VIOLIN TONE-PECULIARITIES

—BY—

FREDERICK CASTLE, M. D.

FIRST EDITION.

LOWELL, INDIANA.

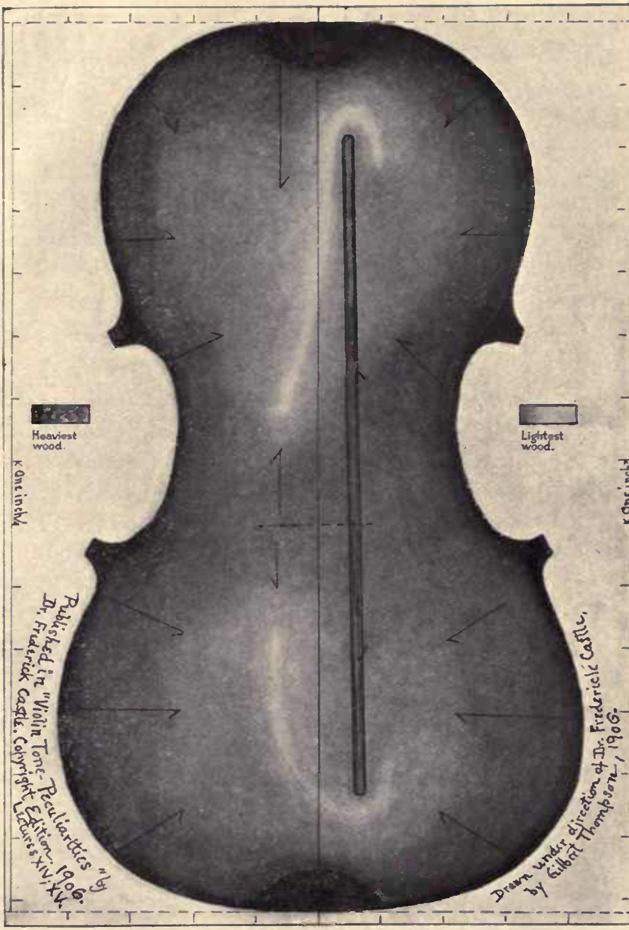
H. H. Ragon & Son, Printers,
Lowell, Indiana.
1906.

DR. FREDERICK CASTLE.

It is gratifying to acknowledge Major Gilbert Thompson, Washington, D. C., and Mr. Frank Spalding, Township Principal, Griffith, Indiana, as persons giving valuable aid in making this book presentable. FREDERICK CASTLE.

EXPLANATION OF CHART:

Because different samples of sounding-board wood must receive different treatment concerning graduation, therefore values for thicknesses are not given; but in lieu of figures, shading is employed as the means of indicating relative quantitive values. The single experiment noted in the text, and, having maximum evenness of tone-power in view, operated to augment *altissimo* tones in a more marked degree than tones of lower pitch. Because power in *altissimo* tones is desirable and difficult to secure, therefore, this method for graduation is given record, and, with the hope that future students of the violin may continue the experiment of shortening the length of sounding-board activity to augment tones of higher pitch. Trial will undoubtedly determine a better ratio than 2-3 for shortening fiber-activity beneath the lighter strings.



CHART, indicating by shading, the relative quantitive values of violin sounding-board graduation for maximum evenness of tone-power.

CONTENTS.

INDEX.

INDEX.

ples

INDEX.

ERRATA.

Page 19, line 8, for "*tenora,*" read *tenoro.*
Page 44, line 2 verse, for "Music," read Music's.
Page 48, line 12, for "give," read gives.
Page 57, line 24, for "govern's," read governs.
Page 96, line 14, for "*a basso,*" read *a bassa.*
Page 173, line 1, for "diminish," read increase.
Page 216, line 20, for "purfing," read purfling.
Page 217, lines 1, 13, for "purfing," read purfling.
Page 297, line 3, for "MOVEMENT," read MOVEMENTS.

INTRODUCTION.

These lectures, addressed to an imaginary audience of violin students, were originally written for and partly published in the *Western Musician*, Dixon, Illinois, and, for entertainment of the many readers of this musical journal. Two of the lectures now appear in print for the first time. As a familiar style was employed, therefore abstruse technical terms were avoided as far as possible without interfering with clearness and precision.

The experiments, results, and conclusions, as thus recorded are not romances of the imagination, as might be inferred at first, but, are conclusions gained by practical experiments, and also by accidents occurring in my experience.

Thus, when violin patients came to my hospital, I was happy, and, because of my enthusiatic devotion to problems in tone-diagnosis, I worked upon them, and over them, until pronouncing them cured, or incurable. Some of those violin-patients were as some human patients, blest with inherently good constitutions to begin with, and, were capable of receiving enhanced tone values from careful adjustment of tone-modifying factors, while some of them were so inherently bad from the day they were named "violin," (misnamed,) that only noisy tone was their inheritance; yet, noisy tone made "interesting cases" of the latter class because of offering incontestable reasons for inferior tone—reasons conclusively demonstrating truth in the statement, "without superior material, without superior violin."

Throughout my period for active work, the following questions were always in view:

"How does the violin operate to produce musical sound?"

"What agents, connected with the violin, operate to modify tone?"

"What are the causes for inferior violin tone?"

"What are the causes for superior violin tone?"

Some of these questions I have solved to my own satisfaction, but, no claim is advanced that such solutions will be acceptable to other students of violin tone-phenomena; nor is the claim advanced that all such tone-problems have received solution. Some of my conclusions are at variance with conclusions of noted scientific investigators, but, for my own conclusions, infallibility is not claimed. To err is human. To follow error is also human. Thus, I followed a scientific conclusion concerning production and modification of violin tone requiring experiences of twenty-five years to dispel the delusion. Upon this ground, the violin student is warned of danger in following abstract theory under the guise of science. It is my belief that theories, even when based upon oft-repeated practical demonstrations upon various violins, should be presented only as conclusions of an individual attempting solution of a problem wherein capricious action of wood has ever been, is now, and forever may remain an unknown quantity; and, I present the thought that such unknown quantity is the reason why science meets defeat in attempting to build a violin to order.

The following problems remain for elucidation:

"Inherent, capricious spring-action of wood."

"Varying degrees of sound-wave concentration at the exits as governed by varying degrees of plate-arching."

"The phenomenon of raising tone-pitch by enlarging area of exits."

The opinion is presented that solutions for the first two of these problems will place violin tone-quality at command of the will. Notwithstanding doubts of solving problems involved in capricious action of wood, yet, the value in such solution remains a powerful incentive to continued effort. The desire for violins possessing "rich" tone combined with marked intensity of tone is a stimulus surpassing the stimulus of fine gold; and, whoever discovers a method producing such violins at command of desire will become a king in his own right.

My method for arriving at conclusions concerning the potency in each modifier of violin tone is to run down the causes for noisy tone, sweet tone, powerful tone, hollow tone, thin tone, tone "all inside," tone "all outside," volume of tone, intensity of tone, tone pitch, unmusical double-stop tones, powerful open tones with feeble *altissimo* tones, *resultant* tones, or harmonics *a bassa*, consonant overtones, dissonant overtones, the "rich" tone. the "cold" tone, sympathetic tone, evenness of tone-power, and tone character based upon tone character of the human voice.

In this work, the conclusions herein presented follow experiments directed upon both old and new violins, and the number of such violins runs into hundreds. From deductions thus obtained, it is my desire to give prominence to the following propositions:

1. Tone-peculiarities, existing in a given violin, may not exist in any other violin.

2. Writing up tone-peculiarities existing in a given violin as infallible necessities for all violins is misleading.

3. Finding two violins possessing precisely similar tone-values is equally difficult with finding two voices possessing precisely similar tone-values.

4. No violin maker whatever, is, or has been able to give marked tone-value to each and every violin.

5. That the mountain herder of sheep *may* produce a violin possessing tone-values equal to the best.

6. That the skillful mechanic, guided by unerring musical instinct, produces a vastly greater number of superior violins than the mechanic minus such instinct.

7. That all violin makers *may* meet occasional defeat.

8. That, barring accident, the superior violin is a product of superior mechanical skill combined with superior musical sense, all being directed upon superior material.

Than the method herein presented for determining the potency and operation of each factor entering into the production and modification of violin tone, there seems no other method offering equal value to conclusions.

To the weighing of such factors, I have given a lifetime; not in abstract theorizing, but in sitting at the bench while repeating demonstration after demonstration, year after year, decade after decade, from youth to old age, determined upon isolating, weighing, and knowing the operation of each and all factors underlying violin tone-phenomena or die in the attempt. At sixty-three years of age, death came near, and three years later remained near, leaving but my right arm sufficiently useful to guide the pen. It is now certain that I shall not reach the goal of my ambition.

Under such difficulties, writing is laborious, besides, the matter herein is made up wholly from memory, no notes having been made with the view of publication. At the present moment, necessary conservation of strength confines me to a limited daily period for work; hence abandonment of intended re-writing of preliminary publication, of which needed corrections are made, and from which some paragraphs are omitted, and to which lectures xvi, and xvii, are added. This publication is presented as my legacy to both the violin student and the American violin maker. That the following record is reduced to writing and published is matter wholly due to encouragement offered by a modern violin maker; therefore, whatever of entertainment, or whatever of other value may be found upon these pages is something not attributable alone to courage of, FREDERICK CASTLE.

Lowell, Indiana, March 20, 1906.

LECTURE I.

GENTLEMEN OF THE VIOLIN STUDENT CLUB:—At this, our first session, I take the opportuity to offer you congratulations for the following interesting facts. First:—The causes for noisy violin tone are discovered. Second:—A successful way to preserve interior surfaces of the violin from disintegration by heat and moisture has been perfected. Third:—Areas of the violin sounding-board, responsible for production and augmentation of tone are now located and defined. Fourth:—A method for sounding-board graduation, securing maximum evenness of tone-power has received demonstration. Sixth:—Principles, governing violin tone-intensity, are brought out into the light. Seventh:—Principles governing violin tone-power are reduced to words. Eighth:—Quality of sounding-board wood, permitting "rich" violin tone, is described. Ninth:—The power of accident to dispel darkness and delusion is placed on record. Tenth:—Some scientific conclusions concerning "how the violin operates to produce musical sound" have experienced a "jar." Eleventh:—The fallacy in the claim that "the best of Cremonas are necessary vehicles for interpretation of Haydn, Mozart and Beethoven scores" is made manifest. Twelfth:—An attempt has been made to right the wrongs heaped upon the modern violin maker by the "old-violin-trade-promoter."

During our course of study, you may be presented with some ideas pertaining to violin tone heretofore not given expression. Indeed, I promise you but little stale hash in our menu. As it is not my intention to rob you of the pleasure afforded by anticipation, therefore you will be given but small doses at one time. This plan is adopted to avoid injuring your digestive power, and, to secure your regular attendance.

Tone taste varies—varies up through every degree of musical culture. A tone suiting one may in no wise suit another. No player can play his, or her, best upon an instrument whose tone to him, or her, is disagreeable. Fortunately, the violin affords a variety in tone-quality so infinitely great that every violin player on earth may own one having tone-quality to his taste.

One might think it possible to make violins having a single standard of tone-quality, but the fact is, inherent peculiarity of action in wood stands in the way.

There is something approaching an unvarying tone-standard for the whole range of wind instruments and instruments of percussion.

But unvarying tone-quality suddenly halts in the presence of the violin family. We can imagine the unbounded surprise of one who never heard other than wind musical instruments upon introduction to this violin family. As he picks up violin after violin, viola after viola, cello after cello, he finds no two possessing an identical tone-character. Each violin, each viola, each cello, has a tone-quality peculiar to itself. These peculiarities are so marked that he soon becomes able to name each violin with whose tones he is familiar, although blindfolded, or in a distant apartment, naming them as unerringly as he can name different singers with whose tones he is acquainted.

He becomes curious to know the reason, or reasons, for the infinite tone-peculiarity of that wonderful musical instrument called "violin."

By observation, he finds its G and D strings sometimes possess the bass tone-character; at another time these strings possess a *baritone-tenor* character; in some instances A and E strings possess *mezzo-soprano* character; in other instances A and E strings possess *soprano* tone-character alone. Because of these tone peculiarities he divides violins into four classes, thus:

1. *Basso-mezzo-soprano.*
2. *Basso-soprano.*
3. *Baritone-mezzo-soprano.*
4. *Baritone-soprano.*

By experiment, he finds that these four classes of tone-character can be given to violins at will; and that they are dependent upon various degrees of sounding-board thicknesses, together with such tone-modifiers as size and position of exits, air capacity of the violin, etc.

From observation he finds a field of usefulness peculiar to two of these classes. Thus: The violin of *basso-mezzo-soprano* tone-character is the more agreeable solo instrument, while the *baritone soprano* tone-character is decidedly the more effective for orchestra uses; that the latter fact is due to high tone-pitch, therefore its tone-waves ride on the topmost wave of harmony parts.

Surprising as are these peculiarities, he yet finds another fact in violin tone still more surprising; that is, some violins possess human tone-quality in a degree far outranking all other musical appliances. Thus a new world of expression is opened to him.

Here is a musical device capable of talking; taking part in dialogue *a la* "Arkansas Traveler" an instrument capable of arresting the song of wild birds, causing them, with outstretched necks and wonder-lighted eyes, to look about for that other strange singer pouring forth those enchanting trills; an instrument capable of breaking out into joyous laughter *a la* the laughter score in Paganini's "Carnival;" an instrument capable of uttering prayer devout in Mozart's "Song Without Words;" an instrument thrilling the air with those trouble-forgetting tones in Schuman's "Traumerei;" anon, awaking human tenderness with sympathetic tones of "Sweet Home;" anon, making human eyes weep with those matchless, touching, despairing, farewell tones, as brave, loving, unfaltering Norma, by a stern Druid father condemned to death by fire, singing in "*duetto e scena ultima*" as she ascends that blazing funeral pyre—— God!—— —— the agony of it!—— and the blinding tears! ——

In all the wide world there's no musical instrument approaching the violin. Our violin investigator is now become a violin devotee. The entrancing tones of this human-attuned wonder compel him to bow down and worship it as "The King."

Thou, O Violin!

Thou that smil'st on beggar and king!

Thou thing that laughs—weeps—prays—sings!
Thou thing of beauty!
Thou joy forever!
Nor kings, nor queens, nor potentates whatever
Reign with thy absolutism.
Thou, O Violin!

Do you condemn this man for such idolatrous worship?

I have given more than fifty years to the search for causes of violin tone-peculiarities; finding some of them, so I think. I claim no superior knowledge of physics, nor superior penetration.

I only claim merit for tenacity.

The physiognomist might say of me, "you have a square jaw." The phrenologist might say, "you have a remarkable developement in the region of never-let-go". Both might conclude by saying, "you have nothing else worthy of remark." Only tenacity can hold any man to fifty years work upon any single problem. I worked forty years in trying to make all violins sweet in tone; trying, in other words, to find the cause for "noise" in violin tone. I had concluded that sweet violin tone is an accident, when a real accident occurred revealing the cause of noise in less than ten minutes.

Irony?

Much.

I confess that a solution by accident is better than no solution at all. When a man, even by help of accident, lives to demonstrate a principle of benefit to humanity, he may then depart, knowing the world is better for his having lived therein. Is it not a fact that when a man can lift humanity above ear-rending, soul-harrowing, suicide-impelling violin noise, he has sufficient basis for any reasonable claim on earth or in the heavens?.

Let millions having "nerves" attest.

Enough!

Some violins are sweet in tone; some are not.

Truthfully, a few violins are thus sweet; many are not.

To the listening ear, sweetness is the chief element of value in violin tone.

Strangely, there are a few violin players who place no value upon sweetness of tone, saying, "I'll take care of the sweetness of tone if I can only get tone-power."

Never was mistake greater.

The best violin players, from Ole Bull down to Mr. "Saw-yer-head-off," could not, nor ever can, conceal "noisy" violin tone. Admitting a difference in favor of skillful bowing, yet, skillful as one may be with the bow, ninety per cent of an audience will say, "That fellow can't play the violin."

By sweet tone I mean tone unaccompanied by sound-waves pitched at inharmonious keys.

Again, it is a mistake to suppose the "noisy" tone to travel an equal distance with sweet tone.

On this point, the following test for carrying-power gives the loud tone devotee a good opportunity for disillusion, and also to part with wealth. It is a test that I have repeatedly made, and made with unvarying results.

As you know, a loud toned, noisy violin, played in a small, bare room makes one long for the quiet of shady woods. From a number of violins, tested in such small room, select the noisiest and the sweetest and take them to an open field, level, and affording at least 1400 lineal feet of unobstructed distance. Select a day when the winds are at rest; a cloudless day is best, because anything approaching the nimbus cloud greatly assists the propagation of sound. Select an hour from 10 a. m. to 4 p. m., because in those hours of any given day sound is propagated with greater difficulty. To make the record of value, take along a thermometer, a barometer, and a hygrometer, and record the readings of these instruments at hour of test. Thus the carrying power, of a violin so tested, can be guaranteed to repeat its performance at any time having similar meteoric conditions. Meteoric conditions, as you know, greatly modify distances at which sounds travels. In our summer months, these conditions often cause violin tone to be disappointing. Thus, any violin may be the object of unwarranted tone-criticism.

In making this tone distance-test, two persons, at least, must assist.

One will play a melody upon the G string; the other retires across the field to a distance at which the melody is faintly distinguished. This distance, being measured, is placed to the credit of that string. Thus a record is made for each string of each violin.

This test establishes:

(1) Evenness of tone power.
(2) Intensity of tone. (Carrying power.)
(3) Purity of tone. (Sweetness of tone.)

In my experience, the sweeter tone invariably travels the greater distance. I have known the sweeter toned violin to win by 250 feet. In evenness of tone, I tested one reputable old violin whose distance record~~s~~ varies from G string 1000, to E string, 1480 feet. Only two violins have I thus tested, securing an equal distance-record for each string.

I assure you this tone distance-test may cause profound atonishment to the participants. Myself, after long experience, dare not risk anything on the result. This test affords ample proof that the listening ear is in the better position for judging tone.

At this point I present "noise."

It is a familiar thing, truly.

It is a thing which ought not be found in the violin.

Not always in text books do we find definition of "noise."

Noise seems to be a painful subject.

Proximity accentuates its painfullness.

The existence of "noise" is as the density of population.

To noise may be charged the existence of "nerves."

This fact may be proven by rolling back a few centuries when there were fewer people on earth, fewer things moving about, and vastly fewer fiddlers, and there we find no record of "nerves." Science would have us believe that where there are no ears, there is no sound, no "noise."

Do you believe this story?

If you do not care to express disbelief you may, at least, call it a paradox.

But, to think of a place where there's no noise! Blessed place! That must be a place where angels do not fear to tread. Let it not be invaded by the "noisy" violin, for the most distracting noise, noise "le plus terrible," can come from the violin.

What is noise? Should you not find a definition to suit you, read the following: Noise is an aggregation of sound-waves pitched at inharmonious keys.

The definition itself makes one shiver.

I'm proud of it; the shiver, I mean.

The shiver is proof that my definition is correct.

What is the cause of "noise" in violin tone? This question is filled to the brim with absorbing interest to the whole violin world.

The accident, affording a solution to this momentous question, is so provokingly accidental as to rob me of all honor for the solution.

I had worked a lifetime for this solution; I had read books, and books; had bought a few books myself; had borrowed more; I had learned therein some facts requiring twenty-five years to unlearn; I had given up the possibility of a solution, believing sweetness of violin tone to be an accident, when the following accident occurred, thus:

LECTURE II.

GENTLEMEN:—I was working upon a used violin, a violin of "noisy" tone-faults, a violin belonging to a "business" player. Re-graduation was completed, a new bar adjusted, interior surfacing-work finished and all ready for assembling when the owner sent in a "hurry up" call. To hurry up meant working at night, and to please my friend, I resolved to do assembling work that same night. Accordingly I returned to my workroom, lighting a 20-candlepower lamp placed before a reflector and seated myself immediately in front of the lamp.

Reaching to my right, I picked up the finished sounding-board. As it came between my sight and the lamp, I noticed some dark spots upon the inner surface. Thinking that in some way I had soiled the surface, I laid the sounding-board down, intending to remove these spots with a cloth. But, as the sounding-board lay upon the bench, there was no soiled spots to be seen. They had disappeared. The inner surface was clear and bright. But, certainly I saw dark spots. Again I hold the sounding-board up to the lamp. There they are, plain enough; several of them; some large, some small. They must be caused by spots on the varnished surface. Critically I examine the varnish. No spots appear thereon. Possibly these spots may be due to opacities in the wood, but I find no opacities; the wood being clear and bright. Again I hold the sounding-board to the lamp. One, two, three, six cloudy areas are there, and located on the upper tone-producing area of the sounding-board.

Motionless, I gaze at those cloudy areas, thinking, thinking hard for an explanation. Slowly the explanation came, slowly of course. I am not brilliant; never posed as a prodigy; am slow, but am a "stayer," also a smoker. As you know, smoking is a prerequisite of the philosopher. We cannot disassociate the pipe and the German, neither can the world match him in solving knotty problems. In imitation of the philosopher, I light my pipe. At once, through clouds of smoke, I see the cause for these cloudy areas. Thus does "smoke" aid philosophy. The great Hahnemann established the principle that "like cures like;" or, as Hahnemann states in choice Latin, "*Similia similibus curantur.*"

I believe in Hahnemann as far as "smoke" goes; yet, that great thinker did pierce the thick skin of the "regular" doctors with the sharp-pointed fact that our doses often surpass generosity. And now myself, one of the "regulars," am going to demonstrate that the "infinitesimal" can cause "noise" inside the violin too. I believe in accident. In due course of time I shall present to you two accidental occurrences pointing directly at solutions of violin tone-problems hitherto pronounced unsolvable. Therefore when meeting unsolvable questions, I do pray for an accident.

Only for accidently carrying this sounding-board with its convex surface towards the lamp, I yet might be searching for the cause of "noise" in violin tone; moreover, might never have found the cause. In the following narration you can plainly see the unquestionable evidence afforded by accident, for, in the light of theories of musical sound, this evidence stands forth in clear-cut outline.

To make my process of reasoning clear, I call up a few familiar facts in natural philosophy: Thus, light rays, falling upon the convex surface of a concavo-convex body, (as the violin sounding-board,) after passing through such body are bent from a direct line at the moment of leaving the concave surface, and thence travel in converging lines to a focus; therefore, objects upon the concave surface become magnified; but, reversing the direction of travel, light rays leaving the convex surface, are dispersed; hence, objects upon the convex surface appear diminished in size; therefore, had I carried this sounding-board with its convex surface towards the lamp, I could not have seen those cloudy areas. [The clear varnish upon the convex surface of this sounding-board greatly facilitates transmission of light rays; and, in applying this test for perfect graduation—work upon sounding-board wood "in the white"—it is necessary first to cover the convex surface with some transparent medium, as oil, or clear varnish, or better, a mixture of these two available substances.]

In doing graduation work upon this sounding-board, I supposed myself to be doing fine work; using calipers in a careful manner; yet, I had failed of doing perfect work, as will now be shown. Had this sounding-board been replaced without discovery of those cloudy areas, there would yet have been mixed with its tone, sound-waves pitched at inharmonious keys—or "noise." As before, holding the sounding-board to the lamp, with a pencil I circumscribe one of those areas, and therein, with a scraper remove a little wood. Now, in this area, light comes through more freely. I continue thus with scraper until this circumscribed area becomes equally luminous with adjoining areas.

"Doctor, how much wood did you thus remove?"

I cannot answer this question with precision; but say perhaps the 100 part of an inch in some places; in other places of deeper cloudiness, a greater amount. You must understand the form of graduation applied to this sounding-board to be 9-64 inch at position of bridge; thence, in either upward o downward direction, down to 3-32 inch at the edge as near as practical to work. Thus, absolute precision in diminution of sounding-board thicknesses becomes a matter of difficulty; in fact, this form of sounding-board graduation is not surpassed in difficulty by any other form known. You must also understand that where thickness equals 9-64, but little or no light passes through; also, that greatest luminosity, on this plate, occurs at the thickness of 3-32 inch; that between these two points, luminosity diminishes, or increases, with a regularity exactly proportionate to diminution, or increase of sounding-board thickness; therefore, irregularities in thickness produce cloudy areas by interfering with the passage of light rays. I recall rules governing tone-pitch. I call up the fact that irregularities of 100th inch in the organ-reed, in organ-pipe, or on a tuning fork, are things inadmissable.

Is such irregularity also inadmissable on the violin sounding-board? Have I, at last, found the cause for "noise" in violin tone? My nerves are tingling. Forty years have I worked upon used violins trying to find a formula for eradicating "noise" therefrom; worked with the usual amount of "noisy" failure. Quicker than I can tell it, the intelligence was flashed to my sensorium that those slight irregularities of sounding-board thicknesses could produce a screaming, ear-piercing, soul-harrowing, immeasurably high-pitched tone; one such tone for each irregularity in the tone-producing area of the violin sounding-board.

You have heard how "prospectors" may "prospect for a lifetime without striking a "lead;" how, when they do strike a "lead" they immediately celebrate the event by going crazy.

Gentlemen: The tone of this violin is not accompanied by sound-waves pitched at inharmonious keys; and you now know the cause of "noise" in violin tone. In connection with the word "violin," the word "noise" vividly recalls untold suffering; therefore, I shall press this subject upon you no further than is necessary for complete understanding of those high-pitched, *dissonant* overtones proceeding from the imperfect violin sounding-board. Science states that musical sound is comprised, in tone-pitch, from 27 to 4000 vibrations per second; and, as violin "noise" is exasperatingly high-pitched, it therefore follows that violin "noise" possesses a pitch exceeding 4000 vibrations per second. Science also states that sound may be pitched so high as to make its accurate measurement impossible. Thus those ear-piercing violin tones, (not legitimate, harmonic overtones,) become legitimate objects for "guessing" at their pitch; and when guesswork becomes legitimate, 'tis the "guesser's" own fault if his "guess" is too low; therefore, I "guess" the vibrations of these suicide-suggesting "noises" to range anywhere from 20,000 to 20,000,000 vibrations per second. In making this "guess," I admit that my figures may be large in proportion to the largeness of my ear; anyway, the opportunity to set these little, pestiferous annoyances out in their true light, becomes greatly soothing to my long suffering nerves.

'Tis said revenge is sweet.

I believe it.

Until after the occurrence of this accident revealing the cause of violin "noise," I never once supposed the violin sounding-board to be thus sensitive; yet enough related examples were near at hand to create precisely such supposition.

The rusted piano wire, even only rusted in local areas, cannot, nor ever can, produce tone unmixed with "noise;" and the reason is plainly due to irregularities in wire-diameter caused by irregular oxidation. The law governing production of musical sound seems explicit, and seems not to permit of even infinitessimal deviations in tone-producing agents.

Again, an organ reed slightly out of "voice" is easily remedied. If its pitch be slightly too low, removal of an immeasurable amount of metal, from its free end, perceptibly raises its pitch; if too high, removal of only enough metal from its base to brighten the surface, lowers its pitch.

I now believe a carefully graduated violin sounding-board to be equally as sensitive as either piano-wire, organ-reed, organ-pipe, or tuning-fork.

"Science never made a violin."

Gentlemen, please keep your seats.

As a veteran violin-student, I am forced by experience to acquiesce to the truthfullness in this startling statement, no matter how distasteful acquiescence may be. I am not among those who ignore science; but I am among those having learned to accept scientific statements with caution. Science in chemistry, geology, minerology, astronomy, botany, even science in violinology, so far as science can go, possesses fascination for me. Once I believed every scientific statement from every source whatever. I have lived to a disillusion. Let me warn you of the danger in implicit belief of statements originating from human sources. There is but One Source for infallibility.

In my day, chemistry was taught as an exact science, equally as exact as figures in arithmetic. Therefore, when I read in text books on chemistry that water is a combination of two elementary, gaseous bodies, hydrogen and oxygen, that water equals one equivalent each of these two bodies, that therefore the symbol for water is H O, I believed that statement to be infallibly correct. Today the symbol for water is changed; so greatly changed that, without assurance, I could not know how H_2 O represents water.

Upon a certain occasion at the University of Michigan, an incident occurred making an impression on my mind to last until death. 'Twas at the hour for lecture on chemistry, wherein we were favored by the presence of an old gentleman who appeared deeply absorbed in matter under discussion. Among other topics presented at this hour was distilled water, a gallon bottle of which stood upon the lecturer's table. Instantly the lecture closed this attentive old gentlemen, with unsuspected agility, climbed over railing to operating floor, pulled the cork from bottle of distilled water, applied his nose, shook his head, shook the bottle, critically examined the "bead," then slowly inquired, "Is—there—anything—about—this—distilled water—intoxicating?"

Today I am the old man.

You are the alert young fellows.

In a subdued manner I ask, "Is your new H_2 O stronger than old H O?"

Then, hydrogen was an element, therefore indivisible. Today hydrogen is separated into argon and boron. Pin not your faith upon human infallibility; it is not in existence. Science is a Collossus; yet, even today, science can't make a violin. Approaching the violin for its secrets, science, proud giant, receives a slap on the face as a reminder that in the world there's one thing "none of his business." In other directions, decade after decade, science advances with prodigious bounds; but in no scientific work can I find a solution for violin tone.

English and German philosophers both dismiss violin-tone with a Latin evasion, "*sui generis.*"

French philosophers dismiss violin-tone by giving it a name belonging to all peculiar musical tone, "*timbre.*"

Science never made a violin.

"Doctor, what did make the violin?"

Experiment, alone, made the violin.

Science came along later, as is often the case, with a *post facto* explanation of a few facts concerning violin-tone, but never an explanation of all facts concerning violin-tone.

[Notwithstanding the statement of apologetic writers, I can find no corrobation for the statement that Stradivarius was a scientist. That he was not a scientist seems clearly established by his earlier work; that he was a tireless experimentalist, is proven by his history. That he is entitled to credit is proven by a few of his violins, I ask you, members of The Violin-Student Club, to state specifically what invention for, or modification of the violin is due to Stradivarius.

Silence?

'Tis no wonder.]

In the violin bibliographic list are nearly 200 books. From these books only can we procure evidence. After wading a distance through this mass of evidence colored by writers who apologize for the Strad "chunks" by stating that those abnormalities must have been built "on contract," colored by writers possessing exhuberant imagination, who forgot to say they have no practical knowledge of either violin-building, violin-wood, or violin-varnish; colored by writers who only know the "yellow" Cremona; again, by writers who only know the "red" Cremona; again, colored by trade promoters, one awakens to the fact that now he knows less of the Stradivarius violins than after having read but a single book.

Neither Gaurnerius nor Stradivarius appear to have improved violin-outline, nor detail of construction, nor violin color-work, nor violin varnish. The first half of Stradivarius' life work was gone before he reduced his table-arching to that given to the violin by Maggini 100 years before. Specifically, I can only determine that both Gaurnerius and Stradivarius reduced table-thickness to a degree wherein lighter strings could overcome sounding-board inertia and rigidity; and that, up to their day, their selection of sounding-board wood, for solo-violin use, was not equaled. Than these two facts, I can find nothing farther in favor of those two reputed violin-builders. If added facts in their favor can be shown me, I will honor them. That Italian music-builders, demanding three octaves of musical tone from each violin-string, gave the hint for reductions in sounding-board thicknesses is extremely plausible. That Gaurnerius and Stradivarius were first in supplying such demand is in evidence.

I think I may safely consider that both reduction in table-thicknesses and the selection of sounding-board wood of softer fiber, were then looked upon as innovations; and that, by other violin-builders, both of these men were looked upon as "cranks." But both men, as solo-violin-builders, were winners, although each adopted a different plan for accomplishing sounding-board reductions of thicknesses.

Ole Bull demanded four octaves of musical tone from each violin-string.

He found satisfaction in a "Joseph."

Paganni, it is claimed, delighted in light violin-strings. Paganni was the first great soloist to exploit the Gaurnerius violin. Honeyman, in an indefinite way, states that the Gaurnerius sounding-board is "thinnest throughout the central portion."

It is a matter of interest to note the varying opinions of violin players concerning the varying tone in the violins of the great violin-builders.

Ole Bull expresses surprise at seeing his contemporary, DeBeriot, appear in public with a Maggini.

In speaking of his Strad, Ole Bull substantially says, "I never play it in public because of its nasal twang," (See Ole Bull Memoirs, by Sarah C., his wife.) I call your attention to notable omission in statements concerning the Stradivarius violins—that the speaker or writer generally omits to mention in which of Strad's "periods" his particular violin was made. I can only account for such omission upon the hypothesis that the speaker, or writer, considers violins from only one of Strad's four "periods" to possess tone-value worthy of remark.

Gentlemen, you make a mistake if you interpret me as not joining in the praise universally accorded these two famous violin builders; but my praise is bestowed only for a definite reason; that is, the great violins of these two great makers are only great as solo-violins.

'Tis honor enough, and richly deserved for their bold innovation and correct judgement of sounding-board wood,

My point is this: The unlimited praise bestowed upon these solo-violins has driven an army of violin-makers to life-long effort at reproduction of solo-violins, until today, there is scarcely a good orchestra violin on the market.

"Doctor, do you mean to say that the best solo-violin is not also a best orchestra violin?"

Yes, sir.

"How is that?"

The sounding-board of the best solo-violin is too light in wood to withstand the terrific force of sound-waves from full orchestra instruments.

"Doctor, please explain."

Thus: The violin sounding-board to yield three octaves of agreeable tone upon each string, must be reduced in thickness to the point of weakness in presence of harmony-waves from full-orchestra; and because of such weakness, its tones are smothered by overpowering harmony-instruments.

"But, Doctor, we understood that first-violin sound-waves ride on top of harmony-waves."

Correct, sir, so long as first-violin-waves have sufficient propelling strength to keep them on top. The swimmer, so long as his strength is sufficient, may keep himself on the crest of a huge wave, but when strength fails his next position is at the bottom of the trough; next, at the bottom of the sea. To say, "the violin reached perfection 200 years ago," means much and means little. To say the solo-violin reached perfection 200 years ago is nearer correct, and is not so misleading. We should insist upon definite specifications in this matter, because of different tone-characters being demanded from the violin. We only need a moment of attention to understand the absurdity of so much misdirected effort to produce solo-violins while the demand for orchestra violins is in the ascendant. Only a few solo-violins are in actual employment at any given date, while the general purpose-violin and the orchestra violin in large numbers, are in hourly employment.

"Doctor, please explain your meaning by general-purpose violin and full-orchestra violin."

With pleasure, sir.

Thus: The general-purpose violin is one whose tone-pitch, upon G and D strings, is distinctly of the bass character, while the tone-pitch of A and E strings is distinctly of soprano character: the full-orchestra violin is one whose G and D string tone-pitch is of baritone character, while the pitch of a A and E strings is distinctly of soprano character.

"Can these different tone-characters be given to violins at will?

Yes, sir.

"Please tell us how."

By combining, in the work of violin-building, certain rules to be found in Lecture III, governing pitch of tone-producing agents.

By reason of repeated, practical demonstrations, I am able to assure correctness of these rules. Before leaving the question of "violin perfection 200 years ago," let me direct your attention to two of its evil consequences.

First: It acts as a discouragement to further experiment.

Second: It acts to place a fictitious value upon a few violins of that date.

Industrious "trade promoters" have lost no opportunity for befogging the public in the matter of old, solo-violin values; thus the public erroneously demands that every soloist shall appear only with either a "Joseph" or a "Strad" under his arm. But, today there are unmistakable signs that the public is emerging from the fog; a few observing persons, having the courage of conviction, pronounce "passing benediction" upon the "old violin." My own veneration, reverance, worship, call it what you will, for the "old violin" was cruelly shattered years ago by discovering that the violin may become "too old", also, by discovering the fact that a modern violin can be made to appear "remarkably preserved."

But a few years ago the public was given an opportunity for observing the inanity of continuing the demand that the soloist use only old violins upon all occasions. 'Twas at the Chicago Auditorium. My friend, Mr. Beebe, himself a violin-maker of repute, upon first occasion, seated himself quite near the stage; upon a second occasion, seated himself farther away from the stage; and, upon a third occasion, in the most distant seat; all for the purpose of judging tone from a Strad in the hands of a star soloist wise enough to permit only piano accompaniment for his old violin. Mr. Beebe rejoices in scheduling a musically-trained ear, and I, of my own knowledge, have assurance that said ear, in the presence of violin tone, stands conspicuously forward. Therefore, when Mr. Beebe states that, while in a distant Auditorium seat, certain efforts of the great violinist were disappointing because of weakness in the tone of that old violin, I accept such statement as coming from a reliable authority.

This incident shows the fictitious value placed upon old violins. That Strad is valued at several thousands—a Beebe at a few hundreds. I value most that violin having the most satisfying tone.

Gentlemen: Let me advise that you build violins with a view to some particular place of usefullness. Thus, when building for solo use, reduce sounding-board thickness to a degree yielding three octaves of musical sound from each string. When building a general-purpose violin, reduce dimensions of bar and sounding-board beneath G and D strings to give those strings the *basso* tone-character, while leaving sufficient wood beneath A and E strings to give them the *soprano* tone-pitch. In building for orchestra use, then leave sufficient wood beneath all strings to secure the *baritone-soprano* tone-character.

After fifty years of practical work given to violin tone-peculiarities, such are my conclusions in the matter of violin building.

I call your attention to the fact that, in skillfully made violins, a wide range of tone-value exists; and to the fact that such wide range of tone-value is due to inherent differences in quality of sounding-board wood. Neither you, nor I, nor any person whatsoever, can exactly pre-determine the tone-quality of any given sample of sounding-board wood. In this fact lies the reason why science cannot build a violin.

I call attention to the fact that 'tis an easy matter to build the "noisy" violin sounding-board. For such work the equipment is contained in the following bill:

1 Three-quarter-inch-gouge.
1 Jack-knife.
1 Twenty-five-cent workman.

For the latter "tool" we must resort to importation from Germany. Even then it is a failure on this side of the Atlantic. When once that twenty-five-cent "tool" puts foot on American soil, "he" becomes a two-dollar man.

Peace to thee, O America!

LECTURE III.

GENTLEMEN:—You understand the aim of our society includes the study of both musical and unmusical sound produced by the violin. It is not agreeable to admit other than musical tone as a possibility for the violin. Instinctively, we are wont to consider "sweetness" and "violin" to be synonymous terms. Even to speak of the "noisy" violin, is rasping to our sensory nerves, while enforced listening to such violins is positive torture. Under the heading, "Cruelty to Humanity," the sale and use of "noisy" violins should receive statutory prohibition. It is a lamentable fact that the most music-destroying sound can come from close imitations of the violin. The outward appearance of these fraudulent imitations is the trap set for the innocent purchaser. Because of appearances, the purchaser thinks himself in possession of a violin. Such deluded victims are today found in every direction. In the credulous ear of every one of these victims was sung that siren song, "The violin always improves with age and use." In trying to apply this old song to the imitations of the violin, trouble begins. The victim's family is made to suffer from an attack of "nerves," and, his immediate vicinity is wholly avoided by Music. His industrious bow-arm is spurred to increased activity by hope of tone-improvement. Steadfastly and affectionately, he addresses that imitation as "old shell." The years roll by with no improvement in tone. Frequently gray-heads, with doubting mein, have brought these imitations to me. (Doubtfully,) "Doctor, can you tell me what ails my old shell?" Rapidly I run the bent "sound" across the inner surface of the sounding-board, the rattle therefrom suggesting the tinner's cart on corduroy road.

"Yes, sir, I can tell you."

"What is it?"

"It's fraud."

As I remove the sounding-board, permitting his doubt-expressing eyes to look upon the scene within his "old shell," the frozen smile on his wrinkled face is something truly pathetic. The graduation, (begging pardon for the use of that word,) of this imitation sounding-board is entirely accomplished with gouge and jack-knife. The bar is a "chunk" left by haste of gouge, and thoughtfully smoothed by jack-knife upon the side exposed to your inspection. Because you cannot see them, the two upper corners are forgotten. The linings, of various dimensions, are both too long, and too short. Outwardly, this fraud appears like the violin. Although the varnish is of cheap quality, the coloring is quite artistic.

Here is a lifetime devoted to music, yet, wasted, wasted by this damnable imposition upon an innocent, credulous, unwary purchaser. Moreover, in this great, enlightened, (beg pardon once more,) liberty-giving United States of North America, this same premeditated, unmitigated fraud is sold by thousands. Such gigantic imposition upon music-loving people is sufficient cause for murderous sentiments within a heart of stone. These frauds are the product of combined cupidity, stupidity, and heartlessness. Cupidity, in these frauds, is shown by charging more than kindling-wood prices, notwithstanding the fact that quotations are placed in the "pfennige" column. In these frauds, stupidity is shown in the fact that fifteen minutes more work upon the sounding-board might place quotations in the "marks" column. In these frauds, heartlessness is shown by the premeditated murder of Music. The criminality of these fraud-builders exceeds the criminality of one who robs little children, because they combine murder with robbery. Poor Music! Standing aghast at sight of her favorite haunt no longer habitable! While professing friendship, you, Mr. Fraud-builder are the cause of her anguish. To you, and to such as you, and of you, I say "Hell knoweth not a greater villain."

Thou O Violin! Thou
Who art sweet Music's only King!
Must thy witching form conceal
Cupidity's rankling deadly sting?
Men! Arise! Stand up now
In ranks of those who wish to fight
To kill this robbing deadly thing,
And give to Music hers by right.

"Doctor, how may the innocent purchaser know Cupidity's hand?"

My friend, the case is hopeless when the purchaser is so innocent as to be thereby unable to read, "Made in Germany."

After a lifetime given to the production of violin-tone, I am compelled to acknowledge the disbelief in the possibility of satisfactory solution for all problems involved therein. I am also compelled to state that my experience, and conclusions, in the matter of how the violin operates to produce musical sound, do not add corrobation to the theories of Savart, Honeyman, et al. Although unable to solve all problems in violin tone, yet, I do not regard my efforts thereat to be entirely fruitless. I give you my conclusions and principles, so far as they are satisfying to myself, in terms as clear in meaning and as concise in form as I am able to command. I shall not indulge in abstract theories. My conclusions are all worded after actual, practical, repeated tests upon the used violin, except the principles of sounding-board graduation for maximum evenness of tone. As will be shown later, this principle, for reasons of physical disability, received but a single demonstration. Whatever of value may exist in my conclusions is hereby bequeathed to you.

I now call up the matter of violin tone-pitch. [This feature of violin tone is worthy of careful consideration. Other things being satisfactory, tone-pitch should govern the place of usefullness for each violin. Thus: The violin of low tone-pitch throughout should not be placed at the head of full orchestra, and, for the reason that its tones have not sufficient intensity, (carrying power) to satisfy the distant listening ear. The place for the violin of low tone-pitch throughout, is that of the solo instrument. Again, the violin of high tone-pitch throughout, should not be employed as a solo instrument, and, because its high-pitched tones, alone, are disagreeable to the listening ear. I have known the reputation of a creditable soloist to be ruined by his employment of a good, high-pitched, orchestra violin as a solo instrument.]

I have formulated eight rules, each of which is capable of modifying violin tone-pitch. For convenience of reference these rules are numbered consecutively from I to VIII. As frequent reference will be given to these rules, they are therefore placed in a group.

Rule I.—Lengthening a tone-producing agent, other dimensions remaining equal, lowers tone-pitch.

Rule II.—Shortening a tone-producing agent, other dimensions remaining equal, raises tone-pitch.

Rule III.—Increasing thickness of a tone-producing agent, other dimensions remaining equal, raises tone-pitch.

Rule IV.—Diminishing thickness of a tone-producing agent, other dimensions remaining equal, lowers tone-pitch.

Rule V.—Lengthening confined perpendicular air columns, lowers tone-pitch.

Rule VI.—Shortening confined, perpendicular air columns, raises tone-pitch.

Rule VII.—Enlarging sounding-board exits, raises tone-pitch.

Rule VIII.—Reducing sounding-board exits, lowers tone-pitch.

In practical violin building, or in violin toning, each of these rules possesses value. In my practice, application of these rules is given to the sounding-board alone. In no way do I apply any of these rules to the back plate. After long continued experiment, I am come to the conclusion that the chief function of the back is that of a reflecting medium. Therefore, I only demand of the back sufficient rigidity to withstand, without a tremor, the terrific charge of molecular wave-movement originating at the inner surface of the sounding-board; and, that its fiber be fine, and dense, and susceptible of high polish. Thus, when "finished," the inner surface of the back presents a perfect reflecting surface. I do not say that the back cannot modify tone-pitch. On the contrary, I state that the rigidity of the back may be reduced until the tone-pitch of the violin is lowered to a hollow, feeble, worthless degree. I have found many violins thus ruined; more thus ruined than by great reduction of sounding-board rigidity. Indeed, many violin builders attempt to regulate tone-pitch by reducing rigidity of the back. In my experience with the long-distance test for intensity, (carrying power) of tone, this manner of regulating tone-pitch has proven itself seriously erroneous. The tone of every violin, thus regulated, has fallen far behind in the distance record. Speaking for myself, regulation of tone-pitch by reduction of sounding-board rigidity, has proven itself to be the safer method. Therefore, these rules for governing tone-pitch are applied to the sounding-board.

I will now consider the practical application of Rule I: "Lengthening a tone-producing agent, other dimensions remaining equal, lowers tone-pitch." In application of this rule to the sounding-board, its effects are greater upon the tone-pitch of G and D-strings than upon tone-pitch of A and E-strings. As an aid to illustration, I will suppose that here is a sounding-board having a uniform thickness of 8-64. This thickness of sounding-board, together with bar dimensions, in length, 10½ inches, thickness, 3-16, depth, ⅝, tapering to ends, gives a high-pitch character to G and D-string tone, not the highest, yet high. Desiring to lower the tone-pitch of the G and D-strings, I proceed to lengthen the tone-producing agent according to Rule I. For the purpose of limiting the tone-pitch to the G and D-strings, at one-half inch upon either side of the bar I draw pencil lines extending to as near the purfing and end blocks as is practical for reduction of sounding-board thickness. Within these lines, beginning at the position of the bridge, I gradually reduce the thickness down to 4-64 at ends of the plate; also, outside of these lines, thickness gradually increases to 8-64. Upon trial, the tone-pitch of the G and D-strings is found to be perceptibly lowered. Thus is the fact demonstrated that, in the sounding-board of 8-64 throughout, the whole length thereof does not act with sufficient energy to produce audible sound; also, thus is demonstrated the correctness of Rule I.

I call up Rule II: "Shortening a tone-producing agent, other dimensions remaining equal, raises tone-pitch." Evidently, the application of this rule must occur at the time of constructing the sounding-board; thereafter, it cannot apply. In the illustration for lowering tone-pitch, by lenthening the tone-producing agent, is sufficient data for raising tone-pitch by shortening the tone-producing agent.

Rule III: "Increasing thickness of a tone-producing agent, other dimensions remaining equal, raises tone-pitch." This rule is applied at time of construction. I have found a few sounding-boards having a thickness of $\frac{1}{4}$ at the position of the bridge; and two having the same great thickness throughout the length of the center join. The extremely high-pitched tone from the sounding-board thus heavy in wood, is not enjoyed even at a distance out of doors. In troubador days, such high-pitched, out-of-doors tone was popular; in fact, quite necessary to satisfy the public taste. Today the street musician, taking pattern after "ye olden time," is yet successful in making the public part with its pennies by use of such high-pitched violins; and personally, I do not object, so long as he accepts my penny as a hint to move on. (Honeyman again, is authority for the statement that the Nicolas Amatus sounding-board has a thickness of $\frac{1}{4}$ inch throughout the length of the center join, thence, laterally, down to $\frac{1}{8}$ at the edges.)

Rule IV: "Diminishing thickness of a tone-producing agent, other dimensions remaining equal, lowers tone-pitch." The high-pitched tone from the thick sounding-board is lowered by reducing thickness thereof. Lowering tone-pitch by reducing sounding-board thickness requires caution, because this work brings into employ two powerful factors, as will be shown after Rule V, towit: "Lengthening confined perpendicular air columns, lowers tone-pitch." Thus, in lowering tone-pitch by reducing sounding-board thickness, the same reduction also lengthens perpendicular air columns within the body of the violin; therefore, two factors are in employ; and hence the necessity for caution. In a sounding-board of sonorous wood, with the thickness reduced to 8-64 throughout, a further reduction of 1-64 causes perceptible lowering of tone-pitch; and, from 7-64, the further reduction of 1-64, lowers tone-pitch two times more than the lowering effected from 8-64 to 7-64. I attribute such arithmetical increase in pitch-lowering to the simultaneous employment of two factors.

Rule VI: "Shortening confined, perpendicular air columns, raises tone-pitch." For the purpose of raising tone-pitch of a violin whose table thicknesses are already at, or below the danger figures, I have successfully applied this rule by diminishing depth of ribs; thus shortening perpendicular air columns within the body. The fact that shortening perpendicular columns raises tone pitch is demonstrated in numerous familiar ways, as in the organ-pipe, the steam whistle, *et cetera*. As a practical demonstration of this rule, I have diminished depth of ribs by 1-16 inch, making a test at each reduction. The result affords ample proof of correctness in Rule VI.

Rule VII: "Enlarging exits, raises tone-pitch." In practice, I only apply this rule after testing the tone of any given violin. Experience affords proof of correctness in this rule. As a matter of safety, the areas of the exits should be made rather small at the time of constructing the sounding-board. After testing the pitch of the finished violin, should the pitch be found but slightly lower than desired, the fault may be remedied by a slight enlargement of exit area. In this work, I prefer to make such enlargement by removing wood from the inner edge of the exits, and for the purpose of bringing the exits nearer the focal points of sound-wave concentration. [Upon a later occasion, sound-wave concentration at the exits will receive consideration.]

Rule VIII: "Reducing area of exits, lowers tone-pitch." Application of this rule should be made at time of construction, although its application to the finished violin is possible. Reduced area of exits is a powerful factor for lowering tone-pitch, and for diminishing volume of tone. For the production of the most agreeable violin tone for studio uses; I know of nothing among tone-pitch modifiers, of greater importance than the small exit.

Musical sound is a fascinating subject to the violin student. In that quality of sound called "pitch" there is ample material for study. Some of the problems in sound are solvable; some are not solvable. The problem of absolute pitch is solvable by mechanisms able to record the number of blows per second delivered upon air molecules. Thus, the pitch of any sound is governed by the striking agent, or, tone-producing agent. But, this fact by no means is a solution of all the problems involved in pitch. Absolute pitch does not cover all the ground. Words seem inadequate to even state all the problems in pitch of sound. Viewing the problems of pitch from the standpoint of the violin, we are compelled to admit eight modifying factors, (as formulated in Rules I-VIII,) in the production of violin sound, while but one of these factors is the striking agent!

'Tis hard work to formulate the problems in violin tone; 'tis even harder work to solve these problems after formulations. I bequeath their solution to you. By your side-long glances, and averted faces, I infer you do not estimate my bequest as a valuable asset. Perhaps such asset is not valuable. 'Tis an easy matter to bequeath assets of which one is not "seized." But, because solution for violin-tone-problem is not now forthcoming, 'tis not certain that such solution never will be forthcoming. I advise continuance of effort. Little by little the solution of these problems may come to each persevering student.

Myself, to continue the subject, must resort to assumption of fact, and mix it with a few positive facts, together with reasoning from analogy. Whether or not, such mixtures may be found agreeable to your palates, depends largely upon your enthusiasm, together with my power of persuasion.

Proceeding: A body may vibrate and yet not produce audible sound. To produce audible sound, the sound-producing agent must deliver blows of sufficient energy, upon contiguous air molecules, as to cause movement in every air molecule between the striking point and our *tympani;* otherwise we are not conscious of sound. These are facts. The following point is an assumption. Thus: I assume that the entire 14-inch length of the assembled sounding-board cannot act upon air molecules with sufficient energy to produce audible sound; but, I am compelled to be content with an approximation thereto. The difficulties in the way of precision in this matter are great. The differences in the elasticity of different samples of wood are infinite. Again, but slight increase in height of arch adds to sounding-board rigidity. As a mere assumption, I give the greatest length of sounding-board, acting to produce audible sound, as equaling 12 inches. In practice, to secure such 12-inch length, I reduce thickness from position of the bridge gradually down to 4-64 as near the ends of the sounding-board as is practical. I consider sounding-board thickness at the edges, when down to 4-64, to be at the limit of safety; and, this degree of reduction I only employ when desiring the lowest, practical, tone-pitch for G-strings.

Should it happen that too great reduction of tone-pitch follows reduction of sounding-board thickness, a reduction of thickness sufficient to to cause a hollow, feeble tone, I know of no remedy by increasing sounding-board thickness; that is, no such remedy having value. I do know that in the city of Chicago there lives a man who claims ability to restore tone-pitch of violins by means of thin veneer of wood applied to the inner surface of the sounding board. A violin, thus treated, was brought to me with the request that something be done for its *dullness of tone.* Not knowing what had been done to this violin, I first applied the bow as usual, expecting thereby to determine necessary work. But, its tone effectually took away all my conceit. In no way could I pre-determine the cause of such extraordinary dullness of sound. In haste I removed the sounding-board —— —— O Chicago! You, so careful not to keep your lights under a bushel! How have you lost distinction! Of your surgeons you have taken good care. Their reputation is world-wide. But the reputation of your fiddle-surgeon has not been equally nursed. By your permission, I will assist in correcting the oversight. First, I will describe the display of plastic surgery within this violin. Second, I will prescribe a course of treatment for the surgeon. The area covered by veneer equals $\frac{1}{2}$ of the sounding-board; but, such areas are divided into two territories, one at either end of the plate. The thickness of the veneer equals 1-32. Its color is dark brown. In fiber it is like coarse paper. Its coherent strength does not equal that of good paper. It is cut in pieces of miscellaneous dimensions; some of the pieces being 2x4 inches, some down to $\frac{5}{8}$ by 2 inches. In places the veneer is doubled. In placing the fragments in position, no order of work prevails; the length of some being across the grain of the sounding-board; of others, with the grain, and others, oblique to the grain, while between patches are areas unaccountably overlooked. The scene arouses unbounded astonishment. Prior to this moment I prided myself on ability to determine the cause of violin tone-faults by use of the bow. Now is my pride humbled. 'Tis said one never becomes too old to learn. 'Tis a truth. Poor violin! By your degradation am I learning. Before your pitiable condition became known to me, I had supposed those insatiable monsters, heat and moisture, were your most relentless enemies. But, you have come to teach me that I was in error, to teach me your worst enemy is man. And *this* man lives in Chicago! These patches of veneer are not attached to the sounding-board by glue, but, by thick paste. Thanks for the little mercy! With cloth wrung from hot water the paste is easily softened, and I lift the various patches entire. Those patches, where veneer is doubled, fill me with surprise at the generosity of a Chicagoan. His bill might be equally large by saving the extra pieces. The whole affair is inexplicable. How this man can live in Chicago and escape notoriety is one of the mysteries. But, the prescription, richly merited by this man, has nothing of mystery about it. It is a prescription dictated by justice. Here is a violin without fault of serious degree, except that of model. The arching drops at the ends of the plates too suddenly for tone power; otherwise it is a fairly good violin. Its sounding-board is really a superior selection. After being again in playing order, I find this violin to be worth \$75. But, its worth, as it came from the veneering works, was less than seventy-five cents. I love Music! Sweet Music! I delight in doing her homage, even to the degree of worship. Therefore, when I see murderous hands reaching out towards Music, the lion within me arouses. Take this guilty wretch out on the lake, (not so far as to reach pure water,) tie a weight to his neck, tie a life-preserver to his feet, (otherwise that head will not go under,) toss him overboard, hold him under until, by cessation of rising bubbles, it becomes certain that within his cranium there is an increment of *gray* matter.

LECTURE IV.

GENTLEMEN:—At this hour I present one of the most absorbing questions pertaining to the violin. It is sounding-board wood. To some violin students the varnish question is particularly attractive. To others the color question may be particularly attractive. Color study, by itself, is a definite department of art. No one ought to imagine himself capable of mastering violin-color work in a brief space of time. Neither can mastery of color work be bought for any certain amount of cash.

[I once had an amateur violin-making friend who enjoyed all the advantages afforded by wealth, and who lost his life in a second European tour searching for violin colors. Poor man! He vainly imagined that money could buy a talent which is either a gift, or is a result of long-time application. Color-sense is a thing not in commercial channels. He had not patience to practice color-work during the years required for the development of color-sense.]

But, nothwithstanding the great interest attaching to varnish and to colors, sounding-board wood retains paramount interest. It seems to be the universal opinion that quality of sounding-board wood largely governs violin tone-value.

Everything in, or about, sounding-board wood has been subjected to hawk-eye scrutiny. In such scrutiny, science has given but meagre assistance. To experiment alone, are we indebted for a limited knowledge thereof. Incidentally, science offers a mite of corroborative value in the record of conductive power for sound-waves in air, gases, water, metals, and different varieties of wood. Botany contributes a mite in the fact that heart-wood capillaries become smaller as a tree advances in age, therefore heart-wood fibers possess greater spring-action.

[To be precise, this statement does not include fibers immediately at the heart, but fibers near to the heart.]

As a matter of interest to the violin student, I quote a few points from the conductivity table in that admirable treatise on the theory of sound in its relation to music by Peitro Blaserna, Royal University, Rome.

[This work is complete in detail and faultless in diction except wherein the translator, throughout the book, with but two lonely exceptions, erroneously uses the word "note" when meaning "tone"] Blaserna's figures are given in the metric system, towit:—

"Velocity of sound in various bodies."

"Air	32 Fahr., meters per second,	330."
"Copper	68 Fahr., meters per second,	3556."
" "	212 " " "	3295."
" "	392 " " "	2954."
"Acacia	wood, along the fibers,	4714."
" "	" across the rings,	1458."
" "	" with the rings,	1352."
"Pine	" along the fibers,	3322."
" "	" across the rings,	1405."
" "	" with the rings,	794."

These figures present some interesting facts to the violin student. Thus: (1) Sound-waves along the fiber in pine, travel with more than ten times the velocity traveled in air. (2) In copper (and in all other metals) as heat increases, distance traveled by sound-waves diminishes.

[The conductivity of metals, diminishing under higher temperature, is here introduced for the purpose of calling attention to the fact that both high and low temperatures greatly modify the conductive power of all bodies. Thus, in the increased temperature of the air from midsummer heat, all sounds, musical and otherwise, can be only propelled to comparatively diminished distances. The same phenomenon occurs in the low temperature of winter. Thus, the intensity, or carrying power of a violin should not be determined by a test given in either extreme of temperature.]

But one variety of wood exceeds pine in the power of conducting sound. That wood, acacia, or cinnamon, is not available for sounding-board uses. Therefore pine is placed at the head of the list. But as there are several species of the genus pine, we therefore must choose between them. It is unfortunate that the particular species of pine, employed in making the record, is not given. We may legitimately suppose that the sample used for the record was taken from near the heart of a mature tree, because, as stated in botany, capillary tubes of heart-wood in the mature tree, diminish in caliber with age until they cease to carry sap. Therefore heart-wood possesses greater density than sap-wood. Heart-wood also possesses much greater spring-action than sap-wood, and also greater weight. But, when seasoned, sap-wood may be harder to cut than heart-wood. Mere hardness in cutting, so far as my observation extends, is a quality detrimental to highest tone-quality. Upon examining the new stump of a mature tree, the recent yearly growths beneath the bark are not yet well marked into hard fiber and connective tissue, but appear more as a homogeneous mass. Approaching the heart, the divisions of grain become well defined. Long experience demonstrates beyond all doubts that wood of well defined grain yields the better single tone, and immeasurably the better double-stop tone. Experience also demonstrates beyond all doubts that heart-wood possesses the greater spring-action. Thus, when forcibly bent, upon release from force, heart-wood returns to the point of rest with the greater rapidity. The point of value in the Indian bow lies in the rapidity with which it returns to the point of rest. Therefore heart-wood is selected for such bows. As youths, many of us learned how unsatisfactory is the bow made from either an immature tree, or from sap-wood of the mature tree. Such dissatisfaction came from the slowness in which the bow returned to the point of rest. The action of such bow is weak, and the arrow can only be projected in a weak manner. In the sounding-board of immature wood I find precisely similar weakness; also, weakness of tone from sounding-boards of mature trees not possessing well defined grain.

In my fifty years' work in re-toning used violins I have carefully scrutinized many varieties of wood. In doing such work I have opened several hundreds of violins; and am now satisfied that this plan affords more satisfactory evidence bearing upon tone-peculiarities than any other possible plan. I think this plan unquestionably discloses the reason why many skillful workmen fail in securing a greater number of tone-art masterpieces. Barring model and workmanship, I now believe that to quality of sounding-board wood is due every violin masterpiece of tone-art. By the words "masterpiece of tone-art" I mean the limit of tone beauty. 'Tis not enough that the single-stop tone is beautiful. All double-stop tones must also be beautiful. In this latter demand is where the sounding-board oftenest displays its lack of highest value. If you have sufficient patience with my slow ways, you will know, in due course of time, my reasons for ascribing violin tone-value to the sounding-board. I shall not claim infallibility for such reasons. I only shall claim such reasons to be satisfying to myself.

In the course of my experience with used violins I have seen changes on the interior sounding-board surfaces not generally known, as I believe. As an instance, I have neither heard of, nor read about unequal shrinkage of sounding-board fibers after the violin had left the builder's hands. Yet, I have seen cases, in violins of faultless workmanship, wherein unequal shrinkage of the sounding-board caused serious injury to tone. I call up a certain violin having a clear record for 150 years, a violin unquestionably built by a workman, a violin wherein unequal shrinkage was located beneath the E string. These inequalities in thickness ran along the fiber in the form of ridges and valleys, and were due to shrinkage of certain fibers in a greater degree than in neighboring fibers. There were three such ridges and two valleys, and their location, either, alone, might injure E-string tone. The only possible remedy lay in re-establishing uniform thickness in that particular area. I assure you that no further work, of any kind, was needed either upon the interior or exterior of this violin. The result of re-establishing uniformity of thickness in this area was the removal of "noise" from E-string tone. I am satisfied that the original graduation work upon this sounding-board was done with precision.

[Although not here to the point, yet 'tis fighting against my nature to omit notice of the fact that the bewitching sweetness of tone, now possessed by this old violin, is something to keep in memory. Its power of tone is but slightly diminished by age and use. So exactly precise was sounding-board thickness guaged for the guage 2 E-string that the slight amount of wood removed from beneath that string resulted in a perceptible diminution of tone-power thereof. One example of unequal shrinkage in the sounding-board, after leaving the builder's hands, may be sufficient explanation of one reason why some well made violins, possessing superior sounding-board wood, fail of becoming tone-art masterpieces. Yet, I will offer another example of shrinkage in sounding-board wood perhaps still more striking. Thus:—From a certain plank, in my possession for forty years, I fashioned a sounding-board. For reasons, this sounding-board was not used until two years thereafter. My surprise was unbounded at discovering additional shrinkage occurring subsequent to its graduation. This fact affords proof that quantity greatly modifies shrinkage of wood while seasoning. The thin shaving from plank, however dry, may yet further dry out. The thin shaving also swells the sooner in the presence of heat and moisture. These facts are of interest to the violin student. Thus, no matter how long the rived block, or plank, may have seasoned, we must yet consider such block, or plank, as new wood in a degree; and, when the sounding-board, from block, or plank, is reduced down to thicknesses considered as the limit of safety, we must not be surprised at yet further shrinkage. Neither must we be surprised at the greater rapidity of swelling in the presence of heat and moisture. Heat and moisture, as will be shown at a later hour, are relentless enemies of the violin. They also combine to defeat intention of the violin builder.]

Because vapor of water can greatly diminish both resonance and brilliance of tone, I therefore depend upon a hygrometer to note the per cent of saturation existing in the air in my workroom, even when retoning long used violins. As moisture in wood is drawn out by dry air, I am therefore careful to employ artificial heat when necessary to secure dryness therein. After becoming satisfied that all moisture in wood is drawn out, then I am ready to do the work of hermetical sealing described upon a later occasion.

Unequal shrinkage by no means occurs in all sounding-boards. How to pre-determine unequal shrinkage I do not know. Undoubtedly the builder of this violin never even dreamed that future shrinkage of a few fibers in the sounding-board would occur to the injury of tone. I consider the workmanship displayed upon the interior of this violin to reach the limit of human skill. That its sounding-board is a good selection, otherwise than those few shrunken fibers, we may know by the beautiful tone. The following point also contains something of interest to the violin student, that is, the faulty tone in this violin never could have been improved by the use of the bow. Nothwithstanding the age and workmanship belonging to this violin, because of tone faults from unforseen causes, its value was inconsiderable. Today its value is changed. He who can buy this violin now, is already rich. Wherein lies its value? 'Tis not in tone-power. Its tone is neither powerful nor weak. The question is difficult to answer. 'Tis not in age. There are violins of greater age, but of less value. 'Tis not in sweetness of tone. There are violins of equally sweet tone, but of less value. The answer defies enunciation. Inadequately, the question is answered by saying, "Its tone arouses a feeling of tenderness." Tender feelings make us part with wealth. I know of no other logic explaining why one will part with more wealth for a certain sweet toned violin than for another equally sweet in tone. Therefore the price paid may be taken as a measure of the purchaser's tenderness. But, why, or how, one sweet toned violin arouses greater tenderness of feeling than another sweet toned violin, remains to me an unsolved problem. The fact exists. That's all I know about it.

Yet, there is something further that might be said about it. Thus:—When the tone of a violin arouses tender feelings within the performer, then, and there-for, will the performer give us his uttermost musical expression. In selling such violin, the owner adds a price for his feelings.

In the course of my work upon used violins, I made some acquaintance with sounding-board wood from different countries, as Scandinavia, Russia, France, Switzerland, Austrian Tyrol and Italy. Briefly, the most resonant sounding-board wood, coming under my observation, grew in Austrian Tyrol; yet, some samples from Switzerland and Italy have proven difficult to surpass in this important quality. Undoubtedly, heat and moisture greatly modify evenness of yearly growth, density of fiber, and the presence, or absence of fat in the genus pine. Because altitude modifies the amount of both heat and moisture, it follows that pine, of widely varying widths of grain, and varying amount of fat, may be found in all mountainous localities where pine grows. Therefore, every sample of pine whatever, from any country whatever, is not of value for sounding-board purposes. For such purpose, pine presents five serious faults; and the finding of even a single tree without one of these faults, even in the most favored localities, is a matter of difficulty. Those five faults are:

(1) Unevenness of grain width.
(2) Crooked grain.
(3) Unmarked grain.
(4) Too great density of grain.
(5) Fat, or pitch.

From some parts of Norway comes pine of perfectly straight, even grain; but, while sonorous in a marked degree, its density is so great as to give a somewhat disagreeable, stinging quality to tone. Were its density less, I believe no better sounding-board wood can be found.

Presuming you to be familiar with foreign grown sounding-board wood, I pass on to the consideration of domestic wood. Foreigners pronounce our wood to be of no value for sounding-board use. They are mistaken. Colorado, in a limited way, offers spruce of unsurpassed value for sounding-board purposes; while Michigan, also in a limited way, offers pine vastly superior to the majority of "ready-made" European sounding-boards kindly sent over to us. The kind of Michigan pine to which I refer, is peculiar in the color of grain. Thus, in European pine the different grains are separated by dark lines; but, the grains of this Michigan pine are separated by white lines. Another peculiarity in this Michigan pine is the fact that its white line is the softest part of the grain. There is another peculiarity yet more striking. It possesses, as transverse markings, numerous scales of silvery brightness; and, as I know by observation, these transverse markings retain their brightness more than half a century. Except in mere power of tone, this quality of domestic pine, for sounding-board use, is unsurpassed by any pine whatsoever. The tone from this wood, for studio, parlor, or the smaller audience rooms, cannot be excelled so far as my observation extends. Even in new violins, double-stop tones from this wood possess exceeding attraction. Its value is only lacking in great power. Upon this wood, varnish must be applied sparingly. It has no coarseness of tone to be smothered. For the bar and sound-post, I have used no other wood in many years. As the bar, from no other wood can I obtain equal beauty for G-string tone.

My experience with white cedar for sounding-board uses is quite limited, having given it but two trials. For these trials I used cedar which had seasoned out of doors during more than thirty years under my own observation. One marked peculiarity of this wood is its power to resist disintegration from heat and moisture. Even after standing uncovered for so many years, its surface only showed but slight traces of decay, while beneath, the color was exceedingly bright. The presence of deep cracks interfered much in the work of securing samples for sounding-board purposes. Indeed, only by joining four pieces could I get a perfectly sound, straight grained sample. The rapidity with which this wood grows produces great width of grain. In my opinion its width of grain, as a rule, is too great for high value for the sounding-board. As a mere supposition, its width of grain might not be objectionable for the bass sounding-board. The tone of this wood, from my two experiments, was peculiar. Volume of sound was very marked, but intensity was very feeble. Thus, at near-by distances, the sound was great; to long distances its sound could not be forced.

Intensity of sound is something defying explanation. We know that sound may possess marked volume while only able to propel itself to short distances; and again, sound may possess diminished volume while able to propel itself to greater distances. Undoubtedly the cause for this phenomeon lies in peculiarity of the sound-producing agent. The human voice affords abundant examples of the differences between volume and intensity of sound. Some voices can be easily propelled to distances impossible to other voices; and, the voices traveling the greater distance, may not sound more than half so loud as voices at near-by points. The same phenomenon is presented by the sounding-board. The quality of intensity cannot be pre-determined in any sound-producing agent. Marked intensity of tone is a valuable asset of the violin. It is an asset largely governing prices. As a mere business proposition to the soloist, the value of the violin should be based upon the square of the distance to which its tone can give pleasure to the listener. Thus:

The tone of violin A gives satisfaction to the listening ear at 400 feet. Employing 100 as a unit, the square of 4 units equals 16. The tone of violin B gives satisfaction at 800 feet; and the square of 8 units, equaling 64, therefore the actual, practical value of these two violins is as 16 to 64.] The tone from these white cedar sounding-boards was of a disagreeable, coarse quality. Strangely, a few violin users pronounced such coarse tone to be quite satisfying. Heavy coating with varnish was required to subdue coarseness of tone; but, in thus removing coarseness, loss of tone-power followed in a marked degree. There was yet one peculiar feature in the tone from these sounding-boards. Thus: Powerful bow-pressure produced no greater tone than moderate bow-pressure. For these reasons I do not consider white cedar the equal in tone-value with the Michigan pine herein described.

That the violin sounding-board is responsible for violin tone-value is a question no longer in dispute. Therefore, to the violin student, wood for sounding-board purpose becomes a matter of chief importance. Seemingly, a life-time given to re-toning used violins might enable one to pre-determine with accurracy the tone-quality of many grades of pine and spruce. Although such experience affords grounds for close guesswork, yet I assure you of my disbelief in the possibility of precise pre-determination of the tone-qualities of any given sample of sounding-board wood. In my experience, the surprises awaiting test by the bow have been infinite. I will describe a grade of pine possessing the nearest approximation to uniformity of tone-quality. But, it is necessary to bear in mind the fact that my description is based upon physical qualities and appearances of pine long seasoned after being fashioned into sounding-board form. This necessity arises from the fact that rapidity in color-changes is greatly modified by quantity of wood. Thus, original brightness of color is longer retained in the log than in the rived block; also longer retained in the block than in the sounding-board. Therefore color cannot be dependable evidence in determining the time elapsed since any given sample of wood was cut from the stump. And further, different samples of sounding board pine take on widely differing depths of color with advancing age. I have one sounding board, of respectable age, showing but a mere shadow of color-change beneath the surface. In others the color-change is marked, having passed to brown-red through and through. The cause for color-changes coming on during the time of seasoning is a mystery baffling explanation. But, by long observation, I know that different tone-qualities follow different depths of coloring in the sounding-board. Thus, from the sounding-board longest retaining original brightness, the tone is of a certain stinging quality demanding the utmost of careful bowing; whereas, the tone, from the brown-red, is quite agreeable whatever the bowing. The greatest difference is shown in double-stop tones. From the bright wood, the most beautiful effect from double-stop tones are impossible, while from the brown-red wood, double-stop tones possess the highest degree of agreeableness. Than beautiful double-stop tones, nothing from the violin gives greater pleasure to the listener. From the violin-soloist, double-stop tones are imperatively demanded. Therefore in selecting a violin for solo use, this knowledge becomes valuable. Because the brown-red sounding-board easily is split, we may suppose that the connective tissue between the denser fibers, is of feeble power. We may also suppose that the absence of power in connective tissue permits greater independence of fiber action, and that to independent fiber action, agreeable double-stop tones are due. The bright wood is not easily split. Its connective tissue is much the stronger. Hence its fibers, or denser part of grain, has less independence of action.

As an assistance in accounting for the brown-red color in pine, long seasoned, I offer the following: Back in the fifties of the last century, a certain barn and shed, several hundred feet in length, were enclosed with Michigan pine. In those by-gone days only large trees in pine forests were felled for lumber. Then the old fashioned "sash" saw was in the heights of its glory. Those large logs were cut "through and through," and each board, or plank, was "edged" with a smaller saw. Thus the lumber was of various widths, and, without assorting, as in the present day, was sold to the consumer. Much of the lumber covering this particular barn would be graded today as "first clear." Many of the boards were 30 inches in width. "Dressed" lumber was then unknown. So was paint——almost. The covering of this barn was neither "dressed" nor ever painted. Forty-five years later I examined these unprotected boards. A majority of the wider boards were split at the center. I could easily determine every board coming from the center of the log by the evidence of disintegration. Thus: Upon the surface of all those "center cut" boards, the soft connective fiber has decayed, turned to dust, and decayed to varying depths on different boards, or rather on boards from different logs. The denser part of the grain remained as ridges.

[Some old, worn violins present similar ridges at the ends of sounding-board; and some do not. The difference is plainly attributable to varying degrees of toughness of connective tissue. In my observation, those old sounding-boards, showing greater loss of connective tissue, invariably possessed greater double-stop tone-value, and greater mellowness of tone generally. Also, such sounding-boards are more easily split.]

On all those weather-worn boards coming from that part of the log near the bark, the ridges of denser fiber are much less prominent. Indeed, some of these boards show no ridges whatever. One striking peculiarity of these ridges is in their line. This line, on the great majority of those old boards, follows a zigzag course. Only upon a very few of them is the ridge-line straight. I am now come to the color question. As I dress the weather surface of all "center-cut" boards, there appears a great variety of colors. *But, only upon the widest* *boards, do I find the brown-red.* Unquestionably those 30-inch boards came from the mature trees. I now return to those boards showing straight ridge-lines. Their color runs from pale to butter color, and their general color-effect is bright. In a very few of them I find silvery bright, transverse markings, or scales.

The evidence afforded by these old boards points towards age in the standing tree as the source of brown-red color developed by seasoning. In woodcraft there is much of value to the violin student. Therein may we learn that the connective tissue in young, or immature trees, is very much tougher than in the mature tree; also, that immature wood, while permitting greater degrees of bending, yet, when released, remains partially bent; whereas, mature wood, permitting less bending, but, when released, quickly returns to its original point of rest. This feature of quickly returning to the point of rest is of great importance to tone-producing agents. Experience clearly demonstrates the fact that immature wood, for sounding-board use, is inferior to mature wood. In my violin retoning experience I have found sounding-boards made of two samples of wood taken from trees of widely varying age. Such sounding-boards have invariably given proof that mature wood possesses the greater tone-value. Thus, in such sounding-boards, when the left half is of mature wood, while the right half is of immature wood, the G and D strings will yield good musical tone, while A and E strings will yield but a "dead," or lifeless tone;

and *vice versa*, the G and D tone will be lifeless.

I am now come to a fact concerning violin sound-board action which seems to have not attracted much attention.

I allude to independent action of contiguous fibers.

From my point of view, other facts being correct, independent action of contiguous fibers, in the sound-producing area of the sounding-board, makes violin tone-value. This view is based upon observation of the fact that agreeable quality, cannot be produced from wood having rigid connective tissue. The latter fact I have observed in many cases. The following considerations explain necessity for independent fiber action in the sounding board: The open tone A requires for its production that certain fibers of the sounding-board strike 450 blows per second upon contained air; open tone E requires 675 such blows. For the simultaneous production of A and E tones, contiguous sounding-board fibers evidently must vibrate at different rates per second. The difference for these tones is the difference between 450 and 675. Therefore, those fibers producing E, move 225 more times per second than the fibers producing A. That the fibers producing the tones A and E are contiguous will be shown upon a later occasion. In this case the evidence seems conclusive. Again I call your attention to pine possessing the brown-red color as being a grade offering the minimum of connective tissue rigidity. As further evidence bearing upon the question of independent action of contiguous fibers, I present this violin which has been in use 40 years within my own knowledge. Two times have I opened this violin in the effort to make its double-stop tones agreeable. By applying a bow, you instantly perceive that my efforts are failures. I pronounce agreeable double-stop tones from this sounding-board to be an impossibility; and the reason for such impossibility is due to inherent rigidity of connective tissue. This violin has something of a history; and, because the history of some violins is the only asset of value they possess, I present the history of this one as evidence. Upon first opening it, I found beneath an accumulation of dirt a legendary label bearing the following:

Andreas Guarnerius
Sub titulo Santa Thresia 1645.

In appearance, this label is the embodiment of innocence; and, in outline and profile, this violin is a *fac simile* of the Andreas. In my earlier observations of the violin, this one is remembered as giving swelling pride to Prof.——. Many times I had gazed upon it in open-mouthed awe. Wanted to own it? Why, yes! But, I didn't have the wealth of Croesus. Another young fellow was more fortunate. Fortune smiled upon this particular young fellow. Prof. —— found necessity for moving to other parts. But, before he could make such move, his unreasonable landlady exacted pay for his board. Under such distressing circumstances the Prof. regretfully "came down" in his price, and that young Croesus became the proud owner of an Andreas Guarnerius. Time not only rolls around swiftly, but also brings swift changes. This young man, becoming obliged to earn a living, laid his Andreas away in the garret together with his other violin of common value. Mice always prefer to live in the garret. 'Tis the warmest apartment in the house. Hitherto mice were not considered as violin "experts." But now, proof of their expert judgment of violins is established by the fact that they gnawed their way into the Guarnerius. Hence this violin came to me for repairs.

[Although not an old violin expert by any means, yet, concerning the modern violin, in the 40 years since I first saw this one, I have learned something. Therefore I am not surprised to read upon the inner surface of this sounding-board, and written with pencil upon the wood, the following words:

Johann Winkerline, Mittenwald
Den ersten Oktober, 1853.

[The suggestion of Mittenwald makes it quite certain that Andreas died some time before making this violin.]

I reduced thickness of sounding-board to what I consider the limit of safety, but only succeeded in removal of a slight amount of its woody tone. After a period of use I again opened this instrument of torture, and gave the sounding-board an hour of *massage*..

[As you know, massage is quite often applied today to human sounding-boards for a fee. When such fee is large there is but little difference in the tone of these two varieties.]

This treatment did just perceptibly diminish disagreeableness of double-stop tones, yet, in a small, bare room they remain suggestive of self-destruction.

I think my experience warrants me in positively stating that, in violins having sounding-boards of a rigidity and density equaling this sample, despair and death precede tone-improvement.

"Doctor, do you mean to state that violins do not always improve with age and use?"

I mean to state that one long life-time is not sufficient to witness tone-improvement in some violins.

"How then may we select new violins certain of tone improvement?"

By ability to correctly judge sounding-board wood, and to judge the graduation thereof by the tone therefrom.

"But, Doctor, all this requires experience?"

Certainly, sir. But in lack of experience it is quite safe to trust the experience of some skillful, ambitious, conscientious, tone-knowing, violin-playing, violin-loving, violin-maker. You have my assurance that such violin makers are not yet all in heaven.

LECTURE V.

GENTLEMEN:—The effect of age upon violin tone is a subject filled to the brim with interest. Among all musical devices, in the matter of tone-improvement by age and use, the violin pre-eminently stands alone. Strangely, tone improvement in the violin follows loss of value in wood in its use for other purposes. Because of such steady diminution in value of wood, unlimited tone-improvement for the violin becomes an impossibility. The fact of loss in wood-value affords a pathetic side to violin history. The *best* violins have been first in succumbing to those insatiable enemies, heat and moisture. The inexorable law of disintegration has stayed not in its hand for best of the Maggini, nor best of the Amati, nor best of the Guarneri, nor best of the Stradivari. The better tone-producing sounding-board sooner yields to attacks of its enemies. Soon will the best old violins only be known in memory.

The many hours of pleasure contributed to humanity by those worn-out violins is something beyond expression in figures. 'Tis well for humanity that the amount of such pleasure cannot be compressed into one hour. Such compressed sweetness could depopulate the world. 'Tis a peculiarity of humanity to love most that which gives the most pleasure. Of all inanimate things contributing to the sum of human pleasure, the violin stands at the head of the list and without a rival. From within the "dugout" on Western ranch to beneath the gilded domes of Czar, the violin carries sunshine.

Deep down in recesses of human affection the violin finds ample room. Must this priceless thing remain a sacrifice to the law of disintegration? Ought not humanity bestir itself to find a safe defense for the violin against this law?

In the light of my experience in searching for means of such defense, I say; "'Tis but folly to sit down and cry while doing nothing to save the violin." In the light of my experience, I say to every man who, without experience condemns all efforts to preserve interior violin surfaces from inevitable "ravages of disintegration," "You are doing an act of criminal violence to Music." To such as have made efforts to thus preserve the violin, and who have abandoned such efforts because of injury to tone, I say, "Persevere." Do as much in such efforts as I have done in ten years. Then, if you are yet dissatisfied with results, possibly my method of preserving those interior surfaces from disintegration may be of interest to you. If called upon, I now consider myself amply provided with proof that interior violin surfaces may be indefinitely protected from disintegration, and without injury to tone. Should my caller be not prejudiced too much, I hope to convince him that the tone of such protected violins remains equally sweet, while the tone qualities of brilliance and intensity are greatly augmented.

There was once a man whose genius as an imitator of the Strad violin, not only filled the violin world with amazement, but also, filled this man's pockets. This man, J. B. Vuillaume, imposter confessed, said that interior violin surfaces cannot be protected without injury to tone. Because this man was an imposter, therefore when he said, "No," possibly he meant, "Yes."

[Strange how an imposter's "No," to this day, influences the violin world. As I view this matter, 'tis but a display of inanity when I act upon proffered advice from a known swindler. As I think, the statements of men, even under oath, who have no other object in life than money, should be taken with the proverbial grain of salt. Indeed, there are cases wherein a pound is better. In the latter class of cases am I inclined to place J. B. Vuillaume.]

As a member of the staff at a violin sanitarium, it came in my way to see somewhat of the pathetic side afforded by violin interior surface disintegration. Truthfully, the sight of such destruction of violin value became the stimulating agent for my later effort to find a safe means and a method for its prevention. Often have I witnessed total ruin of tone-value for no other reason than that of leaving interior surfaces of the violin unprotected from disintegration by the action of heat and moisture. The question, "Can such disintegration be prevented without injury to tone," stood in large type before my eyes until I acted against a universal conclusion. Now, I am surprised that injury to tone, from protection of violin interior surfaces, is but an imaginary bugbear. I do not state that tone cannot be injured by the interior protection. On the contrary, I well know that interior-surface protection can be the cause of tone-value ruin. I know full well that crude means, and crude methods of applying means to interior violin surfaces can injure tone when applied upon exterior surfaces; but, not more; and, not less. But, in accounting for tone-injury, the following fact must not be overlooked. Thus: What ever injures tone when applied upon a single sounding-board surface, multiplies such injury by the factor 2 when applied to both surfaces. The point is, neither means, nor method of applying means for protection of either surface, resulting in injury to tone, should be used upon the violin. As musicians of experience, you well know that 'tis not what you play, so much as how you play, that wins the "encore."

Had I sat down and cried quits after the first few attempts to apply protection to those interior surfaces, I yet might be contemplating this bugbear from the usual distance. Had I then abandoned such effort, I never would have received those marks of approval from the 60 owners of violins thus protected. Had the tone of violins thus treated, been injured by such treatment, then, approval from such owners would have been withheld. In every case my fee was subject to approval. In no case have I lost my fee. I only mention these latter facts as proofs that violin tone is not injured by protection of interior sufaces.

[Perhaps 'tis proper to state that I worked upon violins for more than forty years with no intent, or expectation whatever of turning such work to business account. I only charged a fee when violins came to me in such numbers as to demand much of my time.]

It is my belief that to apply protection to either exterior, or interior surfaces of violin plates, without injury to tone, demands both experience and judgement only obtained by experience.

"Doctor, how long will your protected violins last?" I cannot answer that question further than to say I know of no reason why the material employed by me as interior-surface protection will not last equally with exterior surface-protection. For such interior surface protection, I employ gum copal as a basis, but, the hardness of copal is tempered down with much softer, tougher, and more elastic gums as mastic, elemi, sandarac, etc.

[Details of this work will be given later.]

Again I call your attention to the fact that sounding-board wood, yielding the best tone-quality, is first to be ruined by disintegration from heat and moisture. I know how much of variety exists in the matter of violin-taste. I well remember my own different taste at different periods in my experience. At the earlier periods, I demanded nothing so much as great power in violin tone. Quality, in either single-stop tones, or double-stop tones, I willingly sacrificed to mere power of tone. As I now look backwards upon my earlier attempts at making earth to tremble by my great tone, I am staggered at the mountain of infliction enthusiastically poured into the suffering ear of near friends. The word "near" only refers to proximity, and by no means refers to "loving" friends. Today, when speaking of the sounding-board yielding best tone, I mean the greatest tone-beauty, or, the most agreeable tone, or, the sweetest tone; and I especially mean great beauty of double-stop tones.

As a sample of the destruction wrought upon the better grade of sounding-board wood by heat and moisture, I present this old violin. The maker of this violin is not known. Its worn appearance is such as to make needless any certificate of age. The peg holes are worn beyond the size of any violin peg! The "hand" is deeply worn by shifting thumb and finger. On surfaces touched by chin and shoulder, the varnish has disappeared. At both upper and lower extremities of the sounding-board the soft cellular connective tissue, between denser part of grain, is worn away, leaving the denser part standing as ridges. Because of its great influence upon double-stop tones, I call especial attention to the soft nature of connective tissue in this sample of sounding-board wood. By reason of long experience, I feel safe in stating that double-stop tones from this violin possessed marked beauty.

[I employ the past tense because this violin is not in playing order.]

The only statement in text-books of philosophy, in which I have found something of value to the selection of violin sounding-board wood, is contained in the following sentence: "The sounding-board may be compared to a bundle of strings." I consider this statement to be of value. Evidently, the word "strings" in the text-books refers to the denser part of grain. To be of value for sounding-board use; the "strings" must be held together by a connecting medium. Evidently, the character of such connecting medium modifies action of those strings. Thus: *Freedom in action of those "strings" is as rigidity of connective tissue.* As previously shown by example, the rigid violin sounding-board cannot be made to yield agreeable double-stop tones, because rigidity in connective tissue interferes with independent action of contiguous fibers; ("strings," of the text books.) In this old sounding-board, connective tissue is soft.

The owner of this much worn violin is Mr. August Wolfe, Music Director, Valparaiso College, Valparaiso, Indiana. Prof. Wolfe brought this old violin from his Austrian home. When a small boy, this worn old instrument came to him as a present from his father, and was accompanied by the usual fallacious remark, "It'll do to begin on." [Considering the present condition of this violin, I believe that none other than a German-speaking boy could have survived to become a master violinist.]

In size, this violin is known as $\frac{7}{8}$. I ask you to observe the extremely delicate beauty of this old neck and head. Even Hebe's own is not more beautiful. This slender hand, these thin peg-box walls, those exquisite lines of fluting and scroll, powerfully appeal to our sense of the beautiful. Because the peg-holes are worn out, and a fracture extends down through the A peg-hole, and a piece is gone from edge of fluting, the Prof. suggests replacing this worn old neck with a new one. I have heretofore done surgical work calling for nerve, but, at severing this beautiful head from its body, I halt. 'Tis a case of "heart failure." I can easily give days to the work of restoring the broken lines on this Hebe-like neck and head that those lines of beauty may remain to delight the eye of connoisseur.

I am now to present something unusual. I call attention to the varnish on this old violin. This varnish is soft; rather too soft to agree with modern ideas; also, the amount of varnish originally applied, judging from the amount now found in the hollows, was much greater than is employed today. It is so soft that with but moderate pressure, my finger palp causes perceptible indent therein. As friction produces the familiar odor of mastic, therefore I suppose this soft gum to be in excess. In this varnish, I am less interested in the gums than in the coloring matter employed. As you observe, the prevailing colors are red and black, and mixed, in quantity of each, to produce a deep red-brown, or brown-red shade.

But, such dirty brown-red! No self-respecting modern violin maker would permit such dirty, muddy-looking color-work to appear out of his pile of waste-wood.

"Doctor, isn't this a rare old violin?"

S-u-r-e!

[I gave notice of presenting something unusual.]

I am now to present something yet more striking; more shocking; and more pathetic. I am to present an example of disintegration of sounding-board wood such as will burn into your memory; an example of slow conbustion of wood in the presence of heat and moisture; an example showing the down-hill route traveled by those priceless old gems of tone-art now stranded along the violin's last hundred-year path. This irreparable loss, and this pathetic scene, might easily and with certainty have been averted, I fully believe. With a thin spatula I easily remove this old sounding-board.

Shade of Dante!

[As an application in Hades, we may well fear that slow combustion heads the list. The truth in that old saw, "The devil's in the fiddle," now receives confirmation. But, strangely, and unexpectedly, this confirmatory evidence points to the fact he "is in the fiddle" for the purpose of destroying the fiddle instead of destroying human beings. It is claimed that recent archælogical discoveries bring to light proof of some error in Scriptural readings. The evidence afforded by this example of slow combustion, when supplemented by other examples of like nature, may be sufficient to change orthodox readings thus: "The devil is an *enemy of the violin.*"]

"Punk" may be described as a product of wood by slow combustion in the presence of heat and moisture. Upon the inner surface of the sounding-board we have an example of "punk." It falls as dust mixed with thin threads of wood-fiber as I touch it with scraper. This punk condition extends over the entire inner surface of the sounding-board, and its depth equals 1-32 inch. In places, the linings on upper edge of the ribs are hanging in partially decayed shreds. You observe that both linings and corner blocks are much lighter than those of the present day.

Why all samples of sounding-board wood of equal age, do not present similar punk conditions is a matter beyond my ken. I can only say that different samples of wood possess different degrees of resistance to slow combustion.

[In my younger days, punk, gunpowder, flint and steel, were our only matches. We took equal precaution in keeping punk and powder dry. Thus kept, punk would last a long time; but, exposed to heat and moisture, as when found in the woods, it soon turned to dust. Not every decaying log yields a good quality of punk. The punk hunter must often make extended search before finding the best. At this distant day, to the best of recollection, the best quality of punk was found in large, dead branches upon living trees; or within the trunk of trees dying while standing. In woodcraft it is well known that the greatest depth of color-changes are found in trees dying while standing; also, that lumber from trees thus dying sooner decays. In seeking for reasons explaining rapidity of disintegration observable in the better grade of old violins, some writers suggest that the sound-boards thereof were obtained from trees having died while standing. Upon this point there appears no positive evidence. The fact that some samples of sounding-boards have succumbed to the action of heat and moisture, while other samples are yet sound, remains unexplained.]

I now hold this violin in such manner that you may look towards the inner surface of the back plate. I am thus particular to say "look towards" because you cannot "look upon" this plate. Your gaze cannot penetrate through this deposit of earthy matter. The color of this deposit is black, and therefore suggestive of alluvium. But, alluvium being a deposit from water, we must therefore look elswhere for the origin of this deposit of ærial dust from the "Cremona period."

[Some of you may entertain a different opinion. I admit that your opinion is equally as good as mine, possibly better than mine. I only claim myself unable to estimate "Cremona dust" above its face value. I know that some old-violin experts, "just out for their health," (!), claim no other dust has value. I'm not "out for health." I admit that Cremona dust has a penchant for settling within the violin. Indeed, assisting such dust to settle has improved the health, (!), of many experts. Good health is a valuable asset. For this reason alone, the old-violin "expert" undoubtedly will remain "out."]

Were I attempting the old violin "expert" role, I might continue thus: "Were a few boulders to be seen scattered about in this deposit, 'twould indicate that the age of this old violin is co-equal with the glacial epoch. But, as boulders are absent, we may therefore safely continue *marching* *backwards.* Undoubtedly this deposit was once flying particles of earthly matter—dust—and nebulous. Now we have it. The nebulous period is the limit.

Gentlemen: Behold the *first* violin!"

Having now removed sufficient punk from the sounding-board, and sufficient dirt from the back-plate, we are enabled to observe that both plates are cut from the "slab." This manner of working out violin plates seems to have prevailed to a greater extent in earlier days of violin history than in modern times. In my own experience, the "whole" plate yields tone equally as good as the divided plate, provided that the grain of sounding-board stands at, or nearly at a right angle to the arching in the tone-producing area. But when such grain angle is oblique to the arching I have always found that tone to suffer loss in both power and brilliance. The same loss also occurs in the divided sounding-board when the grain angle is oblique to arching. I attribute such loss to diminished fiber action.

[Honeyman states with positiveness that whenever a Nicolas Amatus sounding-board is found with thicknesses less than $\frac{1}{4}$, at center, and $\frac{1}{8}$ at edges, such sounding-board has been subjected to re-graduation by some modern workman. For the sake of both Music and humanity, I consider such re-graduation to be fortunate. It is my experience with sounding-boards thus thick, and of average density, that even a set of guage 1 strings cannot overcome rigidity sufficiently to yield one octave of good tone upon each string.] As evidence bearing upon the confusion found in violin history, I here quote from the Frenchman, N. E. Simoutre, book and charts, Paris, 1885. Simoutre submits charts of two Nicolas Amati violins without date: Thickness, Plate 1, center of sounding-board, 350*mm*, (meaning three and five-tenths millimeters) down to 250*mm*, and at the edges, 400*mm*, (meaning 4 millimeters.) Thickness, Plate 2, at center 450*mm*, down to 200*mm*, and at the edges, 300*mm*.

(Simoutre explains his figures by *centieme des millimetres*, meaning so many hundredths of a millimetre.)

Comparing the thickness at the center of the Nicolas Amatus sounding-board given by Honeyman with the greatest thickness given by Simoutre, we find a difference of seven-hundredths inch.

Considering the depths of human affection for the violin, I am astounded at its abuse. Were this old violin once a masterpiece of tone-art, the abuse to which it has been subjected is ample for its ruin. Repairing this "worn old thing," in a way to extend its period of usefullness, is a severe tax upon patience. Brittle as glass, it demands careful handling. In this work, a money consideration cuts but little figure. Reward comes in listening to such sweet tones as money cannot reproduce:

VIOLIN TONE-PECULIARITIES.

Sweet old violin! Worn,
Torn, scraped from e'n till morn!
Work for thee has ever been
To hand out joy since thou wert born.
Dotage, now within thy form,
Marks thee down a "worn old thing;"
Yet, thy tone to us remains
A gem beyond the reach of king.