an advantage, but we must not forget that the curved interior surface is very powerful in producing reflexions of the sound. Savart, therefore, in the construction of his new violin, used flat wooden plates instead of the common curved ones; and, in order to maintain an equal vibrating surface on either side of the strings, he formed each breast and back of two pieces cut parallel with the grain from the same board, their edges being united by glueing.

To withstand the increased pressure on the breast at the part where the bridge is placed, he strengthened this part by making it about $\frac{1}{8}$th of an inch thick, whilst the thickness of the outer edges was only about $\frac{1}{12}$th of an inch. The bridge was the next part of the instrument to which he directed his attention.

What purpose the bridge serves besides being a support for the strings, is shown by the following experiment:—Stretch a violin string along a plank 2 or 3 inches thick, fasten the two extremities, and insert a bridge below the string as in the violin. Get a circular disc or plate of lead, and place it between the bridge and the surface of the plank, and upon this leaden plate strew some fine dry sand, when, if a bow is applied to the string, we will find the sand has formed itself into a symmetrical figure upon the leaden plate.

We learn from this that the vibratory motion given to the string by the bow is communicated to the bridge, and from the bridge to the leaden plate on which it rests, and by analogy we now know that it is by means of the bridge that the body of the violin is put into vibration when its strings are played upon, and are thus vibrating.

Now we also know that the back or under surface of the violin vibrates along with breast, and that this vibration is communicated from the breast, by the sides and partly by the sound-post. All violinists are well aware that this small wooden peg or post, which is placed within the body of the violin, and which partly helps to meet the increased pressure (on the breast where the right side of the bridge rests) arising from the smaller strings, has a material influence on the tone of the instrument. If we take a rod of pinewood and place one end upon the lid of a vessel in which water is boiling, whilst we apply the other end closely to the ear or insert it between the teeth, we hear the boiling with great distinctness, owing to the sound being conveyed more rapidly through the pine than the atmosphere, and it is precisely similar with the violin, the sound-post, and in a greater degree the sides, conveying to the back with immense rapidity the vibrations which have been excited in the breast from the strings.

It is essential that we choose the best place for the sound-post, for we have seen that certain portions vibrate stronger than others, whilst others appear almost to remain stationary; thus we are led to suppose the proper place for the sound-post would be the former, viz., where the vibrations are the most intense coming directly from the bridge, but another important use of the sound-post is in rendering the vibrations of the upper and under plates normal.

A violin always yields some tones more brilliantly than others. Savart imagined that this might be owing to the curved form of the surface, some of it being non-vibrating, or that the sound-post happened to be placed at a nodal or quiescent point during some tones; but as the *f* holes in Savart's violin, as we shall presently see, were cut straight and rendered easy of vibration, he placed the sound-post near to one of them, that it might thus be the means (as was supposed) of conveying powerful vibrations from the breast to the back of the instrument.

By pasting a slip of thin paper over one of the *f* holes, the sound is much enfeebled, we may therefore conclude that part of their purpose is to establish a communication between the external air and the internal air vibrating in the body of the instrument. Savart, at the time of these experiments, saw no reason for the *f* holes being fantastically curved, as a greater number of fibres were cut than if the holes were straight, so he adopted this latter method in his violin. Subsequent to this, however, he clearly perceived why the *f* holes were curved in the instruments of the old masters, for the more we may deviate from that form the worse the instrument becomes.

The bass-bar claimed his attention also, for by its being placed under the internal surface of one side of the breast, it thus apparently maintained an unequal elasticity in both sides, so, to equalise this, he placed his bar exactly in the centre, running down the thickest part of the breast.

He now directed his attention to the shape of the instrument, which, being formed in a complicated manner, by having its sides curved into so many arcs, &c., and by having the two deep hollows cut, serving to let the bow pass freely upon the first and fourth strings of the instrument; those appeared to him at this time faults in the construction, as the wood, by being thus bent, acquired an unequal elasticity.

In his violin he did away with this curvature, and made the sides as well as the outline straight, the length being about the same as that of the common violin, and the width being narrowest at the neck and broadest at the other end. In this form of instrument the bridge must be higher than in the common violin, to enable the performer to play separately upon the first and fourth strings, as there are no side hollows cut in this instrument. The sides were also made deeper than in common violins, and by this means the mass of air was augmented, whilst a large vibrating surface was obtained, which would thus tend to produce an increase of sonority. The general appearance of the instrument is shown in Fig. 31.

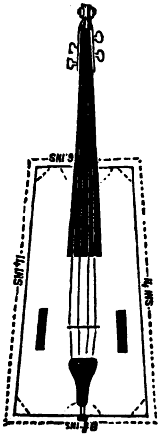
Fig. 31.

Savart having presented a memoir regarding his violin to the Academy of Sciences, at Paris, they instituted a commission to examine and report upon it. This commission consisted of the four following famed men of science: Messrs. Biot, Prony, Hany, and Charles, along with the following four members of the Academy of the Fine Arts, Messrs. Cherubini, Catel, Berton, and Le Seur. The account was drawn up by M. Biot, and the following is a translation from his own words, as given in the "Annales de Chimie et de Physique."

"To assure themselves of this," states M. Biot, "the commission invited M. Lefebure, chief of the orchestra of the Theatre Feydeau, to make a trial of it before them. This able artist, whose performances on the violin—full of grace and sensibility—has been long known and appreciated by the world, yielded to our desire with much courtesy; he was willing to compare the violin of Savart with that of his own, and which is so full of expression in his hands. He played the one and the other in succession before us, and the new violin was found to possess a greater purity of tone, and a more perfect equality in the different tones—the last of which qualities is known to be very rare. The new violin, heard from a short distance, appeared to have somewhat less brilliancy than the other, but this brilliancy decreased at a greater distance. The better to assure ourselves of the comparison, we requested M. Lefebure to retire to an adjoining room, and play the same passages alternately on the two instruments, without telling us which he was about to play, when they were found so nearly equal that the most practised persons confounded the one with the other, or, if there was any difference, it was that the new violin had a little more sweetness of tone."

Thus eminently did Savart's instrument stand such a rigid test as has been related, and such a violin can be made by anyone possessing the least mechanical turn of mind, although, perhaps, not so very fine in quality. To sum up, then, the particulars of construction in Savart's violin are, — 1st. Instead of the back and breast being curved, each are made of two flat plates, similar in size and direction of grain, $\frac{1}{5}$ of an inch thick at one edge, and $\frac{1}{12}$ of an inch at the other, and the thick edges united. 2nd. Instead of the sides being curved, they are perfectly straight. 3rd. The bridge is made higher than usual, to suit the shape of the instrument. 4th. The bass-bar is placed on the middle of the instrument, instead of being at one side. 5th. The holes in the breast are straight, instead of of being curved. 6th. The sound-post is placed very near to one of these holes. 7th. The sides are deeper than in the ordinary violin, thereby increasing the capacity, &c.

About the same time when Savart's violin was thus submitted to the Academy of Sciences for trial, we find another somewhat similar instrument receiving high praise from that learned body. This instrument was constructed by M. Chanot, an officer of the navy, and also a musical amateur. The following are the peculiarities of this instrument,—1st. The violin is of the form of a guitar, with the sides bent in the same manner, and consequently has neither corners nor inner blocks. 2nd. The edges are finished off square with the sides, having an inlaying of hardwood all round. 3rd. The sound-holes are arc-shaped, parallel to the sides, and as near as possible to the bendings. 4th. The bass-bar is placed upon the joint of the breast, being exactly in the middle. 5th. A screw is placed in the end of the tail-piece, which, pressing on the breast, lifts the tail-piece, and lessens the pressure of the strings on the bridge and breast of the instrument. 6th. Passing through the back of the violin, underneath the sound-post, is a screw by which the pressure of the sound-post against the breast can be regulated.

Such were the particulars of this instrument which subsequently was modified by the following,—7th. There was no tail-piece or button, but the strings were fixed to the breast of the violin, half-way between the end and the bridge. The belly being veneered with a strip of hardwood, inside and out, holes were cut in this, through which the strings were fixed, and passed over a little nut (made from the upper veneer) on to the bridge. 8th. The bass-bar was made in the shape of an arch, and was placed under the left foot of the bridge, near the 4th string, and approached the middle at the ends. 9th. The sound-post was placed in front of the bridge.

The box violin, made thus according to the method of Savart, will be found far superior in quality and intensity of tone to any of the common cheap violins. The chief drawback in this style of instrument is the difficulty in holding it with the chin, as the sides are considerably deeper than in the ordinary violin.

CHAPTER VIII.

THE APPEARANCE, QUALITIES, ETC., OF THE VIOLINS OF THE MOST CELEBRATED MAKERS, INCLUDING AN EPITOME OF THE LIVES OF THOSE EMINENT ARTISTS.

THE present work being only designed as an elementary treatise, space cannot be devoted to a lengthened memoir of each of the famed old artists, but a short and rapid glance at the appearance and qualities of their instruments, &c., must for the present suffice. The violins of Stradivarius (Anthony) are of the flat model, the elevation of curvature not being over five-eighths of an inch. It is now well known this model is the best adapted for the production of an intense, deep, and full tone—one reason being that instruments of this class have the wood always essentially thicker, and from this and the other proportions having been so harmoniously combined in the instruments of this maker, their unapproachable quality evidently was derived. In the flat model, the vibrations are always the most energetic and free; whilst in the highly elevated instrument, the tone is feeble, and very often thin and piercing. The first productions of Stradivarius were highly modelled—no doubt from his being still adherent to the form of his master, Nicolas Amati; and even those early instruments are known by the name of STRADIVARIUS AMATIS.

His next instruments were of the flat and enlarged pattern, with the outlines, master-pieces of design, the arching falling in gradual and beautiful curves, whilst the wood of which the instruments were formed was of the most choice figure, and of the finest sonorous qualities. The thicknesses have been reduced with mathematical accuracy, the back being very thick in the centre and diminishing gradually to the edges, whilst the breasts are formed upon an entirely different principle to those of Amati or Guarnerius. The *f* holes are exquisitely cut, and lie pretty near one another; the edges and corners are beautifully finished; the inlaying is neither so narrow nor so near to the edge as in some of the Amati instruments, whilst the varnish is generally of a brown or mahogany colour, although a few are of an orange or yellow tint. The interior of the instrument possesses the same perfection of workmanship, along with accuracy of proportions, which could only have been obtained after a lifetime of study. From the present high pitch, &c., the breasts of some of the instruments have sunk a little under the fourth string, which has necessitated the placing of a rather larger bass-bar in the instrument. The violoncellos of this eminent maker possess the same admirable perfections of quality and finish as his violins.

This talented artist was born in Cremona* in 1644,

* Cremona, of such illustrious note, is a town situated in the province of the same name in Lombardy, in Austrian Italy, about 45 miles S.E. from Milan, on the north bank of the river Po. The town contains many fine buildings, such as palaces and churches, and there are also many fine galleries of paintings. Silks, cottons, porcelain, and chemical products, are its chief

and died in 1737. He appears to have commenced violin making at the early age of 23 years, his last one having been made when he was at the advanced age of 92. During his long and active lifetime he made a vast number of instruments, and his average charge for each appears to have been about £4. The violins of this maker which are esteemed the most valuable, have been made from about 1700 to 1727, and after this latter period, his instruments deteriorate in quality. His finest instruments may be said to possess the following esteemed qualities—delicacy, mellowness, free power, penetrating brilliancy, and roundness of tone. It is related by Forster that he sent a number of violins to a merchant in London, Cervetto (who was a countryman of his own), to be disposed of at a sum equivalent to £4 each, but he having failed to realize such an amount, they were returned to the artist.

How vast and giddy are the rapid changes which time imprints in its onward course even on violin value, as where is the amateur now-a-days who would not gladly bestow £4 upon an instrument by this renowned maker? The highest sum which has ever been given for any violin by this maker has been £600,

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manufactures. One of the principal objects which meets the traveller's gaze approaching Cremona is the famous Torazzo, or belfry tower, which is one of the loftiest in Italy, and is seen from a considerable distance. The poet Virgil is supposed to have been born in this town, and to have received his education at Andes, between Mantua and Cremona. Low marshy lands being contiguous, render the suburbs unhealthy. A canal passes through the town, and joins the Po, which is navigable from here to the sea.

and we learn from Mr. Gardiner's "Music and Friends" that Mr. Salomon the Jew offered *eight hundred guineas* to Dragonetti for his double-bass by the same artist, but with refusal, as he would not part with it for a less sum than *one thousand.* There are a number of instruments by this family scattered throughout Scotland, a few of which are here subjoined. In travelling a few years ago through the North Western Highlands, I accidentally came upon a violin made by Anthony about his best period, which for many years had been suspended like a criminal upon the bare, sooty, and smoky walls of a Highlander's hut amongst the mountains. It was in woeful condition, having been literally plastered or bespattered with rosin or tar, to keep its back, breast, and sides from open rebellion, by separation. The old proprietor would not hear of parting with it, it having descended as an heir-loom amongst the family. Upon the continuation of my tour a short time subsequent to this, I met Mr. Carte from London, who had also seen the same shamefully used instrument, but he, like myself, almost needless to relate, was unfortunately unable to release the tortured gem.

Mr. Muir of Leith possesses a violin made by this illustrious artist, which was formerly the esteemed instrument of the celebrated violinist Viotti; it contains the following inscription, "*Antonius Stradiuarius, Cremonensis Faciebat*, 1704." A splendid instrument by this maker is also in the possession of Sir James Clarke of Penicuik. Sir A. M. Mackenzie of Delvine, Perthshire, possessed an excellent Stradivarius, which was purchased about twenty years ago in Paris for

£300. Mr. Robertson of Ladykirk also possesses a Stradivarius of the long pattern, a well known instrument. Sir — Dalyell of Rennis, Linlithgowshire, has another violin by this maker, also of the long pattern. Another instrument by the same maker is the property of Mr. Malcolm of Perth,—the following is the inscription, "*Antonius Stradiuarius, Cremonensis Faciebat, anno* 1706." I have been informed that a very fine violin by the same maker is in the possession of Mr. John Robertson of Glenisla; but having communicated with this gentleman in reference thereto, and receiving no reply, I am thus unable to furnish any definite particulars.

AMATI.—The oldest maker of this famed family was Andrew, who was born about the commencement of the sixteenth century, and is supposed to have acquired his knowledge of the art in the ancient workshop of Brescia. His instruments were well-finished, and modelled of a small pattern, the archings abrupt and elevated, with the backs cut slabways, whilst their tone was sweet and mellow, with little brilliance or intensity, a distinguishing characteristic of quality in the majority of the violins of the whole family. This maker wrought at Cremona until about 1580, during which year he probably died, and was succeeded by his sons Jerome and Anthony, who flourished at Cremona from 1550 to 1638, being partners for several years, and conjointly produced many violins of much excellence. Whilst thus associated, they built upon two different models, a large and small, but those of the large pattern ranked the first in excellence. After working together for a number of years, they appear to have separated, from which arose a change of form and quality in their instruments. The violins of Jerome were generally of large model, made of excellent wood, arching sloping very gradually, having high elevation, the backs often in one piece, the varnish mahogany-coloured, and the finish usually admirable. Those of Anthony rivalled the preceding in finish and quality, although the wood is scarcely of such choice beauty.

Having thus glanced at the foregoing makers, and their instruments, we now arrive at the most renowned maker of the family—Nicholas,* the son of Jerome, and nephew of Anthony, who was born in 1596. His instruments are masterpieces of workmanship in every detail, possessing a tone of ethereal purity, a combination of brilliant power and sweetness. He adopted two sizes, a large or *grand*—as this form is now familiarly known by—and a small pattern; but the violins of the largest model are those which are held in the most estimation. His instruments are of deep elevation, with a peculiar form of arching, no doubt based upon, and perfected from, the principles of the curves of the vibrating string of the violin, which bear a close analogy in several of their forms to the archings of our finest instruments. The back and breast of his violins are thick in the central parts, diminishing gradually by exquisite workmanship to the sides, where they are

* There was another Nicholas, brother of Andrew, and consequently uncle of Anthony, of whom mention is made in Lupot's work on the Violin. Anthony is also supposed to have had a son named Nicholas—see Translator's note in Otto's work, p. 62.

very thin; the varnish, brilliant and elastic, is of the utmost purity, and tinted from a shade of amber-yellow to that of a cherry-red. This maker died at Cremona in 1684, and was succeeded by his son Jerome, who was born in 1649. The instruments of Jerome, who was the best maker in the family, bear little or no comparison with those of his father; as the violins of sterling worth by the Amati family may be said to virtually terminate with Nicholas. Many excellent violins by this family are to be found throughout the country, a few of which are here mentioned.

At Wardhouse, near Huntly (Aberdeenshire), is a violin made by Nicholas Amati, dated 1625. This violin was brought from Spain by the late Mr. Gordon several years ago. Mr. Gordon—Aberdeen Quill Company—has an instrument by the brothers Anthony and Jerome; and a violin and violoncello by the same makers, of well-known excellence, are in the valuable collection of Mr. Croall of Edinburgh. The violin bears the following inscription, "*Antonius et Hieronymus Fr. Amati, Cremonen; Andrea fil F. anno* 1627." The violoncello is labelled thus,—"*Antonius et Hieronymus Fr. Amati, Cremonen; Andreas F.* 1595." This instrument was formerly the property of M. Kreutzer, who brought it from Germany. Another excellent violin by the same makers is the property of the eminent connoisseur Mr. Wood of Woodcot. Amongst the numerous instruments belonging to Mr. Malcolm of Perth, there is a grand Nicholas Amati violin, along with another by the same maker, dated 1664. The Rev. William Logie, Tynet (Banffshire), possesses a violin by the preceding artist dated 1655; whilst two instruments of the same artist, dated 1604, are in the possession of Messrs. Robert of Fyvie (Aberdeenshire), and Smith of Thistle Street, Glasgow. An Amati violin of merit is also in the possession of Sir James Clarke of Penicuik; another is the property of a lady residing in the neighbourhood of Fraserburgh, at one time a superior instrument. I am informed that several Cremona violins are in the possession of James Gentle, Esq., Edinburgh, one being a Nicholas Amati, which was purchased from Signior Emiliani, the eminent violinist, and which was formerly in the possession of an English clergyman; also that the well-known Maulés Amati is now the property of a gentleman in Perthshire. Several other excellent instruments by this illustrious family are to be found in Edinburgh, the proprietors of such having failed to render any information relative thereto.

GUARNERIUS.—The first of this distinguished family was Andrew, a native of Cremona, who flourished from about 1650 to 1695. The instruments of this maker, although certainly good, claim but a secondary value in comparison with those of the most illustrious of the Cremona makers. His eldest son and pupil, Joseph, who worked from 1690 to 1730, produced instruments of much greater merit, which are characterised from those of Andrew by their difference of model, as well as from possessing a tone more brilliant and penetrating. The next violins of this family are those of Peter, brother of the preceding, who was a pupil of Jerome Amati, and worked at Cremona and Mantua from about 1685 to 1725. The violins of this maker were of a larger model, with deep archings, having the thicknesses graduated in a peculiar manner; the tone was sweet, but subdued. This maker must not be confounded with Peter, the son of Joseph, and *grandson* of Andrew, who wrought at Cremona from 1725 to 1740, and whose violins display but little care and finish, although several of his basses have been held in high esteem. We now arrive at the most distinguished maker of the family, whose finest instruments are so widely known, and appreciated for their eminent excellence, as to require but little comment in the present short notice. This eminent artist, Joseph Anthony, was the son of John Baptiste Guarnerius—the brother of Andrew—and was born at Cremona in 1683. He was a pupil of Stradivarius, but his violins are, generally speaking, finished in a manner very inferior to those of his master. Many of his violins bear a cross upon the label, usually placed over the following letters, thus: ✠ IHS from which quaint monogram he derived the name of Joseph *del Jesu*. His violins may, like those of Steiner, be classified into three distinct epochs. During the first period, his early instruments are but of medium quality, a little later, however, true traces of the master appear. The model is of a small size, the wood of excellent quality, the varnish equals that of his master, Stradivarius, both in quality and colour, but from a disproportion in the thicknesses, the sounds of his instruments, although sweet and mellow, possess but little penetration. The next period is particularly characterised by a change of model, as well as by an alteration in the mode of thicknesses, from which the instruments possess a superior excellence in every respect. At one period he makes the back and breast of his violins thicker than those of his master, and at another the thicknesses of the centres are made equal to those of Stradivarius, but the graduation of such increases in quite a different ratio, to correspond with the flatness of model adopted. His finest instruments may be included in his second epoch, and are supposed to rival those of his master in every requirement. Afterwards, in nearly all the instruments, all traces of the genuine artist disappear, and his violins, being constructed from worthless wood, and with little or no care, are but of trifling value, compared to the preceding. This marks his third period, during which tradition reports that dissipation and debauchery claimed him as their victim, that he was for several years a prisoner, owing to the committal of some crime now unknown, and that whilst in the prison the daughter of the keeper supplied him with wood, tools, and varnish, and even disposed of his violins, at almost nominal prices, in order to administer to his wants in his unfortunate and miserable abode. This celebrated maker commenced working at Cremona about 1720, and is supposed to have died in prison in 1745. The violins of this artist may be generally defined thus:—Flat construction, with very slight elevation, and gradual curvature of arching; varnish remarkably fine, elastic, and of various tints of colour, passing from a light yellow to a deep red. That violinist of immortal fame, Paganini, possessed two instruments by this maker—one of the small pattern, the other, his cherished associate and favorite, was of the larger model, and now remains as a seen but unused memento of the past in one of the cabinets of the Museum of Genoa, his native city. Numerous instruments of this family are to be found throughout Scotland, a few of which are here subjoined.

Mr. Wattie, Bellabeg, Strathdon, possesses a violin in good preservation, bearing the following inscription, "*Joseph Guarnerius, fecit, Cremonensis, Sancia Teresia,* 1684." A well known and highly famed violin by Joseph, nephew of Andrew, is in the possession of H. Gordon, Esq., of Avochie, near Edinburgh. This instrument is in excellent preservation, at least was a few years ago, and was purchased at Paris about the end of last century by Mr. Thomson of Banchory. From what I have learnt regarding it, Mr. Thomson's son sold it about 25 years ago to the late Mr. Hunter of Tillery, Aberdeenshire, for £100. This latter gentleman possessed the finest collection of Cremona violins in the county, and after his decease those cherished instruments were exposed in the market for private sale. This favorite Guarnerius was sent on to Edinburgh, where an eminent connoisseur offered £115 for it, but, as formerly stated, it became the property of Mr. Gordon of Avochie, being sold at £125. Mr. Muir of Leith also possesses a violin by this maker. Another well known violin by this eminent maker is the property of the eminent violinist, Mr A. C. Mackenzie of Edinburgh, and is remarkable for its fine quality and intensity of tone. About the year 1800 this violin was, strange to say, also in possession of an A. Mackenzie, from whom it went to Mr. F. Cramer, through Henry Murray, Esq., for the sum of £262. At the sale of the last named gentleman's effects, it was purchased by Mr. Alexander Crombie, Edinburgh, for £105, and in 1846 became the property of the late Mr. Alex. Mackenzie, the present proprietor's father. As remarks relative to such worthy instruments are always interesting to the young amateur, I subjoin the following verbatim copies of letters relating to the above mentioned violin. The first is a copy of a letter from Francois Cramer, to his son William, dated 1841, which was transmitted in the subsequent letter from Mr. S. W. Forster, to Henry Murray, Esq., Edinburgh, regarding the authenticity of the instrument.

LETTER FROM F. CRAMER TO HIS SON WILLIAM.

MY DEAR WILLIAM,—As you wish to have the pedigree of the *Joseph Guarnerius violin* I bought forty years ago of a Mr. Mackenzie, a distinguished *amateur* in those days, with a warranty of its being a genuine instrument, and soon after sold it, the gentleman who bought it of me died, and his widow returned it to me for sale, as, of course, she had no use for it after his death. It has never been in any other hands, and I can warrant its being a genuine instrument.

Your Affectionate Father,

FRANCOIS CRAMER.

37 Upper Charlotte Street, Fitzroy Square,
June 10, 1841.

LETTER FROM S. W. FORSTER, TO H. MURRAY, ESQ., TRANSMITTING THE PRECEDING LETTER AND RECEIPTS.

I have much pleasure in transmitting the copies of the above, and hope they will give you additional pleasure when gazing on the instrument to which they refer. With best wishes for your health, and thanks for favor conferred,

I Remain,

Yours Respectfully,

S. W. FOSTER.

13 Macclesfield Street, Soho Square,
21st August, 1841.

The following is a copy of the label on the instrument, "*Joseph Guarnerius, fecit, Cremone, anno* 1741, ✠ I H S" Another violin by the same maker is in the possession of that eminent collector, W. Croall, Esq., of Edinburgh, and formerly was in the possession of the great solo player, Wieniawski, for 15 years. This violin was purchased for £200. The following is a copy of the label, "*Joseph Guarnerius, fecit, Cremona, anno* 1734, ✠ I H S" A violin by Andrew Guarnerius is in the possession of Mr. A. B. Wallace, of Edinburgh. This instrument is in good preservation, and was formerly bought from Mr. Chanot, by John Wood, Esq., Advocate, Edinburgh, who sold it to the present possessor. It contains the following inscription, "*Andreas Guarnerius, fecit, Cremona, sub titulo, Santa Teresia,* 1694."

JACOB STEINER.

JACOB STEINER, or STAINER, the founder of the Tyrolese school of violinmakers, was born about the year 1620, at Absom, a village in the Tyrol, situated at a short distance from Innsbruck, the capital, and in his earlier years became the pupil of Anthony, and afterwards of Nicholas Amati, both of Cremona fame. The instruments of this maker have been classed into three distinct epochs, and there is every reason to believe that he also adopted three different sizes of build, a large, a medium, and a small. His first instruments were of small dimensions, with short and narrow *f* holes, having lofty archings, whilst the heads and scrolls were of diminished model, but beautiful finish. Those early instruments are now of the utmost rarity, and bore labels inscribed in his own handwriting, and were dated from Cremona. About the commencement of his second period he married the daughter of Anthony Amati, and this phase of life was marked by misfortune, genuine art having succumbed to carelessness, whilst poverty in all its icy coldness surrounded his home circle, compelling him to travel with his now crude and imperfect instruments, which he gladly, but with difficulty disposed of, for the diminutive sum of six florins. During this his second epoch he returned from Cremona to his native town Absom, where he hastily manufactured a vast number of instruments. Most of the violins of this period were of very inferior quality, and bore little or no trace of the hand of genius. They contained printed labels, and were dated from 1650 to 1667. It is related that during part of this period his brother Mark, who was a monk, frequently chose to exchange the monotonous routine and retirement of the cloister for the practical operations of the workshop, and thus assiduously assisted him in his labours. Now again, however, the dying embers of genius are fortunately fanned into a flame, which bursts afresh with redoubled effulgence, and fame now victoriously crowns him with its never-dying laurels. His violins are now made with extreme care, several having the scrolls beautifully ornamented with the heads of lions and other animals, whilst the varnish appears as a limpid coating of reddish-brown crystal. A few of those violins may be included in the latter part of his second period, during which the instruments bore printed labels. His wife having now died, it is related that he entered the gloomy solitudes of a Benedictine Convent, there not only to adhere to the scrupulously strict duties of an ascetic life, but also to distinguish himself by the completion of sixteen instruments which have been pronounced by all judges as masterpieces of genius. Through the kindness of the Superior, he was enabled to obtain wood of pre-eminent merits for the construction of those instruments which have been known by the name of Elector Steiners, from the fact of twelve of these instruments having been presented to the Twelve Electors of the Empire, whilst the remaining four were presented to the Emperor. Those instruments were all that could well be desired both in finish and quality, and bore labels inscribed in his own handwriting. Those superior violins characterise his third period, but only three of those instruments are known at the present time. No records are known to exist containing particulars relative as to when or where this esteemed maker died. The violins of Steiner may be generally described thus:—They are of high model, the breast being deeper than the back; the edges strong, thick, and round, with narrow indenting or purfling.

The arching of the breast is very peculiar, the curves rising very rapidly to their extreme height from the edges lengthways, thus maintaining an almost even surface upon the upper and middle part of the belly for a considerable length; and at the *f* holes, the arching descends quite abruptly, giving a somewhat strange appearance to this part of the instrument. The varnish is from a golden to a reddish-yellow tint, of exquisite quality in his best instruments, and in the earlier instruments the wood of the belly is open, but well marked in the grain. In the bellies of some of his later instruments the wood is fine and reedy, whilst the backs and sides are of very choice wood. An immense number of instruments by other Tyrolese makers, who forged the name of Steiner, found their way into the market at an early period, and thus criminally obscured the well-merited reputation of this old master.

Amongst the numerous violins in the collection of Mr. Lowe of Edinburgh, is one by this maker. Mr. W. Ingram, of Huntly (Aberdeenshire), has a violin also by this maker, bearing the following inscription, "*Jacobus Stainer, Cremonen, in Absom, prope œnipontum Cremona*, 1647." Another was in the possession of the late Mr. Skene, Tarland. A violin by F. Steiner, dated 1729, is the property of the Rev. D. Wilson, of Fyvie.

Some time ago I was informed, by a gentleman in Aberdeen, that Viscount Arbuthnot, of Kincardineshire, was the possessor of several excellent Cremona violins, but having communicated more than once upon the subject with his Lordship, he, like many others, either refused to reply, or perhaps willingly forgot. Can those people imagine that the publication of such particulars would tarnish their names, or confer a permanent blot upon their reputation, by being owners of such chef d'oeuvres of ancient art? It may be so, and if such is the case, "the more's the pity" that valuable instruments should be in the possession of such parties.

CHAPTER IX.

THE BOW, THE ROSIN, AND THE STRINGS.

THE BOW, that apparently simple and trifling rod which many doubtless consider as unworthy of devoting time and space to, will be found, nevertheless, to possess certain claims upon the amateur's attention which will be well worthy of his earnest notice. In a treatise in which the construction of the violin is initially delineated, it would be considered quite unpardonable to omit all notice of its appendage, the bow—that mysterious assistant, by the combined use of which the artist excites us at one time to bestir ourselves to the lively strathspey or reel, and at another to place us, as it were, in an ethereal and harmonious world of delights, forgetting our existence for a time upon this sublunary sphere, and fascinated by the swift chords of enchantingly sonorous pearls which melodiously emanate upon our ears with a sweetness indescribable. The earliest bows, as can well be imagined, were of the rudest and most primitive form, being, strictly speaking, real "*bows*," or arcs of bent cane, having a number of hairs attached to both ends, to keep them in the requisite position. The first improvement which we find, representations of such being obtained from monumental drawings, is in the bow being formed or cut quite straight from the wood, having both projections on the ends an equal depth, with the hair fixed permanently therein, whilst a century or two afterwards the moveable nut was formed, and at a still later period a loop was made on the hair, which fitted into a notched metallic plate, by which means the player was enabled to graduate the tension. At a period subsequent to this, those primitive methods gave place to other improvements, viz., the substitution of a screw for regulating the tension, whilst the outline approached more closely in form to our modern bow. In the eighteenth century the bow arrived at great perfection through the scrupulous care and attention of that celebrated French maker, Francois Tourte, who has left a lasting fame throughout Europe. The bows of this maker, from their excellent quality, were high in price, and now it is almost impossible to obtain them from their having been anxiously sought after by many of our finest professional violinists and collectors of such worthy mementoes; but excellent bows are now to be had by several other distinguished makers, and, what is of the utmost importance, at a moderate price. Amongst those esteemed makers may be mentioned the following: — Lupot, Tubbs, Stentor, Panormo, Picatte, the Dodds, &c. About the period when Tourte thus perfected the bow in France, we find the elder Dodd distinguishing himself at the same art, whilst a short time after this the bows of his son, John, worthily merited a high degree of fame. They are light and firm, being made from fine wood and well-finished, maintaining permanently their original curvature, and are shorter than those of Tourte, whilst they are moderate in price, being from half a guinea and upwards, according to quality and finish. To violinists, a Dodd bow will prove much cheaper in the long-run than the purchase of one of the so-called *cheap* ones, the latter being after a few months' usage utterly worthless, whilst the former very rarely gets out of shape. Again, in Paris, we have Vuillaume, whose bows also possess great excellence. From the bows of Tourte have been derived the standard measurements of the length and proportions of the stick, the proper balance, the slide for fastening the hairs, &c. We may assume the standard length of the stick to be 29 inches, but the medium length is about $27\frac{1}{2}$ in., the height of the head and nut from the body of the stick being about $\frac{3}{4}$ in. For about $4\frac{5}{16}$ in. from the end, where the nut is placed, the bow is of uniform thickness, being a fraction over $\frac{5}{16}$ in. in diameter, and gradually, but not uniformly, tapering to about $\frac{1}{5}$ of an inch in diameter, where the head is formed.

The bows which have the most perfect balance for playing, have the hair 25½ inches long, and their centre of gravity is about 7½ in. from the nut, and in the bows of the violoncello the length of hair should be 23¾ in., whilst they should balance at 6¾ in. from the nut, the stick being proportionally larger, having a length varying from 24 to 25 inches. In the violin bow, the finest white hair is employed, after being carefully assorted and cleansed. The best bows ought to have a uniform curvature, and this regulated in such a manner that the exact centre of the bow, between the head and nut, ought to be the portion of the bend which approaches nearest to the hair. The number of hairs contained in the violin bow varies according to their size, but the mean number is about 150. The woods principally used in the manufacture of bows are Brazil or Pernambuco wood, snakewood, logwood, ironwood, horsewood, mahogany, beech, &c., whilst the nut is formed of ebony or ivory. Amongst the preceding woods none is found to give the required results equal to Brazilwood, from which all our finest bows are now formed. There are several varieties of this wood named after the places of their growth, viz., Pernambuco, Sapan, Santa Martha, Lamon, Japan, &c. By some it is affirmed that this wood gave the name to the country in which it principally grows—Brazil; and the Portuguese made it a source of vast and royal revenue, hence it was at one time termed Queen-wood. It commonly grows in dry, barren, and rocky places, and its trunk is of large dimensions, crooked, knotty, and full of cracks. The flowers of this tree are of a beautiful red colour, and possess an agreeable aromatic smell, which stimulates the brain, and the branches are slender and full of many prickles. The bark is exceedingly thick, whilst none of this species of wood contains pith, except the Japan variety. The wood is hard, and, when newly cut, of a yellow colour, which becomes red on exposure to the air. It may be distinguished from logwood by its paler colour, and for surety the inexperienced amateur may apply the following test:—Boil a small quantity of the chips in water, filter, and when cold add a few drops of a solution of acetate of lead, protochloride of tin, or lime-water, when if the precipitate is crimson, it is Brazilwood—and if violet, then it is logwood.

Brazilwood is extensively used in dyeing, and is generally exported in bundles, from which the finest pieces are selected by the bowmaker, but those, like angels' visits, are few and far between, as the wood naturally possessing such blemishes and inequalities, few faultless pieces are to be found, hence this alone tends to augment the prices of such bows. Tourte obtained for unmounted bows a sum equivalent to about 30s., and for silver-mounted ones, from 50s. to 60s., whilst those mounted with gold were sold at prices varying from 10 to 11 guineas; but we must not forget his scrupulous care in selecting the wood, and his beauty of finish, combined with such excellence of quality, circumstances which thus obliged him to charge those high prices.

The finest bows have the curvatures finished by heat, every part of the bend being subjected to its action, as, agreeably to this method, the inner as well as the outer side will always retain its proper curve; whereas if only the inside of the stick has been heated, the inner woody fibres being in their normal condition, will always have an opposing resistance to the outside ones, and thus the bow will gradually be drawn from its finished curvature to its original form—a fact too well experienced in those bows which infest the shop windows of several of our *cheap* musical instrument dealers. Several important improvements in the bow have been effected through the exertions of M. Vuillaume. One convenience is that the hair maintains always a flat surface, from having each extremity inserted into a sort of tubular pliers, one of which fits into a pierced cavity in the head of the stick, and the other into the interior nut, the mechanism being exceedingly simple. Another excellent improvement to meet the changes of position of the hand of the player caused by the variations in the length, consequent upon the changes of distance effected by the different tensions from the nut screw, is obviated thus:—The nut is attached permanently to the stick, and is mortised out to receive an interior nut of brass, which advances and recedes within the permanent one by a screw—thus maintaining always a uniform distance between the head of the bow and the outside of the exterior nut. I must not omit herein to mention a simple and ingenious method of bow-hairing invented by Mr. Walker, late of Castle Newe, Aberdeenshire, a gentleman who possesses a large collection of violins, and who is also author of a Collection of Strathspeys and Reels. In this invention, the extremities of the hair are inserted under two metallic hinges, one being fixed to the head, the other to the nut. The former is kept shut by a small piece of wire, which passes through the outside case of the shutting hinge, whilst the latter hinge is closed by a metallic slide, which retains the hair in position, as in the ordinary bow.

By this method, one can rehair the bow with the utmost facility by merely taking out the pin, slipping off the slide, and inserting the new hank, cut to the proper length. Ironwood bows are generally too heavy, and lack the necessary elasticity. Steel is now used in the formation of bows, but wood will always have the preference over metals in the construction of such an article as a violin bow. Space will not permit of herein including a practical description of bowmaking, but the amateur will, at the present day, be enabled to readily purchase excellent bows at a medium price, as he cannot do better than supply himself with one made either by Vuillaume or Dodd. The prices of Vuillaume's bows, made either of wood or steel, with moveable hair and mounted in silver, are 30s. each; and without moveable hair, plain wood, 10s. 6d. Dodd's bows are sold at prices varying from 10s. to 30s., according to quality and finish. The essential qualities found in a good bow are, its perfect balance, light, but strong and firm, possessing the necessary flexibility, and straight as an arrow from heel to point, as observed by looking along its outer side. When the hair of the bow gets dirty, it may be readily cleaned by washing it with soap and water, after which it should be sponged with cold water to remove all traces of soap, and then allowed to dry. In conclusion, let the young and inexperienced amateur beware of buying any of those abominable rubbish which are often palmed upon the unwary by disreputable dealers, at a favorite price of 7s. 6d., when, for the difference of a few shillings, he would have been enabled to purchase one by an eminent maker, from a respectable house, and which would have proved serviceable to him, instead of the former foreign and worthless toy, which was made for the mere purpose of finding its way into the market or mart of the cheat, there to be sold at a price exceeding six times its original cost.

THE ROSIN.

Common Rosin, Colophony.—A short description of this substance may prove interesting, as, to the violinist, this forms an article of indispensable necessity. Rosin is the residue left in the vessels after the distillation of turpentine, and is used by the druggist in the manufacture of some of his ointments, by the colorman in his varnishes, the shoemaker and saddler in their wax, in the yellow soaps of the soapmaker, and to a small extent by the perfume maker; whilst it is extensively employed by the wholesale manufacturer, in extracting the various oily bodies which it produces by destructive distillation and which are extensively used in the arts. Its specific gravity averages about 1·080, it softens at 160°, and enters into fusion at 275°. When the common rosin, which always contains water, is deprived of this by fusion, it is termed brown or black rosin, and whilst still fluid, if agitated with about one-eighth part of water, and dried, it forms the yellow rosin of the chemist. The bleaching of common rosin has been often attempted, but with unsuccessful results, but latterly the patented process of Hunt & Pochin has enabled the soap and varnish makers to obtain it of an almost transparent white.

The following is a short description of the process. Ordinary rosin is placed in a suitable vessel, and then melted, and whilst fluid, steam, carbonic acid, or a mixture of carbonic acid and nitrogen, is passed through the mass, until nearly the whole has been distilled, when the rosin having been condensed in a receiver, surrounded by constantly flowing cold water, is afterwards dried, and will then be found adapted for the purposes required. Violinists' rosin of very good quality may be made from Venice turpentine. Otto's method is this—Put a quantity of Venice turpentine in a pipkin, add a little water to it, and boil for two or three hours over a slow fire. As it rises, pour in small quantities of cold water to keep it from overflowing, and allow a drop now and again to cool on a plate, when if it rubs clear between the fingers, without sticking, it is sufficiently boiled. When thus boiled, pour it into cold water, work it well with the hands, to press out the water, and break it into pieces when cold; expose to the sun and air until all the moisture is evaporated, and the rosin quite transparent. Many violinists adopt a method of purifying, and rendering the rosin more transparent, by boiling it in vinegar, and whilst it is warm it is poured into paper moulds, after which it is exposed for some time to the sun and air. The purest and finest rosin for the violin is that made from pure Venice turpentine. The violinists of Vienna and several of the other continental capitals are now using liquid colophony, instead of solid rosin. The mixture is applied with a camel's-hair brush, and is said neither to injure the bow nor the strings of the instrument, and to last one hundred hours playing. It is also stated that the strings give out a clearer tone than when solid rosin is used.

THE STRINGS.

GUT STRINGS.—In the manufacture of violin strings there are various separate operations undergone ere the article in its finished form is arrived at. Strings vary very much in quality, but certain it is that our English friends can in nowise worthily compete with the French and Italian manufacturer in this well-known article. Whether the muscular thalms of our mountain sheep are equal in quality to those of France or Italy, is a question for others to investigate, but the fact is undeniable that the French and Italian musical strings are vastly superior to those of English manufacture. Violin strings are made from the smaller muscular intestines of the sheep. Catgut is an old and almost universal cognomen for the material forming the violin string, and which undoubtedly has led many of the ignorant to fancifully imagine that such strings are made from the muscular intestinal fibres of our whiskered fireside favorite, the cat, but when or where this term first originated is a mystery.

Sheep of a small size, which have been fed upon dry, mountainous pasture, are those preferably selected by the string manufacturer. The finest Italian strings are made from the intestines of the lamb, or those sheep which have been killed during their first year's growth. When the sheep have been slaughtered and whilst still warm, the small intestines are carefully taken out by the workmen and cleaned. In this operation the intestines are steeped in cold soft water, for a period varying from 12 to 24 hours, during which time the water is several times changed, after which they are subjected for several hours to a current of hot water, which tends to separate the muscular membrane from its skinny and mucous coatings. Those coatings are afterwards roughly removed by the scraper, when the remaining muscular membranes are repeatedly cleaned and soaked in an alkaline solution, this latter operation occupying several days. The membranes now having been thoroughly cleaned, are arranged according to their size and quality. Those of the largest and most irregular dimensions are split and made uniform in diameter, after which the whole are carefully assorted into separate bundles, each lot corresponding with the No. of string it may be intended for in the subsequent process, viz., that of spinning. Manual labour is frequently employed in this, as well as the subsequent operations of finishing and wire covering, but in the larger manufactories this is now supplanted by steam motive power. The spinning wheels are of simple construction, and the mechanism is such that a multiform movement is given to the wheel upon which the strings are attached. The strings, whilst moist, are subjected to a slight degree of twisting, after which they are exposed in bleaching chambers to the fumes of sulphur, for a period varying from 2 to 10 days. During this interval the torsion is several times gradually augmented by spinning, until they are of a firm consistence, when they pass through the process of finishing. In order to attain this latter and important object, the strings are subjected to a sustained friction by being partly covered with a helix of horse hair, or tube of haircloth, to which motion is imparted, by which they are rendered of a uniform diameter. They are now dried and polished, by being rubbed with a piece of cloth, upon which has been sprinkled a mixture of olive oil and ground pumice, after which they are moistened with olive or almond oil, to which a small quantity of creosote or oil of laurel is added, when they are afterwards sufficiently dried, and made into bundles of 15 or 30, each helix containing three or four lengths of string, as the case may be.

Silk Strings are now in common use by many violinists, especially by the open-air musician, and the country-ball player. They withstand the effects of perspiration better than gut, whilst they are not so liable to break from the variations of temperature and dryness arising from a crowded atmosphere, but their sound is shrill, and nowise to be compared with that of the finest Roman strings. Being subjected to a strong tension in their manufacture, they are difficult to adjust in tune, consequently they stretch but little. Twisted silk 1st strings are generally rough, and contain a number of silk filaments which project from the surface of the string, causing often a harshness in the sounds emitted. This defect may be remedied thus:—Pour a small quantity of strong spirits into a shallow vessel, as a saucer, and light it, then draw the whole length of the string evenly and quickly over the flame of the spirits, which will consume all the outstanding filaments, after which rub the string several times with a piece of gauze or taffeta. By this operation the string is rendered more elastic, and the tone is much improved.

COVERED STRINGS are formed from gut or silk, and have a covering of fine wire wound round their surface, which augments their mass. This wire is made of copper, silver, gold, or platina, as the case may be. Common violin fourth strings are made of gut, upon which is twisted a covering of fine silvered copper wire, but for the execution of violin solos upon the fourth string, silver wire is substituted, which is generally of remarkably fine quality, and wound so close and equal as to be scarcely perceptible. In small manufactories the strings are covered by means of a small wheel, driven by hand, in the surface of which a small hook is inserted, for the purpose of holding one end of the string, whilst the other is fixed to a swivel. Another string is attached to this swivel, which passes over a pulley, and has a weight suspended, which keeps the string to be covered at a proper stretch; the wheel is turned, causing the string to revolve, upon which the thin wire is regularly and uniformly wound. In large establishments this ancient method is supplanted by intricate machinery, by which means enormous lengths of strings are covered in a few hours. An early patent for the manufacture of such strings, by a process somewhat similar to that already described, was obtained by William Lovelace, on January 31st, 1772, No. 1001. The intestines, after having been scraped, soaked and twisted, were bleached with sulphur and oiled, (the two latter processes being now discontinued in the manufacture of strings intended to be wire covered,) after which they were covered in the following manner, as given by the patentee:—"Let two wheels, with grooves on their edges, be fixed on a frame close and similar to each other. Wind the string round the rim of one of these wheels, put the other end of the string through a hollow iron-turned stud and fasten it to the rim of the other wheel, upon the other iron stud, whose bore must be in a line with the upper edges of these wheels or pulleys, so as not to draw the string from a right line. On the stud there must be a pulley, for the band of a large wheel, to move it round, and on the flat of this pulley must be a stud, with a bobbin filled with wire, to move round the stud with a proper degree of stiffness to bind the wire tight upon the string. When this pulley is set in motion, the end of the wire from the bobbin being fastened to the string, it will be wound round the string with very little strain upon the string, and as it winds round the string it will be conveyed from the wheel or pulley on which the string was first wound upon the other; by reason that the string but just fill the bore of the stud, weights or spring must be used to the two pulleys to give the string a proper tension." A patent for a method of making silk strings was obtained by Peter Nouaille, on January 22nd, 1774, No. 1062. Raw silk of the finest and whitest quality is soaked in an animal or vegetable mucus, then spun into strings, after which they are varnished. A method of rendering gut, silk, or other strings waterproof was patented by Isaac Hawkins, No. 2446, November 13, 1800. A patent for an improvement in covering strings with gold or platina wire, was obtained by William Bundy, on April 24, 1811, No. 3436; whilst in 1854, March 11, No. 589, John Maynard claims provisional protection for an improvement in covering strings, from wire made from a particular composition of metals.

Characteristics of Good Strings.

A good violin string ought to be perfectly cylindrical from one extremity to the other, having a regular thickness throughout, and possess the necessary elasticity. A packet of strings upon being compressed, or bent together, ought not to change colour, or the united parts to break, but to quickly return to their original shape. They ought also to be transparent throughout their entire length, like a thread of glass, and possess no wavy or curled markings. The best, second, and third strings are of a transparent white; the firsts not being so white, but perfectly transparent.

If the first strings are very white, we may safely assume that they have been made from the intestines of animals which have been prematurely used by the manufacturer. The strings should be now and again oiled, preserved in oil-paper or bladder, and laid aside in covered tin boxes, in a dry place. For oiling the strings, a small piece of woollen or other cloth may be used, upon which is poured a few drops of olive or almond oil. If olive oil is used, it should be purified by a mixture of lime and lead, until it is perfectly limpid. The first string should require a tension of 15lb to bring it to opera pitch; the second 17lb; the third and fourth about the same as the first. The first string ought not to break under a tension of 26lb; the second, 33lb; the third, 93lb; and the fourth 30lb. We must carefully observe that the tone of any violin is very perceptibly affected by the size of the strings, as if not in due proportion the one to the other, no uniformity of tone or power will be obtained. If the strings are too thin or light, the tone of such will be weak and feeble, whilst on the contrary, if too thick or heavy, the sounds will be hard and coarse, and an unnecessary strain and pressure will be exerted on the bridge.

CHAPTER X.

VARNISHES, STAINS, ETC.

THE Cremona Varnish! How many minds have been eagerly and enthusiastically bent upon the solution of the query as to the composition of this beautiful and diaphanous substance! Volumes have been written containing the authors' choicest receipts for this varnish, or rather its imitation, but with what result—despondency, for the common cry is, "the secret is lost, never to be regained." A few enthusiastic writers have even gone so far as to declare that the varnish made the violin, or, in other words, that the superiority of our ancient instruments arose solely from the excellent qualities of their varnish—an idea so monstrous and opposed to reason, that they might, with equal probability, have concluded that a worthless violin only required to be placed in the hands of an eminent player in order to be transmuted into one of the finest and most bewitching toned instruments which ever graced the orchestra.

That the varnish bears an important influence upon the quality of the instrument is not to be doubted, but this influence must be regarded in a modified degree. Would the so-called re-discovered Cremona varnish of Monsieur Grivel if applied to a faulty-constructed instrument, ever render it a good one? Never; for the fault, arising from malconstruction, would never be redeemed by the application of a coating of varnish. The Cremona varnish was considered by many makers to be composed principally of amber dissolved in some suitable fluid, which solvent has now unfortunately been lost in oblivion, whilst others adopted a somewhat different theory by supposing the amber had been dissolved in oil, constituting the *old* "oil-varnish" of a somewhat similar nature to the common amber oil-varnish. It is now generally admitted by the best authorities upon the subject that amber in nowise entered into its composition, or, if so, in an exceedingly small proportion, as from several copies of analysis in my possession of samples of varnish, taken from genuine old Cremonas, there was not a trace of amber to be found.

There is every probability for supposing that this ancient varnish was an oil one, or at least that the first coatings of varnish applied to the instrument were such, for Lupot, in his excellent work, confirms this, wherein he states that the substratum of the varnish should be "*bonne huile fine;*" and another fact of significant importance is that, in the letter of Stradivarius to a clergyman, a fac-simile of which is contained in the learned work of Fetis, he states, "*Compatira la tardanza del violino, perchè è stato la causa per la vernice per le gran crepate che il sole non le faccia aprire.*" "Pardon the delay of the violin, occasioned from the varnishing of the large cracks, that the sun may not reopen them"—a delay which had been caused from the varnishing (drying). It is evident this had been an oil varnish, as no apology would have been required if spirit-varnish had been used, on account of the shortness of time taken by it to dry. Monsieur Grivel states that alcohol removes the Cremona varnish—so it does, but this is no proof that the Cremona varnish was a spirit one.

If we make a varnish composed of any resin which is soluble in oil or alcohol, such as common rosin, Venice turpentine, Canada balsam, &c., with a certain proportion of oil, and a solvent capable of dissolving both oil and resin, as spirits of turpentine, mineral naptha, &c., we will find that this varnish, on drying, will leave a slight film of the gum or resin, which can easily be removed by alcohol.

As a proof of this, let the amateur try the following experiment:—Mix a small quantity of Venice turpentine with drying-oil, and boil the mixture for a short time, then dissolve the product in mineral naptha, when the result will be a beautiful golden-coloured varnish, that will give a good surface if applied sparingly, but will sink into the wood if used too thickly. This varnish, when dry, will be brought off immediately by pure alcohol. Mineral naptha dissolves most of the resins, unites in all proportions with strong alcohol, ether, and the essential oils, and extracts the colour from numerous roots and woods used as stains in varnishes. The disagreeable odour of this solvent soon vanishes by evaporation; and from being a natural product in Italy, may it not, with every reason, be supposed that this formed one of the chief solvents in the oil-varnish of the old Cremona makers. From certain experiments made with a varnish composed of oil and gums having naptha as a solvent, I found the tone of a new violin very perceptibly improved by the application of such varnish. I at first used one composed of the common gums, dissolved in alcohol, by which the tone was rendered harsh and grating; whereas upon the application of the first mentioned varnish, the volume of tone was not only increased in fulness, but a bland and sustained mellowness was combined therewith. From the few and hurried experiments made as yet, arising from want of time and opportunity, the author for the present declines entering further into details respecting this varnish, but the subject is one highly worthy of investigation.

The Cremona makers no doubt had been led to adopt oil in their varnish, from the fact that such would tend to give the dissolved gums a certain amount of elasticity, which never could be obtained by the employment of alcohol as a solvent. The spirit varnishes dry quickly, but their chief disadvantages are their want of elasticity, and aptitude to crack and peel off, whereas in a good oil-varnish, the former defect is greatly ameliorated, whilst the latter is almost entirely obviated.

Oil-varnishes are also the most durable and lustrous, and yield better to the operation of polishing than spirit-varnishes.

The following receipts for varnishes have been more or less used by violinmakers. No. 2 was kindly given the author by one of our most eminent Scottish makers, who obtained it from the well-known Hardies of Edinburgh many years ago. The following short description of the chief substances used in the composition of the varnishes may not be out of place here:—

AMBER is a fossilized vegetable gum or resin of the extinct coniferæ tribe, forests of which were abundant at an early epoch over Northern Europe. Anciently a fabulous origin was attributed to it, as from its having been found on the sea shore after a tempest, it was believed to have been the solidified tears of the sea nymphs, or of the sisters of Phaeton. It is generally found in irregularly-shaped masses of no great size, the colour varying from a light yellow to a deep orange, having various degrees of transparency, some pieces being entirely opaque. The milky or cloudy-coloured pieces have the most value, as the clear semi-transparent pieces can be easily imitated by copal or other gums.

To the varnish maker the most transparent are equally valuable, as the milky-coloured pieces are used chiefly by the carver and turner.

By friction it becomes negatively electrical, indeed so much so that the workmen in turning it are often affected by nervous twitchings, and are frequently obliged to change the pieces they are handling. Many animal and vegetable remains are to be often found embedded in some of the pieces, as insects, leaves, &c., specimens of which are to be found in our national museums. When heated it exhales a fragrant odour, hence its being a favorite with the meerschaum-pipe-maker; it burns with a yellowish flame, leaving a shiny bituminous deposit. Amber is found on the beach in Norfolk, Suffolk, Isle of Wight, and North of Scotland, as well as in parts of America and India, and in Prussia mines exist of this singular substance.

It is somewhat brittle, and breaks in conchoidal fragments. Absolute alcohol extracts about one-ninth of its weight of pulverised amber, and in pure chloroform it is dissolved readily, whilst ether dissolves from ten to twelve per cent. of it; it is also entirely soluble in a mixture ot alcohol and spirits ot turpentine heated in a close vessel. Amber, after having been kept in a close vessel at a high temperature, becomes completely soluble in alcohol.

Benzoin, or Benjamin, is a somewhat costly gum resin, and is but little used in varnishes. It is brittle, breaks with a conchoidal fracture and fuses at a gentle heat. It readily dissolves in alcohol, to which it imparts an agreeable odour. It is obtained from a tree which grows abundantly in the islands of Sumatra and Java, also in Cochin China and on the coast of Malabar. The white tears, or those pieces possessing the least colour, should preferably be selected for varnish-making.

Canada Balsam is obtained from a tree of the same name, which is very abundant throughout Canada. It is perfectly transparent, having an agreeable odour, and is wholly soluble in rectified oil of turpentine.

Copal is a gum resin which exudes naturally from a tree which grows in New Spain and the East Indies. In durability it ranks second to amber as a varnish, and when of excellent quality, is too hard to be scratched by the nail. It is only partially soluble in alcohol, but is freely so in ether. Fused copal is completely soluble in boiling alcohol or spirits of turpentine. Copal is freely soluble in oil of rosemary, or spike-lavender, and the addition of any of those oils to alcohol promotes its solubility. It is also wholly dissolved in oil of turpentine, which has been ozonised or exposed for a length of time to the light. The clearest pieces are to be selected in the preparation of varnish.

ELEMI.—There are several varieties of this gum, but that which is imported from Ethiopia is the best and most valuable. Elemi is so liable to adulteration, that there is much difficulty in obtaining it pure. The common gum is of a yellow colour, but genuine Ethiopian elemi is of a greenish colour, mixed with reddish stripes, of a solid body, but softens by the heat of the hand, and emits a very agreeable odour, resembling fennel. It is wholly dissolved by alcohol, and is generally imported in pieces, which are surrounded by the leaves of the palm-tree or Indian cane. The addition of this gum to varnish promotes its toughness and durability.

LAC is a resinous gum which results from the puncture of a small winged ant, upon the twigs of various trees, which grow in several parts of India. There are several varieties of this substance, distinguished thus: stick-lac, seed-lac, shell-lac, &c. Stick-lac is that which is allowed to remain upon the small branches; seed-lac, that which has been taken off such twigs, and this lac melted, and run into thin scales or plates, forms shell-lac. Seed-lac forms a strong and tough varnish, which is often applied to the violin and violoncello, but possesses little or no elasticity. Shell-lac is used in the common hard varnishes, and forms the chief ingredient in the various French-polishes. Lac is soluble in alcohol, in a solution of borax and hot water, ammonia, naptha, &c. There is another species of lac, of a white colour, and opaque, which has undergone the operation of bleaching by chlorine. This variety is termed bleached-lac, and is now much used in the preparation of varnishes.

MASTIC is a gum resin, which exudes from the bark of a tree which grows abundantly in the Levant. It is generally sold in small round tears of a yellowish colour, which are transparent. It is freely soluble in alcohol, and oil of turpentine, and is employed chiefly to give toughness and hardness to varnish which is intended for polishing.

SANDARAC is obtained from a species of juniper which grows in Africa. It is usually in the form of elongated tears or drops of a pale yellow colour, and is freely soluble in alcohol. If much of this substance enters into the composition of a varnish, it is rendered very brilliant, but soft, and is easily scratched by the least friction.

TURPENTINE.—Of turpentine there are several varieties, as Chio, Strasburg, Bordeaux, Venice, oil (spirit or essence) of, and the common turpentine. They are all obtained from species of pine or larch trees. The Chio turpentine is greatly esteemed, but is much adulterated. This species when pure has a warm and acrid taste, and possesses a strong balsamic odour. That of Strasburg is produced from a species of silver fir, of Bordeaux, of a somewhat similar nature. That of Venice is extracted from a species of larch, and is of the consistence of treacle or honey, whilst common turpentine is so well known as to require no description. The oil, spirit, or essence of turpentine is distilled from a mixture of the common or American turpentine and water, and is a clear, limpid, and colourless fluid, possessing an agreeable fragrance when newly prepared, or kept excluded from light or the oxygen of the atmosphere. The foregoing include all the chief substances employed in the formation of the following varnishes:—

OIL-VARNISHES.

No. 1.

Amber, coarsely powdered,	2 oz.
Venice turpentine,	2 fl. drs.
Prepared Linseed-oil,	1¼ fl. oz.
Oil of Turpentine,	2 fl. oz.

Dissolve by heat.

No. 2.

Amber, fused,	2 oz.
Oil of turpentine,	5 „
Drying Linseed-oil,	5 „

Dissolve by heat.

No. 3.

Amber, fused,	4 oz.
Lac,	1 „
Drying Linseed-oil,	4 „
Oil of Turpentine,	8 „

Dissolve the lac separately, then add the amber, and thoroughly dissolve by heat.

No. 4.

Clear and pale African copal,	1 ℔.
Pale drying-oil,	1 quart.
Rectified oil of turpentine,	3 pints.

Boil the copal and drying-oil till stringy, then thin with the turpentine, and strain immediately into the store jar. This varnish is hard and durable, and dries hard in from 12 to 24 hours.

No. 5.

Clear pale rosin,	3½ ℔s.
Oil of turpentine,	1 gallon.

Dissolve. This is the varnish generally used in the cheap violins.

No. 6.

Colourless Copal-Varnish.—To prepare this varnish the copal must be picked, each piece then broken, upon which a drop or two of rosemary-oil is to be poured; the pieces which become soft upon the application of the oil are those only to be used. Those pieces having been selected are to be ground to a fine powder and then sifted. Place the powder now in a glass vessel, and add to it a corresponding volume of the rosemary-oil; stir for a few minutes, when you will have a thick liquid. Leave the liquid to rest now for two or three hours, then add a few drops of pure alcohol, and mix slowly, after which reduce with alcohol until the required consistence is obtained. This is a clear and beautiful varnish.

SPIRIT-VARNISHES.

	No. 1.	No. 1 A.
Elemi,	½ oz.	1 part.
Mastic, in tears,	½ ,,	2 ,,
Seed-lac,	1 ,,	2 ,,
Sandarac,	2 ,,	or 4 ,,
Venice turpentine,	1 ,,	2 ,,
Powdered glass,	1 ,,	4 ,,
Alcohol,	16 ,,	32 ,,

No. 2.

Mastic,	1 dr.
Sandarac,	1 ,,
Lac,	6½ ,,
Alcohol,	5 fl. oz.

No. 3.

Gum Sandarac,	4 oz.
Seed-lac,	2 ,,
Mastic,	1 ,,
Benzoin, in tears,	1 ,,
Powdered glass,	4 ,,
Venice turpentine.	2 ,,
Alcohol,	32 ,,

No. 4.

Seed-lac,	5 oz.
Sandarac,	2 ,,
Elemi,	1½ ,,
Venice turpentine,	2 ,,
Powdered glass,	5 ,,
Alcohol,	24 ,,

No. 5.

Coarsely powdered copal and glass, of each,	4	oz.
Camphor, ...	½	,,
Alcohol (64 O.P.), ...	1	pint

Heat the mixture (with frequent stirring) in a water-bath, so that the bubbles may be counted as they rise, until solution is complete, then decant the clear portion.

No. 6.

Mastic,.	¼	lb.
Turpentine varnish, ...	2½	fl. oz.
Alcohol, ...	1	pint.

This is the spirit-varnish so often seen upon the cheap German violins.

No. 7.

Colourless Spirit-Varnish.—Dissolve 2½ ounces picked orange lac in a pint of rectified alcohol, and boil well for a few minutes with 5 ounces of well burnt and recently heated animal charcoal. A small quantity of the solution should now be filtered, and if not colourless add more charcoal. When colourless, press the liquor through a piece of silk, and filter through fine filtering-paper. This varnish must be used in a room where the temperature is about 60° Fahr. It does not chill or bloom, and dries in a few minutes.

The preceding varnishes may be coloured to any suitable shade by the use of the following substances:—For a yellow tinge, aloes, annotto, gamboge, turmeric, or saffron; any of the foregoing will give various shades of yellow. For red, use dragon's blood, or red saunders-wood, and by a judicious mixture of the foregoing colours, almost any of the violin tints may be obtained. The substances are to be allowed to soak in the alcohol until the desired amount of colour is produced, or a small quantity of alcohol may be used separately to extract the colouring matter, which may be made of a deep intensity. This can afterwards be mixed with the varnish until the proper colour is arrived at, observing that every coating of varnish adds a perceptible depth of colour to the preceding one. Madder and logwood are sometimes used for the various shades of brown. Some violin makers adopt quite a different method of colouring their instruments; thus, instead of colouring the varnish, they stain the violin with the liquid stain or colour, and afterwards apply a light coloured varnish. The foregoing spirituous extracts would give such stains, or merely watery infusions of several of the substances, laid on hot. Stephen's wood-stains have also been used for the same purpose, but the violins finished by this method have always a painted appearance, and can be easily recognised from those which have been finished with the colour in the arnish, as by this latter means a certain transparency and harmony of colour is obtained, which never can be produced by the application of a wash of stain to the surface. The amateur will require but few tools in the operation of varnishing, viz., a few brushes, tripoli-powder or fine glass-paper, oil, &c. The brushes, if for spirit-varnishing, may be flat camel-hair ones. Those vary in size, being from a quarter of an inch to five inches and upwards in breadth. A brush an inch in diameter will be found large enough for general purposes, whilst a small camel or sable brush may be used for varnishing the scroll work of the hand, but the former brush, if carefully used, will answer for the whole manipulations. The brushes, after being used, may be dipped in methylated spirit, and afterwards pressed out between the thumb and finger, when they may be laid aside in a closely-fitting tin box. By this method they will be rendered clean, and adapted for instant use at any required time, as if this final washing is neglected, the brushes get quite hard, and the amateur will experience some difficulty in getting them properly cleaned, and even when they are so, the hairs have a tendency to get broken or loosened, and such loose hairs are certain to attach themselves to the first coatings of varnish. Care should be taken not to flood the brush with varnish, to spread the coating freely, lightly, and pretty quickly, as the varnish soon dries; to pass the brush over one part only once at a time, and never to return twice or backwards over the same part, as if such has been the case, the part alluded to is sure to be rough and flaky when dry. The room, also, ought to be moderately warm, and free from floating dust or particles, or the varnish is almost certain to chill or bloom.

The first few coatings of spirit varnish may be applied to the wood crossways, although the final coatings must be laid on in the direction of the grain or woody fibres. When one coating is perfectly dry another may be applied, always leaving a sufficient interval of time to allow the separate coatings to become thoroughly free from tackiness, when the rough surface left by the brush marks has then to undergo the operation of polishing.

This is the most tedious part of the work, and unless carefully conducted, is sure to be attended with anything but satisfactory results. When several coats of varnish have been applied and thoroughly dry—no definite number can herein be specified, as much depends upon the quality and fluidity of the varnish, and the finish of the wood—the surface may be smoothed with glass-paper. A very small quantity of raw linseed-oil may be used with the glass-paper, which assists in hastening the smoothing of the inequalities, and tends to prevent heating by the friction. When the surface is thus rendered smooth, it may be wiped with an old silk handkerchief, to remove all traces of oiliness, after which several coats of varnish are to be applied, as already described. When dry, the polishing is again to be resumed as previously, after which a coat or two of thinner varnish may be laid on and afterwards polished with tripoli-powder and oil, until the surface is perfectly smooth and even, after which it may be rubbed with fine flour or starch, and finally polished with a piece of clean silk or flannel.

Several hours ought to elapse between the last smoothing and varnishing as well as the final polishing, that the whole may have attained thorough hardness, otherwise an excellent lustre cannot be produced. The preceding remarks chiefly apply to spirit-varnish, the essential difference in oil-varnish being the length of time taken to dry, and the varnish being of thicker consistence, necessitates fewer coats—one, in some instances being sufficient—but the amateur will readily understand this from the nature of the varnish he may be inclined to adopt.

MISCELLANEA.

The Biter Bit.—A curious ancecdote is related of a violin maker so skilful in his trade that he could imitate an old violin to perfection. One day a fiddler more eminent than honest, brought him a fine Cremona, and said, with a sly twinkle in his eye, "Mr. ———, I want you to make me an exact copy of this Amati." The maker, who knew to whom the fiddle belonged, and guessed the object, promised to have it ready in two months. At the end of the time the player came, paid the money, and received the two violins; but when he got home and examined them closely, he found they were *both* counterfeits, the clever imitator having kept the true Amati for himself.

An Adroit Sell.—One day a gentleman called into the shop of Mr. Abraham Isaacs, with a violin case under his arm. He purchased a necktie, for which he paid three-and-sixpence, and then asked permission to leave his box while he did a few errands in the neighbourhood. Old Isaacs, a dealer in new and second-hand clothing, had no objection. "It is a violin," said the gentleman, "which I prize very highly. It was given me by an old Italian, who died at my father's house. I beg you will be careful of it, sir." Mr. Isaacs promised, and the owner of the precious violin departed. Towards noon, while the old clothes dealer was very deeply engaged in the work of selling a suit of very old clothes for bran new broadcloth, a stranger entered the shop, a remarkably well dressed man, with a distinguished look. The violin case was in sight upon a shelf, and as no one was near to prevent him, the new comer slipped around, and opened the case, and took out the instrument, a very dark hued and ancient looking one. "Hallo," cried Isaacs, when he heard the sound of the violin, "what for you touch dat, eh?" The stranger explained that he was a professor; that he was the leader of an orchestra; and that he could never see a violin without trying it; and then he drew the bow across the strings, playing a few passages of a fine old German waltz. "My soul," he cried, after he had run his fingers over the instrument a while, "that is the best violin I ever saw. There is not a better in England—a perfectly genuine old Cremona. I will give you twenty pounds for it." Isaacs said it was not his. "I'll give you fifty—a hundred." Mr. Isacs was forced to explain how the violin came to be left in his shop. The stranger had taken out his pocket-book and drawn forth a roll of bank notes. He put them back, remarking—"I must have that violin if money will buy it. When the owner returns will you ask him to wait for me? If he cannot wait, ask him to meet me here at six o'clock. If he cannot do that, tell him to call at the office of the treasurer of the Royal Academy of Music, and inquire for the director of the orchestra. Will you do it?" Isaacs said he would. "But," suggested the stranger, "you need not tell the man what I have said about his violin, nor what I have offered, because he may have no idea of the treasure he possesses. You will be careful and circumspect." The stranger went away, and Abraham Isaacs reflected. In the course of an hour the owner of the violin returned and asked for his box. But the "old clo'" man had been captivated by the golden bait. What would the gentleman sell his violin for? At first the gentleman would not listen to the proposition, but after a deal of talk he confessed that he was not himself a professor, and could not well afford to keep such a valuable instrument. He would sell it for fifty pounds—not a penny less. Mr. Isaacs paid the money and became the legal possessor of the violin, ready to take anything from two hundred to two hundred and fifty from the director of the orchestra, as he might be able. But the director did not come. At the end of a week Isaacs carried the violin to a professional friend, and asked him what was its real value, before calling on the professor. "Five-and-twenty shillings, without the case!" Abraham Isaacs was strongly of opinion that the gentleman who left the violin in his care was a swindler, that the director was a partner in the business, and that together they had made him their victim. That night old clothes went up ten per cent.

Fiddling.—Even Tom Hood is inexcusable for such a description of music as this:—"Heaven reward the man who first hit upon the very original notion of sawing the inside of a cat, with the tail of a horse." We never thought he could have been guilty of such *violins* (violence).

Fiddle—Irishman's Description of.—"It was the shape of a turkey and the size of a goose, he turned it over on its back and rubbed its belly with a stick, and och, St. Patrick! how it did squale."

Sheer Strength.—Ole Bull was once seeing the sights at Donnybrook Fair, when he was attracted by the sound of a very loud violin in a tent. He entered and said to the player, "My good friend, do you play by note?" "The divil a note, sir." "Do you play by ear, then?" "Never an ear, your honour." "How do you play then?" "By main strength, be jabers, rejoined Pat.

Sound-Post.—Sound-posts made from glass tubes have been held in high estimation by several violinists, and another ancient form of sound-post has been lately re-adopted and highly extolled, as giving superior results to the one in common use, but this is very doubtful. The following is the method of making this latter form of sound-post. Drill a longitudinal hole through a square, clean piece of *cedarwood*, about ⅛ of an inch in diameter; now drill a number of holes crossways through two opposite sides, so as to have a space of about half an inch between each; then, in the other two sides of the square, drill a number of holes of the same size as the preceding, so as to pass through about the middle of the former spaces, in a direction thus crossways to the others; now reduce and cut the post to its proper dimensions, having the ends pierced, and fit to the violin in the usual manner.

Bass-Bar.—A new and *original* form of bass-bar has been lately introduced by Mr. Walker (late of Donside). Having as yet had no opportunity of deciding upon its merits, the author hazards no definite opinion; but the following extract from one of Mr. Walker's letters, explanatory of the above, may prove acceptable to the reader. "Instead of the bass-bar in common use, I have for some time past used another form of bar, which improves the instrument generally from twenty to thirty per cent. This bar consists of a piece of pine wood cut on the slab—with the grain consequently running on the edge, of the following dimensions:—length, 10 in.; breadth, $\frac{5}{8}$ in.; and thickness, $\frac{1}{8}$ in. Bend the bar, and glue the flat surface to the inside of the violin, in the usual place. I have always found this form of bar improve the instrument." No doubt this bar may cause mere *loudness* of tone; but as to *quality*—Query?

A Holy Fiddle.—A Scottish divine, now deceased, and formerly pastor of a congregation not a hundred miles from Aberdeenshire, was not only eminently known for his virtues of benevolence and charity, but also for his accomplished performances on the violin. This latter art, as practised by their clergyman, found but little favour with the majority of the hearers, who held a noisy meeting for the purpose of deciding upon what steps should be taken to put an end to such impious howlings. At this *special assembly* it was arranged that several of the most pious, or "*unco guid*," should proceed to the manse, and hold a conference with the musical divine, in order to sift the matter properly. The orthodox elders having fortunately found their pastor at home, began to pour out their dogmas upon the unholiness of "*fiddling*," when their venerable pastor asked them if ever they had seen *his fiddle*, or heard him play, to which they responded in the negative. Those righteous and long-faced worthies being now anxious to hear him play, he brings a violoncello, and pathetically plays a psalm-tune, to which they willingly accompanied him by singing, after which they appeared completely satisfied, expressing their verdict of sanctity in the use of such by the following choice decision. "A muckle, fat, *releegious* soonin fiddle like that, there was nae hairm in, na, na; *that* was nane o' yer scandalous penny waddin' fiddles that they hed haurd tell o'"

The Minister-Painter, and Fiddler.—The following extract, relative to the late "Minister-Painter," the Rev. Mr. Thomson of Duddingstone, may appositely follow the foregoing. "A solitary, sad-eyed, mediæval monk, illuminating missals in a cloistered silence, broken only by the tinkling of refectory or prayer bells is familiar enough to the imagination, but a modern presbyterian clergyman, painting pictures on week days, and preaching sermons on Sundays; writing papers on optics to the Edinburgh Review, and drawing tears in the evening by his *violin performances;* throwing down his brushes of a forenoon, placing against the wall a picture of the Bass, with a thunder-cloud blackening over it; going out to see an ailing parishioner, and noting on his way how a sunbeam made gleam the ivies on Craigmillar, which a shower had just wet, and returning to receive to dinner Sir Walter Scott, fresh from the Bride of Lammermoor, and Sir David Wilkie, fresh from Spain and the study of Velasquez; this complex activity, this variety of duty, this fulness of noble life, is something not very frequently met with.—*Argosy.*

The Dance of David.—Having, in all probability, already taxed the patience of the reader with *fiddles* and *fiddling*, sacred and secular, let us now—previous to parting company—conclude with the dance. "An elder, who is also precentor in a Free Church not fifty miles from Inverness, lately attended the marriage of his eldest son, and in the evening, joined the young couple and others in a reel, by way of leading off the dance. This having come to the ears of the other elders of the church, they held a conclave, to which David was summoned. He made a full confession, and has been suspended from his office of precentor for three calendar months. David has been an elder and precentor for twenty years. So much the more reason, argued the kirk-session, why he ought to know better than to make merry at his son's marriage."—*Inverness Courier*, *April* 1870.

Punch gives the following comment upon the foregoing.

> "Elder David, the precentor, his son's wedding dance attended,
> Elder David, the precentor, from his office was suspended.
> Though old David, the Psalmist, danced, we know, 'fore the ark,
> Elder David, the precentor, must *not* dance for the lark.
> Let the fate of elder David, the precentor, *in terrorem*,
> Hang o'er the heads of elders when they list to "*Tulloch-gorum*;"
> But one point in the punishment appropriate one feels,
> That such elders, when suspended, be suspended by the heels!"

ALPHABETICAL LIST OF VIOLIN MAKERS.

ACEVO. ———, 1640, a pupil of Giofreda Cappa. The violins of this maker were much esteemed

ADAMS, Cathune, Garmouth, 1800, made kits, violins and violoncellos. He was chiefly famed for his kits and violoncellos. The fingerboards of some of his violins were inlaid with ivory. The Rev. Wm. Logie, Tynet, possesses a violoncello by this maker, a good, round toned instrument. A violin by this maker is also in possession of Mr Boyne, Achinhalrig, Banffshire.

AIRETON, E., London, 1726. Some of his instruments have a very fine and full tone.

ALBANI, ———, Palermo, 1633.

ALBANI, Matthias, born at Botzen, or Bolzano, in 1621, died 1673, a maker of medium quality. The archings of his instruments being too deep, they have a nasal tone.

ALBANI M., son of Matthias, Bolzano, 1702, 1709, reputed a good maker.

ALBANI, Paolo, Cremona, 1660, a pupil of Amati.

AMATI, Andreas, Cremona, 1520, 1580.

AMATI, Nicholas, Cremona, brother of Andrew.

AMATI, Nicholas, Cremona, nephew of the former.

AMATI, Antonius, Cremona, 1550, 1635, brother of the preceding.

AMATI, Hieronymus, Cremona, 1638, brother of Anthony.

AMATI, Nicholas, Cremona, 1596, 1684, son of Jerome, the most celebrated of the Amati family.

AMATI, Hieronymus, Cremona, 1649, 1672, son and pupil of Nicholas. This artist was the last of the family.

BACHMANN Louis Charles, Berlin, 1736, 1800. An excellent German maker.

BAGATELLA, Antonio, Padua, 1780. Wrote a work on the violin, also a good maker.

BALESTRIERI, Thomas, Cremona and Mantua, 1720, 1750. An excellent maker, and a pupil of Stradivarius.

BANKS, Benjamin, Salisbury, 1740, 1795. An excellent English maker.

BANKS, Benjamin, James, and Henry, sons of the former, and good makers. One of Benjamin's violins the author has heard played, which had a very fine tone. It was purchased for four guineas. Date, 1812.

BARRETT, John, London, 1720. Another good English maker.

BENTE, Matteo, Brescia, 1580. A famed maker of the Brescian school. His violins are much esteemed.

BERGONZI, Carlo, Cremona, 1720, 1750. An excellent maker and a pupil of Stradivarius.

BERGONZI, Michael Angelo, Cremona, 1725, 1750. Said to have been a pupil of Stradivarius.

BERTRAND, ———, a French maker.

BETTS, John and Edward, London, 1780, 1823. Good makers, and pupils of Duke.

BEVERIDGE, William, Craigh, Aberdeenshire, 1870. The violins of this maker are of exquisite finish, with beautifully carved scrolls and tail-pieces; he is also the inventor of an improved tail-piece, which adds much to the neatness of the violin. In this tail-piece the holes for the strings are pierced longitudinally, having a small cavity cut at the extreme ends of each for containing the knots, similar to that commonly used for containing the button string. The strings are simply inserted through the longitudinal holes, and a knot formed, which is prevented from slipping by the holes being graduated to a size corresponding with the four strings. This artist was patronised by the late Prince Consort for his violins, bows, snuff-boxes, &c., and Her Majesty has at various times commissioned him to supply her with many articles in wood-carving.

BLAIR, William, Abergeldie, now living, born 1796, violinist to H.M. Queen Victoria, and H.R.H. the Prince of Wales, also a maker; some of his violins are pretty well finished, and have much power and brilliancy of tone, but want the bland and silvery sound of the old Italian instruments. The best instruments of this maker have been all baked in the wood by fire.

BOCQUAY, Jacques, Paris, 1715, 1725. A native of Lyons, and a good French maker. A violin by this maker is in the collection of Mr. Lowe, Edinburgh, which, from the extraordinary volume and intensity of its tone, is familiarly known as "The Emperor;" the model is large, the varnish of a fine yellow tint.

BOIVIN, Claude, a French maker.

BOURDOT, Sebastian, Mirecourt, about the eighteenth century.

BOUSSU, B. A., Etterbeeck, 1752. A good maker. Some of his violins are sold for about five guineas.

BUCHSTADTER, Ratisbon, recommended by Spohr. Otto states that the instruments of this maker are not highly esteemed.

BUDIANI, Javietta, Brescia, 1580. A good maker of the rescian school.

CAPPA, Giachimo and Geofreda, Cremona and Saluzzio, 1590, 1640. Pupils of Nicolas Amati, and founded the Saluzzian school of makers.

CARTER, John, London, 1785. A good English maker.

CASTAGNERY, Jean Paul, Paris, 1640. A good French maker.

CERUTI, H., Cremona, 1868. A good modern maker.

CONTRERAS, Joseph, Madrid, 1745. A good maker. I have seen a violin by this maker, for which the possessor refused thirty guineas. It was made of excellent wood, of rich figure, and possessed a fine round tone.

COSTA, Della Pietro, Treviso, 1660, 1680. Considered a good maker.

CRAMOND, Charles, Aberdeen, 1821, 1833. Made some good instruments, of which several are in the county; his usual charge for a violin was about £5. About 1834 he went to Nova-Scotia.

CUNI, ———, a good French maker.

DARCHE, Aachen, a good imitator of old Italian violins

DARDELLI, Pietro, Mantua, 1500. An early maker of viols, bass-viols, and rebecs.

DAVID, ———, a French maker about the eighteenth century.

DAVIDSON, Hay, Huntly, 1870. Several violins by this maker have been pronounced good.

DECOMBRE, or de Comble, Ambrose, Tournay, 1700, 1750. A pupil of Stradivarius. His basses are much esteemed.

DODD, Edward, Sheffield and London, an improver of the bow.

Dodd, John, son of the above, the celebrated bow-maker

DOMINICELLI, ———, Ferrara, 1695, 1715. A pupil of the Amati school.

DUCHERON, Mathurin, a good French maker.

DUIFFO-PRUGGARD, or Duiffoprugcar, Gaspard, Bologna, Paris, and Lyons, 1510, 1540. Stated hy some to have been the first maker of the real violin; he was born in the Italian Tyrol. Several violins and violas of this maker still exist, but upon minute examination many of them have been proved to have been refitted and altered viols; some of the scrolls have beautifully carved figures.

DUKE, Richard, London, 1767, 1791. A celebrated English maker. A violin of this maker, dated 1776, which I have seen, possesses a very fine tone. It was purchased for thirty shillings.

DUNCAN, ———. Aberdeen, 1762.

DURFFEL, Johann Gottfried, Altenburg, 1778. Made fine toned instruments; his double-basses are highly esteemed. His violins have a very fine outline. Mr. W. Duncan, late of Tilly-drine, possesses one having a fine tone, but no great intensity; it bears the following inscription:—"*Johann Gottfried Dürffel, Violinmacher, Altenburg*, 1778." It is not inlaid, and the interior of the instrument is rather roughly finished, but the thicknesses are well proportioned.

EBERLE, Jean Ulric, Prague, 1749. An eminent German maker, recommended by Otto. Mr. M'Donald, Mossat (Aberdeenshire), has a violin by this maker.

EDLINGER, Thomas and Joseph, Prague, 1710, 1748. A family who made several good instruments.

ERNST, Frank Anthony, Bohemia and Gotha, 1778. Said to have made many good instruments, the celebrated Spohr having performed a concerto upon one of them.

FENDT or Finth, Paris, 1770, a native of Germany, and a good maker. His violins are beautifully finished, and varnished in oil.

FERGUSON, Donald, Huntly (Aberdeenshire), 1870.

FICKER or Fieker, Johann Christian, Cremona, 1722. His instruments are not amongst the best. He used a peculiar monogram, stamped upon the wood, indicative of his being at the head of the family.

FINDLAY, James, Padanaram (Forfarshire), 1870.

FLORENTUS, Florinus, Bologna, 1685, 1715, one of the Amati school.

FORSTER, 1739, 1824, an English family who made excellent instruments. I have seen a violoncello by the elder William which was purchased for £20, a very fine-toned instrument; a tenor and violoncello of exquisite quality, by the same maker, are in the possession of that eminent collector, Mr. Croall of Edinburgh.

FOURRIER, N., Paris, 1810, an excellent French maker.

FRITZSCHE, Samuel, Leipsig, 1790, made good instruments.

GALBUSERA, C. A., 1830, said to have been the inventor of a peculiar chemical preparation by which he extracted the resin from the wood. He made his violins and tenors without corners, being of a guitar-shape.

GALIANUS, or Gagliano, a family of Naples, 1695, 1790, celebrated makers who imitated the method of Stradivarius; one or two of the family have been considered the immediate pupils of Stradivarius.

GALIANUS, Alexander, Naples, 1695, 1725.

GALIANUS, Nicolo, Naples, 1700, 1740.

GALIANUS, Ferdinand, son of Nicholas, Naples, 1760, 1780.

GALIANUS, R. and A., 1868, good modern makers.

GAND, Charles Francois, Paris, 1806, 1845, a pupil and successor of Lupot. This maker died at Paris on 10th May, 1845.

GARANI, Michael Angelo, Bologna, 1685, 1715, an excellent maker, being one of the Cremona school.

GARANI, Nicolo, Naples, 1700, also one of the Cremona school.

GAVINIES, Paris, 1734, a good French maker.

GEMUNDER, ———, New York, 1869. It is stated that the instruments of this maker are not particularly fine.

GILKES, Samuel, London, about 1800. A good maker, being a pupil of one of the Forsters. I find in a London catalogue the following:—"A fined-toned double-bass by Gilkes, 1840, 15 guineas."

GIOFFREDA, B., Turin, 1860. The instruments of this maker are of medium quality.

GOBETTUS, or Gobetti, Franciscus, Venice, 1690, 1720, a pupil of Stradivarius.

GOFILLER, a family of Venice, about 1720. Good makers.

GRANCINO, a family of Milan, 1665 to about 1746, the earliest being pupils of Nicholas Amati.

GRANCINO, Paolo, Milan, 1665—1690.

GRANCINO, Francisco, Milan, 1710, 1746.

GRANCINO, Giovanni, Milan, 1697, 1735. The instruments of this maker are said to have been of rather an inferior quality.

GRANJON, J. Paris, 1867. The instruments of this maker are brilliant, but want intensity.

GRAY, James, Fochabers (Banffshire), 1870. Has made some finely-finished instruments after the method of Bagatella. They possess good intensity of tone. This is not a professional maker.

GRIUNN, C., Berlin, 1865. Considered a good modern maker.

GROSSET, Paul, a good French maker, and a pupil of Pierray.

GUADAGNINI, Joannes Baptista, Placentia and Milan, 1710, 1750, a good maker. I have seen one of this maker's instruments, which contained the following on label:—"*Joannes Baptista Guadagnini, Placentinas fecit Mediolani*, 1714," which was purchased for five guineas. The tone of this violin was very fine and mellow. Amongst the numerous instruments in the collection of Mr. Lowe of Edinburgh, is one by this maker, made in 1750.

GUADAGNINI, B. G. Piacenza, 1755, 1785, of the same school as the former.

GUADAGNINI, Lorenzo, Cremona, 1695, 1740, a pupil of Stradivarius, and an excellent maker. His violins are generally of the small pattern, the third string sometimes lacks roundness and intensity of tone. Two violins by this maker, in 1715, I have seen sold for eight guineas each.

GUADAGNINI, L., Milan, 1740, 1770, son of the former, modelled his instruments after those of the father, but the violins of this maker are not held in very high esteem.

GUADAGNINI, A., Turin, 1868. The violoncellos of this maker possess fine tone.

GUARNERIUS, Andreas, Cremona, 1650, 1695, a pupil of Nicholas Amati.

GUARNERIUS, Guiseppe, Cremona, 1690, 1732, son of the former.

GUARNERIUS, Pietro, Cremona and Mantua, 1690, 1725, another son of Andrew.

GUARNERIUS, Pietro, Cremona, 1725, 1740, son of Joseph and grandson of Andrew.

GUARNERIUS, Joseph G., Cremona, 1725, 1745, surnamed *del Jesu*. Many of his instruments bear the monogram ✠ I.H.S. The following is a copy of the label:—"*Joseph Guarnerius, fecit Cremone, anno* 17—. ✠ I.H.S." This was the last maker of this illustrious family.

GUERSAN, Ludovicus (Louis), Paris, 1730, 1766, an excellent French maker. His violins are of the small pattern, and finely finished, being covered with oil-varnish. A few of the violins of this maker were covered with spirit-varnish, but these are supposed to have been made by his pupils, and are of an inferior quality to the former.

GUIDANTUS, Giovanni F., Bologna, 1740, followed the Cremona patterns.

HARDIE, Matthew, and his son Thomas, Edinburgh, 1815, 1856, well-known makers.

HARE, J. London, 1725, made some good instruments.

HARRIS, 1800, a London family, good makers.

HART, John, London, a celebrated judge, maker, and repairer of instruments.

HASSERT, Rudolstadt. Otto states that the instruments of this maker are shrill and hollow in tone.

HASSERT, Eisenach, brother of the above and said to have been a good maker.

HELMER, Charles, Prague, 1742, a careful maker, and pupil of Eberle.

HENDERSON, D., Aberdeen, 1867.

HENRY, J., Paris, 1869. The bows of this maker are excellent.

HILL, William and Joseph, London, 1730, 1780, made several excellent violoncellos. I have seen a fine-toned tenor which contained the following inscription:—"*Made by Joseph Hill & Sons, at the Harp and Flute, in the Haymarket, London.*"

HOFFMAN, Martin, Leipsic, recommended as being a good maker, but his instruments have a rather inelegant outline.

HUNGER, Christopher F., Leipsic, 1787, stated by Otto to have been a superior maker.

JAUCH, Dresden, 1770, reputed as having been a good maker.

JAY, Henry, London, 1753, chiefly renowned for his kits.

JULIANO, Francisco, Rome, 1690, 1710. Mr. G. Neil of Wreaton, Aberdeenshire, possesses a violin by this maker, a fine-toned instrument. It bears the following inscription:—"*Francisco Juliano in Roma*, 1700."

KENNEDY, a London Family, said to have been good makers.

KERLINO, or Kerlin, Joan, Brescia, 1450, a native of Brittany, and one of the earliest makers of the violin; he also made viols, rebecs. La Borde, author of "Essai sur la Musique," states that he saw a violin by this maker with four strings and having, instead of the common tail-piece, a piece of ivory inlaid in the breast and pierced with four holes. The breast of the instrument was higher than those of the common violins, whilst the outline was unequally curved at the ends, and the sides badly formed. This violin contained the following on label—"*Joan Kerlino, ann.* 1449." The tone was sweet but weak—similar to some of the instruments of Anthony Amati.

KOLIKER, Paris, a celebrated maker.

KLOTZ, Matthias, Tyrol, 1670, 1696, one of Steiner's best pupils.

KLOTZ, George, Mittenwald sur l'Iser, 1754, son of the former.

KLOTZ, Egitia, brother of the former, made good instruments.

KLOTZ, Sebastian, said to have been the best maker in the family. Large sums have been given for some of the violins of this maker.

KLOTZ, Joseph, used very fine woods in his instruments.

LAMBERT, Nancy, about the commencement of the eighteenth century, surnamed "Charpentier de la Lutherie." None of the violins of this maker are held in much esteem.

LANDOLFI, or LANDOLPHI, Carlo, Milan, 1750, 1760, said to have been a good maker.

LENTZ, John N., London, 1810, made good instruments.

LEWIS, Edward, 1715, also a good London maker.

LINAROLLI, Venturi, Venice, 1520, also a maker of Viols, &c.

LOTT, 1800, a London family who made good instruments.

LOUVET, a French maker.

LUPOT, Francis, Stutgard, 1725, 1750, made some excellent instruments.

LUPOT, Nicolas, son of the former, the finest of the French makers. His first instruments are dated from Orleans. He was born in Stutgard in 1758, in 1785 removed to Orleans, and about nine years afterwards came to Paris, where he was appointed maker for the Chapel Royal, in which city he died on 13th August, 1834. He wrote a work on the Violin which far surpasses any of our English works, of which an edition was printed for the "Academie des Bibliophiles" in 1869. His violins are much valued, and rank next to the old Cremona instruments.

MAGGINI, Giovanni Paolo, Brescia, 1590, 1640, a native of Brescia, pupil of Gaspar di Salo, and an esteemed maker. His violins are of a large pattern, and are made similar to those of di Salo. Most of his instruments are covered with spirit-varnish of a deep gold colour, with the back and breast generally double purfled, and terminating at both ends in an ornament.—In the collection of J. A. Wood, Esq., of Edinburgh, is a violin by this maker, of great depth and purity of tone.

MAGGINI, Pietro Santo, Brescia, 1635, son of the former, renowned for his double-basses.

MANSIELL, Leonard, Nuremburg, 1728. His instruments are recommended by Spohr.

MARATI, Verona. Mr Malcolm, Perth, has a violin by this maker, dated 1690.

MARIANI, Antonio, Pesaro, 1570, 1620. Fetis states that his instruments are not of much value.

MAUCOTEL, C., London, made some beautiful instruments.

MEDARD, Henry, Paris and Nancy, 1680, 1720, supposed to have been a pupil of Stradivarius, he generally followed the model of Jerome Amati.

MEZZADIE, Alexander, Ferrara, 1690, 1720, one of the Amati school.

MILANI, Francisco, considered to have been a good maker.

MILLAR, Alexander, St. Andrews, 1870. This maker chiefly follows the Guarnerius model. His instruments are well and carefully finished.

MIRECOURT, C., Paris, 1868. The instruments of this maker are very brilliant in tone: the varnish is very fine.

MONTADE, Gregory, Cremona, about 1730, a pupil of Stradivarius.

MONTAGNANA, Dominicus, Cremona and Venice, 1700, 1740, made excellent instruments.

MORELLA, Morglatto, Mantua and Venice, 1550. Some instruments of this maker still exist. He is supposed to have been a pupil of Dardelli.

MURDOCH, Alexander, Aberdeen, 1870. His instruments are well finished, and possess much intensity, but want mellowness of tone. Mr Walker, late of Castle-Newe, possessed a number of this maker's violins.

NORMAN, Barak, London, 1680, 1740, a well-known English maker.

OTTO, Jacob Augustus, Gotha, 1780, 1830, author of a treatise on the Violin, and is said to have been a good maker.

OUVRARD, Jean, a pupil of Pierray; considered a good maker.

PAMPHILON, Edward, London, 1680, made several fine instruments.

PANORMO, Vincenzio, Palermo 1750, England, 1775, an excellent maker.

PANORMO, George L., son of the above, the celebrated bow-maker.

PARKER, Daniel, London, 1710, an excellent English maker. The eminent connoisseur, Mr Lowe, of Edinburgh, possesses a fine specimen by this old artist.

PASTA, Dominico and Gaetano, Brescia, 1710, good makers of the Amati school.

PAZZINI, Giovanni Gaettano, Firenze, 1640, 1650, one of the Brescian school, and a pupil of Maggini, made good instruments.

PEMBERTON, J., London, about 1570. The violins of this maker are said to have been good.

PEZARD, Brescia, 1562, one of the early makers, and a contemporary of Maggini.

PIERRET, or PIERRAY, C., Paris, 1710, 1730, made excellent violins after the model of Jerome Amati, but of no great finish.

PITET, French maker, about the eighteenth century.

PIQUE, Paris, a pupil of Saunier. His instruments have been highly recommended, but at the present time are held in no great esteem.

PLACK, F. Schoenback, 1740, considered to have been a good maker.

RAPHAEL, Nella, Brescia; beautifully finished instruments.

RAUCH, Breslau and Wurtzburg, a family who are said to have produced some excellent instruments.

RAUT, Jean, Rennes, 1780, a good French maker.

RAYMAN, J., London, 1640, an excellent maker.

RENAULT, Nicolas and John, good French makers.

RIESS, Bamberg, also an excellent maker, who imitated Steiner.

ROOK, Joseph, London, 1807, a good maker.

RUDDIMAN, Thomas, Aberdeen, 1769, at that time ranked as among the best of our Northern makers.

RUGGER, RUGGIERI, or ROGERIUS, Cremona, and Mantua, a family who made excellent instruments.

RUGGER, Francis, Cremona, 1670, 1720, surnamed "Il Per," and a pupil of Amati. A violin by this maker is in the collection of Mr Malcolm, Perth.

RUGGER, Vincent, Cremona, 1700, 1730.

RUGGER, John Baptista, Brescia, 1691, 1725, a pupil of Nicolas Amati. Some of the violins of this maker have been sold for 6 guineas.

RUGGER, Peter James, Brescia, 1700, 1720.

RUPPERT, Francis, Erfurt, also an excellent maker.

SAINT, PAUL, Paris. Some of this maker's instruments are said to have been very fine.

SALLE, 1800, an excellent French maker.

SALO, Gaspar di, born in the town of Salo, upon Lake Garda, Brescia, 1560, 1610, one of the celebrated old artists. His instruments possess great power and excellence of tone. He was chiefly celebrated for his viols, basses, and double-bass viols. Amongst the numerous fine violins in the possession of Mr A. C. Mackenzie, of Edinburgh, is one by this maker of a somewhat small pattern, tone very full and powerful, with excellent varnish, arching of breast very elevated, and workmanship very fine.

SALOMAN, Paris, about 1740, considered a good maker.

SAPINO, 1630, a pupil of Giofreda Cappa, imitated the violins of Amati, and was formerly esteemed a good maker.

SAUNIER, Lorraine, 1720, a pupil of Lambert, and surpassed his master in quality and finish.

SCHEINLEAN, Jean M., Langenfield, 1730, 1771, a good maker, but his instruments are somewhat weak in the wood.

SCHLICK, said to have discovered a process for rendering the wood free of water, acid, and resin. He also made good instruments.

SCHMIDT, Cassel, 1817, recommended by Otto as a good maker. He used spirit-varnish.

SCHONGER, G. Erfurt, made some very fine instruments.

SERAPHINO, Sanctus, Venice, 1730, 1745, one of the Amati school, and a maker of excellent instruments.

SMITH, Thomas, London, 1760, chiefly noted for his violoncellos.

SOQUET, a good French maker.

STATELMANN, Johann J., Vienna, 1784, a well-known excellent maker.

STEINER, or STAINER, Jacob, Tyrol, 1650, 1700, a well known maker.

STEINER, Marc, Tyrol, 1660, brother of the above, who assisted him in the workshop for several years.

STEINER, Fred., 1729, imitated the foregoing makers.

STIRRAT, Edinburgh, 1815, a pupil of Matthew Hardie, and only lived to work a few years on his own account. The violins of this maker are considered to have been superior to those of Hardie. Mr. Lowe, Hopetoun Rooms, Edinburgh, possesses a violin by this maker, dated 1815; this ranks amongst the finest of the instruments of this artist.

STORIONI, or STORIONUS, Lorenzo (Laurence), Cremona, 1780, 1795, a famed maker; he imitated the model of Joseph Guarnerius. M. Vieuxtemps played for a time upon an instrument made by this maker, which possessed excellent sonority.

STRADIUARIUS, or SRADIVARIUS, Cremona, one of the illustrious families well-known for their excellent instruments.

STRADIUARIUS, Anthony, born 1644, died 1737, the best maker.

STRADIUARIUS, Homobono, or Omobono, son of the former, died 1742.

STRADIUARIUS, Francisco, brother of the former, 1725 to 1740.

STRAUBE, Berlin, made excellent instruments, and was also a good repairer.

STRAUSS, Joseph, Neustadt, 1745. A violin of good quality by this maker is in the possession of Messrs. Reid, Aberdeen.

SURSANO, Spiritus, Coni (Cuneo), 1714, 1720, one of the Amati or Stradivarius school.

TECCHLER, David, Salzburg, Venice, and Rome, 1690, 1742, chiefly celebrated for his Basses. Mr Taylor, Cambridge Terrace, London, possesses a violin by this maker, dated 1728, of a very fine quality of tone. The breast is of fine reedy and close-grained wood. The Right Honorable Lord Forbes, Castle Forbes, Aberdeenshire, possesses another violin by this maker, bearing the following inscription: "*David Tecchler, fecit Româ*, 1742"—a well-known and delicious instrument.

TESTORE, Milan, a family of excellent makers, of the Amati and Stradiuarius schools.

TESTORE, Carlo Guiseppe, Milan, 1690, 1712. A violin by this artist is in the collection of Mr Malcolm, of Perth.

TESTORE, Carlo Antonio, Milan, 1700, 1740. One of this maker's instruments I have seen, which bore the following inscription: "*Carlo Antonio Testore figlio Maggiore del fu Carlo Guiseppe in Contrada Larga, al segno dell Aquila* 1735." Some good instruments of those two makers may be purchased for about eight guineas.

TESTORE, Paolo Antonio, Milan, 1710, 1745.

THOMSON, Aberdeen, 18—, made some good instruments; also a good repairer.

THOMSON, James, Easter Balmoral, 1870. Has made several instruments after the method of Bagatella, which possess a good round tone. Not a professional maker.

THOMSON, Charles and Samuel, London, 1720, 1748. Several good instruments are known by these makers. Mr. John Munro, Aberarder, Aberdeenshire, has a violin by this maker, having a good mellow tone; it contains the following inscription:—"*Charles and Samuel Thomson, in St. Paul's Churchyard*, 1746."

TONONI, Giovanni, Venice, 1700. An excellent maker.

TYWERSUS, French maker; adopted the model of Andrew Amati; was a pupil of Nicolas Renault.

URQUHART, Thomas ("London Bridge"), London, 1648. An early maker, of worthy excellence. In the valuable collection of violins belonging to Mr. Muir, of Leith, are two very fine instruments by this eminent maker.

VAILLOT, a French maker.

VERONA, Adrian, Paris, 1720. A good French maker, and followed the model of Amati.

VUILLAUME, Jean, Mirecourt, 1700, 1740. One of Stradivarius' pupils, and an eminent maker. Three excellent instruments by this maker are in the collections of Messrs. Lowe & Mackenzie of Edinburgh.

VUILLAUME, Jean Baptiste, Paris, 1870. A well-known famed maker. His instruments are beautifully made and finished, his bows are also of excellent quality: he is also the inventor of a peculiar kind of mute, which acts upon the tail-piece of the violin by the chin of the performer.

VUILLAUME, N. F., Brussels, 1867. A good maker, his instruments possess fine tone.

WALKER, Alexander, late of Castle-Newe, Aberdeenshire, 1870. Composer of a volume of Scottish Dance music, also a repairer of violins, &c.

WAMSLEY, Peter, London, 1720. A good English maker.

WEICKERT, Halle. Otto states that he steeped the breasts of the old violins in pine oil, under the ridiculous impression that the instruments were too old.

WITHALM, Leopold, Nuremberg, 1765, 1788. Highly recommended by Otto, and modelled his instruments after the Steiner pattern.

YOUNG, John, London, 1726. Made some good instruments.

YOUNG, John, Aberdeen, 1860. Chiefly a repairer.

ZANETTO, Peregrino, Brescia, 1540. Little is known of this maker.

ZANTI, Alexander, Mantua, 1770. A good maker, and one of the Amati or Stradivarius school.

APPENDIX.

A LIST OF VIOLINS, &c., SOLD BY MESSRS. PUTTICK & SIMPSON AT THEIR SALE-ROOMS IN LEICESTER-SQUARE, DURING THE LAST TEN YEARS, AT PRICES EXCEEDING £10 EACH.

VIOLINS, &c., BY ANTONIUS STRADIVARIUS.

Date.		Date.		Date.	
1674 . . .	£24	1700 . . .	£125	1715 . . .	£120
1684 . . .	31	1701 . . .	135	1716 . . .	45
1684 . . .	48	1708 . . .	60	1724 . . .	50
1685 . . .	135	1710 . . .	149	1727 . . .	20
1699 . . .	56	1712 . . .	70	1732 . . .	140
1700 . . .	50	1713 . . .	90	1734 . . .	33

The following prices were given for violins by this maker, but bearing no date, and defined in catalogues thus :—

A violin by Ant. Strad., fine and perfect, .	£40	0
Do. do., ...	63	0
Do. do., during his best period,	81	0
Do. do., ...	52	10
Do. do., formerly the property of Viotti, ...	65	0
Do, do., ...	120	0
Do. do., . . . , . .	28	0
A violoncello, by this maker, dated 1687, .	115	0
Do. do., 1697, .	210	0

Other violoncellos, bearing no dates, sold as follows, £11 10s., £13, £30, £70, and £150.

VIOLINS, &c., BY THE GUARNERIUS FAMILY.

A Violin by Joseph Guarnerius, dated,	1715, .	£44
Do. do., ...	1734, .	45
Do. do., ...	1740, .	19
Do. do., ...	1746, .	22

Other 15 violins by this maker, bearing no dates, were sold during the last 10 years, at prices varying from £17 to £50; exclusive of these were two specified thus:—One termed by

Paganini "*The Giant*," at £39 18s; the other, distinguished as "*Mori's Favorite*," sold at £105. Four violoncellos by this maker were sold respectively at £15, £21, £55, and £75.

A tenor by Peter Guarnerius was sold at £62, and a violoncello at £40. Three violoncellos by Andrew realised respectively £27, £30, and £35.

VIOLINS, &c., BY THE AMATI FAMILY.

A violin by Nicholas Amati,	dated	1647,	£25	0
Do.	do.,	1658,	21	0
Do.	do.,	1659,	50	0
Do.	do.,	1674,	40	19
Do.	do.,	1675,	25	0
Do.	do.,	1689,	50	0

Nine violins, without dates, sold at prices varying from £20 to £60. Another violin, formerly the property of Sir Wm. Curtis, sold at £84. Three tenors realised respectively £20, £21, and £42; two violoncellos, bearing no dates, £20 and £60, and one dated 1687, sold at £130. A violin by Andrew Amati, formerly the property of Corelli, was sold at £44; one by Nich. and Ant. Amati, dated 1653, was sold at £50; whilst two by Jerome were sold at £10 and £19 10s. Three violins by Anthony and Jerome were respectively sold at £12 5s, £16 10s, and £21. A tenor by those makers, dated 1629, was sold at £90; and a violin by Anthony at £40.

Instruments by the following Makers were Sold at the Prices specified, details of which may prove interesting to the Violin Amateur.

ALBANI, M.,	A violoncello bearing no date was sold at	£34	0
BANKS, B.,	A violoncello bearing no date was sold at, . . .	19	0
BERGONZI, CARLO,	Two violins, dated 1722 and 1730, were sold respectively at £30 and	90	0
	Two, having no date, at £23 and	25	0
	A violoncello, ...	37	0
BUENSI PAOLO,	A violin dated 1650, sold at .	15	0
CAPPA, G.,	A violin, without date, sold at	40	0
FORSTER (elder),	A violin dated 1782, sold at .	19	0
	And a double-bass at . .	30	0
GAGLIANO, A.,	Two violoncellos bearing no date, sold respectively at £20 and	30	0

		£	s.
GUADAGNINI, L., ..	A violin, no date, sold at .	£13	0
LANDOLPHI, or LANDULPHUS, &c., C.,	A violin, no date, sold at . . .	10	10
MONTAGNANA, D., ..	A violin, do., sold at . .	50	0
	And a tenor, dated 1738, sold at	13	10
ROGER, or ROGERIUS, &c., F.,	Two violins, without date, sold at £14 and £21; a violoncello, dated 1640, at £37; one dated 1686, at £30; another, without date, at .	100	0
Do. P., ...	A violoncello, dated 1723, sold at	27	6
SALO, G. DI, ...	A tenor, without date, sold at .	64	0
SERAPHINO, S., ...	A violin do., sold at .	18	0
STAINER, J., ...	A violin, dated 1660, sold at .	25	0
TECHLER, D., ...	A violoncello, no date, sold at .	40	0

END OF THE APPENDIX.

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