"Interpreters Series" FSI-29

THE MOUNTAIN DULCIMER

—How to make it and play it—

(after a fashion)

INCLUDING BOOK OF COMPLETE INSTRUCTIONS

by

HOWARD W. MITCHELL

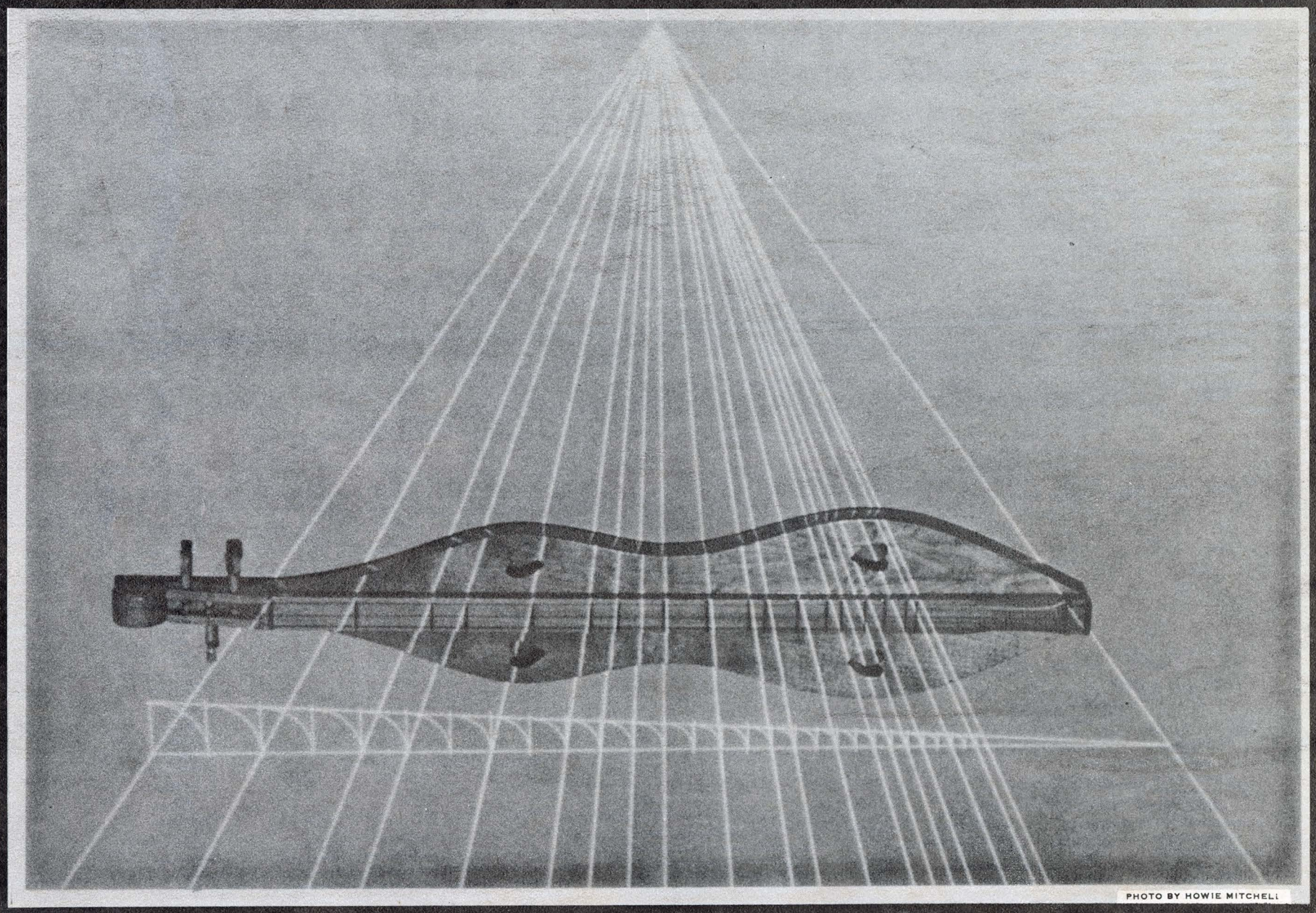

PHOTO BY HOWIE MITCHELL

FOLK-LEGACY RECORDS, INC. SHARON, CONNECTICUT

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Howie Mitchell became fascinated by the mountain dulcimer when he first heard it played as an accompanying instrument over ten years ago. Since that time, he has constructed a large number of instruments based upon the traditional dulcimer, has developed certain methods of construction which incorporate features he has found to enlarge the tone and increase the versatility of the instruments, and has devised several individual techniques of playing which extend the musical potential of what is basically a very simple instrument. All of these are presented on this record and/or in its accompanying book.

Although this is designed to be essentially an instructional record, it is also much more than that. It could almost be subtitled "Home-made Music in the Mitchell Manner," for it includes many examples of Howie's musical artistry. But Howie's purpose is not to demonstrate various methods of constructing and playing the dulcimer which the listener/reader may then follow in slavish imitation. His idea is, rather, to suggest to each of you certain possibilities and let you take it from there, according to your own musical interests and abilities. As can be seen below, the material used to illustrate Howie's discoveries ranges from the banjo tune "Flop-Eared Mule" to Bach's "Jesu, Joy of Man's Desiring."

With the aid of this record and book, you may construct your own dulcimer, develop your own style of playing it, and even, should you be so inclined, proceed to create your own musical compositions. The possibilities are unlimited—it's up to you!

Side 1:

INTRODUCTION AND DEMONSTRATION OF THE "DULCI-LESS"
"FINGER EXERCISE" (Mitchell)
TUNING THE DULCIMER; THE PHENOMENON OF "BEATING"
TUNING BY HARMONICS; THE "CLASSICAL" STYLE OF PLAYING
"DRINK TO ME ONLY WITH THINE EYES"
"STUDY IN COUNTERPOINT" (Mitchell)
THE "BAGPIPE" TUNING AND THE QUILL TECHNIQUE
"MACPHERSON'S LAMENT"
"FLOP-EARED MULE"
THE "FINGER-STYLE" OF PLAYING
"IN THE GOOD OLD COLONY DAYS"

Side 2:

SIX MODAL TUNINGS FOR THE TRADITIONAL DULCIMER
THE "DOUBLE-THUMBING" TECHNIQUE
"IF HE'S GONE, LET HIM GO"
"BUCKDANCER'S CHOICE"
THE "THREE-PAIRS-OF-STRINGS" DULCIMER
"FRANKIE AND JOHNNY"
"TWO SISTERS"
THE DOUBLE DULCIMER
"THE ASH GROVE"
"LADY, COME AND SEE"
"BABYLON IS FALLEN"
THE DOUBLE PSALTERY
"JESU, JOY OF MAN'S DESIRING"

The Mountain Dulcimer

How to make and play it ~ (after a fashion)

by Howard W. Mitchell

A FOLK-LEGACY BOOK • $ 3.95

Preface

This little brochure, and the accompanying recording, will hopefully provide sufficient information to the average amateur musician and home craftsman to enable him (or her) to make and begin to play a remarkably beautiful type of instrument found in the Southern Mountains. Several changes in the design and tunings of the traditional instrument have been suggested in order to achieve a richer and louder tone and a more flexible system of tuning and chording.

Anyone attempting such a project is, quite frankly, in for a task that is most demanding of patience, time, effort, and love. A prime requisite is complete involvement, in order to get through the inevitable sequence of little frustrations and problems that will appear. Consider such a project very carefully, for you are liable to become utterly fascinated.

* * *

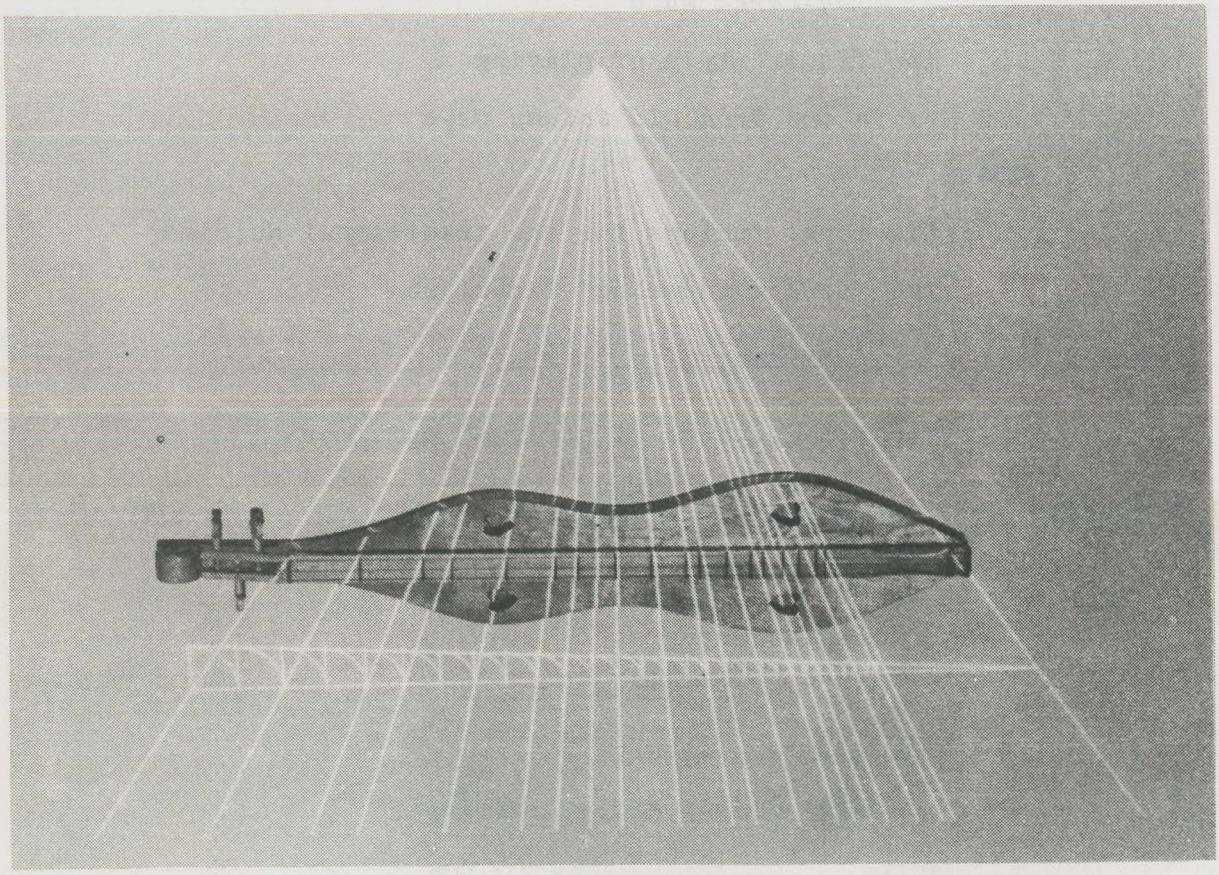
My deepest thanks and gratitude to Dr. Asher Treat, of Dumont, New Jersey, for first introducing me to these instruments directly; to Jean Ritchie, for showing so much patience and encouragement in my attempts to change and deviate from the traditional dulcimer; to Dennis Dorogi, for his catalytic comments and timely assistance in refining the "eighteen rule"; to John Shortridge, for helping extend my awareness of good music; and to my wife, Ann, for helping us both to survive it all. Of no less importance are the numbers of persons who, by way of letters, encouraging smiles and remarks, insistent questions, and occasional photographs, have kept my spirits up during the struggles to set this information down in writing.

Howie

The Mountain Dulcimer

How to make and play it — (after a fashion)

by Howard W. Mitchell



FOLK-LEGACY RECORDS, INC.
SHARON, CONNECTICUT

Contents of the companion record (FSI-29)

SIDE 1

SIDE 2

This new printing contains the complete text and drawings from the original Folk-Legacy edition (with postscripts); it was reset and redesigned, with minor editorial corrections, by Lani Herrmann.

Contents

Introduction

I can still vividly recall the sensation of hearing and seeing a dulcimer for the first time. It was during my first visit and acquaintance with the Treats in the fall of 1953, if I remember correctly. Asher's playing and singing were simple and restrained, yet a peculiar charm and trace of melancholy within the voice of the instrument brought forth an enchantment that has remained with me ever since. This spell has led, and at times even driven, me into a series of explorations from which have come several instruments and modes of construction that are at once composites of tradition and of innovation.

I have often wondered at the strength and permanence of this interest in instrument making. It is remarkably satisfying, in spite of (and probably because of!) the momentary irritations that are bound to be present. If it turns out that you are a borderline case, and are in the midst of trying to decide whether or not this would be too much for you, my first advice is *don't be afraid.* I think a lot of persons have developed quite an inferiority complex by seeing the handsome, gleaming, finely finished musical instruments that appear in some better stores nowadays. The dulcimer is a peculiarly rugged sort of instrument, and choices of wood, shape, size, finish, etc., are not particularly critical. An instrument made with reasonable care from cheap, roughly finished pine plywood *can* end up with its own special dignity and personality, and will somehow hold its own with instruments made with a high degree of craftsmanship.

I shall make no attempt to describe in detail the large and remarkable family to which the plucked dulcimer belongs, nor to present much of its personality as it exists in tradition. This *is* an important story, however, and is beautifully presented by Jean Ritchie in *The Dulcimer Book* (Oak Publications, New York). Jean is a lovely and sensitive person, and this shows in her manner of written description of the background (local and historical) of the dulcimer. She is not only a traditional singer and musician but also an accomplished scholar; reading her account of the way this instrument became part of her way of life in the Kentucky mountains places the dulcimer in a charming fashion into its proper setting.

If it turns out that you are completely unfamiliar with the dulcimer, I would most strongly recommend Jean's dulcimer instruction record, *The Appalachian Dulcimer* (Folkways Records FI-8352), as an important prerequisite to this booklet also. As you will see, my particular approach to this instrument is that of the self-taught innovator and experimenter, which right away imposes certain limits upon the overall view.

The dulcimer, as you may know, is an instrument that is particularly well suited to being played "by ear." This process, by which a musician intuitively "knows" how to construct a tasteful and effective musical accompaniment, is a most elusive one. Even though I apparently have this ability to a certain extent, it still remains a mystery to me. It is, perhaps, a *selective* process, guided by personal training and experience, whereby the musician extracts from his memory certain note and rhythm sequences and combinations which he has learned are allowable (and thus "feel right") within a particular musical context. Certainly, contact with music, combined with a good, selective memory for musical sounds, should form a useful "storehouse" to draw upon. A tendency toward experimentation, disciplined by experience, might well determine the ease with which "original" tunes can be created, or competent accompaniments fitted to a given melody.

If the conjectures above are true, it seems to follow that the art of "playing by ear" is an indeterminate one that cannot be taught in the ordinary sense of the word. It must be learned from within, so to speak; it is rather like a personal, unique lock and key that are inseparable from each other and from the intellect that gives them form.

I might add that the dulcimer is well suited to being "designed by ear," if I may use a mixed analogy. It was the intention of transmitting as much of the "by-earness" concept as possible that induced me to leave out the fine details of construction or of playing methods. In this brochure, I have attempted to give you form without finality, hoping that this will cause and enable you to draw upon your own background of experience and good sense to fill in the rest of the puzzle.

H. W. M.

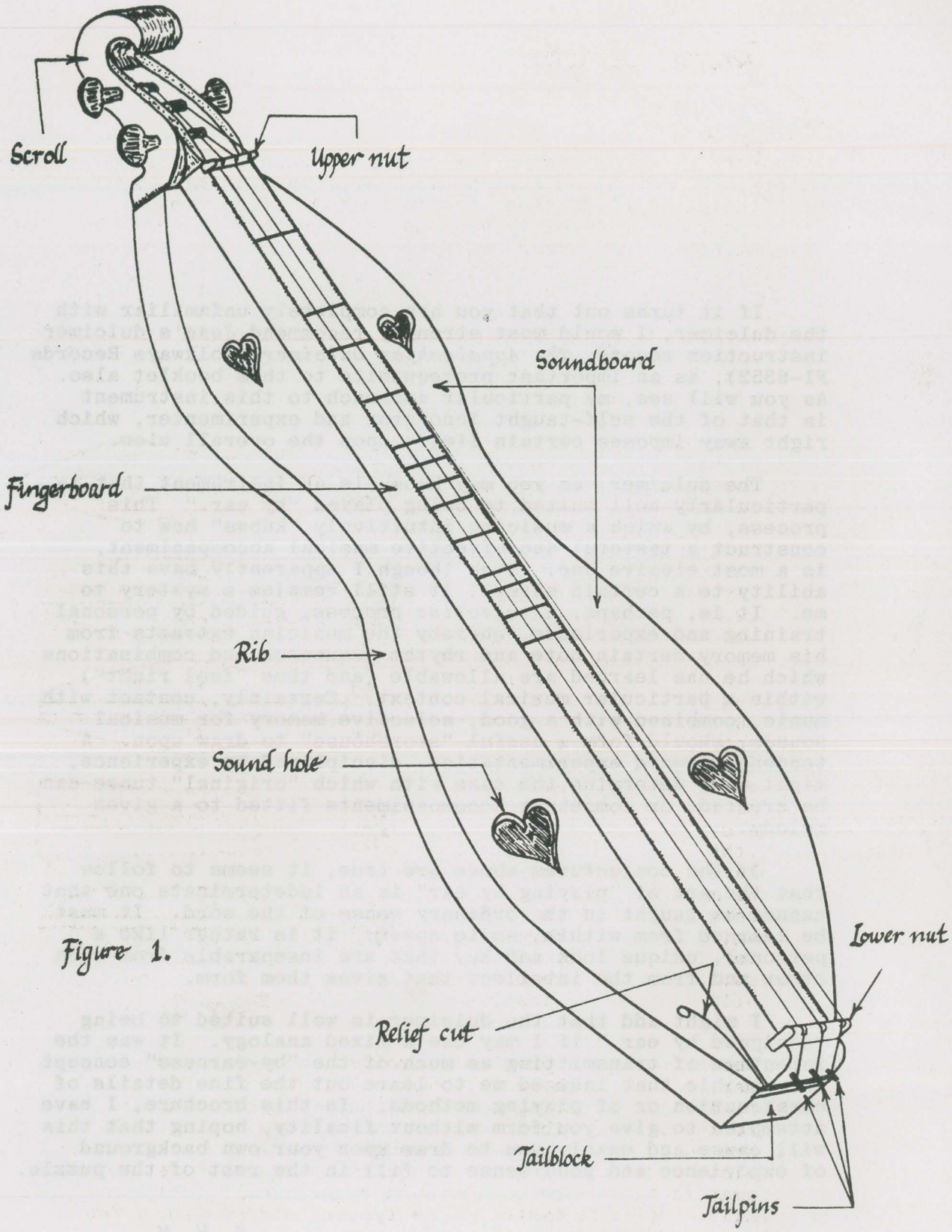

Scroll
Upper nut
Soundboard
Fingerboard
Rib
Sound hole
Lower nut
Relief cut
Tailblock
Tailpins

Figure 1.

General description

Very little is known for sure concerning the direct ancestry of the plucked Appalachian mountain dulcimer, as it is often called, and even less has been written about it. It seems to be related to a number of European zither-like instruments: the German *scheitholt*, for instance, and the Pennsylvania-Dutch *zitter* become, with very little stretch of the imagination, the primitive counterparts of the dulcimer. An excellent and well-illustrated account of the dulcimer, written by Mr. Charles Seeger, can be found in the January-March 1958 issue of the *Journal of American Folklore* (published by the American Folklore Society, 1703 New Hampshire Avenue, N.W., Washington, D.C. 20009).

The dulcimer takes the form of an elongated wooden box, somewhat under three feet in length, and having any of a number of different symmetrical shapes. It may have three or four, or occasionally six or even eight strings, which are affixed to a wooden stick glued to the top and running the length of the box. The dulcimer is designed to be played crosswise on the lap or on a table in front of the player, with the tuning pegs to the left. It creates a sound reminiscent of the bagpipe, for some of the strings serve as drones, while the string closes to the player is (usually) used for the melody. For the instruments described in this writing, provisions have been made for fretting all of the strings, to extend the musical possibilities of the instrument.

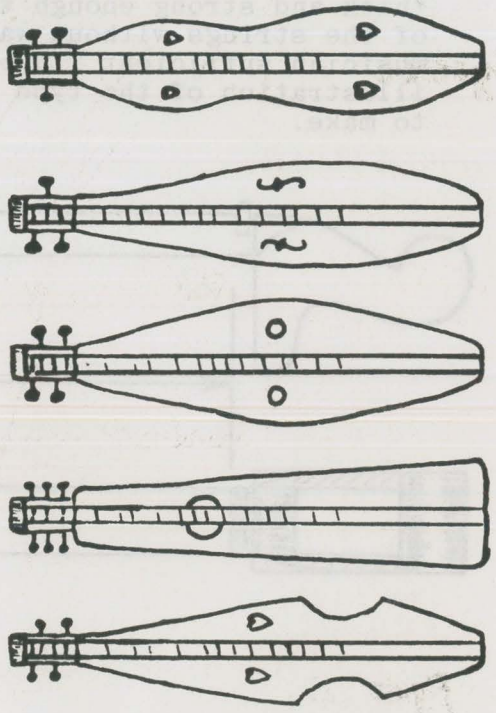


Figure 2.

One of the main problems involved in making a fine dulcimer, or any high-quality musical instrument for that matter, lies in creating a device that will efficiently convert the minute vibrations of the strings into sounds that are audible and pleasing enough to make good music. The dulcimer does not seem to require an exact shape; the craftsman is therefore bounded and restricted largely by his skills and good taste. Some typical shapes are shown in figure 2 above.

Main parts of the dulcimer

There are two main parts to the mountain dulcimer: the *staff* (or fretboard), which supports the strings and frets, and the *soundbox*, upon which the staff is cemented. These two parts will be discussed separately.

The staff

The purpose of the staff is threefold: it serves as a support for the strings, its upper surface contains the frets, and, finally, an extension of the staff holds the tuning pegs which are used to regulate the string tension. It must be thick and strong enough to stand up under the constant pull of the strings without warping, and wide enough to allow the musician sufficient finger room. Figure 3 is an approximate illustration of the type of fretboard and pegbox that I like to make.

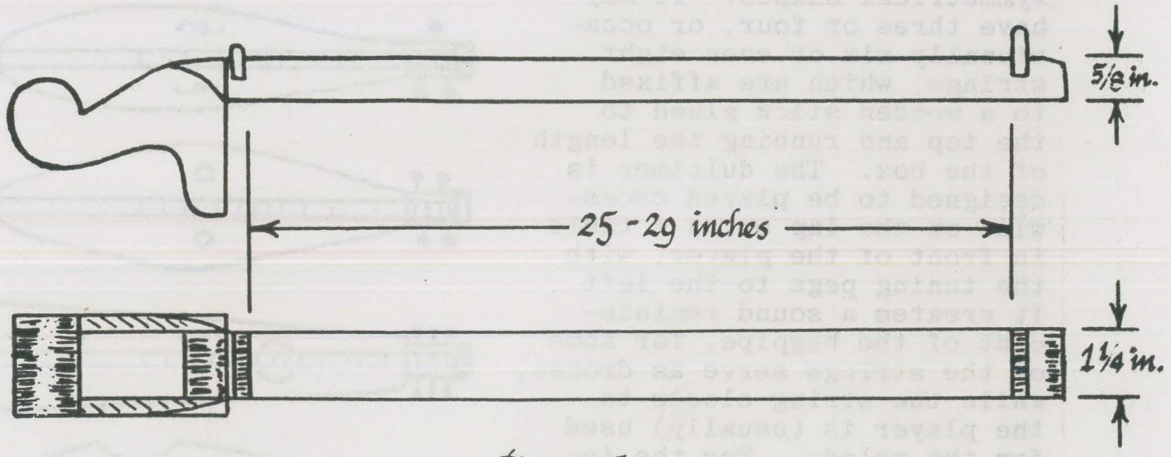
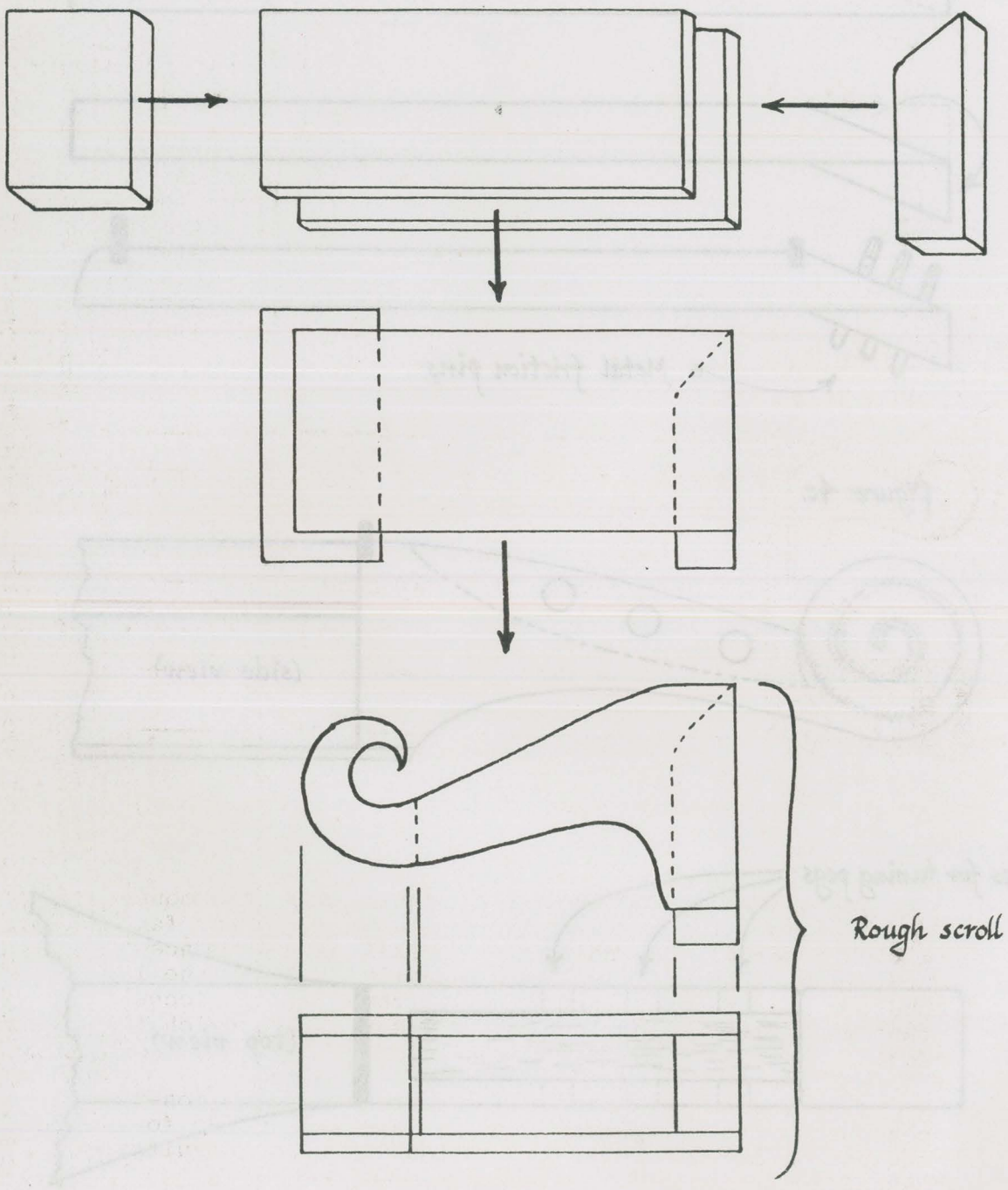


Figure 3.

As was mentioned above, the tuning pegs are mounted on an extension of the staff, which can be plain, or fancy like a fiddle scroll, depending on the skill and patience of the craftsman. The scrolls I make usually resemble the little shoe of a leprechaun, and are cut from several pieces of wood that have first been glued up in a sort of sandwich (see figure 4a).

The tuning pegs can either be regular friction-type violin pegs (they are quite handsome, but are bothersome for precise tuning) or machine pegs, as are usually seen on guitars and mandolins.

Figure 4a. One way to make a leprechaun scroll, if you like sandwiches!



A couple more pegbox f'instances:
Figure 4b.

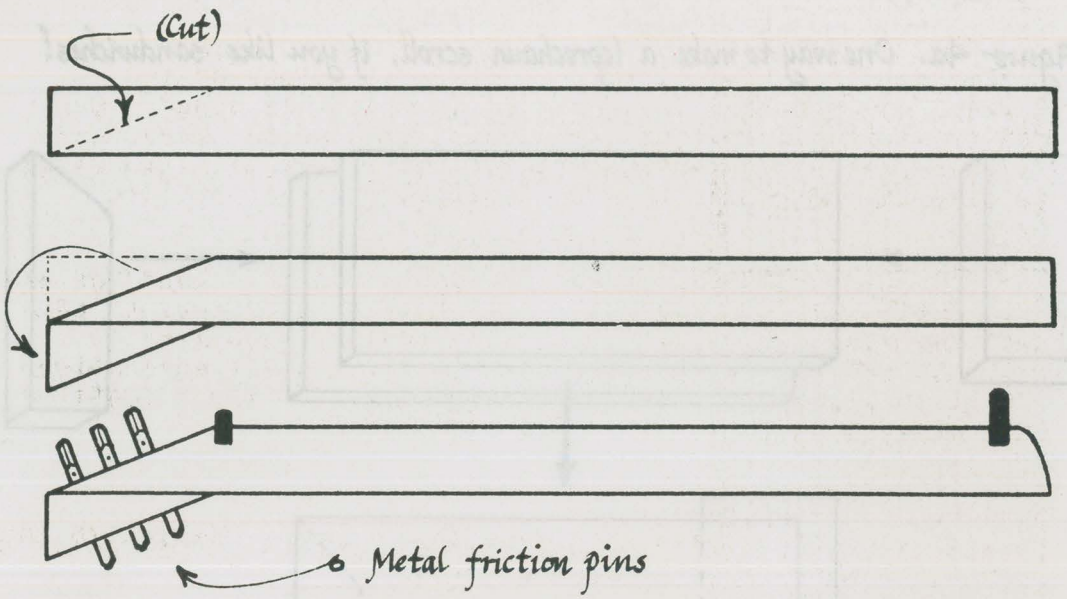
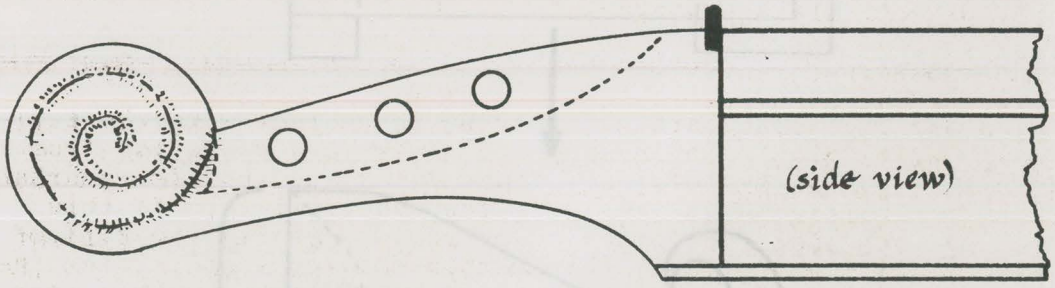
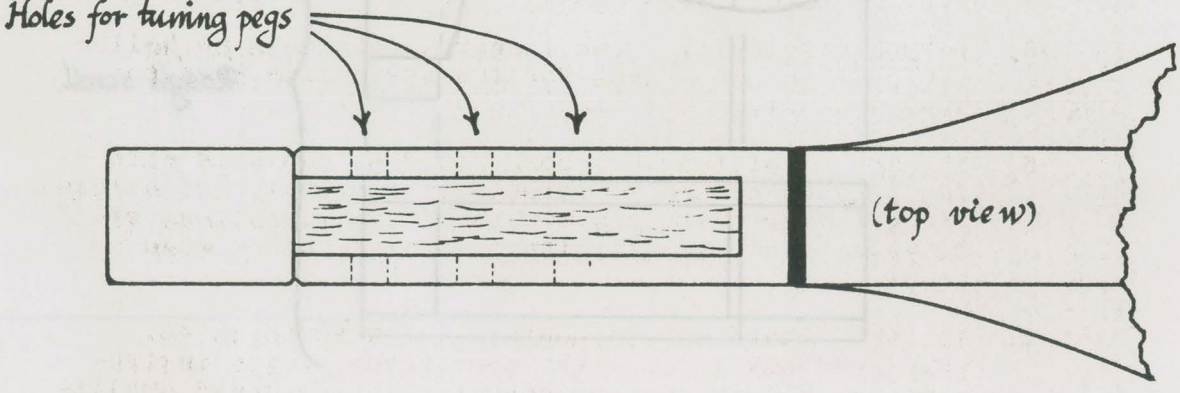


Figure 4c.





The soundbox

The main purpose of the soundbox, as the name implies, is to amplify mechanically the faint vibrations of the strings so that they produce a readily audible sound. One important property of the soundboard (top of the soundbox) is therefore *area*, for, the greater the extent of a vibrating surface, the more air there is available to be set into motion.

The variables that might be considered in a soundbox are apparently endless, and much still remains a mystery to persons far more authoritative on this subject than myself. Nevertheless, there are a few simple first-order suggestions that I shall mention that aid tremendously in the effectiveness of such a device.

In general:

1. The soundboard should be thin (approximately 1/8 inch), light, and flexible.

2. The bottom of the soundbox should be light, but stiffened with braces.

3. Thickness of the sides (or ribs) seems to be relatively unimportant.

4. The soundboard must *not* be in contact with the tailblock of the instrument. This is a deviation from the design of traditional dulcimers, but is remarkably effective in improving the tone quality. If this change is accompanied by relief cuts in the tail of the soundboard, this member becomes free to flex independently of the rest of the soundbox. *This step is so important that I am outlining it!!*

5. If at all possible, the fingerboard should be hollow (leaves less wood mass for the strings to have to work against).

6. The bottom of the soundbox should be equipped with feet. This not only protects it somewhat, but allows the dulcimer to transmit part of its vibrations effectively into any furniture it might be on when played.

7. The soundboard should contain a few sound holes. They not only improve the appearance of the instrument, but aid in some obscure way in the sound quality.

Construction procedure

As far as I can see, there is no particular "best way" to make a dulcimer; each method will have its own set of advantages, disadvantages, and peculiarities. This, now, will be most of the steps involved in the way that I usually prefer to make a dulcimer:

1. Make a full-scale top view of the fingerboard,* and then sketch in a soundboard shape that appeals to you. Most of the instruments I have made have shapes that I drew freehand; a few have curves generated by bending a long, flexible strip of wood until it assumed a pleasing configuration, and then tracing that on the drawing paper.

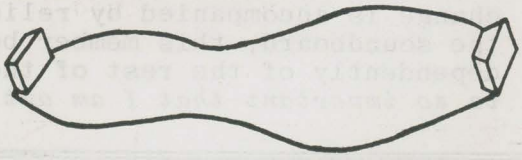
2. Using the drawing as a guide, cut out the top and bottom pieces from the proper stock (remember to make the top *thin*).

3. Chisel or saw out the sound holes.

4. Cut out strips of wood for the ribs (about 1 3/4 inches wide, and a bit longer than the instrument).

5. Prepare endblocks for the instrument and glue into place on the bottom. *Be sure to make the tailblock about 1/16 inch less tall than the ribs, so that it won't touch the soundboard later on.*

Figure 5.



6. Prepare the ribs so that they can be fitted to the bottom. If they are fairly thin, they can be bent and shaped easily after a few minutes' exposure to boiling water. For my purposes, I have preferred to use 1/4 inch thick veneer plywood, which I saw-kerf in the portions to be bent (see figure 6).

* The exact spacing of the upper and lower nuts is not critical, though I have come to prefer the tone of instruments with string lengths of about 28 inches. This spacing, of course, is what determines the *size* of your drawing.

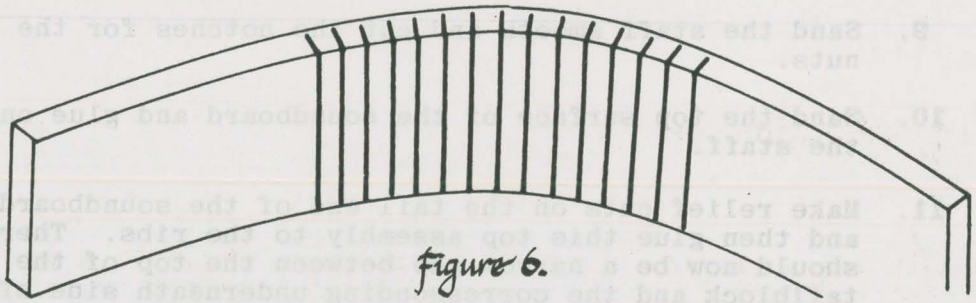


Figure 6.

7. Match the ribs to the tail block and then glue them to the bottom ("C" clamps are good for this step). Add crossbraces to the bottom. Write your name, date of construction, instrument number, etc., on the bottom of the dulcimer, so that it will show through one of the sound holes. This is purely for the future; it is sometimes quite pleasing to find an instrument you made some years ago, and *recollect*.

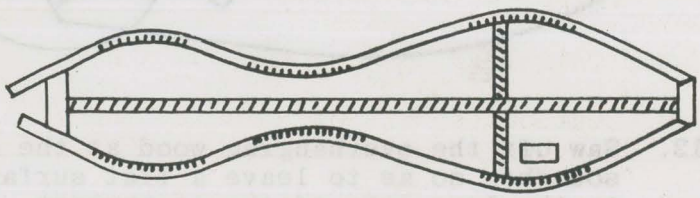


Figure 7.

8. If you're equipped for it, take the staff stock and remove some of its interior so as to leave a channel. If you have a bandsaw, or something similar, you might consider the method illustrated in figure 8.

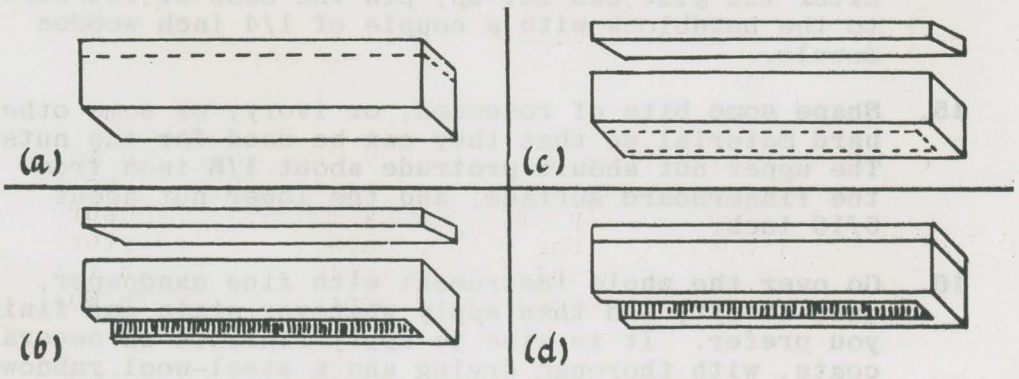


Figure 8.

9. Sand the staff smooth and cut the notches for the nuts.

10. Sand the top surface of the soundboard and glue on the staff.

11. Make relief cuts on the tail end of the soundboard and then glue this top assembly to the ribs. There should now be a narrow gap between the top of the tailblock and the corresponding underneath side of the soundboard. Moderate downward pressure on the lower nut should cause a small but visible downward flexing of the soundboard.

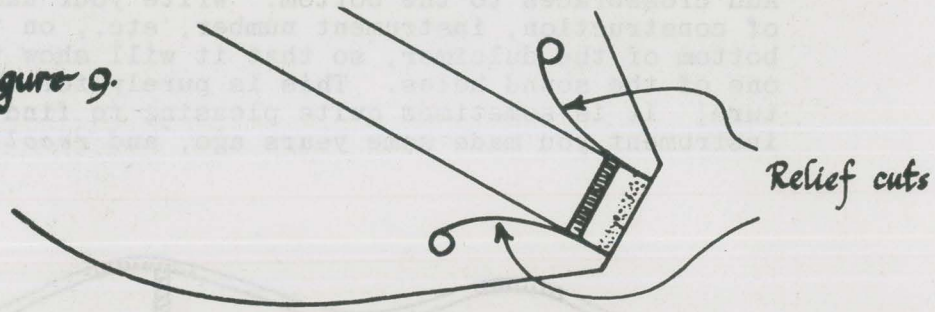


Figure 9.

12. Saw off the overhanging wood at the head of the soundbox so as to leave a flat surface perpendicular to the long axis of the instrument. This is where the scroll will be attached. Sand the soundbox.

13. Make up a scroll, being sure to use a strong, heat-proof and waterproof glue.

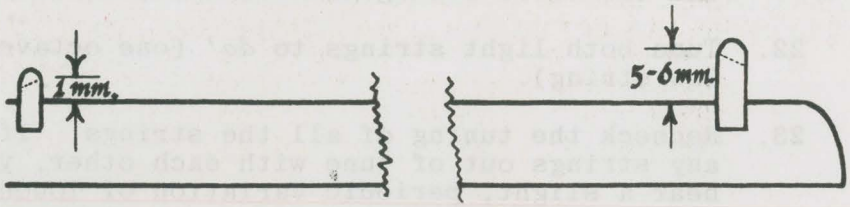
14. File and sand the scroll so that it will match with the flat surface at the head of the soundbox. Glue it on with a heatproof and waterproof glue. After the glue has set up, pin the base of the scroll to the headblock with a couple of 1/4 inch wooden dowels.

15. Shape some bits of rosewood, or ivory, or some other hard material so that they can be used for the nuts. The upper nut should protrude about 1/8 inch from the fingerboard surface, and the lower nut about 5/16 inch.

16. Go over the whole instrument with fine sandpaper, dust it off, and then apply whatever stain and finish you prefer. It is wise to apply finishes in several coats, with thorough drying and a steel-wool rubdown between coats. If you finish off with a gentle polishing using an old underwear shirt, it'll look especially handsome.

17. After the last coat of finish is dry, file grooves in the nuts for the strings. These notches should be such that the strings will be about 1 mm above the fingerboard at the scroll end, and about 5 mm above the fingerboard at the lower end. The notches *must* slant as shown (figure 10), or else you'll have all sorts of trouble with buzzing strings and generally poor tone.

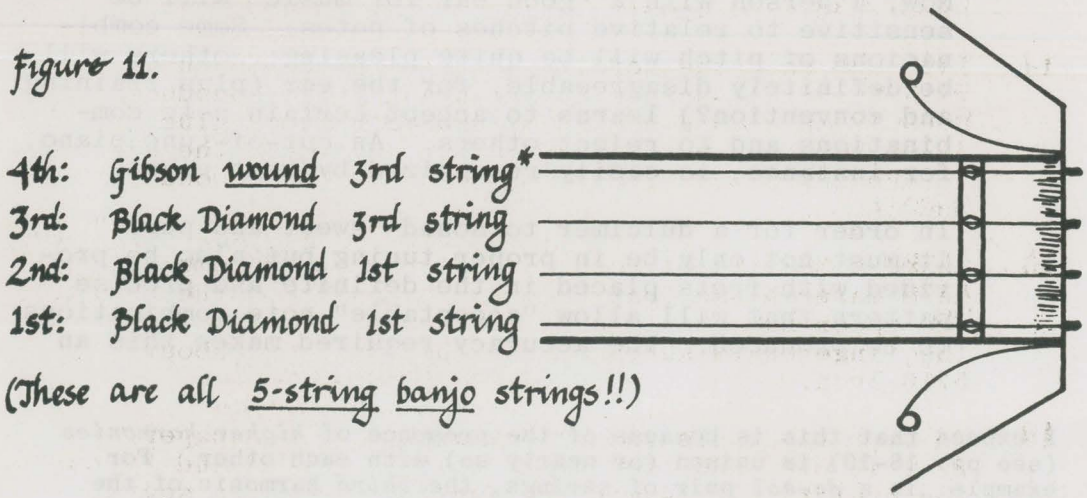
Figure 10.



18. Put in the tailpins and mount the tuning pegs in the scroll. If this is your first dulcimer, I would recommend that you put in four pegs. You will then be free to use or not use as many as four strings, and the instrument will be more adaptable for playing around with various combinations of strings and string spacings.

19. You are now ready to put on the strings, and to hear the voice of the instrument for the first time. There are many possible combinations of number and weight of strings that can be used, some of which will be described later on. The arrangement below is the one I like best all around. The extra string (most dulcimers you see nowadays have only three strings!) allows for four-note chords, yet the instrument can be played in very much the same fashion as a regular three-stringed dulcimer.

Figure 11.



* *Substitute:* Black Diamond *wound 4th* string, or Mapes *wound 4th*. A bronze or "Mona-Steel" wrapped string lasts longer and sounds much better than a string with a softer wrap.

20. Carefully tighten the low (fourth) string until it will give a good clear note. *Check the string tension and pitch constantly* whenever you are tuning, to make sure the string doesn't get too tight.

21. Tune the third string to what musicians call a *fifth interval* above the low string. (In the *do, re, mi* system of description, the low string will be *do* and the third string will be *sol*.)

22. Tune both light strings to *do'* (one octave above the low string).

23. Recheck the tuning of all the strings. If you have any strings out of tune with each other, you will hear a slight, periodic variation of loudness when an out-of-tune pair of strings is plucked. This wavering phenomenon, known as *beating*, will slow down in frequency, and will finally cease, as the strings are brought into proper tuning.

Note. Beating is best heard with strings tuned almost in unison. It can also be detected (by careful listening) in slightly out-of-tune fourth, fifth, and octave intervals.* Plucking the strings *close* to the lower nut will usually cause the beating to be more prominent.

24. The final step of construction is the placing of the frets on the fingerboard. (When a string is pressed down into contact with a given fret, the string portion remaining free to vibrate will be shorter, and it will vibrate at a faster rate. The note that is heard will be higher in pitch. Fretting is thus a means of obtaining at will a number of different notes from the same string.)

    Now, a person with a "good ear for music" will be sensitive to relative pitches of notes. Some combinations of pitch will be quite pleasing; others will be definitely disagreeable, for the ear (plus training and convention?) learns to accept certain note combinations and to reject others. An out-of-tune piano, for instance, is easily recognized by most people.

    In order for a dulcimer to sound "sweet and pure," it must not only be in proper tuning but also be provided with frets placed in the definite and precise pattern that will allow "acceptable" note combinations to be produced. The accuracy required makes this an

* I expect that this is because of the presence of *higher harmonics* (see pp. 18-19) in unison (or nearly so) with each other. For example, in a *do-sol* pair of strings, the *third* harmonic of the low string will be identical in pitch to the *second* harmonic of the higher string (if they're in tune!). For a *do-fa* pair, the *fourth* and *third* harmonics (of low and higher string, respectively) should agree! Now, is that clear?

important operation. Persons with a good ear for relative pitches can tune a dulcimer accurately and then place the frets "by ear" with usually excellent results. Persons whose ears are not yet sharp enough for this can rely upon various mechanical and/or mathematical processes to yield a satisfactory fret pattern. It is therefore wise for me to take a momentary detour, to present what I feel is a really marvelous geometric construction for creating a fret pattern. I will then show how this pattern, with a little bit of care, can be adjusted and adapted to a *particular* dulcimer and set of strings.

Detour:

Constructing a fret pattern: the 'eighteen rule'

If you will play around with a tuned string for a while, you should see (and hear) that, when the string is fretted at its midpoint (approximately), it will give out a note whose pitch is *one octave* above the pitch of the open (unfretted) string. The vibrating length will have been reduced to 1/2 its former value. If you fret the *remaining* length at *its* midpoint, the string's pitch will be raised one octave more, and it will then be two octaves above the open string's pitch. The vibrating length will then be 1/4 of the original (open) length. This behavior seems to occur over and over again: when a string's vibrating length is made half as long as before (by fretting), the pitch that will be emitted by the string will be one octave higher than before.

If the fret points for the first few octaves from a vibrating string are represented on a diagram, an intriguing pattern emerges: the fret points for the higher octaves appear at closer and closer spacings (see figure 12). The first five octave-fret positions have been represented, assuming the open string was tuned to the pitch of C.

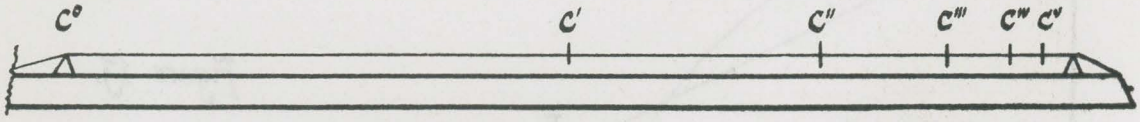


Figure 12.

As you may know, a complete musical scale (chromatic scale) within our culture commonly consists of twelve "equal" steps in pitch (called "half-tones") to the octave. A major scale *(do, re, mi, fa, sol, la, ti, do')* consists of a specific pattern of whole and half-tone intervals, *seven* to the octave. If a vibrating string is to be provided with fret positions

for some sort of musical scale, it must follow from the preceding discussion that the frets will, in general, have to be placed at closer and closer spacings for notes that are higher and higher in pitch. This is where the geometry can be applied, to produce a pattern of marks of shorter and shorter spacings.

For the sake of demonstration, let me first show how the octave-fret pattern in figure 12 can be duplicated:

1. Construct line segment *AB*, arbitrarily representing the open length of a string.

2. Construct line segment *AC*, perpendicular to *AB*, and of a length equal to 1/2 *AB*.

3. Draw *CB*, thereby forming right triangle *ABC*.

4. Using *A* as center and *AC* as radius, draw an arc cutting *AB* at point *D*. Since *AC* was constructed to be 1/2 of *AB*, it follows that point *D* must be the midpoint of *AB*!

5. Construct a perpendicular to *AB* at point *D*, and extend it until it crosses *CB* at point *E*. You will now have right triangle *DEB* which is similar to right triangle *ABC*. A moderate amount of Euclidian geometry can now be used to prove that *DE must* be equal to 1/2 *DB*.

6. Using *D* as center and *DE* as radius, draw an arc cutting *DB* at point *F*. Since *DE* is 1/2 *DB*, it must follow that *F* is now the midpoint of *DB*!!

7. This process may be continued indefinitely, and it will produce a pattern of arcs along *AB* whose spacings are almost identical to the marks in figure 12. The end result is a rather handsome construction of triangles and arcs (figure 13).

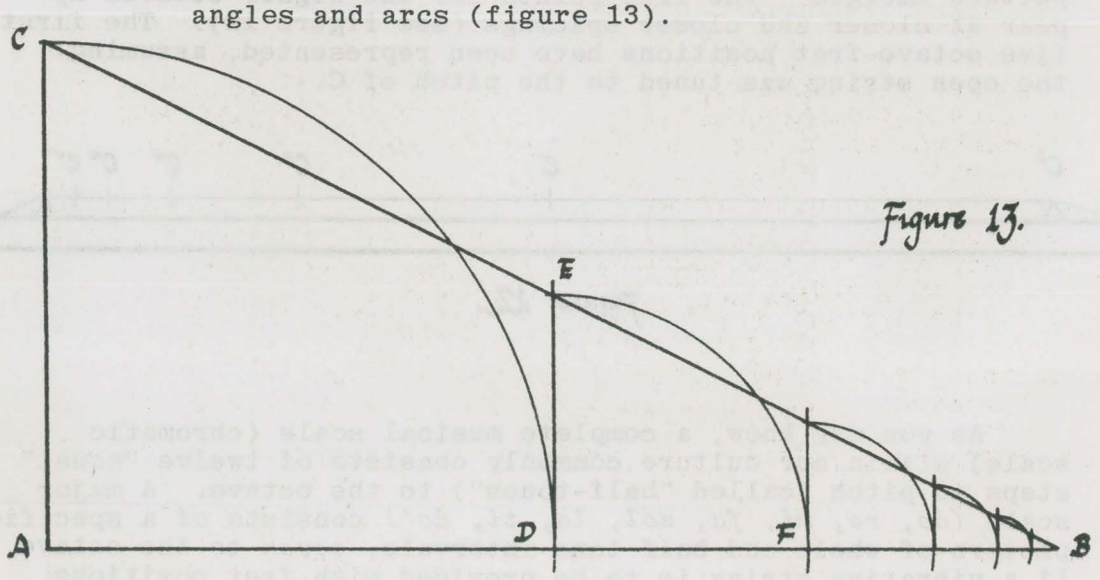


Figure 13.

Now take a look at the construction below (figure 14). The drawing procedure was similar to that used in figure 13, except that the short leg of triangle *ABC* was made 1/6 of the longer leg.

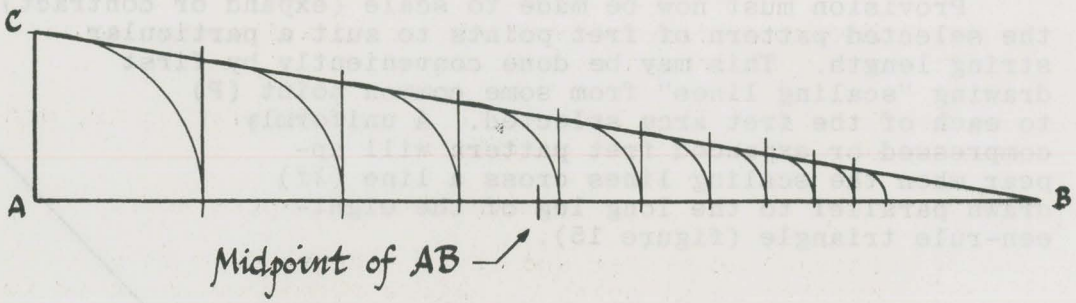


Figure 14.

As you might have expected, several arcs had to be drawn before the midpoint of *AB* was reached. It should be clear at this point that it is the ratio of lengths of *AC* to *AB* that controls the number of arcs between point *A* and the midpoint of *AB*. Furthermore, there should exist the *very special ratio* such that each *twelfth* arc would hit an octave fret point. Mightn't this be the very fret pattern necessary to yield twelve half-tone steps per octave for our chromatic scale??

The answer is *yes*: the required ratio does exist and is quite close to the fraction 1/18.* In other words, if you begin a geometric construction as just described, using a right triangle whose short leg is 1/18 of the long leg, every twelfth arc will land quite close to an octave point.

Once you have drawn a satisfactory eighteen-rule triangle of convenient size (say, 20 inches long), you will need to select arcs for the particular musical scale desired. This

* Mathematical analysis will indicate that the ratio 1/17.835 is necessary for each twelfth arc to make a "direct hit" on an octave point. If you are a stickler for precision and have the proper drawing instruments, this ratio can be easily set up by first drawing the 1/18 ratio of lengths, and then *reducing the length of the long leg by an amount equal to 1/6 of the short leg*. In practice, I have begun to suspect that such accuracy is a bit unnecessary; I have used ratios between 1/16 and 1/20 with surprisingly good results.

is simple, if you will first label the arcs in sequence, beginning with C and using a piano keyboard as a guide. A traditional dulcimer scale is commonly made up of the "unsharped" notes, with the exception of A# substituted for B, if this system of labeling is used (I prefer to include B also!). A slight amount of musical background will enable you to see that this pattern will yield a common major scale in the key of F.

Provision must now be made to scale (expand or contract) the selected pattern of fret points to suit a particular string length. This may be done conveniently by first drawing "scaling lines" from some common point (*P*) to each of the fret arcs selected. A uniformly compressed or expanded fret pattern will appear when the scaling lines cross a line (*XY*) drawn parallel to the long leg of the eighteen-rule triangle (figure 15).

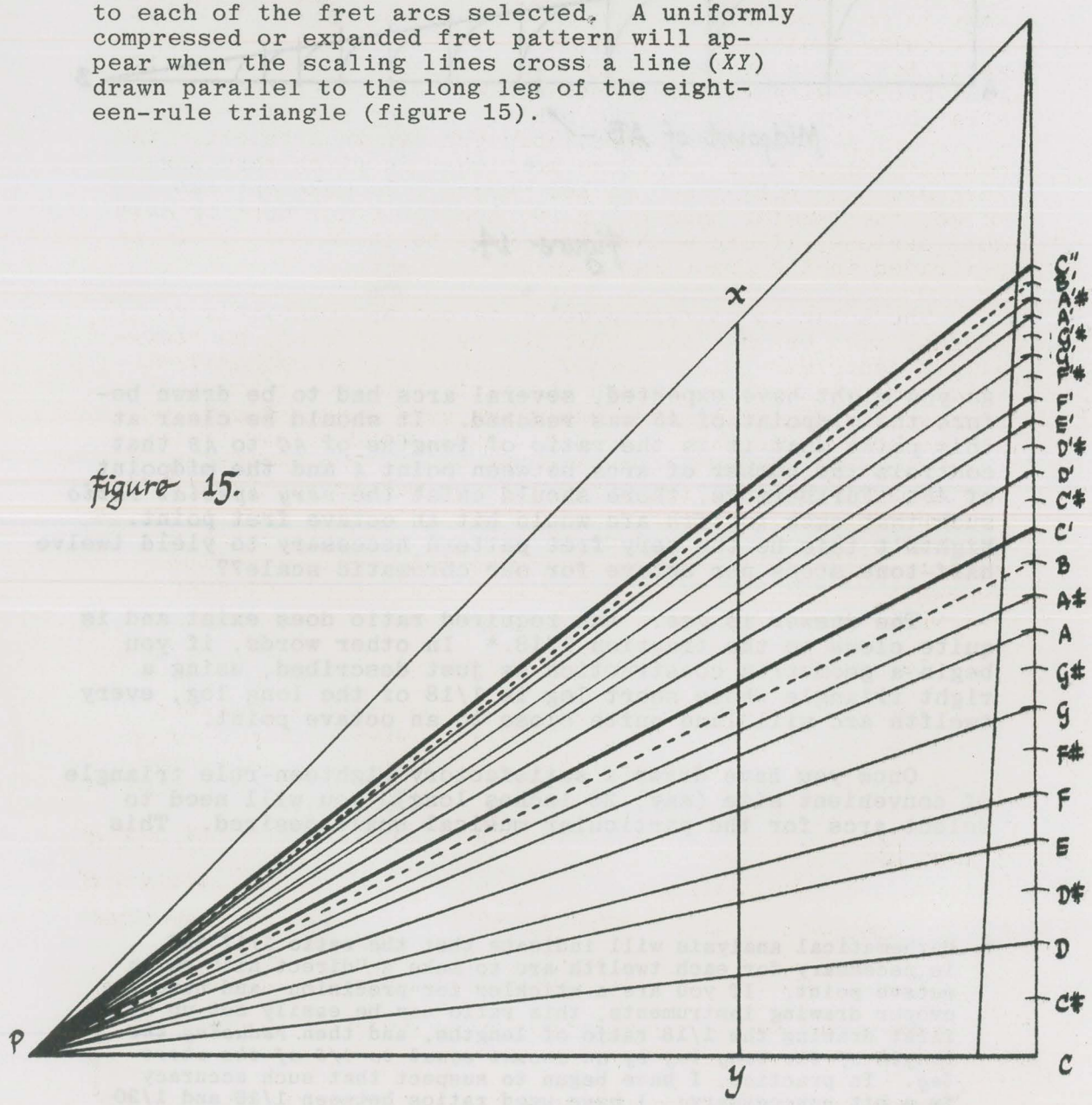


figure 15.

A bit about
The behavior and misbehavior of musical strings and some suggestions on how to compensate

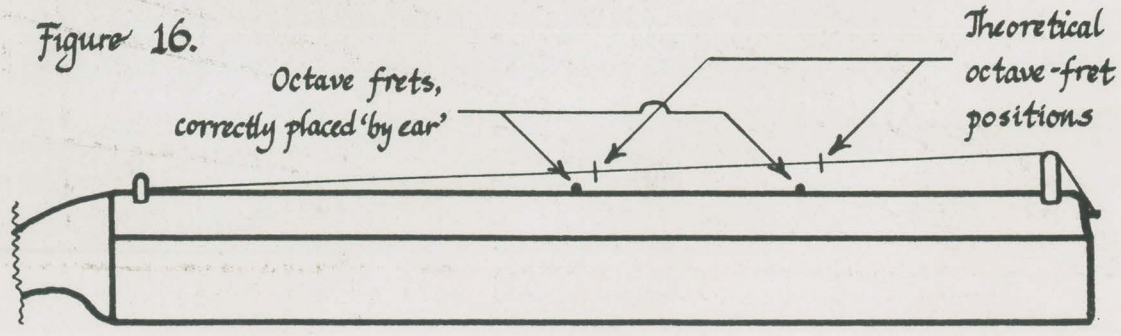
It might seem at this point that a dulcimer could be fretted simply by first using the eighteen rule to create a fret pattern, and then scaling this pattern up or down in proportion to the actual vibrating length of string used. A fret placed right under the midpoint of the string should, by all indications thus far, be usable for producing a note that is one octave above the string's lowest note (for that particular tension). Unfortunately, this doesn't work too well, for, as a string is pressed downwards onto a fret, it must become slightly longer than when it was stretched straight from one nut to the other. At the same time, the string tension becomes appreciably greater than before; the resulting note will therefore be higher in pitch than was intended, and will sound rather "sour." To make matters worse, the tension change for the second octave note is even more serious, if one wishes to adhere to the simple patterns portrayed in the preceding pages.

The solution to this problem is not as impossible as it sounds, once one realizes that theory is, at best, an elaborately contrived image, forged and tempered by mathematics into some reasonable, though abstract, likeness of what it represents. In this case, one's own good sense of hearing is the best authority; the first and second octave frets must first be placed accurately "by ear." The remaining frets may then be fitted into place by making a slightly distorted copy of the geometric fret pattern. The copy line, instead of being parallel to the long leg of the eighteen-rule triangle (see line *XY* in figure 15), must be tilted somewhat, resulting in a non-uniform scaling of the fret arc spacings.

Let me show this process by example:

1. For the moment, assume that the first and second octave frets have already been correctly placed on the new, tuned instrument, "by ear." A side view of the fingerboard might appear as shown in figure 16.

Figure 16.



2. The positions of the octave frets, relative to each other and to the upper nut, will be what determine the dulcimer fret pattern. (It is truly remarkable to me that marking the position of the *lower* nut is now completely unimportant. It is almost as if a phantom image of the lower nut is contained within the positioning of the octave frets.) Anyhow, these fret locations may be marked conveniently on a strip of paper, in preparation for use with the eighteen-rule pattern. Assuming that one end of the paper had been butted up against the upper nut, the paper copy might look like the drawing in figure 17.

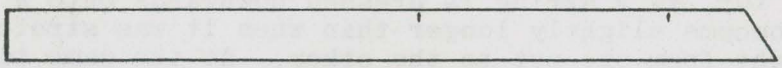


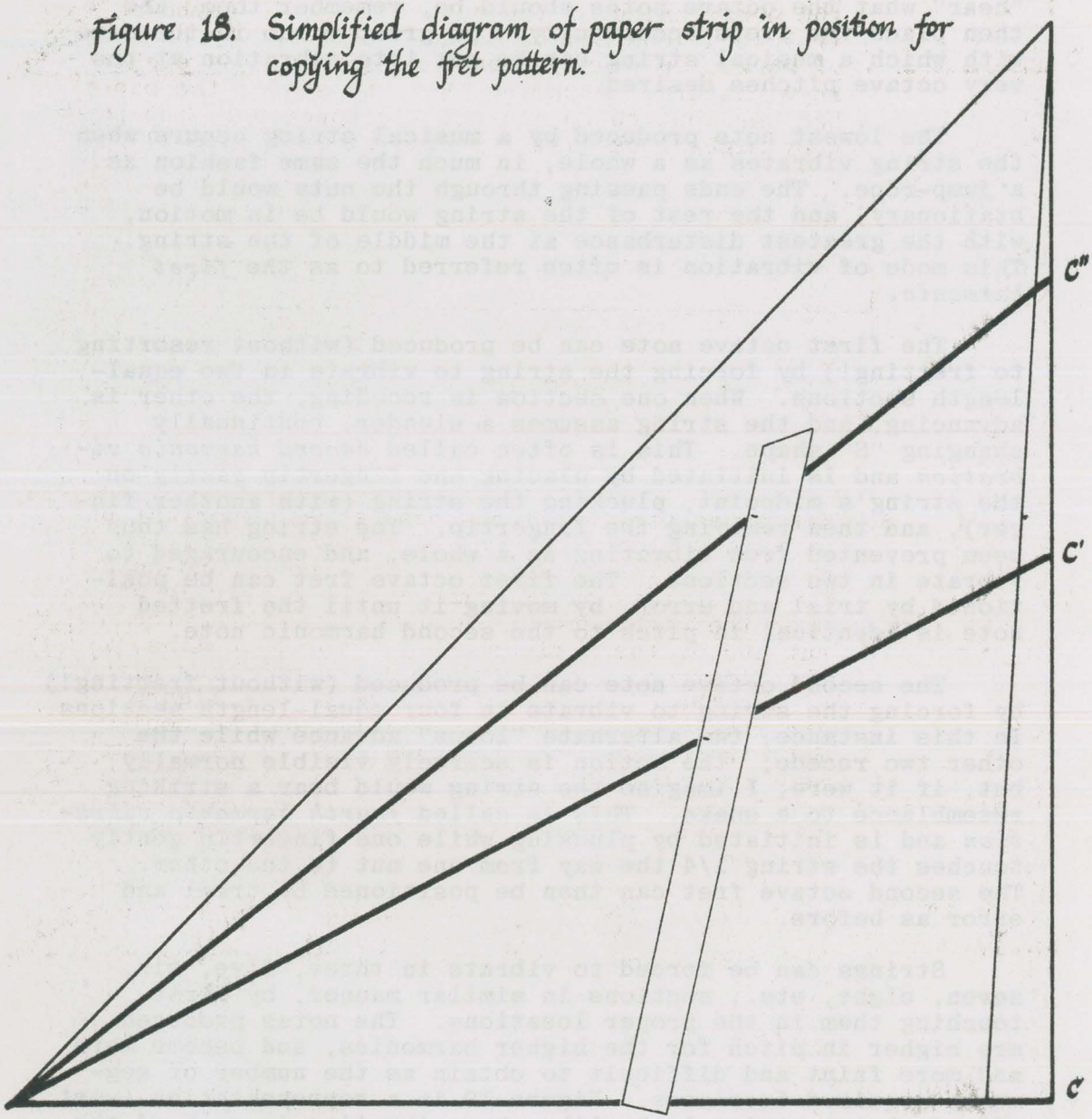
Figure 17.

3. The paper strip will now bear three important bits of information: the relative positions of the upper nut, the first-octave fret, and the second-octave fret. If this paper strip is now carefully set down upon the eighteen-rule drawing, such that the upper-nut end of the strip matches with the C line, while the first and second octave marks coincide with the C' and the C" lines, respectively (see figure 18), the remainder of the fret pattern can be copied immediately. The original fret pattern will thus have been adjusted not only to the particular string length used, but will have been further refined to take care of the effects of tension change when the string is fretted!

* * *

(No more until you have studied figure 18.)

Figure 18. Simplified diagram of paper strip in position for copying the fret pattern.



Since the whole fret pattern will depend upon an accurate placement of the octave frets, this operation is both significant and critical. The tricky part is really to be able to "hear" what the octave notes should be, remember them, and then place the frets accordingly. Of great value is the ease with which a musical string can be set into vibration at the very octave pitches desired.

The lowest note produced by a musical string occurs when the string vibrates as a whole, in much the same fashion as a jump-rope. The ends passing through the nuts would be stationary, and the rest of the string would be in motion, with the greatest disturbance at the middle of the string. This mode of vibration is often referred to as the *first harmonic*.

The first octave note can be produced (without resorting to fretting!) by forcing the string to vibrate in two equal-length sections. When one section is receding, the other is advancing, and the string assumes a slender, continually changing "S" shape. This is often called *second harmonic vibration* and is initiated by placing one fingertip *gently* on the string's midpoint, plucking the string (with another finger), and then removing the fingertip. The string has thus been prevented from vibrating as a whole, and encouraged to vibrate in two sections. The first octave fret can be positioned by trial and error, by moving it until the fretted note is identical in pitch to the second harmonic note.

The second octave note can be produced (without fretting!) by forcing the string to vibrate in four equal-length sections. In this instance, two alternate "loops" advance while the other two recede; the motion is scarcely visible normally, but, if it were, I imagine the string would bear a striking resemblance to a snake. This is called *fourth harmonic vibration* and is initiated by plucking while one fingertip gently touches the string 1/4 the way from one nut to the other. The second octave fret can then be positioned by trial and error as before.

Strings can be forced to vibrate in three, five, six, seven, eight, etc., sections in similar manner, by first touching them in the proper locations. The notes produced are higher in pitch for the higher harmonics, and become more and more faint and difficult to obtain as the number of segments required increases. Figure 19 is a representation (sort of) of what a string looks like when vibrating in each of the first four harmonics. I think that the best way, by far, to study this peculiar type of motion is to tie one end of a clothesline to a stationary object, and then wiggle the other end.

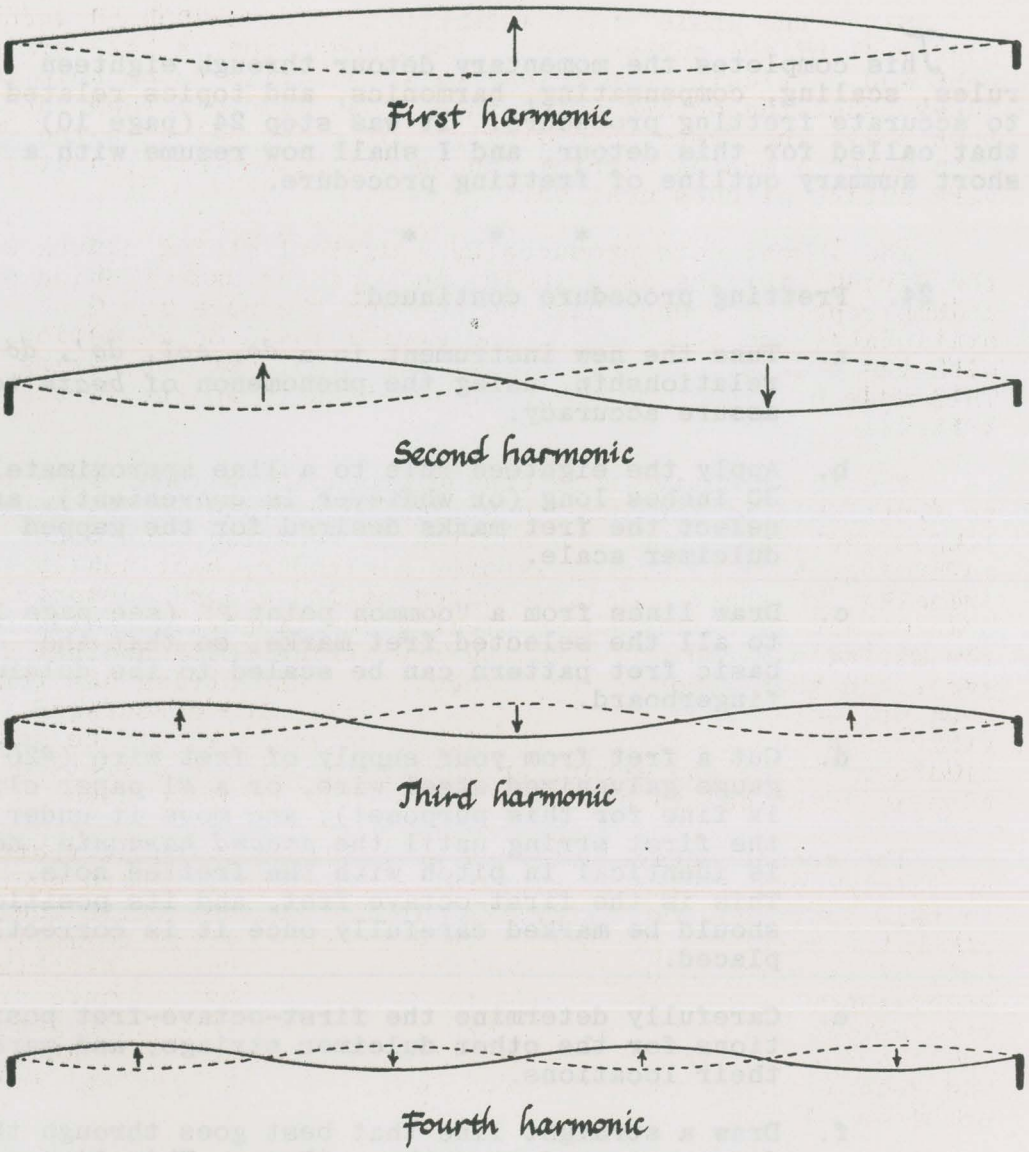


Figure 19.

Representation of a musical string when vibrating in each of the first four harmonics. I recommend once again that you observe the behavior of a taut, light rope when set into vibration. It makes a fascinating and lovely sight.

A return to construction procedure

This completes the momentary detour through eighteen rules, scaling, compensating, harmonics, and topics related to accurate fretting procedure. It was step 24 (page 10) that called for this detour, and I shall now resume with a short summary outline of fretting procedure.

* * *

24. Fretting procedure continued:

    a. Tune the new instrument in a *do, sol, do', do'* relationship, using the phenomenon of *beats* to assure accuracy.

    b. Apply the eighteen rule to a line approximately 30 inches long (or whatever is convenient), and select the fret marks desired for the gapped dulcimer scale.

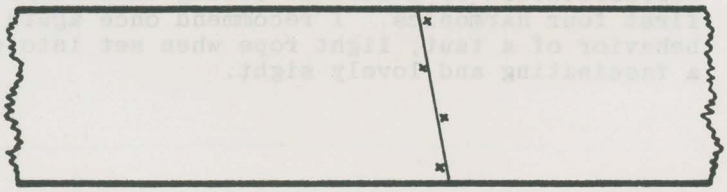
    c. Draw lines from a "common point *P*" (see page 14) to all the selected fret marks, so that the basic fret pattern can be scaled to the dulcimer fingerboard.

    d. Cut a fret from your supply of fret wire (#20 gauge galvanized steel wire, or a #1 paper clip, is fine for this purpose!), and move it under the first string until the *second harmonic* note is identical in pitch with the fretted note. This is the first-octave fret, and its position should be marked carefully once it is correctly placed.

    e. Carefully determine the first-octave-fret positions for the other dulcimer strings, and mark their locations.

    f. Draw a straight line that best goes through the first-octave-fret marks. (*Note:* This line may end up slightly slantwise across the fingerboard, as shown in figure 20.) When in doubt, *favor* the outside strings for your fret line.

Figure 20.



g. Similarly, determine and mark carefully the position of the second octave fret, by using the *fourth harmonic* pitch of each string in turn.

h. Use a long strip of paper to copy the relative locations of the upper nut and the middle of each of the octave frets. Adding-machine paper is fine for this purpose.

i. Orient the paper strip properly on the eighteen-rule drawing (see figure 18), and copy the remainder of the fret pattern.

j. Carefully mark each fret position along the centerline of the fingerboard, and then draw straight lines through these marks, parallel to the first-octave-fret line. (In some cases, the slants of the first- and second-octave frets may disagree to such an extent that an average slant of some sort may have to be devised.)

k. If your work has been accurate, frets can now be placed at each of the fret positions just determined, and the dulcimer will be ready to play. If you are at all *unsure* of your work, this whole process can be done on a strip of masking tape stuck to the top surface of the fingerboard, and the frets then glued on temporarily (use contact cement!) to see if the musical scale is correct.

l. The exact method of permanently attaching the frets will depend upon what sort of fret material you use. I now prefer to file grooves on the *sides* of the fingerboard, where the ends of each fret will be. If the fret wire is then cut and bent to fit, it can be applied rapidly and easily, and held securely with contact cement.

m. After the glue is dry (almost at once!), retune the dulcimer, and go to some far lonesome place to get acquainted.

A few words about Wood and glues

Many persons ask me about what are the "best" kinds of wood, glue, fret material, wood finish, and so on, as if they really thought I knew all the answers. I am not so sure that there *is* a set of right answers to the above questions, for every day finds new materials on the market, and new ways of preparing the old. I have tested and selected according to my own tastes and approaches, and I think that's part of the fun of it. For instance, I like to use "Styreseal" clear wood finish, because it works well and smells good. Since the dulcimer top is stiffened to such an extent by the staff, the choice of wood and degree of seasoning don't seem to be very critical, beyond visual taste. One-eighth-inch spruce is always a good soundboard wood, but there are a number of 1/8-inch-thick plywoods that come in big sheets and give excellent results. Probably a wise move is to visit a cabinetmaker's shop: there you can see a lot of what is available, and perhaps be allowed to take home some scrap pieces that are big enough for your purposes. For more exotic woods, there's always Craftsman Wood Service (2727 South Mary Street, Chicago, Illinois 60608).

For glues, I like the "Weldwood" products especially. The white "Presto-Set" glue is fine for most parts of the dulcimer *except for the scroll*. The scroll requires something that sets up permanently, and that is heatproof and waterproof ("Plastic Resin Glue," by the same maker, has served me well for this).

Although there is a special wire (with a "T" cross-section) made for frets, I have already indicated that I prefer #20 gauge galvanized steel wire. The #1 paper clip is good also, since it is so easily available; by cutting off the long side, you get a little fret with its ends already curved!

I once asked Frank Proffitt (dulcimer and banjo maker from Vilas, North Carolina) about his experiences and suggestions with regard to dulcimers, and this is how he replied:

Some comments by Frank Proffitt

A lot of people wanting Dulcmores now.

You know Dulcmers might sell too if Made Right.

I made two Dulcmers out of Popalar
Some how they wasent Popalar.

I sent one to fellow made of Sasafras.
He didn't like the tone But crazy about the Tea it made.

Dog wood makes good Dulcmers but Bad for Fleas.

Sour wood Makes a Beauty But not sweet toned
Seem like.

I made one for the Andrew Jackson off springs.
This I made of old Hickory.

One fellow sent a Dulcmer Back Complaining the pegs
Slipped. I glued them good. I presume they are holding
I hant heard Nothing yet.

Sandel wood Makes good one for them who
play with their Toes.

Most of my oak Dulcmers go to Oakland Calif.

I have had one order from our Prison Camp
for a Dulcmer he wanted it Fretted with Hacksaw Blades.

I guess I had Better close these few lines
Hope the Hymns picked up your Spirits if not try
the other way

Frank

A few words about
Tuning, chording, and playing the dulcimer; presented intuitively

After talking to and observing and thinking about a number of persons, I am beginning to suspect that careful *listening*, *hearing*, and *remembering* of musical sound is an absolutely essential part of the makeup of a good musician. The amount and type of experience within your background will probably have marked effect upon the texture of your playing. The more contact that you have had with music, the greater the chances that you will have a large store of remembered melodies, harmonies, and musical "clichés" to draw upon; the greater your inventiveness and ingenuity, the greater the possibility that you will play and compose by ear. Although I can not do very much toward increasing this area of experience in the time and space available, I can and shall present some ideas and attacks that may cause you to draw upon what you have already acquired.

The instrument that you have just constructed is a bit more complicated than the commonly seen (three-string) dulcimer. The soundbox has been altered to make the tone louder and richer (especially in the low notes), and it has been tuned and fretted so that it can produce an amazing variety of chords. I would like to acquaint you with some of these chord possibilities; later on, I shall discuss how the instrument can be converted into a more conventional three-string dulcimer.

* * *

I want you to play a sequence of chords that seem (to me) to contain a melody. I will present this sequence in a numbered tablature form, and leave it up to you as to exactly how you play it. I will use numbers to represent the particular frets to be used, with "0" standing for an unfretted string. The numbers from left to right stand for the first, second, third, and fourth strings in order. For example, the chord 2012 would call for strings to be fretted as shown in figure 21. The dulcimer should be tuned in the *do*, *sol*, *do'*, *do'* relationship described earlier. *Listen* as you play.

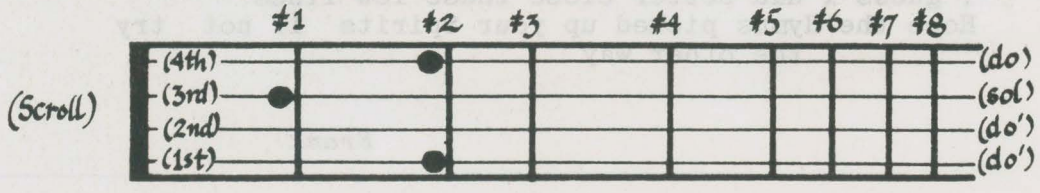


Figure 21. (Please note the 'extra' (or B) fret!)

For preliminary practice:

Scale tune #1	*Scale tune #2*	*Scale tune #3*
0000	0012	0020
1001	1111	1003
2000	2012	2100
3010	3111	3010
4002	4222	4020
5333	5232	5450
7444	7454	7444
8450	8555	8670

Note: The first tune above is probably recognizable as a standard major scale within chords; the second is a major scale enclosed within mostly minor chords; the third is a major scale enclosed within quite a number of rather horrible-sounding chords. If I may conjecture a bit, I would imagine that the great degree of unacceptability in the third scale tune is due to the normally little-used note combinations and chord sequences. This may be what "listening and remembering" within our own musical culture will do!

Now, try this:

(start here)	*(continue)*	*(continue)*
4200	5232	4032
3100	4222	5333
2000	5333	5343
2020	7444	3111
2012	8555	2222
1003	*	*
0013	8565	3333
1001	9565	3335
2000	7444	4001
*	8450	3001
4200		3000
3100		2000
2000		
2020		
2012		
1003		
1001		
0002		

Here is one more to try:

2000	repeat	4200	repeat
2xxx	the	4xxx	the
2xxx	first	2xxx	first
3011	column	4xxx	column
4xxx	|	8450	|
4022	|	4xxx	|
3xxx	|	4200	|
2xxx	|	2xxx	|
1010	|	4xxx	|
2xxx	|	4022	|
3xxx	|	4xxx	|
4200	|	5333	|
0xxx	|	4xxx	|
3010	|	4200	|
2000	|	3xxx	|
xx2x	|	2xxx	|
1003	|	2012	|
0002	|	1003	|

(The symbol "x" means *do not play this string!*)

A 'classical' finger exercise

I have often wondered about what it is in a joke, an anecdote, and in certain stories I have heard, that causes the sudden flood of laughter, or surprise, or intense feeling of one sort or another. It has been explained to me that it is the introduction of the unexpected, the sudden change of pace or direction, that causes this effect. Certainly, when the punch line of a joke is reached, the mind is abruptly snapped from its preconceptions to the reality of the end remark. I often think that I see this same type of thing at work in the more interesting and lovely kinds of music I have heard. If a melody weaves about unexpectedly, and if the tempo and rhythm change now and then, the effect is rather powerful. It's a way of keeping the listener off balance, so to speak, and, depending upon what is done, and how well, the effect can range from the hilarious to the exciting to the achingly beautiful.

One style of playing that seems to lend itself well to the unexpected is what I call a "classical dulcimer" style (for lack of a better name). A dulcimer played in this way sounds quite a lot like a classic guitar. Technically, it is fairly easy to do, for it involves picking the strings (either individually or in groups) with just the index finger of the right hand. Learning the following finger exercise will, I believe, help you to educate your finger to this style.

In this exercise, the strings will be plucked in an almost unchanging order, beginning with the first string, followed by the fourth, the third, and then the second, after which the pattern repeats itself. For a *chord* like 2000, for instance, my tablature would look as follows:

```
2xxx
xxx0
xx0x
x0xx

2xxx
xxx0
xx0x
x0xx

etc.
```

To save time and space, and since the picking pattern will remain essentially the same, let me designate such a patterned chord by enclosing it within parentheses.

Thus:

```
(2000)  now means:  2xxx
                    xxx0
                    xx0x
                    x0xx

(4200)  now means:  4xxx
                    xxx0
                    xx0x
                    x2xx

(7450)  now means:  7xxx
                    xxx0
                    xx5x
                    x4xx

... etc. ...
```

Finger exercise:

```
(2000)      (2000)      (8450)      (2000)
(3001)      (3001)      (7450)      (3001)
(4002)      (4002)      (5003)      (4002)
(5003)      (4002)      (5003)      (5003)
(4002)      (5003)      (4002)      (4002)
(3001)      (8005)      (2000)       4001
(2000)       7xxx       (1003)       3xxx
(1003)       xxx4       (1003)       3000
             xx4x                    2xxx
             5xxx                    1xxx
            (4444)                  (2000)
```

This is my first attempt at devising a tablature for dulcimer music. I can see, with some uneasiness, how much it resembles a high-powered mathematics problem in its *appearance*. If you are unfortunate enough to have grown (groan?) up with a dislike for mathematics, the above horrifying reminder may cause you to want to quit before you get started. I suppose that *any* symbolic representation of music will be complicated visually. Anyhow, I fully believe that a little patient study and concentration and practice of the pattern described will make the notation unfold without further trouble.

* * *

Once you have more or less mastered the finger exercise, you should be ready to introduce a little bit of the "unexpected" that I mentioned earlier. I have done this in the recording of "Finger Exercise" (in the record accompanying this brochure) by simply leaving out a note here and there.

For example, I play:

1xxx
xxxx
xxx3
xx0x , instead of (1003).

If preceding notes have been played at a steady rate, the *gap*, unimportant as it looks, produces a little jolt, just like the usually punctual friend who comes late, or not at all. There are other little gaps and changes in the recording; for instance, toward the bottom of the second column in the exercise, and close to the end, where *chords* instead of single notes are played. You will probably produce these gaps unintentionally; if so, and if the effect is pleasing, *remember* it!

One of the best samples of the "classical dulcimer" style that I can demonstrate at present is "Drink to Me Only with Thine Eyes," which appears on the record and is notated in simple (chord) form on page 26 of this booklet!

Something new:
The bagpipe-tuning

If you have ever heard the sound of the bagpipe, you will have been exposed to a very primitive type of accompaniment to melody: the *drone*. The bagpipes most usually seen and heard in this country use three reeded pipes, two tuned in unison, and one an octave below. These three pipes continually emit notes of constant pitch, while a fourth pipe (the chanter) is used to play the melody. There is an amazingly large number of notes that can be played along with the drones and that are pleasing to the ear. I shall now describe a "bagpipe" tuning for the four-string dulcimer, so you can play and *hear* this type of sound.

First, tune the *third* string (next to the lowest) up until it is *fairly* tight (not *too* tight!), and then tune the two light strings *down* until they are in unison with the third string. Next, tune the fourth (low) string down until it is *one octave below* the other three strings. This would be called a *do, do', do', do'* tuning, in the nomenclature I have used previously (i.e., using the low string's pitch for *reference do*).

Now, play the scale that you have for the first string, beginning with that string unfretted, and going on up to the eighth (octave) fret. If you also play the drones, and if your hearing is like mine, your ears will "accept" the note combinations with varied amounts of pleasure. Some combinations (like the 2000 or the 4000 chord) will stand out as being especially lovely, while one combination, the 7000 chord, is, I think, just *TERRIBLE*. If you leave out the 7th fret, you will be playing what amounts to a regular major scale with the seventh note flatted. Some melodies (for example: "Old Joe Clark") use this particular *set* of notes instead of our usual major scale.

Next, play a scale on the first string, sounding the drones as before, but start on the *third* fret, and leave out the "terrible" (7000) chord. Interestingly enough, this will be a common major scale, and these are the frets and spacings usually found on a traditional dulcimer!

There are names for several of these "sets" of particular notes and spaces. The sets are called *modes*, and you have just played the *Mixolydian* (flatted seventh) and the *Ionian* (present-day major scale) modes!

Something else:
Playing with quill and noting stick

Since the traditional dulcimer is noted (pun unintentional) for its droning similarity to the bagpipe, perhaps this is as good a time as any to describe a very common and quite exciting method of playing the dulcimer, involving the use of a quill plectrum, and a hard cylindrical object (such as a wooden dowel) for fretting.

Traditionally, the quill was a large bird feather (goose or turkey, for instance) with its nib sharpened down to a long flexible point. A simple substitute is *anything* long and flexible, such as a sharpened collar stay, a short length of music wire, several broom straws, a thin sliver of hickory, or a piece of Younameit.

To play with a quill, the dulcimer is first placed in the usual way across the lap, with the peg box to the left. The quill is held in the right hand, and the strings are struck by a rapid back-and-forth motion of the quill point, a couple inches or so up from the lower nut. The hand moves in a steady rhythm, back and forth, and, if the strings are struck during each passage of the quill, the sound will be a steady, repetitive "bid-dy-bid-dy-bid-dy." If the strings are *missed* periodically, however, the effect can be an exciting, galloping "bum, biddy-bum, biddy-bum, biddy-bum," or perhaps "bum, biddy-bum, biddybiddy-bum, bum, biddy-bum, bum, bum, biddybiddy-bum" if the *misses* occur at unpredictable times.

The noting stick is held in the left hand and pressed downward against the first (or melody) string at whatever fret point is desired. As the noter is *slid* from fret to fret, a delightful and characteristic slur or "whistle" is heard when the string changes pitch.

When you try this with the four-string dulcimer, you may discover that the three drones will just about *drown* out the sound of the melody string. This is easily cured by noting *both* first and second strings, by inserting a small wedge into the gap in the tail of the instrument, or by attaching a "C" clamp to the lower end of the fingerboard (be sure to use padding to avoid denting the wood!). The wedge, or the clamp, of course, serves to stabilize the lower end of the soundboard (by obstruction or by inertia), leaving the *middle* portion of the top to vibrate unimpeded under a fretted string. The note of the fretted string is thus *forced* to stand out above the drones!

The finger style of playing

One method of playing the dulcimer that I like especially well involves using the right index finger in a back-and-forth motion similar to (and with much the same result as) the quill method just described. The bouncing bum, biddy-bum rhythm appears as before, but proper care and placement of the hand makes it possible to play the drones selectively, and as often, or seldom, or as loudly or as softly as desired. In addition, the quality or "crispness" of the notes produced can be varied between wide limits by changing the *location* of the picking finger along the string.

The finger style is difficult to execute, because of the *precision* of placement required; the back of the hand must remain almost motionless, to provide a stable reference position for the index fingertip as it moves in an arc and grazes the strings. The fingernail must be long enough to strike the strings without the flesh part touching also, but not so

long as to endanger the wood surface of the fretboard, or to be in accord with the latest fashion requirements (1/16 inch long, and well rounded, is about right).

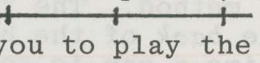
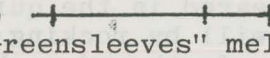
First, brace the right thumb against the near side of the fingerboard, a couple inches or so from the lower nut, and tilt the back of the hand in such a way that the *straight and stiffened* index finger can sweep in an arc without quite touching the melody string. Now, wiggle it up and down in a *steady* to-and-fro motion, *keeping it stiff and straight as possible.* Slowly rock the back of the hand forward until the index fingernail just barely begins to graze the melody string as it passes by. You should immediately hear the steady bid-dy-bid-dy-bid-dy rhythm that first appeared in the quill method. The "misses" can be introduced at will by rocking the *back* of the hand slightly away from the fretboard each time a gap is to be produced. The drones can be brought in as much as desired by repositioning the back of the hand so that the fingernail grazes these strings also. I personally like to keep repositioning the back of the hand so that the drones are heard with varying loudness or softness. I also like to move my hand along the string, toward or away from the lower nut, to vary the harshness of the notes.

One tuning for a minor scale

Many melodies, especially in some of the old songs, use some form of what is called a "minor scale," whose most obvious characteristic, I suppose, is the *flatted third* note. The "Greensleeves" tune and the Christmas carol "We Three Kings" are set primarily within minor scales. The dulcimer, with its gapped fret pattern, will not allow a minor scale to be played along with the drones and still "sound right" without retuning. Follow me, and I shall attempt to show you why.

First, retune your dulcimer to the *do, sol, do', do'* arrangement and play a major scale on the first string (start with that string *open*), sounding the drones. Notice the seventh note (*ti*), if sounded with the drones, is not *quite* so *TERRIBLE* as it was in the bagpipe tuning. If you will sound the two notes 7x0x, you may see the possible answer: these two notes sound well together. One of the horrible combinations has been removed, and a sweet-sounding pair substituted. If you play the major scale that starts at the *third* fret (with the drones), no combination sounds very bad, but the scale seems to start wrong and to end "up in the air somewhere," so to speak. The low drones, tuned a fifth interval apart, have somehow forced the "starting note" of the scale to be a *specific* one (first string open), rather than a choice of two. This I cannot explain to you; you have to *hear* that it is so!

If you will now try to play the "Greensleeves" melody, you will find that the second note in the tune refuses to appear; it belongs in the gap between the first and second frets. The tune calls for a *mi*-flat note, for which there seems to be no fret!

Try this: tune the first string so that, when it is fretted on the first fret, it will be in *unison* with the second string. Now, *starting* with the first string fretted on the first fret, attempt to play "*do, re, mi*" as before, and sound the drones. Notice that the third note comes out flatted as required, and the relative fret points have changed from  to  . This tuning will allow you to play the "Greensleeves" melody, as well as a number of other minor tunes (you may find it necessary to use the third string to carry the melody for some of the lower notes).

Now, sound the fourth, third, second, and first strings open, and listen to the notes that appear. If you have a good ear, you will understand why this could be called a *do, sol, do, ti-flat* tuning! It will allow you to play in the *Aeolian* mode (disregarding the seventh fret), with drone accompaniment.

The six modes

Thus far, I have made only slight mention of the modal scales used in the old songs, and, indeed, it is rare that they are heard any more. The *names* of the modes are, I think, musical in themselves, and the *sound* of the modal scales and melodies, played with properly tuned drones, creates all sorts of mental tensions and images. For these reasons, I would like to name and describe the different modes, and show how the dulcimer can be tuned to illustrate each.

As I have said before, a mode is a musical scale, having eight notes to the octave, with a particular pattern of whole- and half-tone intervals. The modal names and scale descriptions (in the *do, re, mi* system) are as follows:

Ionian: do, re, mi, fa, sol, la, ti, do'

Dorian: do, re, mi-flat, fa, sol, la, ti-flat, do'

Phrygian: do, re-flat, mi-flat, fa, sol, la-flat, ti-flat, do'

Lydian: do, re, mi, fa-sharp, sol, la, ti, do'

Mixolydian: do, re, mi, fa, sol, la, ti-flat, do'

Aeolian: do, re, mi-flat, fa, sol, la-flat, ti-flat, do'

I want you to listen to these scales now, in sequence. In order for you to make a better comparison, the scale "starting note" should, I think, be the same pitch each time. This will cause a certain amount of difficulty, for the first (melody) string will have to be playable in a wide variety of tensions. For this demonstration, you should tune the three drones as low as possible, and play and fret *gently*; otherwise some notes will sound sour.

So: first, tune your dulcimer in a *do, sol, do', do'* relationship, using the *lowest* tensions possible that will give good notes.

Ionian mode:

Fret the first string on the third fret, and then tune that string *up* until it gives a note that is *one octave* above the second string open. Play the scale and drones, starting at 3000, and avoid the seventh fret.

Dorian mode:

Fret the first string on the fourth fret, and tune that string *down* until it again gives a note *one octave* above the second string. Play the scale and drones, starting at 4000, and avoid the seventh fret.

Phrygian mode:

Fret the first string on the fifth fret, and tune it down again until it sounds a note one octave above the second string. The scale will start at 5000. Avoid the seventh fret!

Lydian mode:

Similarly, tune and play the first string, using the sixth fret. Complete scale begins at x000 and then continues on the first string. Avoid the seventh fret!

Mixolydian mode:

Similarly, tune the first string, using the eighth fret. Note that this places the open first string in unison with the open second string. Complete scale begins at 0000 and skips the seventh fret.

Aeolian mode:

Similarly, tune the first string, using the ninth fret. Complete scale begins at 1000, missing the seventh fret.

In doing this run-through, please don't take me completely literally, but *dwell* within each tuning for a while, making up tunes and note-sequences in addition to just playing the scales. Allow the modes to "soak in"!

Some intermediate summary remarks and a table of other tunings

Up to this point, I have attempted to clarify several things to you by example: the surprising variety of chord possibilities on the dulcimer, some of the effects obtainable by striking the strings at various positions and in various ways, the modal behavior of the gapped fret pattern, and the peculiar "limiting" consequence of the drones tuned a fifth interval apart (see bottom of page 31).

It turns out that there is a confusingly broad number of possible tunings of drones and melody string, each having its own natural "beginning note" and mode and its own characteristic flavor and set of chords. I really don't feel qualified to discuss these tunings exhaustively, nor am I convinced that this type of approach would be particularly beneficial. On the other hand, it might be wise simply to list some of the more interesting tunings that I am aware of at present, and then leave it up to you to delve into them according to your own discretion.

Some tunings, beginning notes, and modes available (if the seventh fret is avoided!) appear on the next page. It is in table form, and is thus *highly concentrated*, so don't panic. I shall begin with a few of the tunings already mentioned, and then go to others of varying usability. As you become more and more accustomed to the sound and behavior of the tuned drone and melody string combinations, you may begin to discover and to invent your own tunings.

	String Tuning				*Starting Note*	*Mode*
	(4th)	*(3rd)*	*(2nd)*	*(1st)*		
a)	do	sol	do'	do'	0xxx	Mixolydian
b)*	do	do'	do'	do'	0xxx or 3xxx	Mixolydian or Ionian
c)	do	sol	do'	ti-flat	1xxx	Aeolian
d)	do	sol	sol	sol	3xxx	Ionian
e)	do	fa	fa	fa	0xxx	Mixolydian
f)	do	fa	do'	do'	3xxx	Ionian
g)	do	fa	do'	ti-flat	4xxx	Dorian
h)*	do	sol	do'	fa'	4xxx	Dorian
i)*	do	do'	sol'	sol'	3xxx	Ionian
j)	do	mi	sol	sol	3xxx	Ionian if chorded+
k)	do	fa	la	do'	3xxx	Ionian if chorded+
l)*	do	sol	mi'	do'	0xxx	Ionian if chorded+ and 7th fret used
m)*	do	sol	do'	mi'-flat	5xxx	Aeolian if chorded+ and 7th fret used

* Take care to start with the 4th string fairly low. Otherwise, you may break a string!

\+ *Listen* to the 3333 and 4444 chords!

Converting to a 'three-string' form of dulcimer

The four-string dulcimer, by virtue of its many four-note chord possibilities and numerous drone tunings, is an excellent solo instrument. It also can sound well when used to provide melody, counter-melody, or harmony with other instruments, or with the human voice. In this sort of application, it may be preferable to *reduce* the number of drones and *bring out* the loudness of the melody string.

I have found the following procedure to be quite practicable: I simply cut extra grooves in the upper and lower nut, so that the *second* string can be brought close to the *first*, and the *third* string repositioned along the centerline of the fingerboard. The result is, in effect, three strings, with a louder (double) melody string (see figure 22).

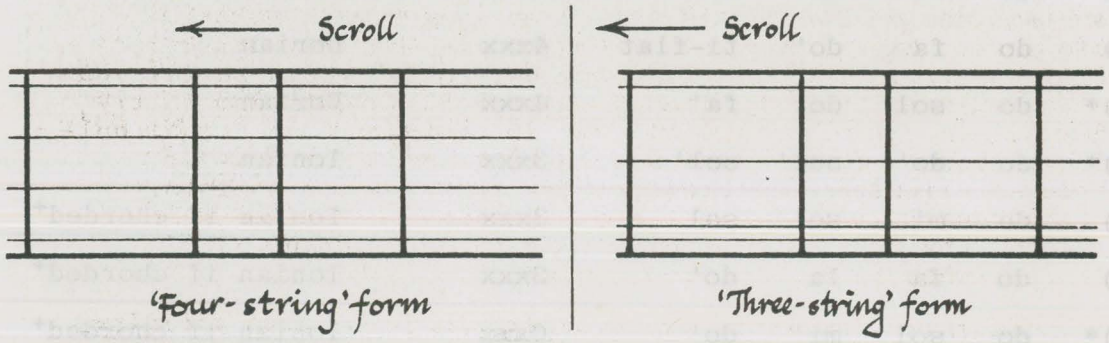


Figure 22.

The nuts will end up with six grooves each, and a well-chewed appearance (see figure 23), but the dulcimer will be easily convertible just by loosening the strings and slipping them over into the proper notches.

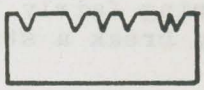


Figure 23. Illustrating the 'well-chewed' appearance of a nut (seen from scroll end)

The instrument in the three-string form can be tuned according to the table on page 35, if the second string is considered to be nonexistent.

Some comments on Selecting dulcimer strings

You may happen to hit upon a particular tuning that you prefer above all others (my own preference, for example, is the *do, sol, do', do'* tuning). This may warrant your experimenting with and selecting musical strings other than those mentioned so far. For instance, a traditional three-string dulcimer is more commonly tuned in a *do, sol, sol* relationship (three evenly spaced strings, with the two nearest the player tuned in unison). If you like this form, it might be sensible for you to remove entirely the double melody string (see figure 22) and replace it with a single string that is more nearly identical to the middle string (use a Black Diamond second or third string, for example). The heavier melody string would be tighter in this tuning, would tend to go off pitch less easily, and would probably sound better.

An excursion into creating special effects with unique combinations of strings is available to you as a maker of dulcimers. Experimental instruments are somewhat unpredictable, however. I expect that my best advice would be for you to obtain samples of strings of different weights and to try them out in various combinations and tunings on an actual dulcimer. Lower, more mellow sounds will come from heavier strings; lighter, brighter effects from thinner strings. I have usually had the best results when the strings were selected (by trial and error) so as to be at about *equal tensions* when in the desired tuning.

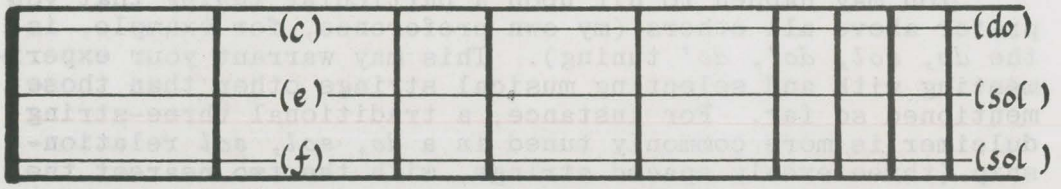
The following table and diagrams show the more satisfactory string types, tuning combinations, and arrangements that I have worked with to date:

Reference	*Manufacturer*	*Instrument*	*String no.*
a)	Gibson	guitar	5th
b)	Gibson	guitar	3rd
c)	Gibson	5-str. banjo	3rd
d)*	Black Diamond	5-str. banjo	4th
e)	Black Diamond	5-str. banjo	3rd
f)	Black Diamond	5-str. banjo	2nd
g)	Black Diamond	5-str. banjo	1st

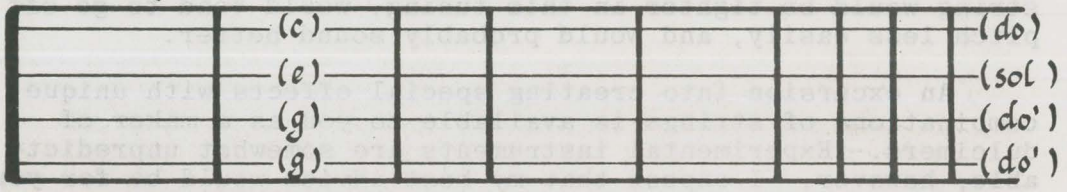
* This is a fair substitute for string c).

Figure 24a. String placements and relative tunings.
(Refer to previous table.)

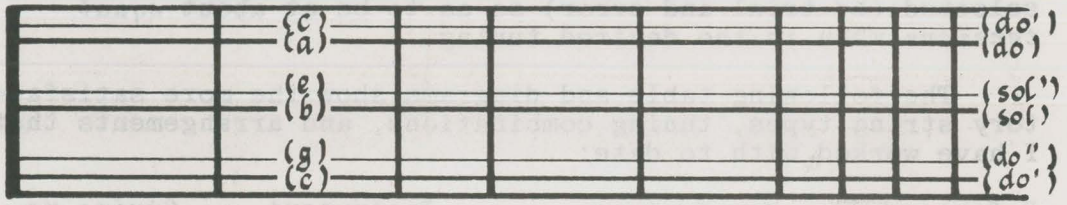
Traditional



Four-string



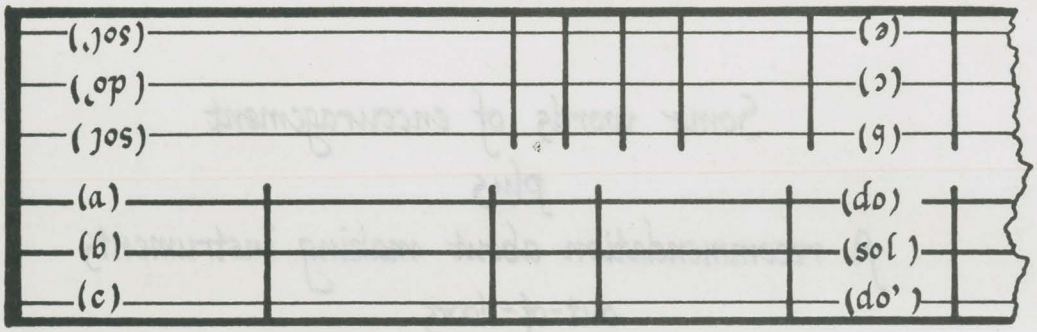
Three pairs of strings



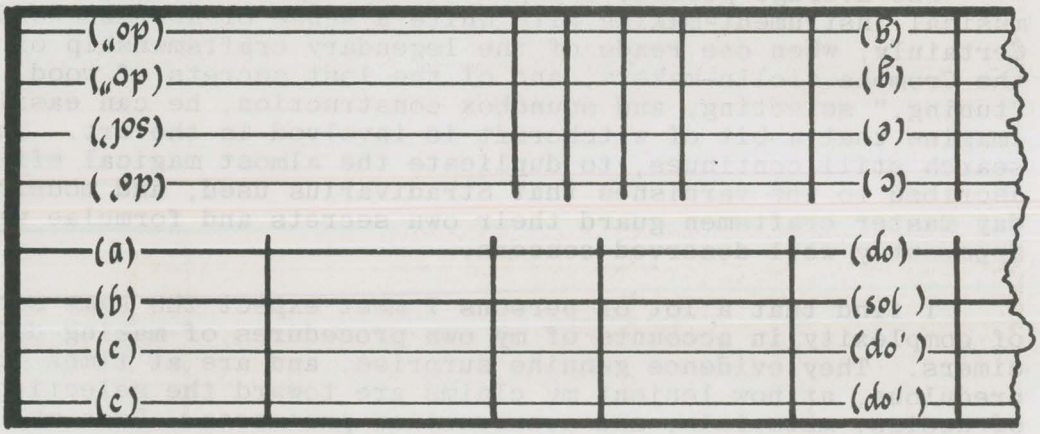
Fingerboard representations for three of my more successful string placements and tunings. Diagrams are drawn for instruments as would be seen from the playing position (with the pegbox to the left).

Figure 24b. String placements (continued)

'Twicimer'



'Elbuodremiclud'



Fingerboard representations for two double dulcimers. As the name implies, they are designed as duet instruments, and are accordingly strung, tuned, and fretted to be playable from both sides at the same time. The "upside-down" strings would be played from the "other" side. Each instrument has a set of both heavy and lighter strings, and is thus capable of a fairly wide range of effects. I hope that you will try this sort of creation eventually, for they really are fun. Jean Ritchie, bless her heart, likes to refer to them as "Courting Dulcimers"!

Some words of encouragement plus A recommendation about making instruments out-of-doors

The average person, I expect, looks upon the subject of musical instrument-making with quite a sense of awe and wonder. Certainly, when one reads of the legendary craftsmanship of the Cremona violin-makers, and of the lost secrets of wood "tuning," selecting, and soundbox construction, he can easily imagine that a bit of witchcraft is involved in the art. The search still continues, to duplicate the almost magical effects ascribed to the varnishes that Stradivarius used, and modern-day master craftsmen guard their own secrets and formulae with apparently well-deserved concern.

I find that a lot of persons I meet expect the same sort of complexity in accounts of my own procedures of making dulcimers. They evidence genuine surprise, and are at times incredulous, at how lenient my claims are toward the selection of design, materials, and construction processes. Even my own thinking, until recently at least, has been that the large proportion of successful instruments I have made were due primarily to a few shrewd good guesses, plus a lot of lucky fumblings in the darkness of the unknown.

A recent line of exploration has begun to reveal to me that I am not as favored with Special Talent as I might like to believe. It would now seem that, at least for dulcimers, the restrictions on wood, shapes, sizes, glues, finishes, etc., are arbitrary almost to the point of being ridiculous.

I found support for this way of thinking recently, when I prepared a loose fingerboard complete with strings, tuning pins, and frets (see figure 25). My intention was to be able to test at will the musical soundbox properties of any common object, simply by holding the fingerboard against it and strumming away.

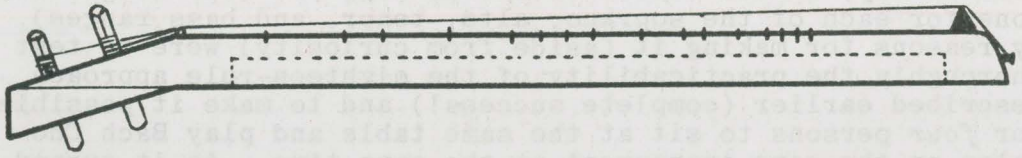


Figure 25. Side representation of my four-stringed DULCILESS.

I had expected the faint twanging of the loose fingerboard to become somewhat louder when in contact with something, but I was totally unprepared for the degree of improvement of audibility as well as tone quality. One after the other, I tried walls, floors, tables, bureaus, windowpanes, cardboard boxes, bookcases, and an old ironing board. In each instance, the object worked well enough to be used for musical purposes, and in a few cases (notably a cardboard box) the tone and loudness compared favorably with some of my better instruments!

This bit of madness was as intriguing as it was disturbing. It was impossible really to accept the contradictions between the visual and aural impressions of, say, a singing trash basket, or a musical windowpane. My momentary entanglement with what an instrument-maker friend (Dennis Dorogi) calls "musical pop-art" turned out to be a blind alley, with a couple of exceptions.

One of these exceptions is the amount of encouragement that can be offered to the would-be dulcimer-maker who is defeated by his awareness of how little he knows about musical instruments. The window and the floor and the ironing board all seem to be saying that the chances for at least moderate success in an instrument are far greater than for failure. This reassurance, along with the endless possibilities of variations on (and behavior of) the dulcimer principle, make this sort of project nearly ideal for anyone really interested.

The second exception, for me at least, was the fun I've had making instruments from one of the superior soundboard-objects, namely, the hollow-core door. As you may know, these are doors that are made commercially by gluing thin (1/8 inch) veneer plywood on both sides of a reinforced wooden frame. They are light and strong, and (most important of all) hollow for the most part; the extensive surface affords really fine amplification for any musical strings attached.

Perhaps my first full use of a door was a trifle too far-out, except possibly for the gods of Musical Revelry. It was, essentially, a door fitted with four legs and four fingerboards (one for each of the soprano, alto, tenor, and bass ranges). My reasons for making it (aside from curiosity) were to test thoroughly the practicability of the eighteen-rule approach described earlier (complete success!) and to make it possible for *four* persons to sit at the same table and play Bach Chorales on the same instrument at the same time. As it turned out, the Bach Chorales proved to be somewhat beyond our meager abilities, but we did do a fair job of four-part extemporizing on some Old Familiar Hymns, at any rate.

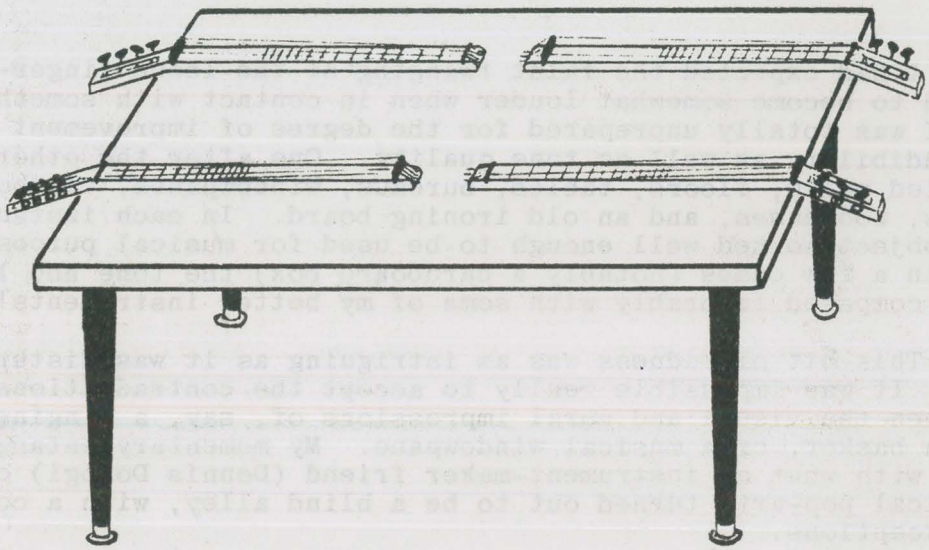


Figure 26. The fourteen-stringed D'ORCIMER.

I am sure that this instrument is much too complex to be included within the dulcimer classification. Besides, it was fretted *chromatically*. I think that was a mistake, because losing the "gaps" from the usual dulcimer fret pattern made it frightfully difficult for the players to locate their fingers on the fretboards.

My next game of musical doors began one day when my wife brought home a small *psaltery* from the school where she teaches. This was a delightful little toy I thought, and of simple construction, consisting of a dozen or so musical strings that were tuned in a major (diatonic) scale. The strings were arranged parallel to each other, over two bridges mounted on a trapezoid-shaped soundbox. The psaltery, made by Oscar Schmidt International of Jersey City, N.J., looked something like the diagram in figure 27, which was drawn from memory.

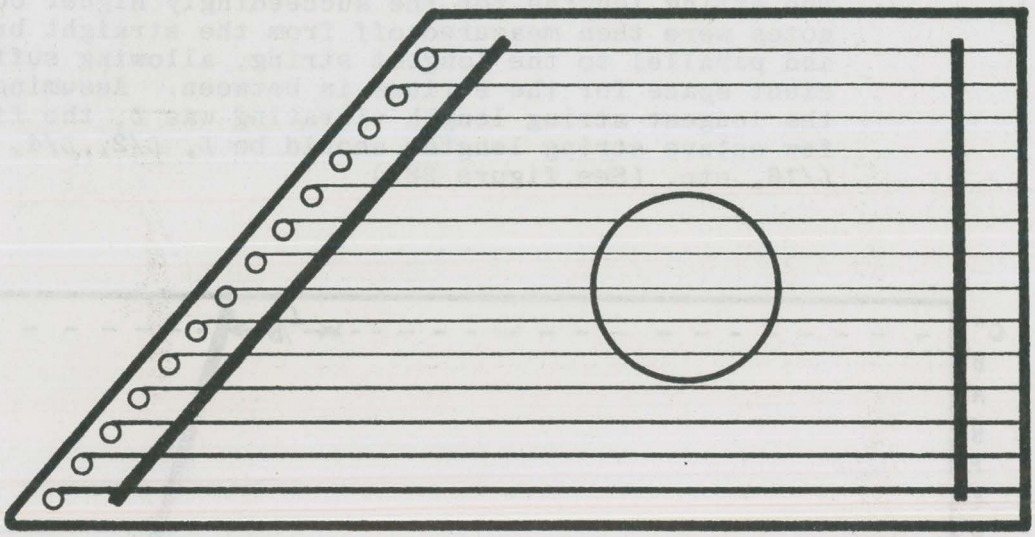


Figure 27.

The little instrument was so absorbing, and yet so uncomplicated, that I decided to try making my own somewhat larger version. Unlike the Schmidt psaltery, though, I was confined to using music wire of approximately the same weight (#24 through #27 spring brass....That was what I had, and I was unwilling to wait a moment longer to get started!). I decided to design the bridges assuming *constant tension - constant weight* strings, and see what would happen. This decision resulted in one of the bridges having to be curved! Let me explain:

If you will think back to my introduction of the eighteen rule, you may recall the following empirical relationship: *For a given string at constant tension, each higher octave note is obtained by making the string's vibrating length half as long as before.* I used this precept to plan the bridges in the following manner:

1. I first sawed about 20 inches from one end of a hollow-core door, and attached the straight bridge obliquely on one side, near the edge.

2. I then decided upon and located a vibrating length for the longest string, by using a terribly arbitrary system of thinking.

3. The string lengths for the succeedingly higher octave notes were then measured off from the straight bridge and parallel to the longest string, allowing sufficient space for the strings in between. Assuming the longest string length vibrating was *L*, the first few octave string lengths should be *L*, *L*/2, *L*/4, *L*/8, *L*/16, etc. (See figure 28.)

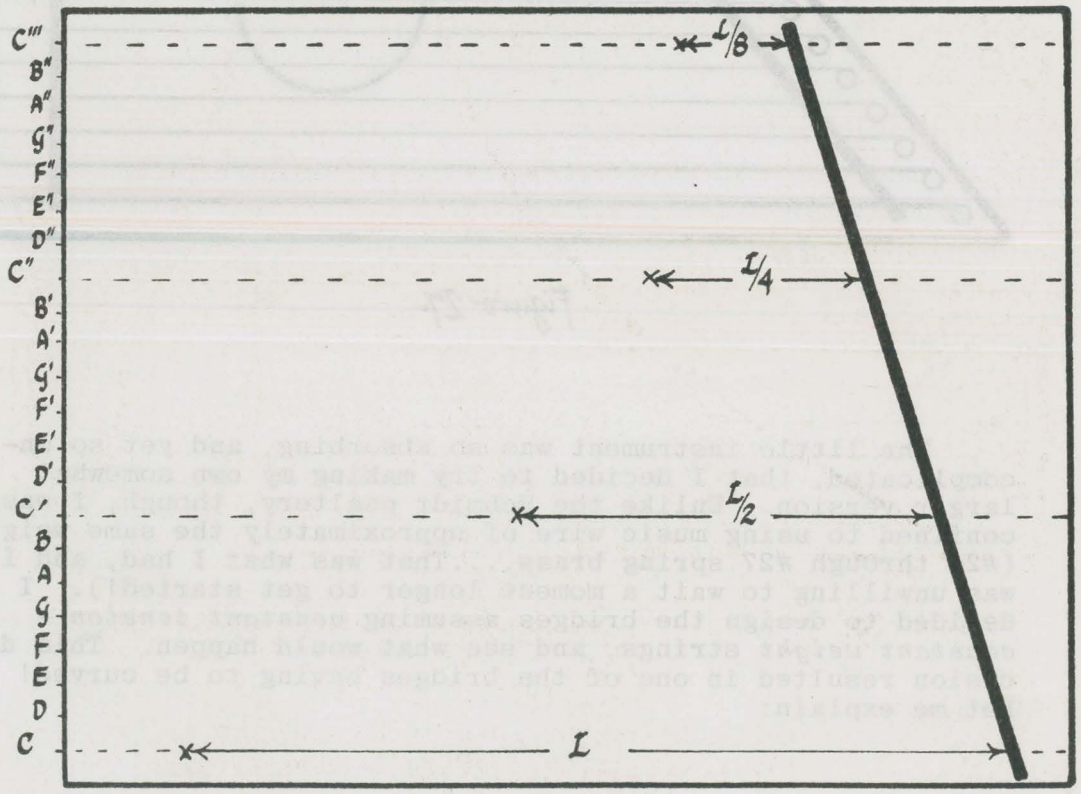


Figure 28. Early stage of planning the psecond bridge for the psaltery.

4. The second bridge was next steamed and bent to agree with a smooth hand-sketched curve drawn through the theoretical "other ends" of the octave wires.

5. The psaltery was finally finished off by notching the bridges for the strings, adding hitch pins (carpet tacks) and tuning pins (similar to "Autoharp" tuning pins), stringing it up, and tuning to a major scale.

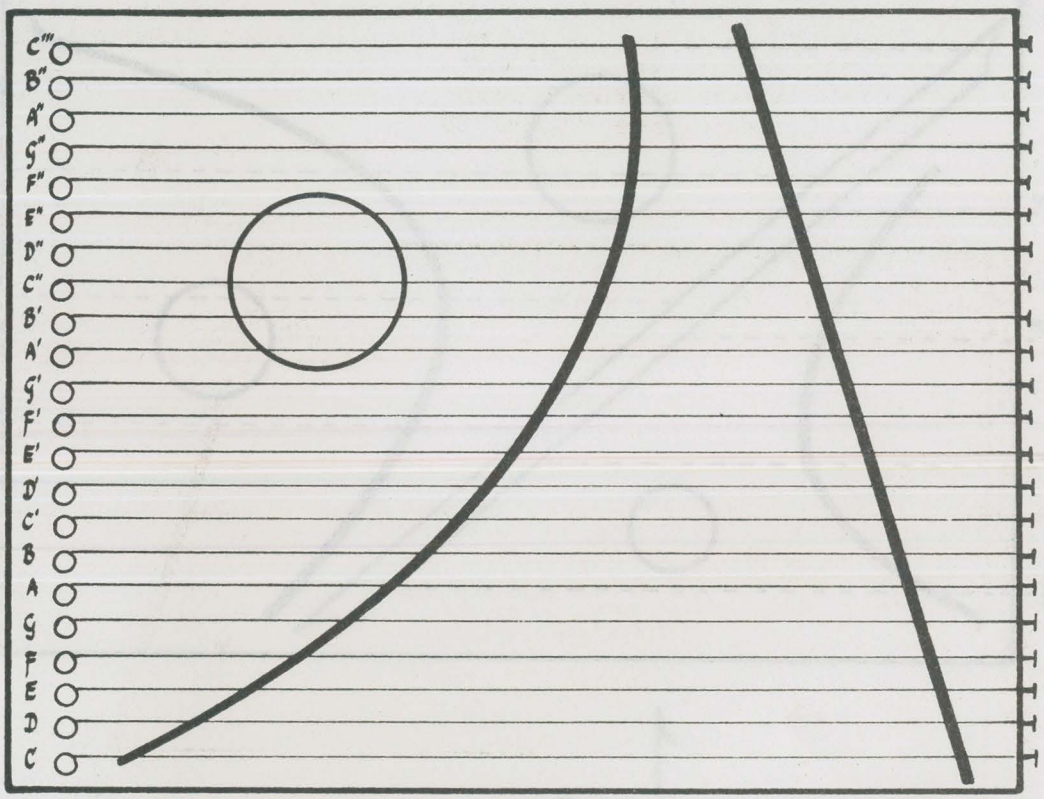


Figure 29. Approximate representation of the finished psaltery.

I felt so successful and was so pleased with my pfirst door-psaltery that, within the week, I began to plan a much larger *double psaltery* for the remaining 3-foot-by-5-foot section of door. It was designed in much the same way as the first, except that the hitch-rail was an oblique member located *between* the pair of curved second bridges (see figure 30). It was, of course, large enough to require legs, and was playable as a duet instrument by two persons seated facing each other (see arrows).

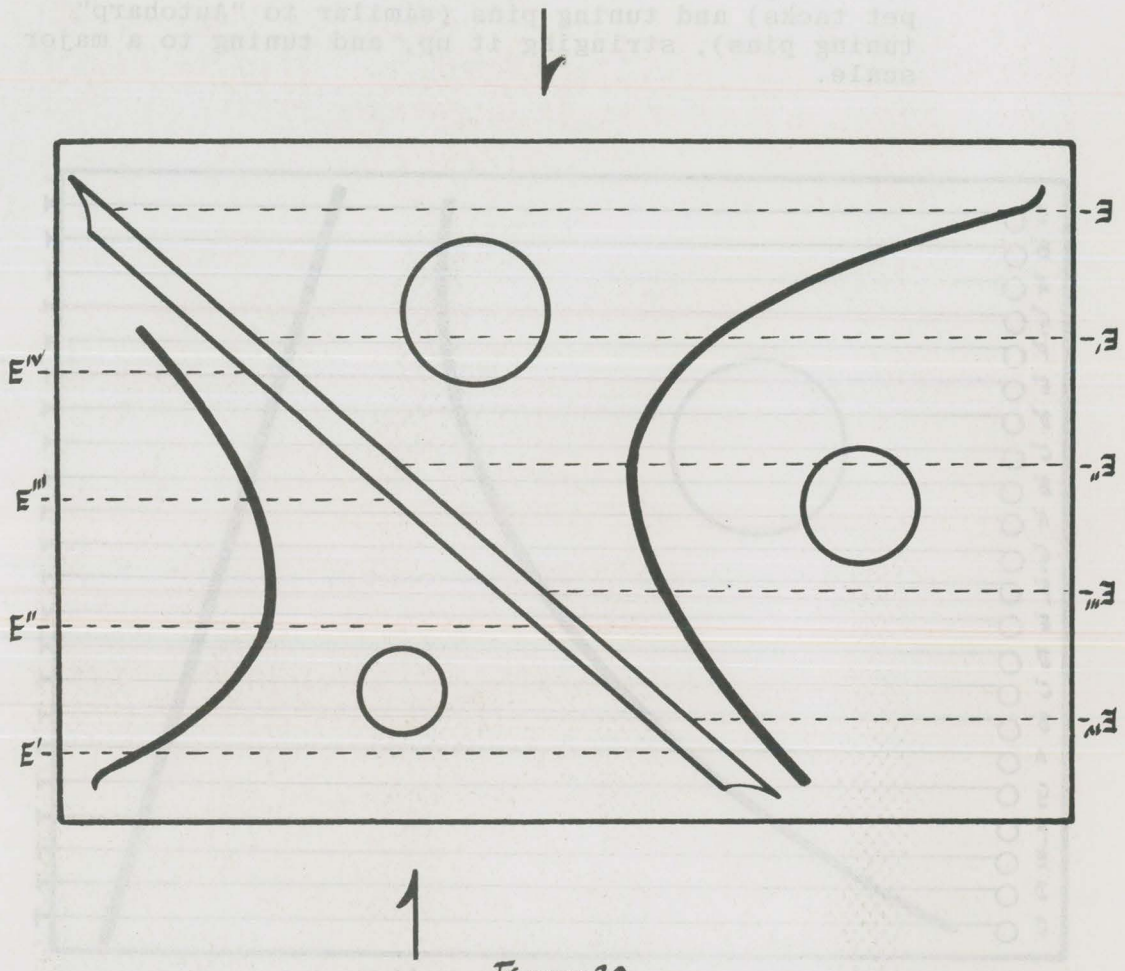
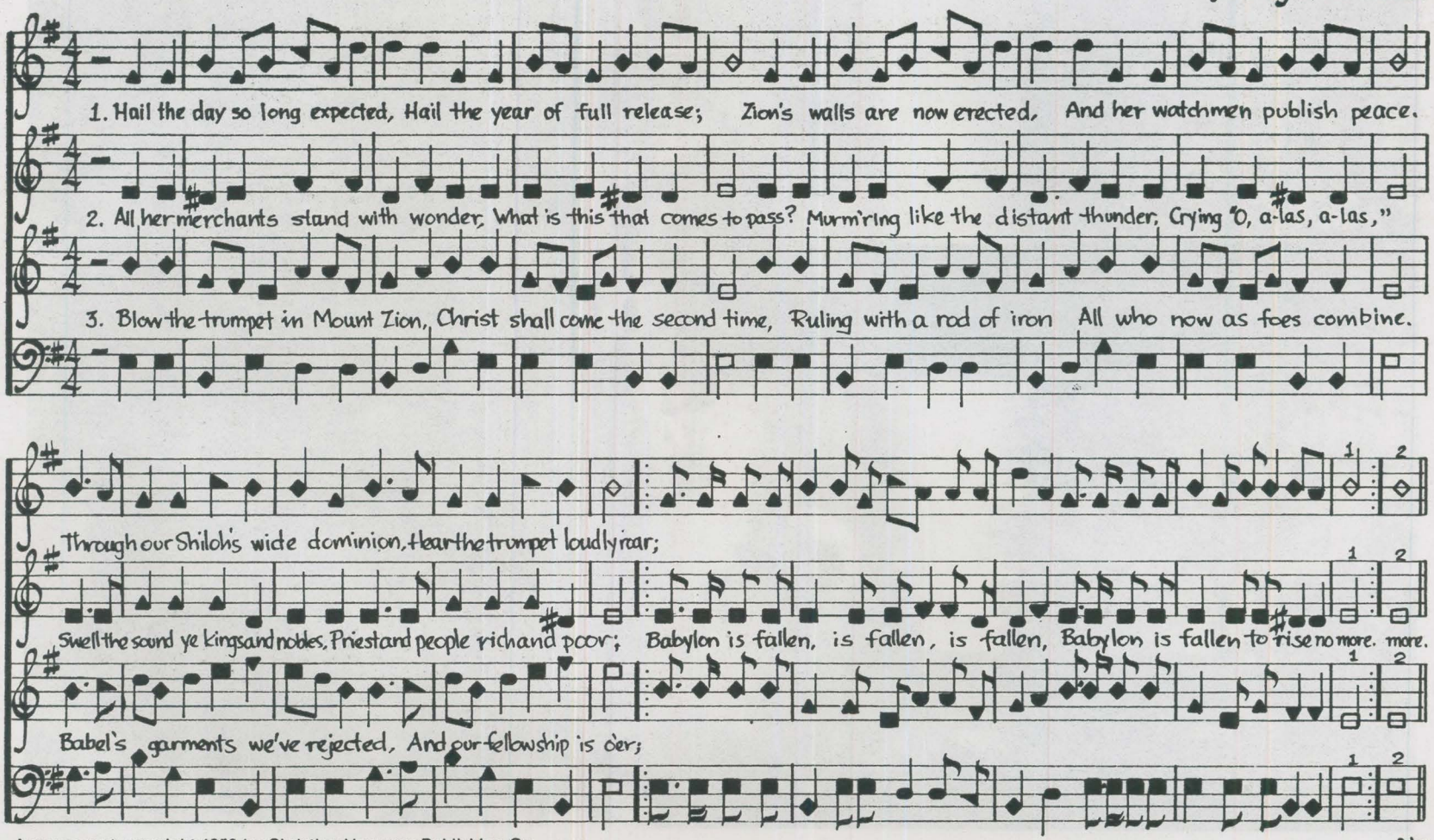


Figure 30.

Representation of the double psaltery, showing placement of hitch-rail, curved bridges, sound holes, and octave strings. The "sound holes" were cut more for their visual improvement than for any other reason; the addition of gilded paper doilies in the holes obscured the door's inferior interior, and looked surprisingly elegant.

BABYLON IS FALLEN.

Arr. by G. S. DOSS.



Afterword

This account of experimental instruments pretty well brings me up to the present (July 1965). Before closing, however, there is something that I wish to make clear about this last section of the booklet. It is not my intention to encourage people toward the making of musical monstrosities; indeed, the markets are often filled with good examples of poor taste, and without even a touch of humor offered to allow for better perspective. The points I want to make are superbly expressed in a letter I received recently from Mr. Dennis Dorogi, a maker of exquisite reproductions of historical instruments, and presently teacher of sculpture and ceramics at New York State University College.

From Mr. Dorogi's letter:

"As you may have realized I look upon instruments as works of art. An object can be visually attractive and still function well. Is the auditory really more important than the visual? I believe a fine-looking instrument can be built as easily as an ugly one and can be a more meaningful experience for the novice. I can't really say what attracted me to dulcimers, the shape or the sound. The instrument can be looked upon as a temple for the sound it produces.

"Why subordinate one to the other? Different people are attracted to different art forms. I like building instruments because it involves the visual, tactile, and auditory senses. Playing them also involves these senses. I don't like using ugliness for examples. Our society is overflowing with awful-looking cars, architecture, furniture, and musical instruments. Progress should not involve sacrificing one thing to gain another. I don't like going forward in one direction and backward in another. It does sort of shake me up.

"Old musicians must have been interested in the visual bit or we wouldn't have so many fine-looking old instruments around (carved rosettes on lutes, etc.). A good example — I know a number of people that own old dulcimers but don't know how to play them and have never even heard one played. They survived (for us) because of their intrinsic beauty, visual that is, not auditory. It's a darn good reason for making them look well. I don't think fine craftsmanship is essential, but an eye or hand for form is. A deaf person would get little joy from an ugly instrument. To please one, let's not offend the other....The instrument shouldn't be an end in itself, *but it could be.* The instruments of Harry Partch look as far-out as they sound — they can be played or exhibited as sculpture. That should be the way.

"Well, at least it's the direction that I'd like to go."

D.

Postscript:
To the experimenter

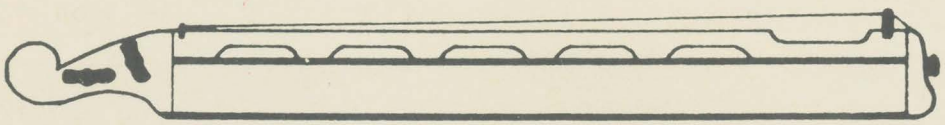
As you may readily discover, the Appalachian dulcimer is remarkably compliant to variations in construction details. Perhaps this is one of the really exciting realities of the instrument: to yield so well to the multitude of ideas that may occur to its builder and to its player. It is this same lack of definite form, however, that makes an instruction book and record combination, such as this, ever open to obsolescence. The very existence of this insert attests to this fact, for I have recently become aware of a fret scheme that may, in some ways, be superior to the eighteen-rule method that is described in the accompanying brochure.

Use of the numerical information below will result in what is known as a "*mean-tone*" pattern of musical intervals. This is an *unequal*-tempered system, used extensively on keyboard instruments from the mid-1500's through the mid-1800's, until it was finally replaced by the equal-tempered system. The main noticeable characteristic of mean-tone tuning is the presence of *pure* major-third intervals in many of the chords available, rather than the slightly sharp, somewhat harsh third intervals of even temperament. A mean-tone-fretted dulcimer will thus sound "sweeter" than an eighteen-rule dulcimer.

If you will refer to page 14 of my dulcimer brochure, you will see a system of arcs, created via the eighteen rule, and a series of "scaling lines" used to alter the fret pattern to suit a particular string length. The measurements below will replace the eighteen-rule compass-and-arc procedure with *direct measurements to each of the frets needed.* All distances will be as measured from the upper vertex on the page (see figure 15), assuming an open string length of 30 inches.

Fret note	*Distance from upper vertex (in inches)*	*Fret note*	*Distance from upper vertex (in inches)*
C	30.00	C'	15.00
D	26.83	D'	13.42
E	24.00	E'	12.00
F	22.43	F'	11.22
G	20.06	G'	10.03
A	17.94	A'	8.97
A#	16.82	A'#	8.41
B	16.05	B'	8.02
		C"	7.50

A second point, in keeping with this bits-and-pieces addendum, is the remarkable improvement in tone when a traditional-style dulcimer (i.e., *without* the gapped tail) is fitted with a scalloped fretboard, as illustrated below. I understand that this feature was used by a Mr. J. E. Thomas, a Kentuckian, who is reputed to have made as many as 1500 dulcimers throughout his lifetime (c. 1850 - 1933).



H. W. M. 5/21/1966

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Howard W. Mitchell

is a soft-spoken fellow with an inquisitive mind and an irrepressible streak of "do-it-yourself-ism." Not only does he like to make his own music, but he also likes to make the instruments upon which to make the music. The results, in music and in craftsmanship, might give the impression that he is a professional musician, or a professional instrument-maker, but Howie Mitchell is a full-time teacher, and a very special one at that.

In this book he shares his fascination with the mountain dulcimer and its music in a concrete but creative way. After a brief introduction to the instrument and its forms, he leads you through the development of his own interests and thinking about the dulcimer through several years and lines of experimentation. There are no highly detailed building plans here, and very little note-by-note instruction, but Howie's explanations are clear and gently logical and encouraging, so that, with a little patience, you can succeed in building an instrument and making your own music on it. There is system here, and plenty of information, the kind that gives you a good start and then frees you to go on.

First published over a decade ago, this book and its accompanying instruction record have maintained their uniqueness and relevance. It is now reprinted—with new, more legible type and a new cover—for the next generation of dulcimer-builders and -players.

FOLK-LEGACY RECORDS, INC. SHARON, CONNECTICUT 06069