

THE MOUNTAIN DULCIMER

—How to make it and play it—

(after a fashion)

INCLUDING BOOK OF COMPLETE INSTRUCTIONS

by

HOWARD W. MITCHELL

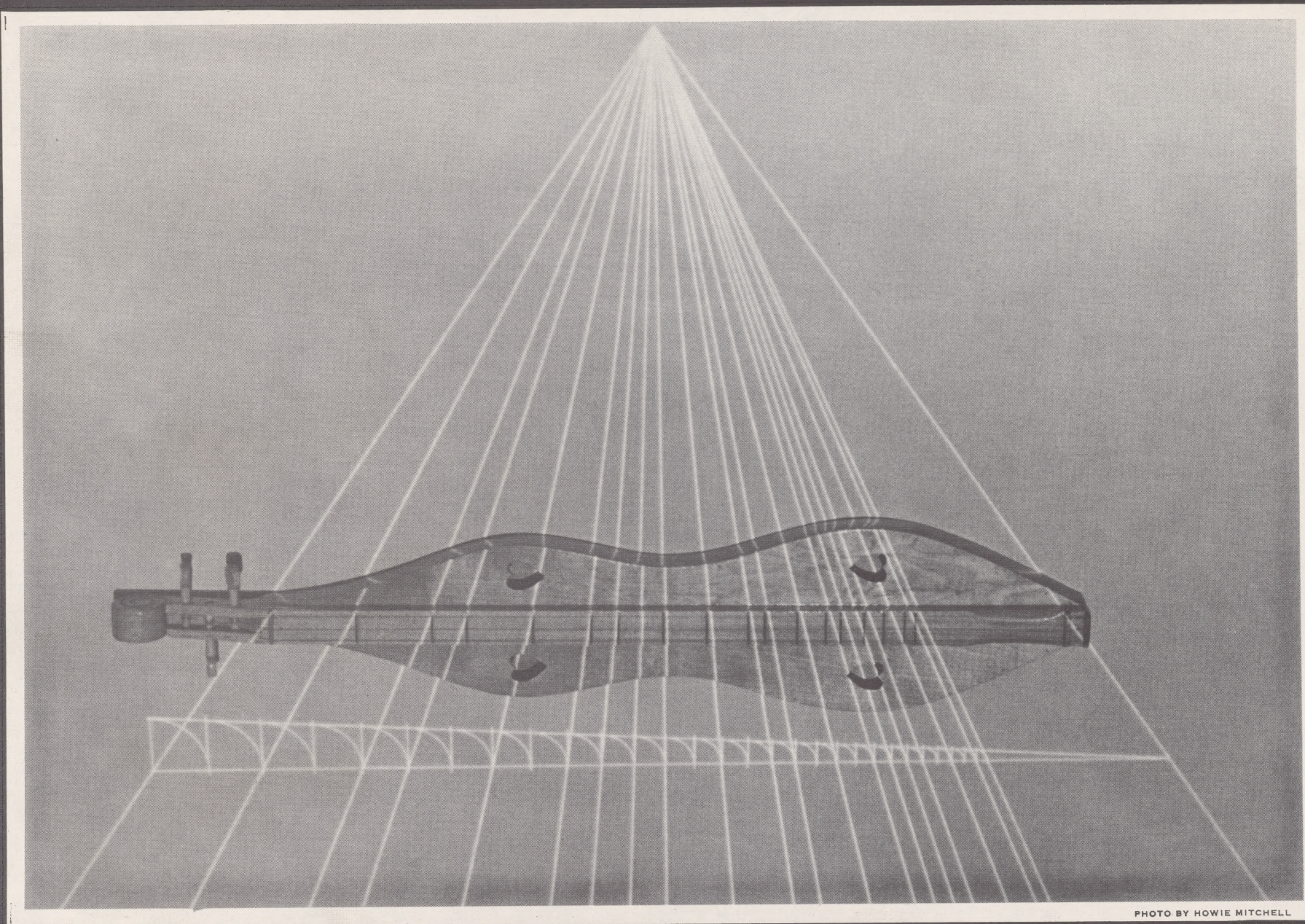


PHOTO BY HOWIE MITCHELL



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"

\$2.95

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SHARON, CONNECTICUT

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- INTRODUCTORY -

The Mountain Dulcimer

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

* * *

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

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 border-line 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, N.Y.). 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 is 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.

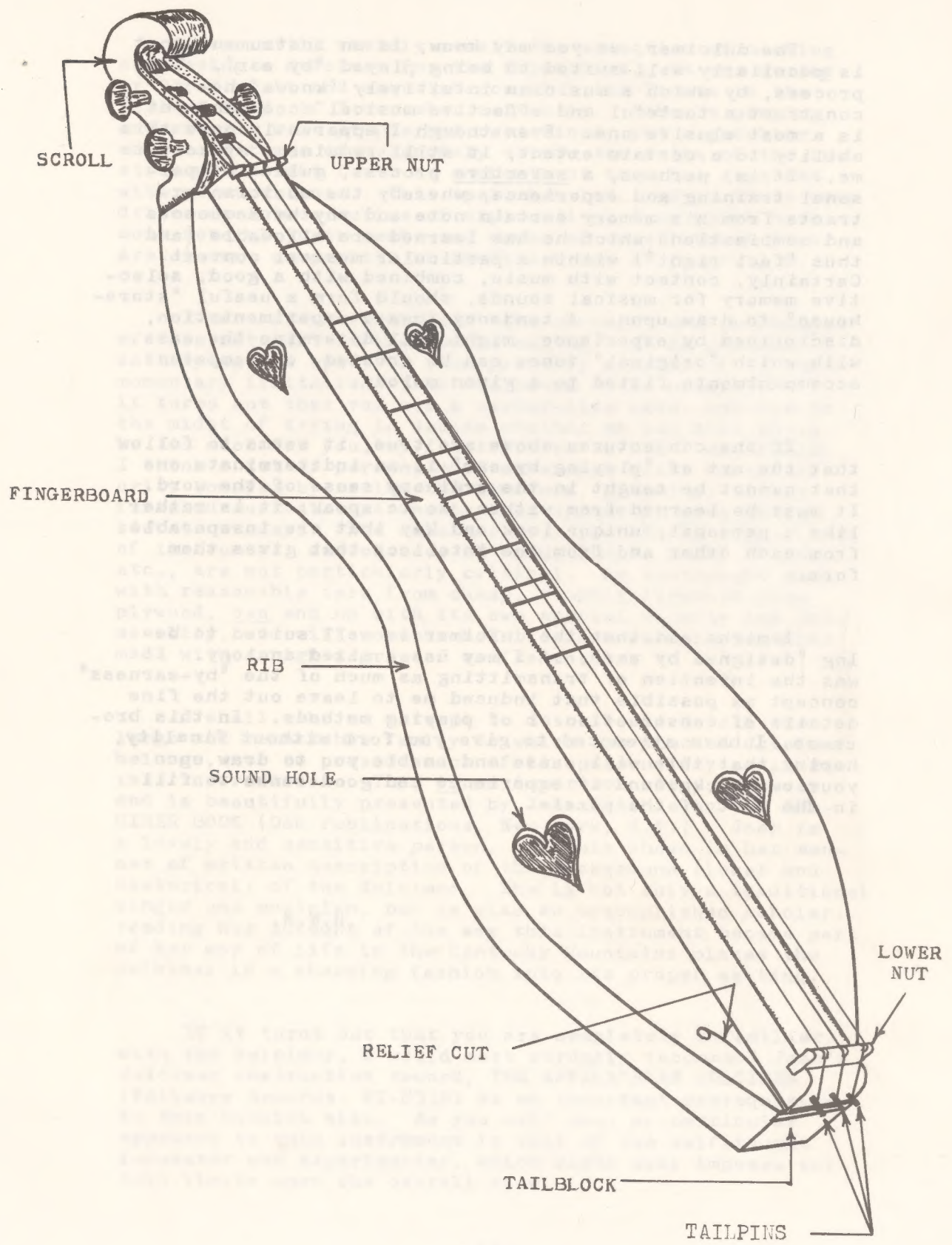
If it turns out that you are completely unfamiliar with the dulcimer, I would most strongly recommend Jean's dulcimer instruction record, THE APPALACHIAN DULCIMER (Folkways Records; FI-8352) as an important prerequisite to this booklet also. As you will see, my particular approach to this instrument 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 peculiarly 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.

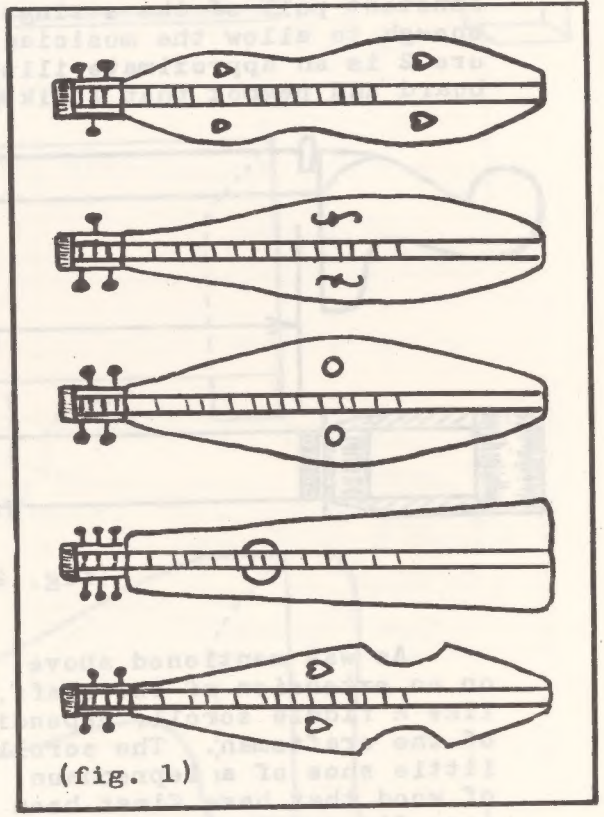
H.W.M.



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 counterpart 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 (available for \$1.75 from publisher at 1407 Sherwood Ave., Richmond, Va.)

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 cross-wise 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 closest 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.



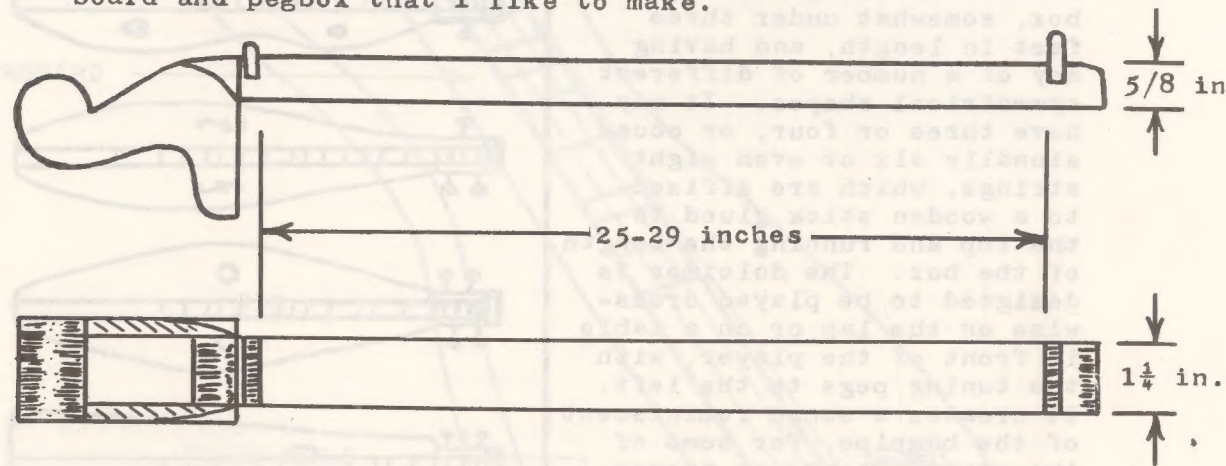
One of the main problems involved in making a fine dulcimer, or any high quality musical instrument for that matter, lies in creating a device that will efficiently convert the minute vibrations of the strings into sounds that are audible and pleasing enough to make good music. The dulcimer does not 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 1 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 2 is an approximate illustration of the type of fretboard and pegbox that I like to make.

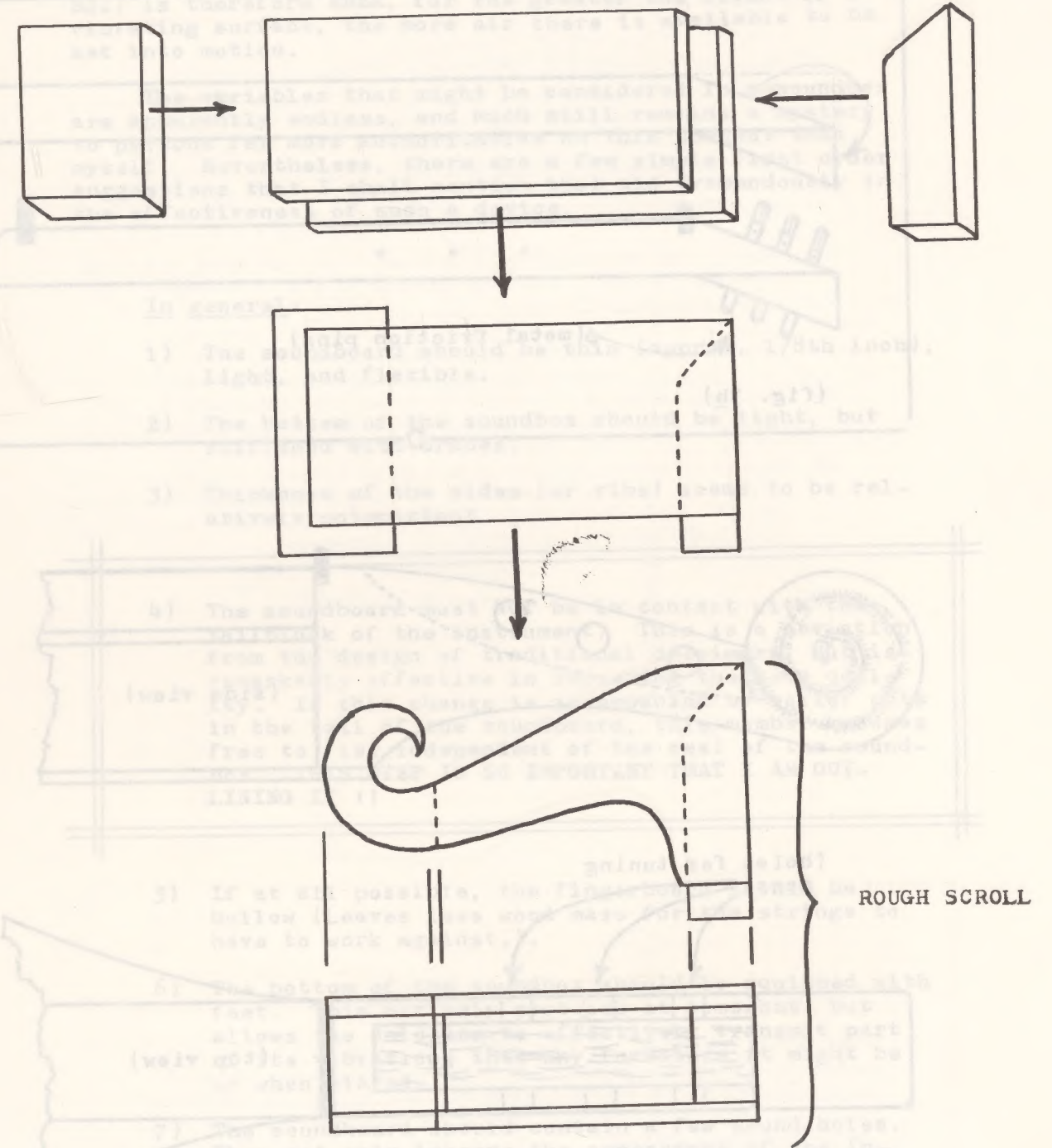


(fig. 2)

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 fig. 3a, next page).

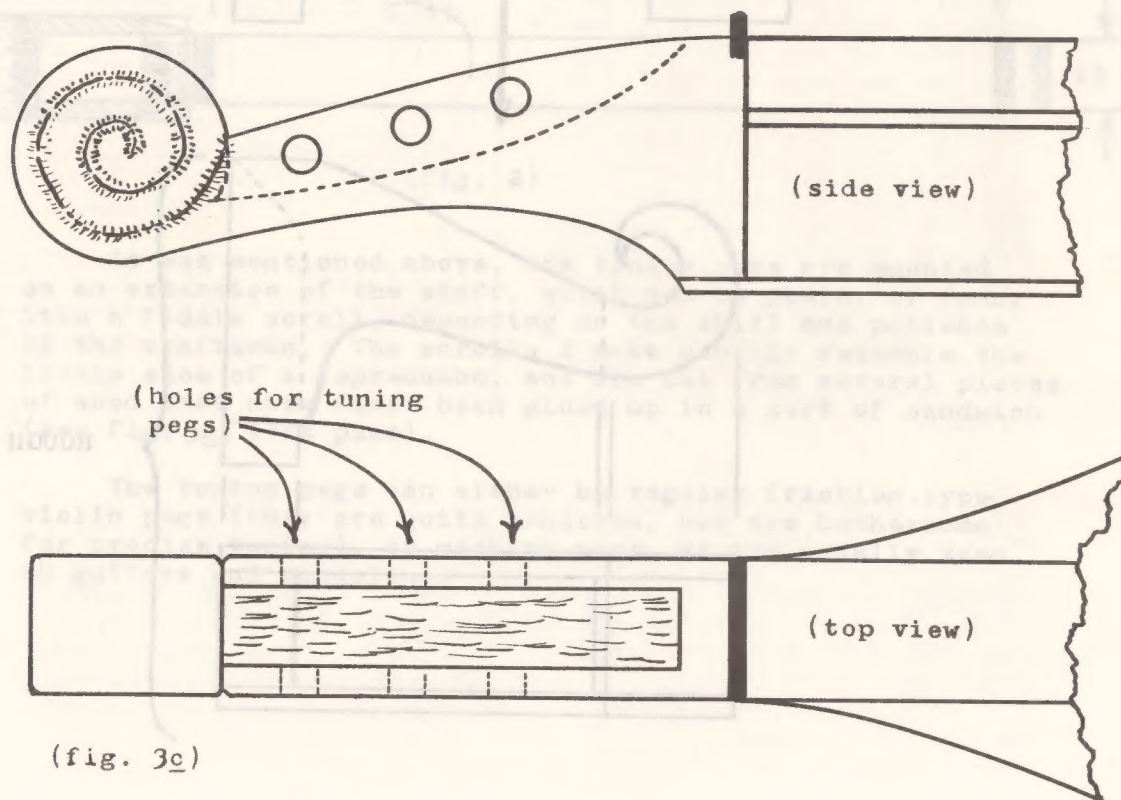
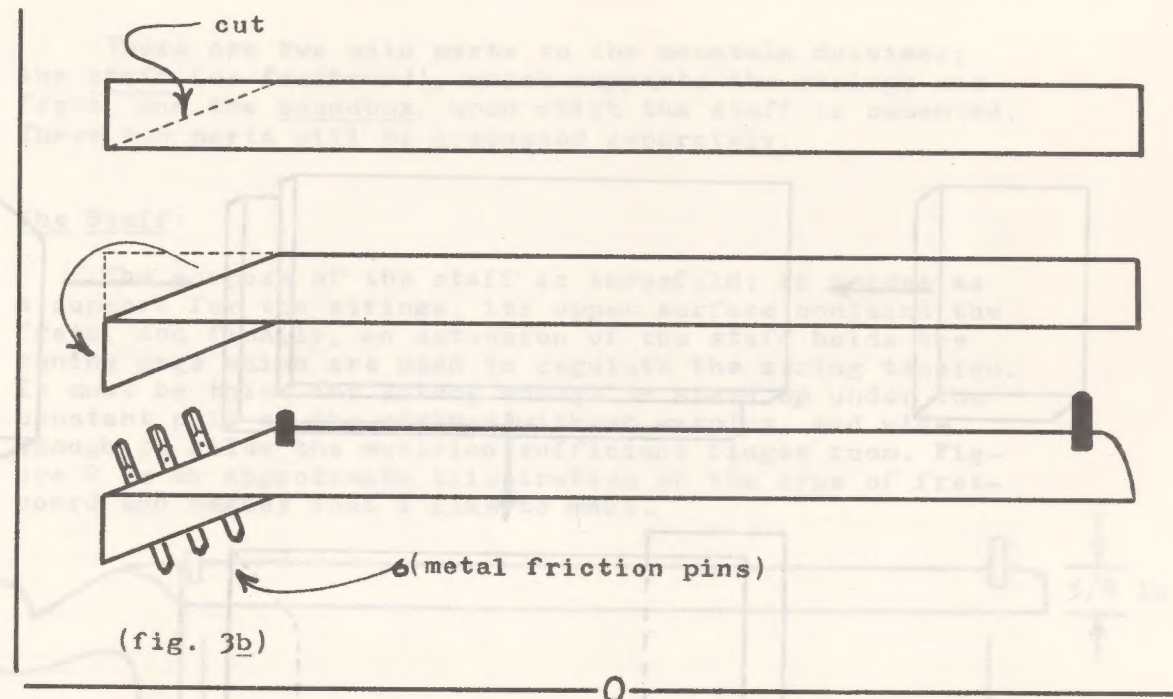
The tuning pegs can either be regular friction-type violin pegs (they are quite handsome, but are bothersome for precise tuning), or machine pegs, as are usually seen on guitars and mandolins.

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



(fig. 3a)

...a couple more pegbox f'instances:



The Soundbox:

The main purpose of the soundbox, as the name implies, is to mechanically amplify 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.

* * *

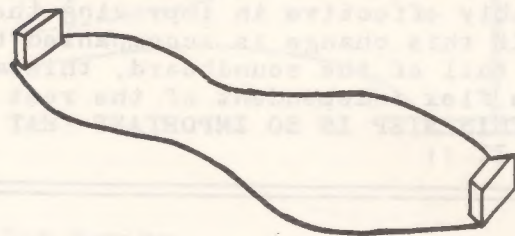
In general:

- 1) The soundboard should be thin (approx. 1/8th 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 independent of the rest of the soundbox. **THIS STEP IS SO IMPORTANT THAT I AM OUT-LINING 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 effectively transmit part of its vibrations 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:

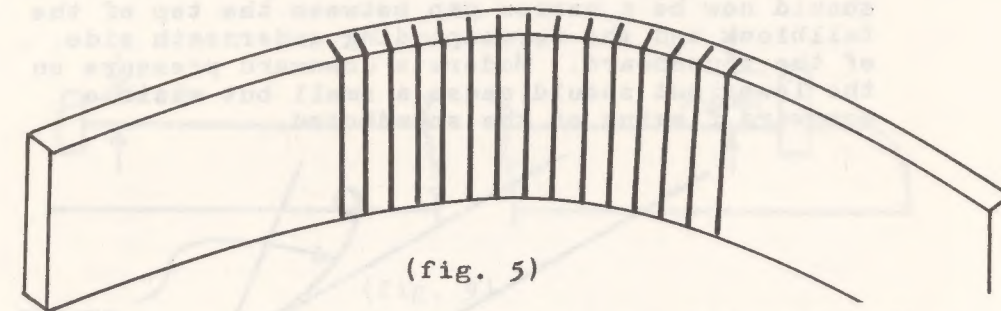
- 1) Make a full-scale top view of the fingerboard*, and then sketch in a soundboard shape that appeals to you. Most of the instruments I have made have shapes that I drew freehand; a few have curves generated by bending a long, flexible strip of wood until it assumed a pleasing configuration, and then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



(fig. 4)

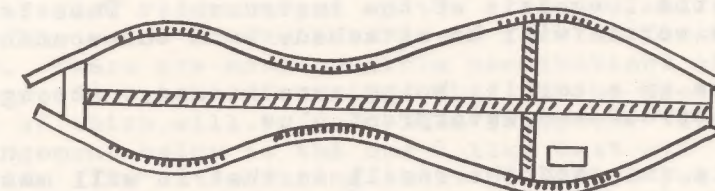
* The exact spacing of the upper and lower nuts is not critical, though I have come to prefer the tone of instruments with string lengths of about 28 inches. This spacing, of course, is what determines the SIZE of your drawing.

- 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 fig. 5, below).



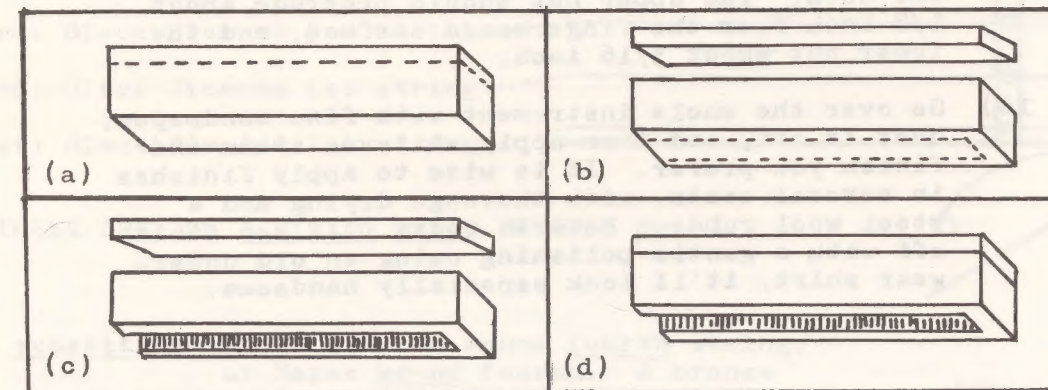
(fig. 5)

- 7) Match the ribs to the tail block and then glue them to the bottom ("C" clamps are good for this step). Add cross-braces 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.



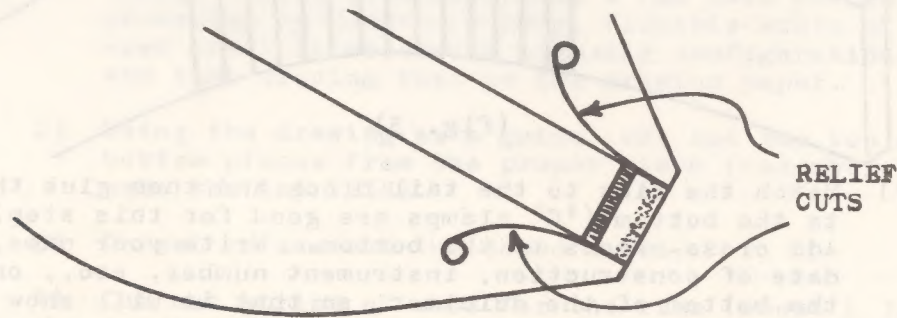
(fig. 6)

- 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 following method illustrated:



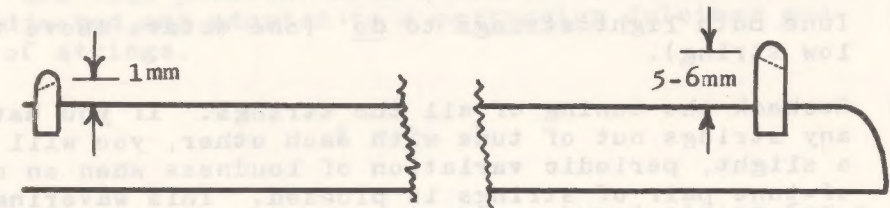
(fig. 7)

- 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.



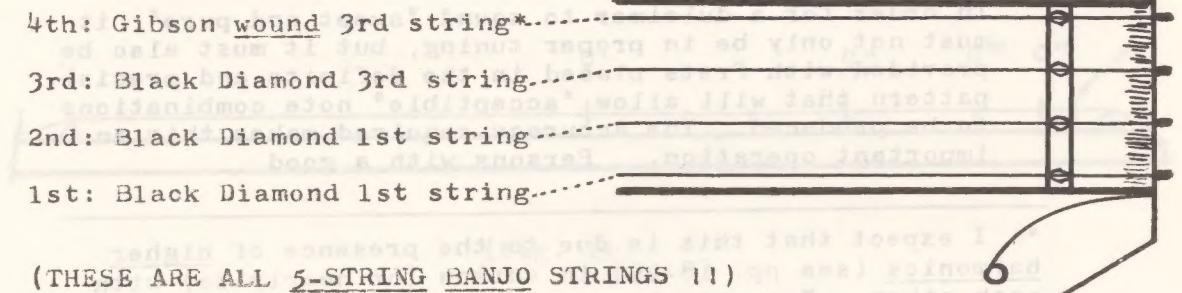
- 12) Saw off the overhanging wood at the head of the soundbox so as to leave a flat surface perpendicular to the long axis of the instrument. This is where the scroll will be attached. Sand the soundbox.
- 13) Make up a scroll, being sure to use a strong, heatproof and waterproof glue.
- 14) File and 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 1/4 inch wooden dowels.
- 15) Shape some bits of rosewood, or ivory, or some other hard material so that it 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 1mm above the fingerboard at the scroll end, and about 5mm above the fingerboard at the lower end. The notches MUST slant as shown, or else you'll have all sorts of trouble with buzzing strings and generally poor tone.



(fig. 9)

- 18) Put in the tail pins and mount the tuning pegs in the scroll. If this is your first dulcimer, I would recommend that you put in 4 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 4-note chords, yet the instrument can be played in very much the same fashion as a regular three string dulcimer.



* substitute: Black Diamond wound fourth string, or Mapes wound fourth. A bronze or "mona-steel" wrapped string lasts longer and sounds much better than a string with a softer wrap. (fig. 10)

- 20) Carefully tighten the low (4th) 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 3rd 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 for 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 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 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 it must 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 important operation. Persons with a good

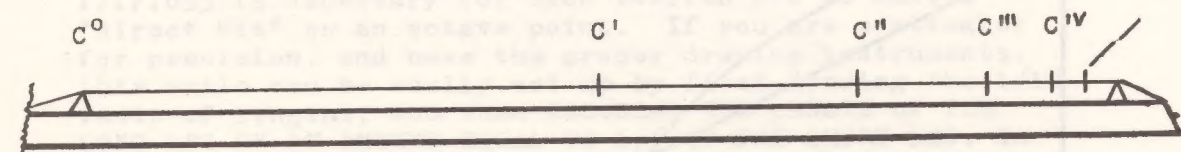
* I expect that this is due to the presence of higher harmonics (see pp. 18-19) in unison (or nearly so) with each other. For example, in a do-sol pair of strings, the third harmonic of the low string will be identical in pitch to the second harmonic of the higher string (if they're in tune)! For a do-fa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

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.

* * *

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 of its former value. If you fret the remaining length at its midpoint, the string's pitch will be raised one octave more, and 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 1/2 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 fig. 11, below). The first five octave fret positions have been represented, assuming the open string was tuned to the pitch of C.



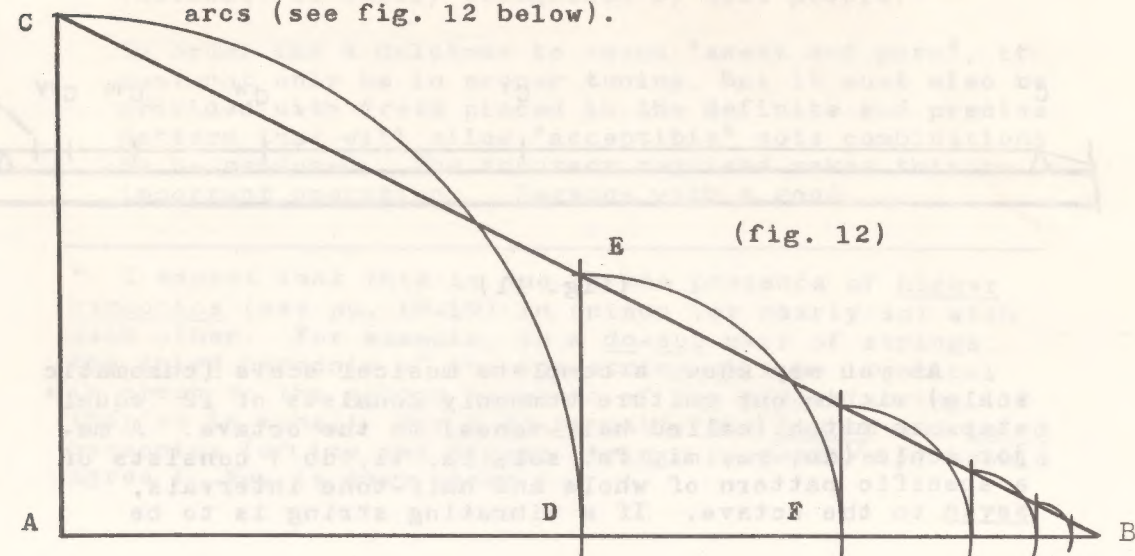
(fig. 11)

As you may know, a complete musical scale (chromatic scale) within our culture commonly consists of 12 "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.

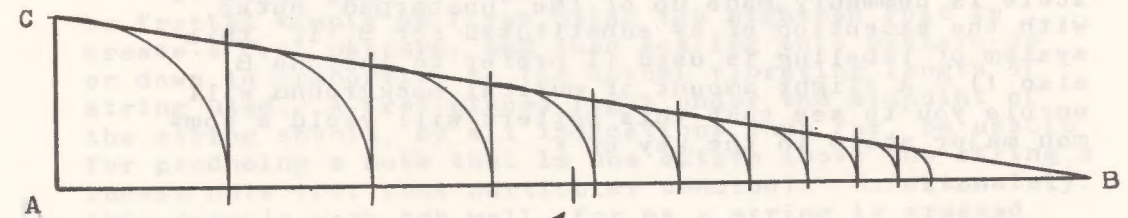
For the sake of demonstration, let me first show how the octave fret pattern in fig. 11 can be duplicated:

- 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 mid-point 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 Euclidean geometry can now be used to prove that DE must be equal to $1/2$ of DB.
- 6) Using D as center, and DE as radius, draw an arc cutting DB at point F. Since DE is $1/2$ of DB, it must follow that F is now the mid-point of DB!!
- 7) This process may be continued indefinitely, and will produce a pattern of arcs along AB, whose spacings are almost identical to the marks in figure 11. The end result is a rather handsome construction of triangles and arcs (see fig. 12 below).



(fig. 12)

Now take a look at the construction below (fig. 13). The drawing procedure was similar to that used in fig. 12, except that the short leg of triangle ABC was made $1/6$ of the long leg.



Midpoint of AB

(fig. 13)

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??

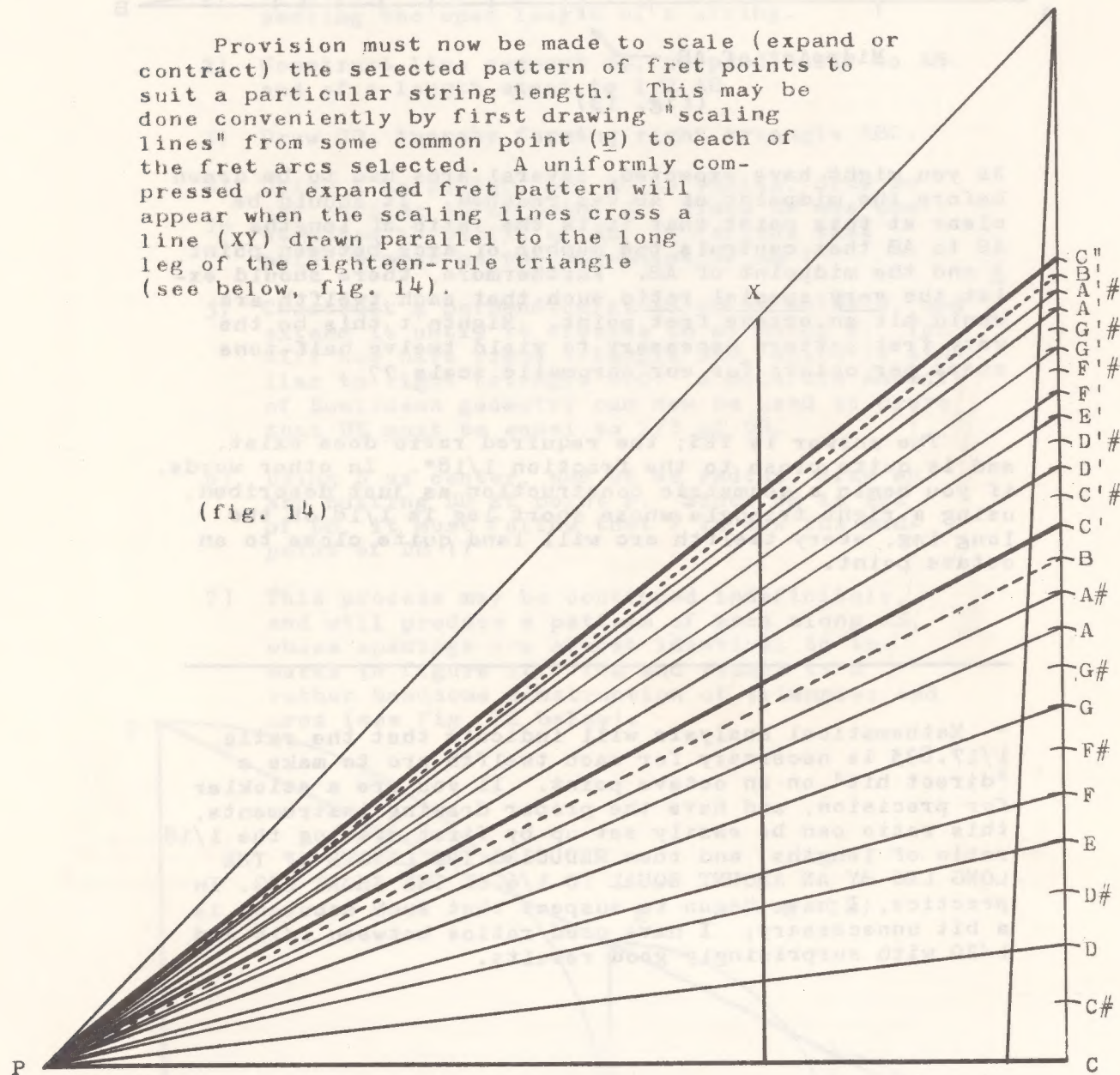
The answer is YES; the required ratio does exist, and is quite close to the fraction $1/18^*$. In other words, if you begin a geometric construction as just described, using a right triangle whose short leg is $1/18$ of the long leg, every twelfth arc will land quite close to an octave point.

* 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.

Once you have drawn a satisfactory eighteen-rule triangle of convenient size (say, 30 inches long), you will need to select arcs for the particular musical scale desired. This 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 (see below, fig. 14).

(fig. 14)



A bit about the behavior and misbehavior of musical strings, and some suggestions on how to compensate.

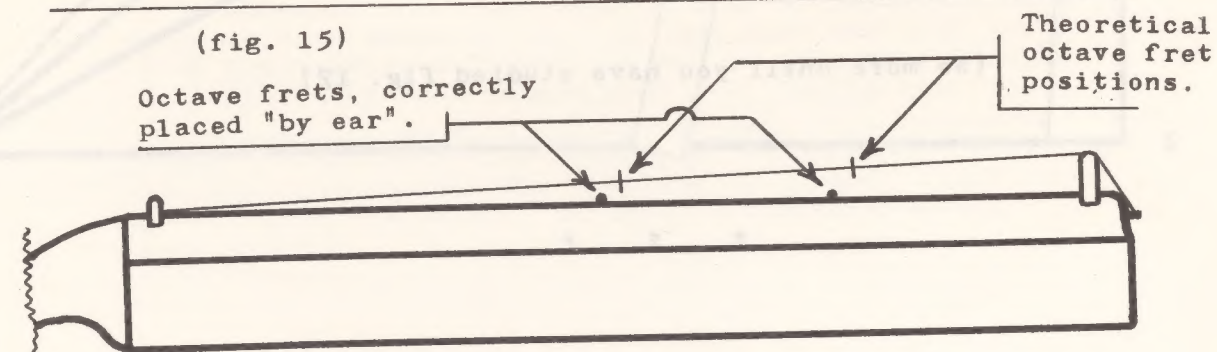
It might seem at this point that a dulcimer could be fretted simply by first using the eighteen rule to create a fret pattern, and then scaling this pattern up or down in proportion to the actual vibrating length of string used. A fret placed right under the midpoint of the string should, by all indications 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 fig. 14), must be tilted somewhat, resulting in a non-uniform scaling of the fret arc spacings.

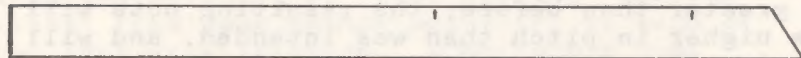
Let me show this process by example:

- 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 below in fig. 15.

(fig. 15)



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 fig. 16, below:



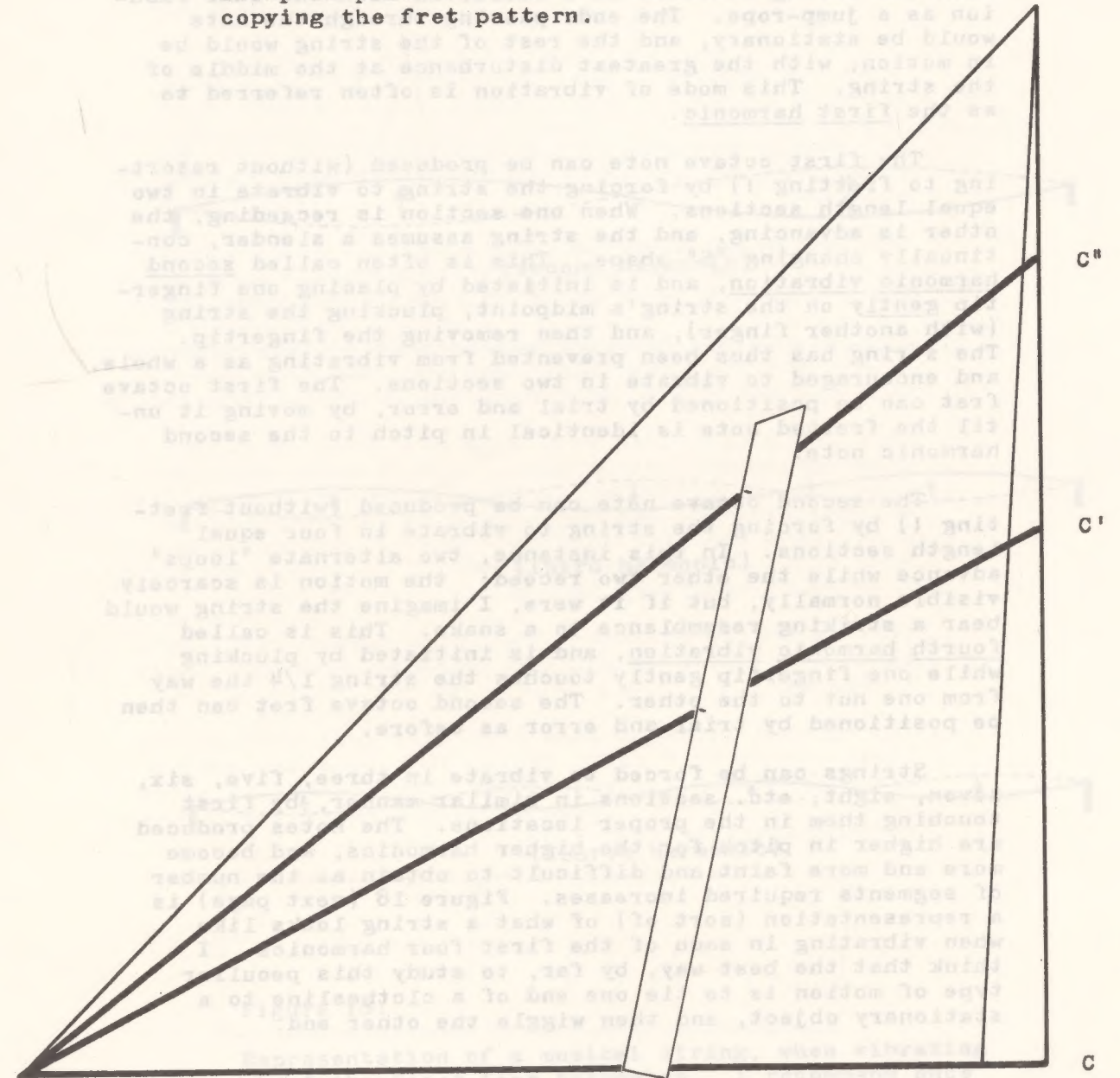
(fig. 16)

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 fig. 17, next page), 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 fig. 17)

Figure 17:

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 18 (next page) 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.

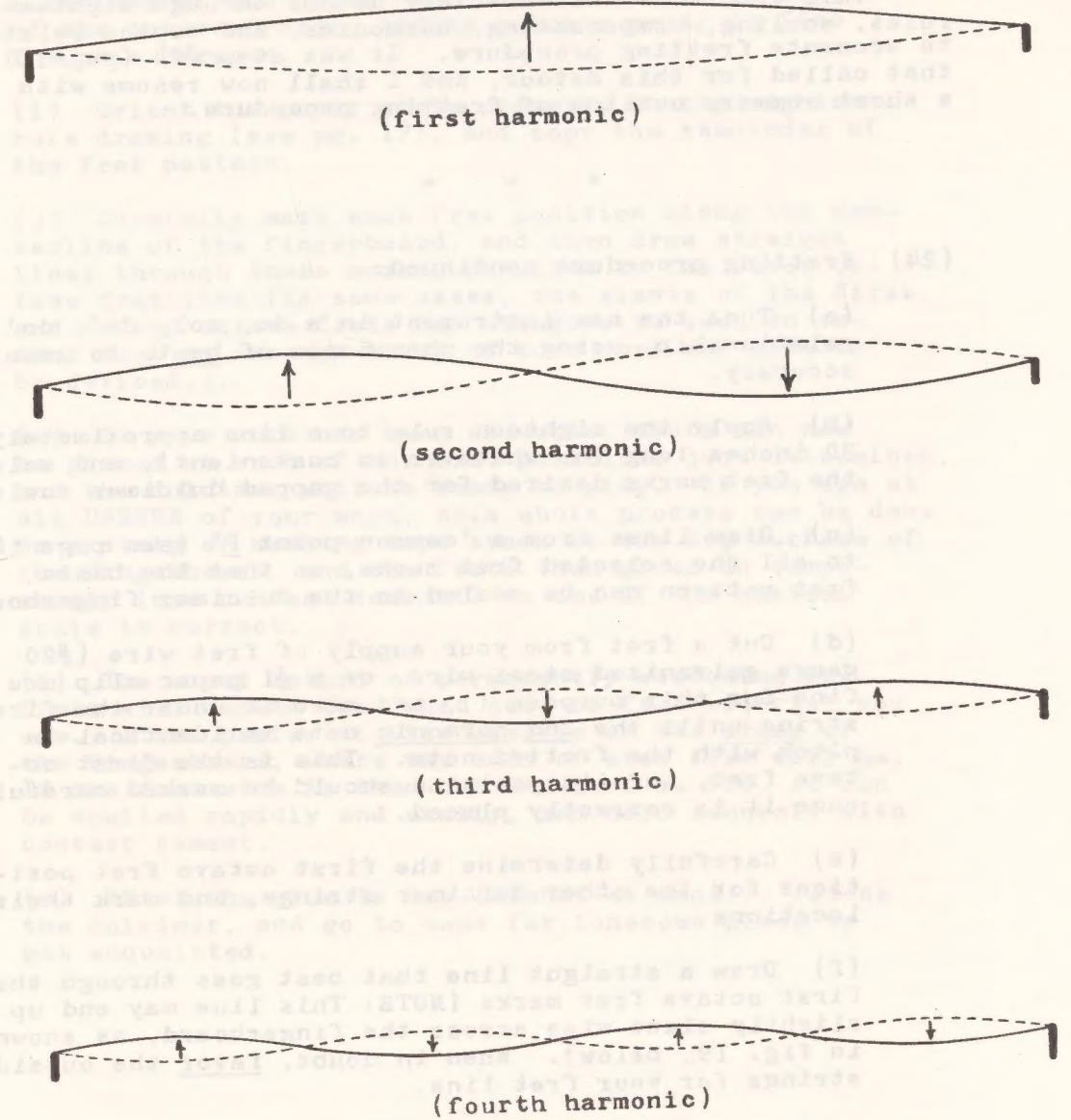


Figure 18:

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.

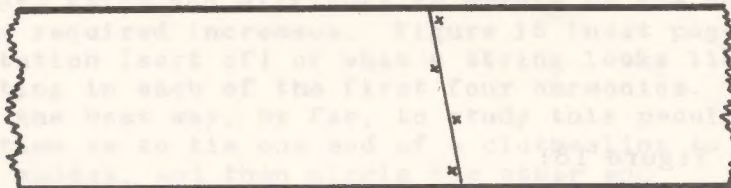
A return to construction procedure.

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 are fine for this purpose !), and move it under the first string until the 2nd 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 slant-wise across the fingerboard, as shown in fig. 19, below). When in doubt, favor the outside strings for your fret line.



(fig. 19)

- (g) Similarly, determine and mark carefully the position of the second octave fret, by using the 4th harmonic pitch of each string in turn.

Fretting procedure continued:

- (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 pg. 17), 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.

* * *

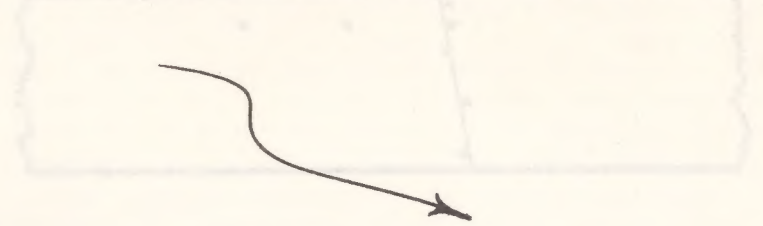
A few words about woods and glues.

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 doesn'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 cabinet maker'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 in Chicago, Illinois.

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 heat proof 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.

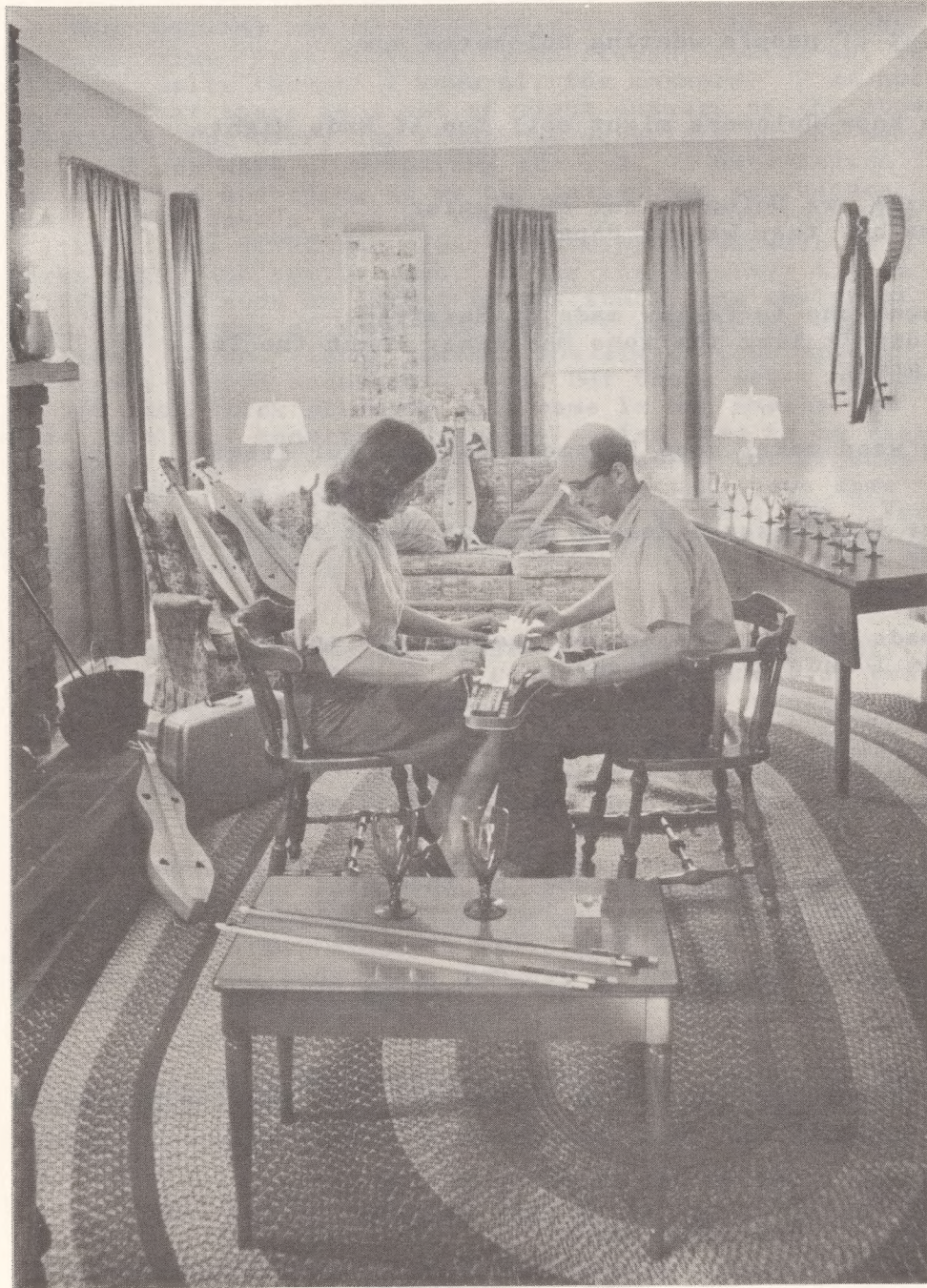
I have had one order from our Prison Camp
for a Dulcmer he wanted it Fretted with Hacksaw Blades.

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

Frank

Some comments by Frank Proffitt

THE UNIVERSITY OF CHICAGO



After playing and observing and thinking about the number of persons, I am beginning to suspect that the... (text is mirrored and difficult to read)

... (text is mirrored and difficult to read)

A few words about tuning, chording, and playing the dulcimer, presented intuitively.

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 to decide how you play it. I will use numbers to refer to 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 10, below. The dulcimer should be tuned in the do, re, mi, fa, so, la, ti relationship. (text is mirrored)

Figure 10: A tablature diagram showing fret positions on four strings (1st, 2nd, 3rd, 4th) for a chord. The strings are labeled '1st', '2nd', '3rd', and '4th' from top to bottom. The fret numbers are 2, 0, 1, 2.

Please note the "extra" (or B) fret

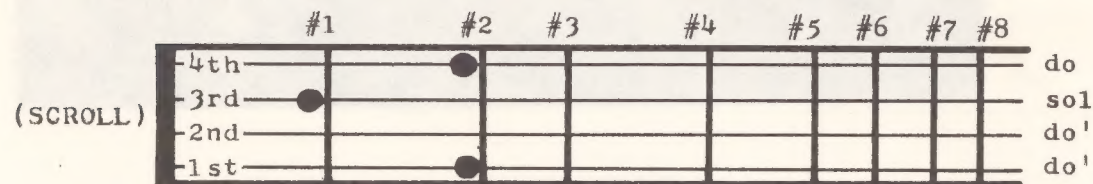
* * *

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 "cliches" 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 16, below. The dulcimer should be tuned in the do, sol, do', do' relationship described earlier. Listen as you play.



Please note the "extra" (or B) fret !

(fig. 16)

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 above 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 above, and close to the end, where chords instead of single notes are played. You will probably produce these gaps unintentionally, due to inaccuracies; 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 are 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 7th 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 (like 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 finger-board (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) 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, due to the precision of placement required; the back of the hand must remain almost motionless, to provide a stable reference position for the index finger tip, as it moves in an arc and grazes the strings. The finger nail 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 (1/16th inch long, and well rounded is about right).

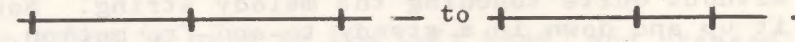
First, brace the right thumb against the near side of the fingerboard, a couple inches or so from the lower nut, and tilt the back of the hand in such a way that the straight and stiffened index finger can sweep in an arc without quite touching the melody string. Now, wiggle it up and down in a steady to-and-fro motion, KEEPING IT STIFF AND STRAIGHT AS POSSIBLE. Slowly rock the back of the hand forward until the index finger nail 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 my 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, due to 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; those 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 

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 7th 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 7th 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 7th 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 7th 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 7th fret.

AEOLIAN MODE:

Similarly, tune the first string, using the ninth fret. Complete scale begins at 1000, missing the 7th 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 middle of page 32).

It turns out that there are 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 to simply 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 7th 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'	sol do' do'	do' do'	do'	0xxx	Mixolydian
b)* do do sol do'	do' do'	do' do'	do'	0xxx or 3xxx	Mixolydian or Ionian
c) do do sol do'	sol do' sol	do' sol	ti-flat	1xxx	Aeolian
d) do do sol do'	sol sol	sol sol	sol	3xxx	Ionian
e) do do sol do'	fa fa	fa fa	fa	0xxx	Mixolydian
f) do do sol do'	fa fa	do' do'	do'	3xxx	Ionian
g) do do sol do'	fa fa	do' do'	ti-flat	4xxx	Dorian
h)* do do sol do'	sol sol	do' do'	fa'	4xxx	Dorian
i)* do do sol do'	do' do'	sol' sol'	sol'	3xxx	Ionian
j) do do sol do'	mi sol	sol sol	sol	3xxx	Ionian if chorded+
k) do do sol do'	fa la	la do'	do'	3xxx	Ionian if chorded+
l)* do do sol do'	sol mi'	mi' do'	do'	0xxx	Ionian if chorded+ and 7th fret used.
m)* do do sol do'	sol do'	mi'-flat	mi'-flat	5xxx	Aeolian if chorded+ and 7th fret used.

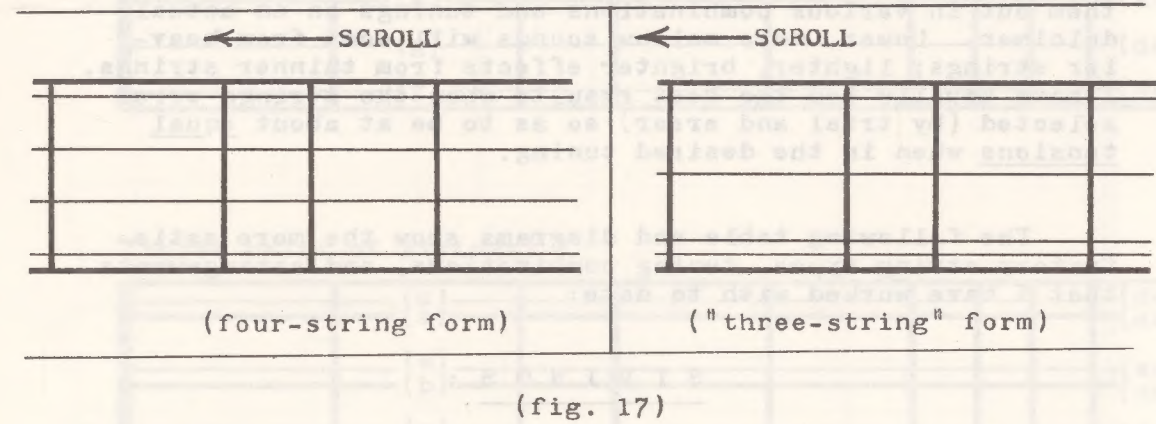
* Take care to start with the 4th string fairly low. Otherwise, you may break a string!

+ 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 fig. 17).



The nuts will end up with six grooves each, and a well-chewed appearance (see fig. 18), but the dulcimer will be easily convertible just by loosening the strings and slipping them over into the proper notches.

The instrument in the three-string form can be tuned according to the table on page 36, if the second string is considered to be non-existent.

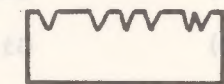


Figure 18, illustrating the "well-chewed" appearance of a nut (seen from scroll end).

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 3-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 entirely remove the double melody string (see fig. 17) and replace it with a single string that is more nearly identical to the middle string (use a Black Diamond 2nd or 3rd, 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 different weight strings, and 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:

STRINGS :

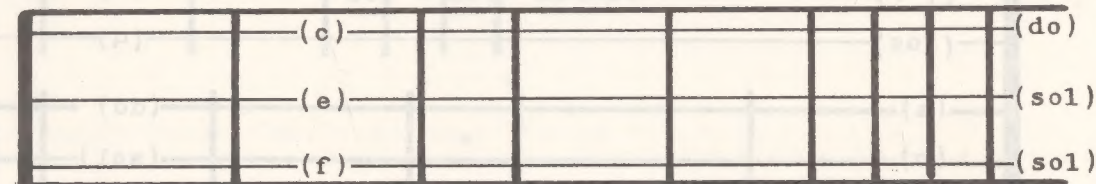
REFERENCE	MANUFACTURER	INSTRUMENT	STRING NO.
a)	Gibson	guitar	5th
b)	Gibson	guitar	3rd
c)	Gibson	5-str-banjo	3rd
d)*	Black Diamond	5-str-banjo	4th
e)	Black Diamond	5-str-banjo	3rd
f)	Black Diamond	5-str-banjo	2nd
g)	Black Diamond	5-str-banjo	1st

* This is a fair substitute for string c.

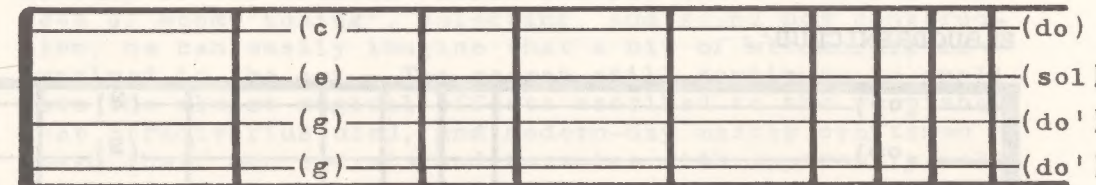
STRING PLACEMENTS AND RELATIVE TUNINGS:

(refer to preceding table)

(traditional)



(four-string)



(three pairs of strings)

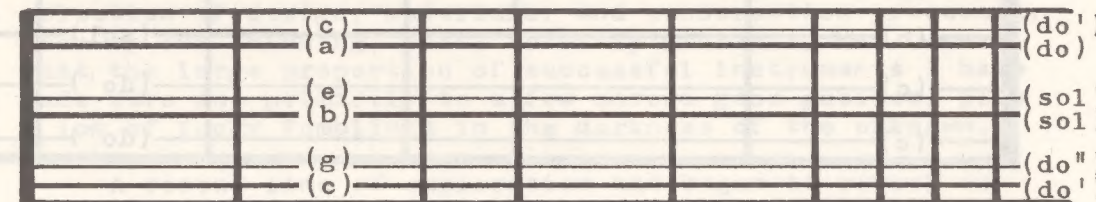


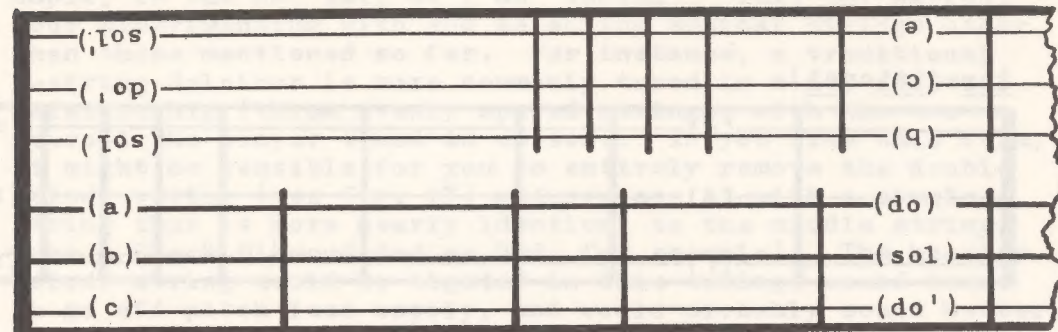
Figure 18a

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 peg box to the left).

STRING PLACEMENT DIAGRAMS, con'd.:

(refer to preceding table)

TWICIMER:



ELBUODREMICLUD':

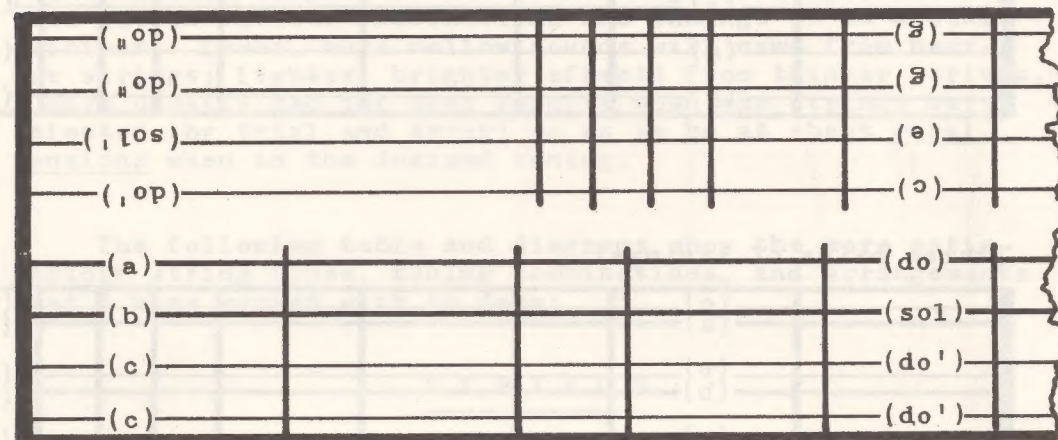


Figure 18b

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 sound box 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.

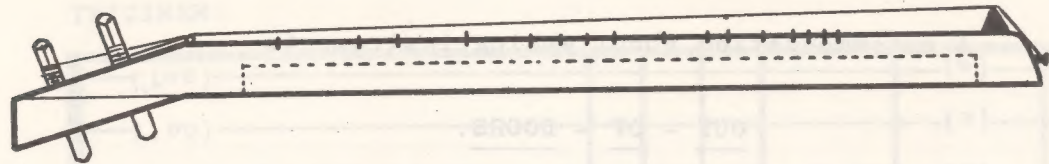
I find that a lot of persons I meet expect the same sort of complexity in accounts of my own procedures of making dulcimers. They evidence genuine surprise, and are at times incredulous at how lenient my claims are toward the selection of design, materials, and construction processes. Even my own thinking, 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 fumbings 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 fig. 19, next page). My intention was to be able to test at will the musical sound box properties of any common object, simply by holding the fingerboard against it, and strumming away.

Figure 19:

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, window panes, 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 to really accept the contradictions between the visual and aural impressions of, say, a singing trash basket, or a musical window pane. 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 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 thoroughly test 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.

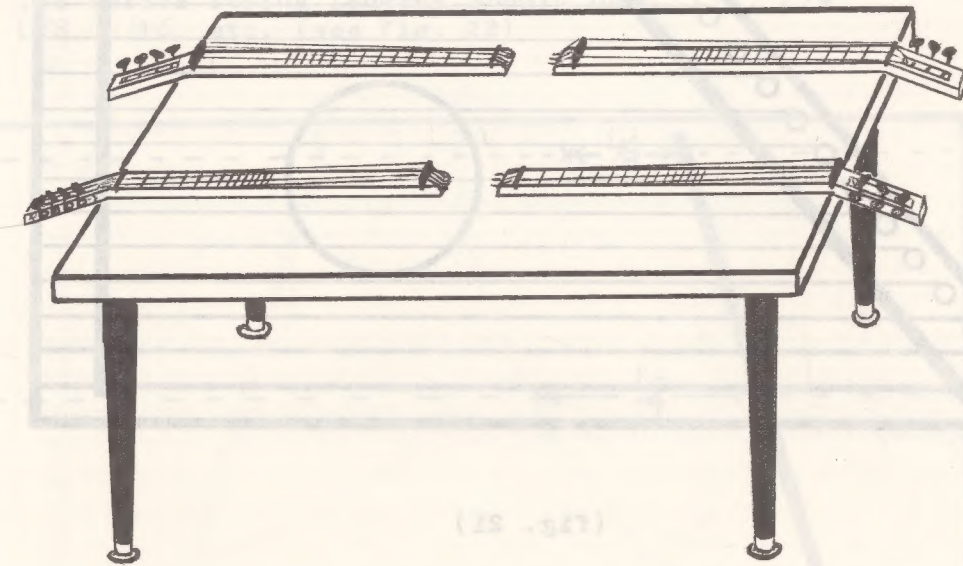
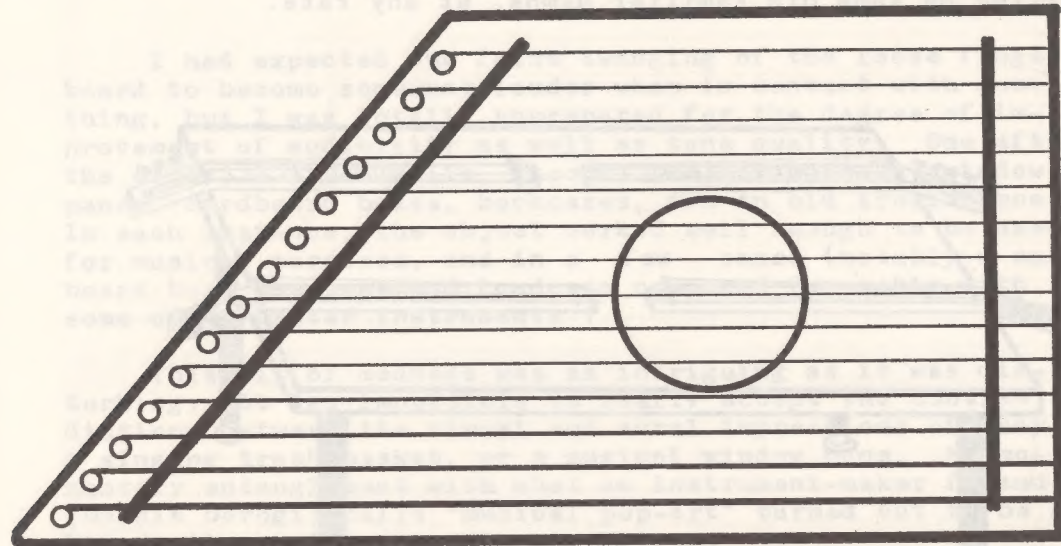


Figure 20: The 14-stringed D'ORCIMER.

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 sound box. The psaltery, made by Oscar Schmidt-International of Jersey City, N.J., looked something like the diagram in fig. 21 below, which was drawn from memory.



(fig. 21)

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 1/2 as long as before. I used this precept to plan the bridges in the following manner:

Planning the psaltery, con'd.:

- 1) I first sawed about 20" 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 succeeding 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 fig. 22)

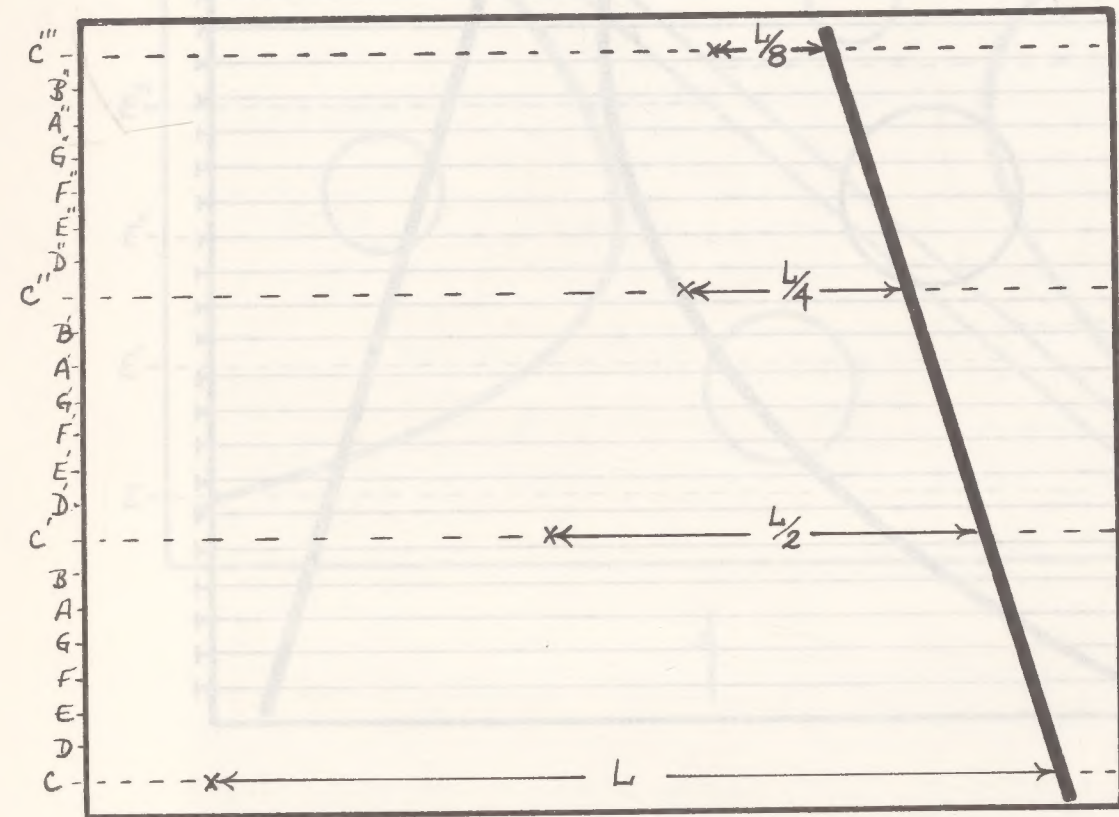


Figure 22: Early stage of planning the psecond bridge for the psaltery.

The psaltery, con'd.:

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.

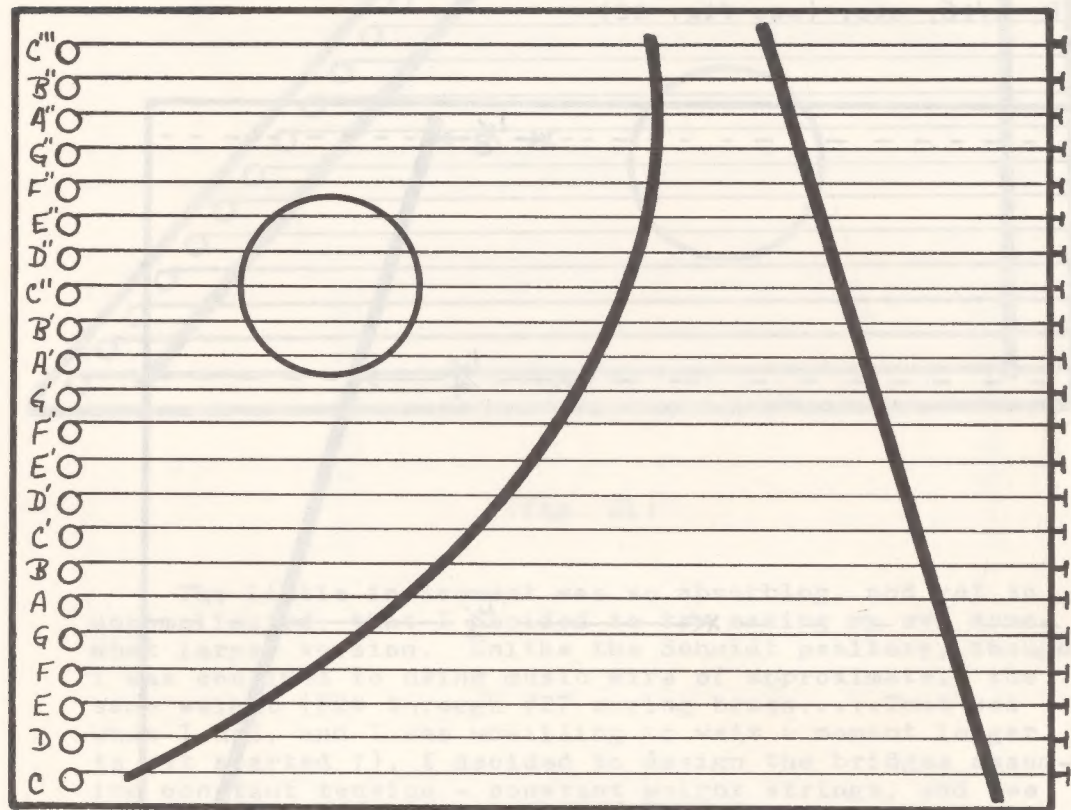


Figure 23: Approximate representation of finished psaltery.

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' X 5' 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 fig. 24 below). 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).

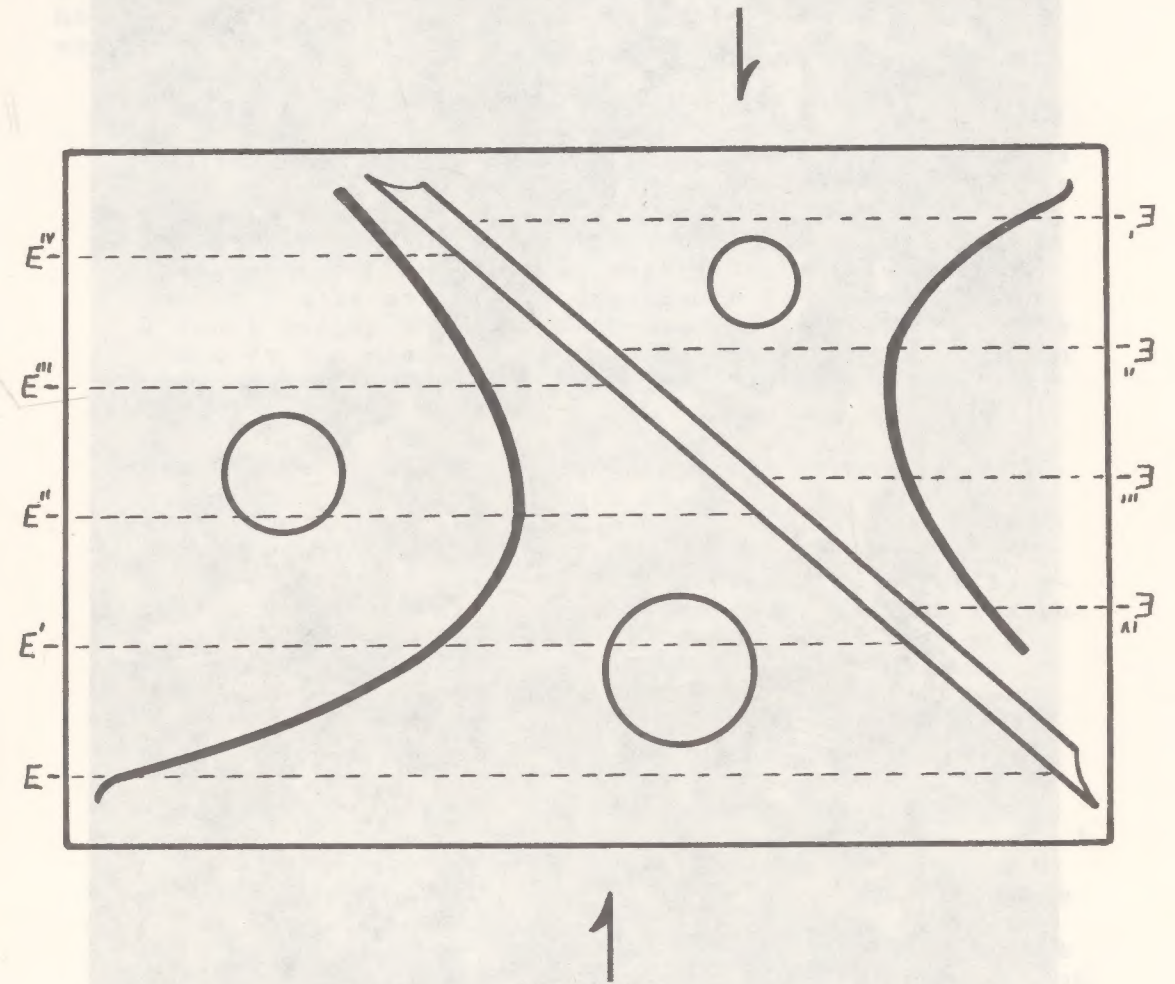


Figure 24: Representation of the double psaltery, showing placement of hitch-rail, curved bridges, sound holes, and octave strings. The "sound holes" were cut more for their visual improvement than for any other reason; the addition of gilded paper doilies in the holes obscured the door's inferior interior, and looked surprisingly elegant.

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 a 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 otherThe 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.



To the Experimenter:

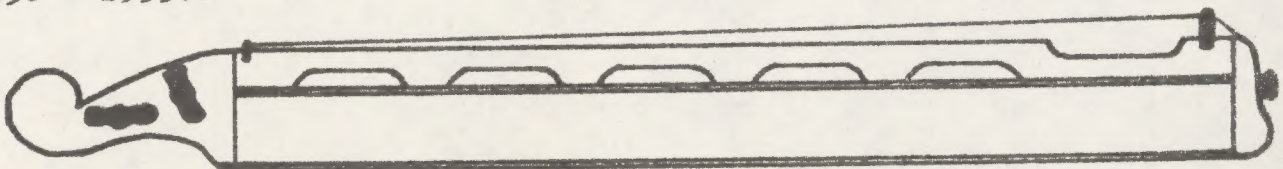
As you may readily discover, the Appalachian dulcimer is remarkably compliant to variations in construction details. Perhaps this is one of the really exciting realities of the instrument: to yield so well to the multitude of ideas that may occur to its builder and to its player. It is this same lack 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 18-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 18-rule dulcimer.

If you will refer to page 14 in my dulcimer brochure, you will see a system of arcs, created via the 18-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 18-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 fig. 14), 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).



BABYLON IS FALLEN.

165

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By G. S. DOSS

1. Hail the day so long expected, Hail the year of full release; Zion's walls are now erected, And her watchmen publish peace.

2. All her merchants stand with wonder, What is this that comes to pass? Murm'ring like the distant thunder, Crying "O, woe, alas, alas."

3. Blow the trumpet in Mount Zion, Christ shall come the second time, Ruling with a rod of iron; All who now as foes combine-

Thro our Shiloh's wide dominion, Hear the trumpet loudly roar,
Swell the sound ye kings and nobles, Priest and people rich and poor; Babylon is fallen, is fallen, is fallen. Babylon is fallen to rise no more, more.

Babel's garments we've rejected, And our fellowship is o'er;

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presented by

Howard W. Mitchell

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3. Tuning by Harmonics; The "Classical" Style
"Drink to Me Only with Thine Eyes"
"Study in Counterpoint" (Mitchell)
4. The "Bagpipe" Tuning; The Quill Technique
"MacPherson's Lament"
"Flop-Eared Mule"
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3. The "Three-Pairs-of-Strings" Dulcimer
"Frankie and Johnny"
"Two Sisters" (Child #10)
4. The Double Dulcimer
"The Ash Grove"
"Lady, Come and See"
"Babylon is Fallen"
5. The Double Psaltery
"Jesu, Joy of Man's Desiring"

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