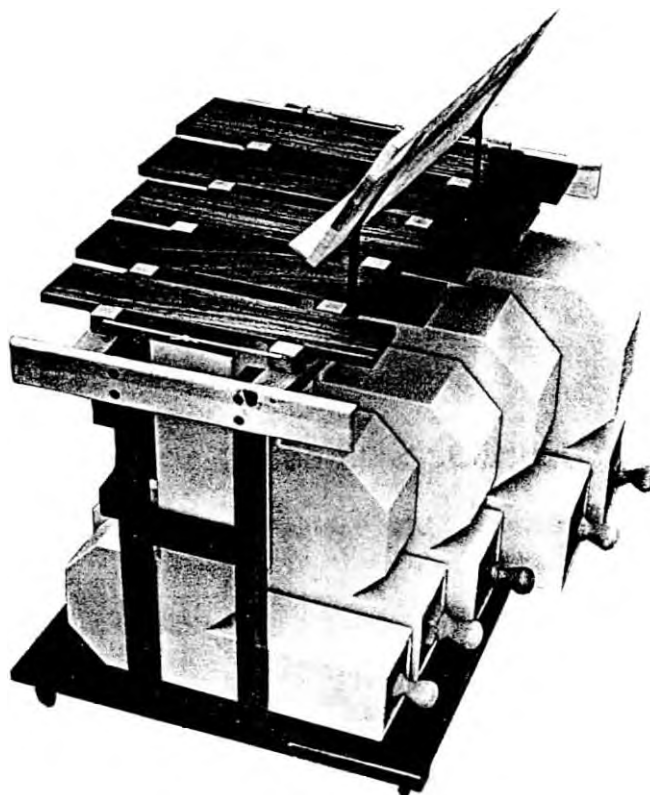


Mallet Percussion Science

# **CONTRA BASS MARIMBA (1974)**

Instrument Development Document  
Revision A



Christopher C. Banta

October 1990

**CCBANTA PUBLICATIONS**

232 Wyoming St.  
Pasadena, CA 91103

Doc. No.: CCB-1002

## TABLE OF CONTENTS

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	<u>Page</u>
<b>INTRODUCTION</b>	<b>3</b>
<b>DESIGN CONCEPT AND INSTRUMENT DESCRIPTION</b>	<b>4</b>
INSTRUMENT'S PREDECESSOR	4
EVENTS LEADING UP TO THE INSTRUMENT'S DESIGN	4
ACKNOWLEDGMENT	4
ABOUT HARRY PARTCH	4
ABOUT THE HARRY PARTCH MARIMBA EROICA	4
ENGINEERING DESCRIPTION OF THE CCBANTA CONTRA BASS MARIMBA	5
Figure 1 Description and Photo of the Harry Partch Marimba Eroica	6
Figure 2 The Harry Partch Marimba Eroica	7
Figure 3 The Harry Partch Marimba Eroica in Concert	8
<b>PRE-FABRICATION INFORMATION</b>	<b>9</b>
SIGNIFICANT EVENTS IN THE INSTRUMENT'S DESIGN	9
PRE-FABRICATION SKETCHES'	9
Sketch No. 1	10
Sketch No. 2	11
Sketch No. 3	12
Sketch No. 4	13
Sketch No. 5	14
Sketch No. 6	15
Sketch No. 7	16
Sketch No. 8	17
Sketch No. 9	18
Sketch No. 10	19
Sketch No. 11	20
Sketch No. 12	21
Sketch No. 13	22
Sketch No. 14	23
Sketch No. 15	24
<b>POST-FABRICATION INFORMATION</b>	<b>25</b>
CONSTRUCTION COMPLETION DATE	25
LOCATION OF CONSTRUCTION	25
SIGNIFICANT EVENTS IN THE INSTRUMENT'S	
CONSTRUCTION AND FUNCTION	25
SUMMARY OF IMPROVEMENTS LACKING IN THE PREDECESSOR	26
POST-FABRICATION PHOTOGRAPHS	26
Photo No. 1	27
Photo No. 2	28
Photo No. 3	29
Photo No. 3	30
<b>INSTRUMENT SPECIFICATIONS</b>	<b>31</b>
<b>INSTRUMENT EXHIBIT/DISPLAY SUMMARY AND STATUS</b>	<b>32</b>
INSTRUMENT'S EXHIBIT/DISPLAY SUMMARY	32
INSTRUMENT STATUS	32

## INTRODUCTION

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I developed this document to describe the issues surrounding the design, development, and fabrication of a class of [CCBANTA] percussion instruments known as the "Contra Bass Marimba". I felt it was important to document my bass marimba projects, and to make them available to anyone interested in low-frequency mallet percussion instruments.

I apologize for the sketches contained herein if they are unclear, incomplete, and messy. They were included to show the reader my thought processes in the instrument's development prior to fabrication. The information was not intended to be adequate to build a bass marimba. Instead, it was included so that it might be entertaining or helpful to those who are involved in their own bass marimba projects.

A handwritten signature in black ink that reads "CC Banta". The signature is stylized and includes a long horizontal stroke extending to the right from the end of the name.

Christopher C. Banta

## DESIGN CONCEPT AND INSTRUMENT DESCRIPTION

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### INSTRUMENT'S PREDECESSOR

Since there was no *contra* bass marimba [starting with the pitch of Bass C, 32.7 Hz], the Bass Marimba constructed in 1973 could be considered the predecessor

### EVENTS LEADING UP TO THE INSTRUMENT'S DESIGN

My continuing curiosity with low percussive bass notes abounded. With the completion of the 1973 bass marimba, it was only natural to see if I could build an instrument that went an octave lower! Hence, a *contra* bass marimba was in order.

The *Contra-Bass Marimba* represented the "low-end" extension to the 1973 bass marimba. One primary reason for its design and construction, was to see if I could build such an instrument without prior knowledge of the physics of these lower frequencies. It became a test to see if the illustrations and math on paper could yield a functional instrument of this type. An additional reason for my desire to design and build this marimba came from my hearing the "*Marimba Eroica*" passages from various Harry Partch compositions.

### ACKNOWLEDGMENT

As with the 1973 bass marimba project, I graciously cite Harry Partch as the inspiration for my instruments and give him complete credit for my [CCBANTA] bass marimbas of today.

### ABOUT HARRY PARTCH

A written description of Harry Partch and his music can be found in the "Instrument Development Document (No. CCB-1001), Bass Marimba (1973)".

### ABOUT THE HARRY PARTCH MARIMBA EROICA

A brief description and photographs of the Harry Partch Marimba "*Eroica*" is provided in Figures 1, 2, and 3.

ENGINEERING DESCRIPTION OF THE CCBANTA CONTRA BASS MARIMBA

*The Contra-Bass Marimba shall be a five-note, percussion musical instrument starting with the bottom pitch of C (32.7 Hz). There shall be five notes ascending from the bottom pitch of bass C. The notes shall be C, D, F, G, and B-flat. Each bar shall have its own corresponding quarter-wavelength resonator with an adjustable stopper at the closed end. As required, resonators shall be extensively mitered to accommodate the playing surface height of 37 inches. Both bars and resonators shall be held in precise alignment with each other using a support frame. The whole instrument shall be made mobile through the use of casters.*

Rationale for notes selection - *The rationale for selecting these specific notes was that they matched the I, IV, and V7 "boogie-woogie" changes in three keys. The three keys are: Key of C [C, F, & G], Key of F [F, B-flat, & C] and the Key of G [G, C, & D].*



BILL &amp; GWEN SLOAN

**MARIMBA EROICA.** Built 1951-1955, at Mills College and at Gate 5, Sausalito, California. The largest resonator is 8 feet long, 4 feet high, and 14 inches wide. The plank above this is close to 8 feet long. All planks are mounted at the nodes on foam rubber. The player stands on a riser 14 inches high.

Resonators are of five-ply  $\frac{3}{4}$ -inch redwood veneer, with steel rods for holding the sides rigid. The four tone-producing planks are of vertical-grain Sitka spruce; one is vertical-grain redwood.

The lowest tone gives an approximate F below the lowest piano A. Above this are (approximately) the lowest piano C, the lowest E, and the octave above the lowest A. The instrument is played with heavy padded mallets, and with hands in padded gloves.

Figure 1

Description and photo of Harry Partch playing the Marimba Eroica

[Ref: Album liner notes "From the Music of Harry Partch", Composers Recordings, Inc., No. CRI 193]

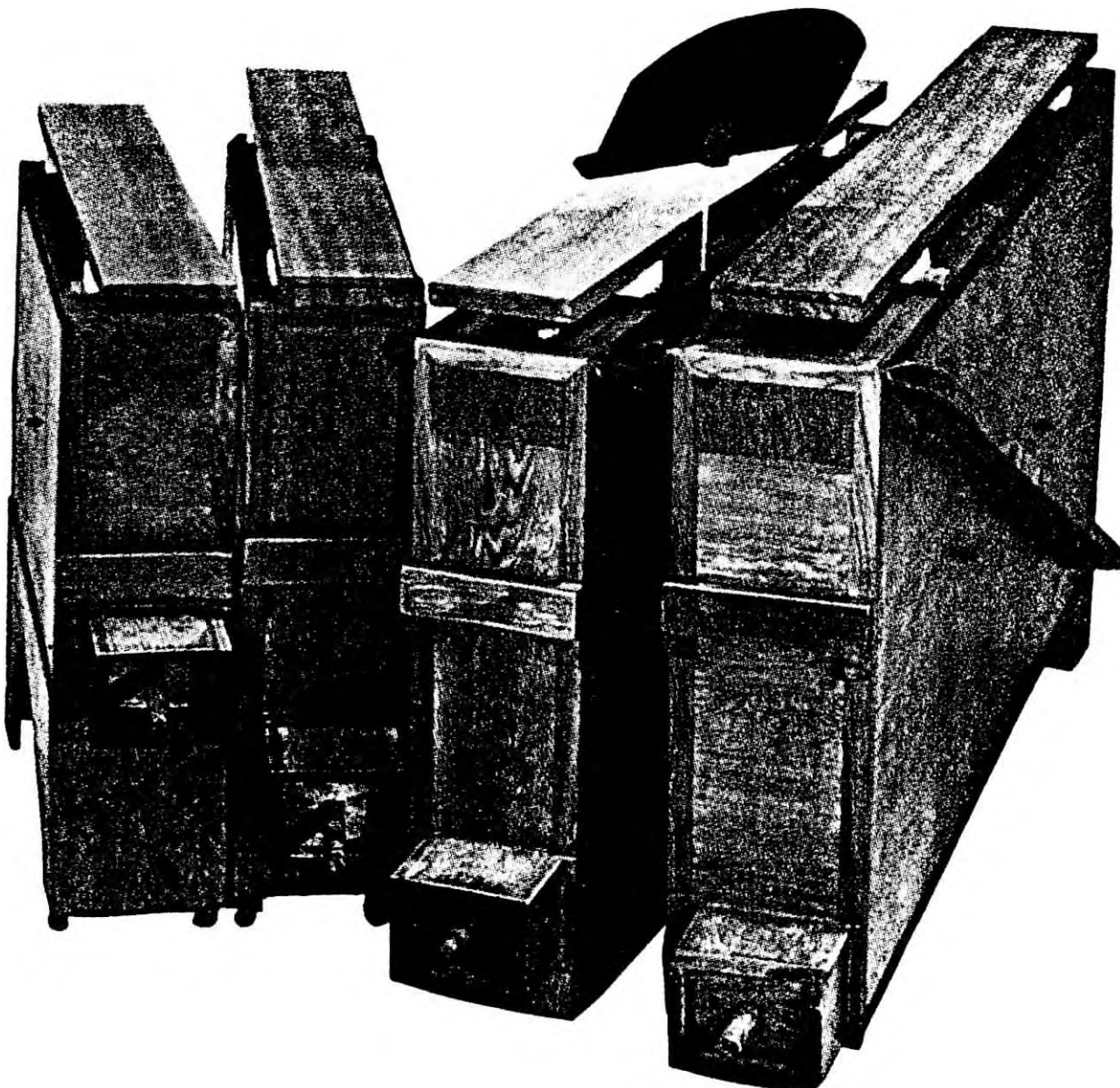


Figure 2

Photo of the Harry Partch Marimba Eroica

[Ref: Album liner notes "Harry Partch/Delusion of the Fury", Columbia Masterworks, No. M2 30576]

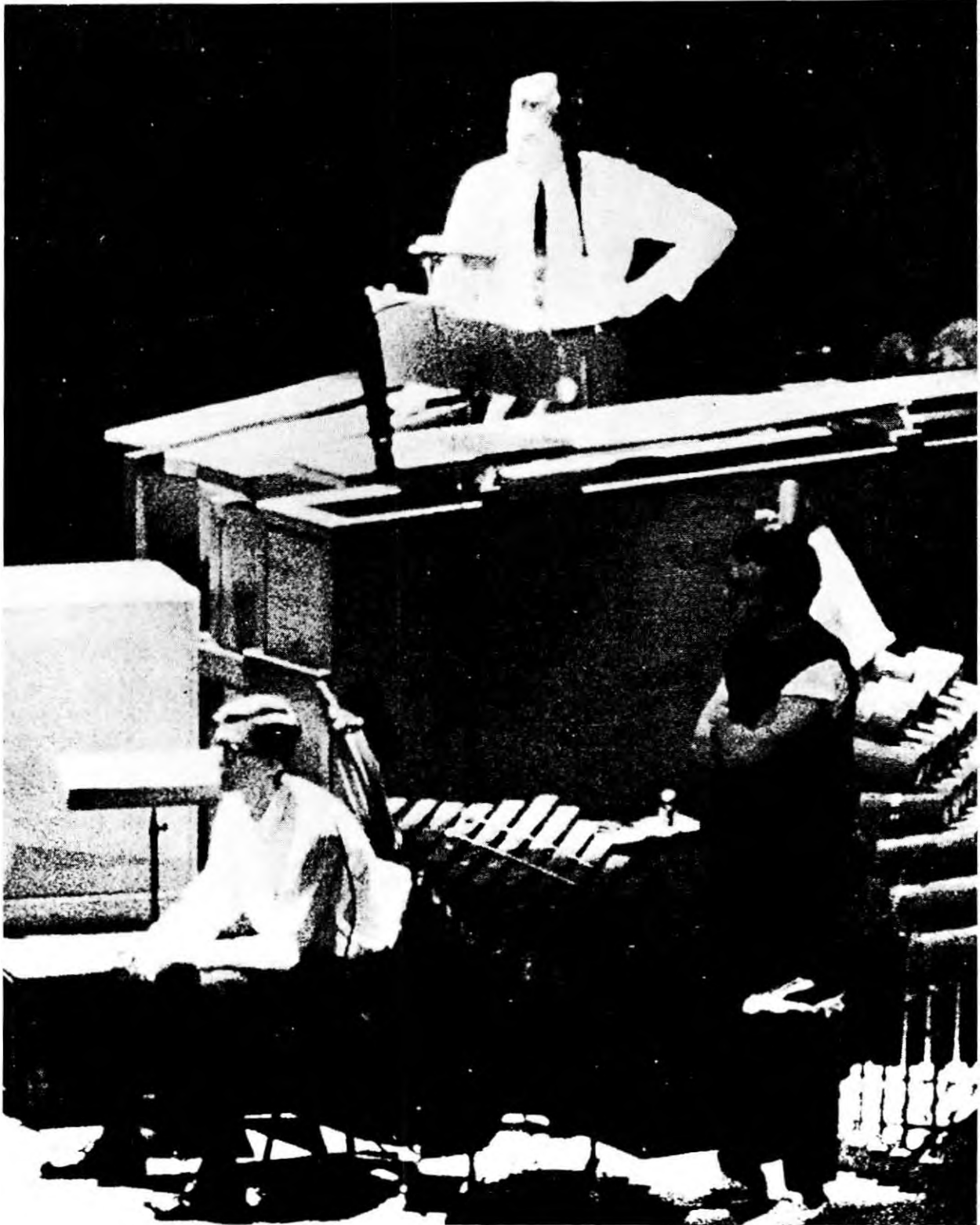


Figure 3

Photo of the Harry Partch Marimba Eroica in Concert

[Ref: Album jacket "From the Music of Harry Partch", Composers Recordings, Inc., No. CRI 193]



## PRE-FABRICATION INFORMATION

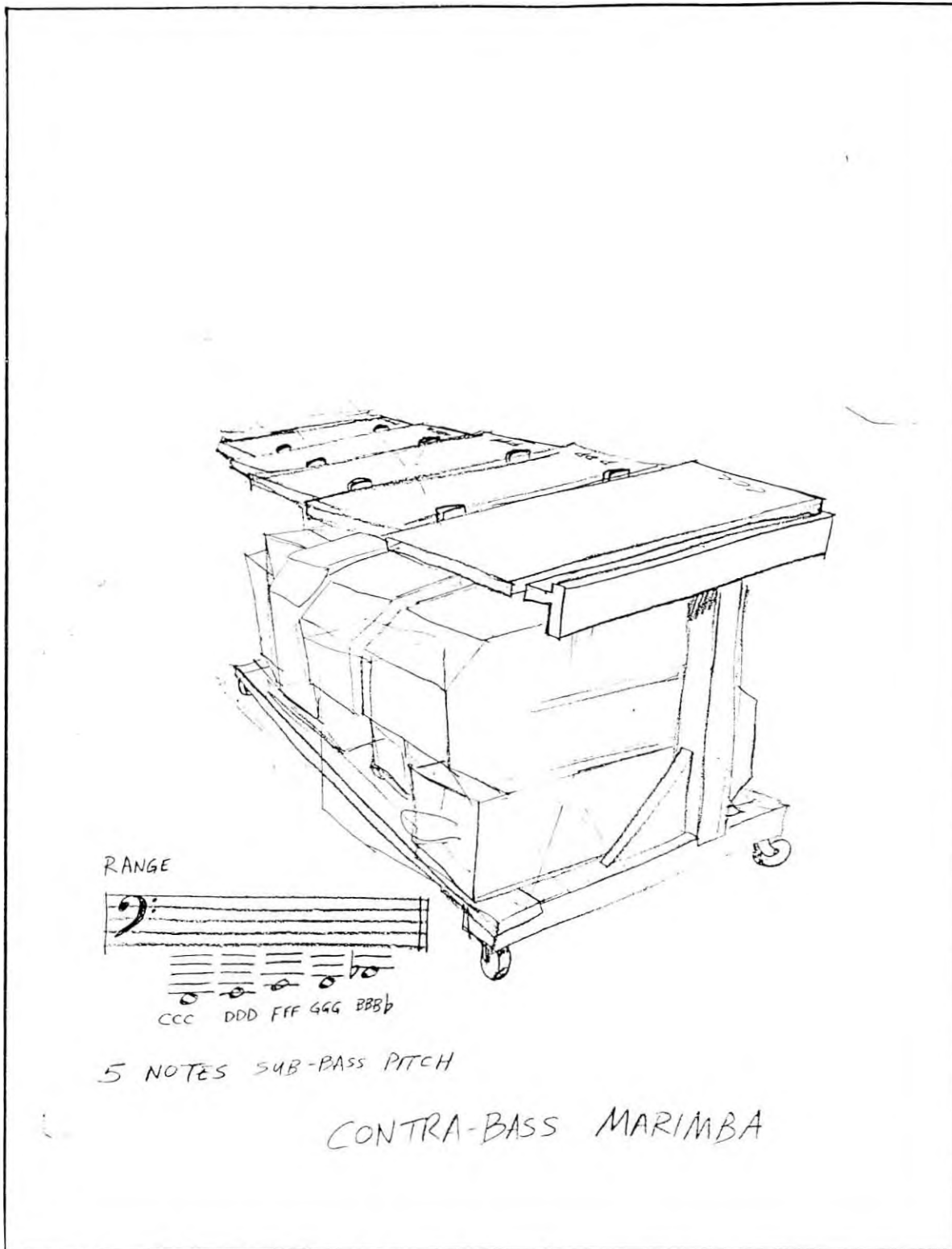
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### SIGNIFICANT EVENTS IN THE INSTRUMENT'S DESIGN

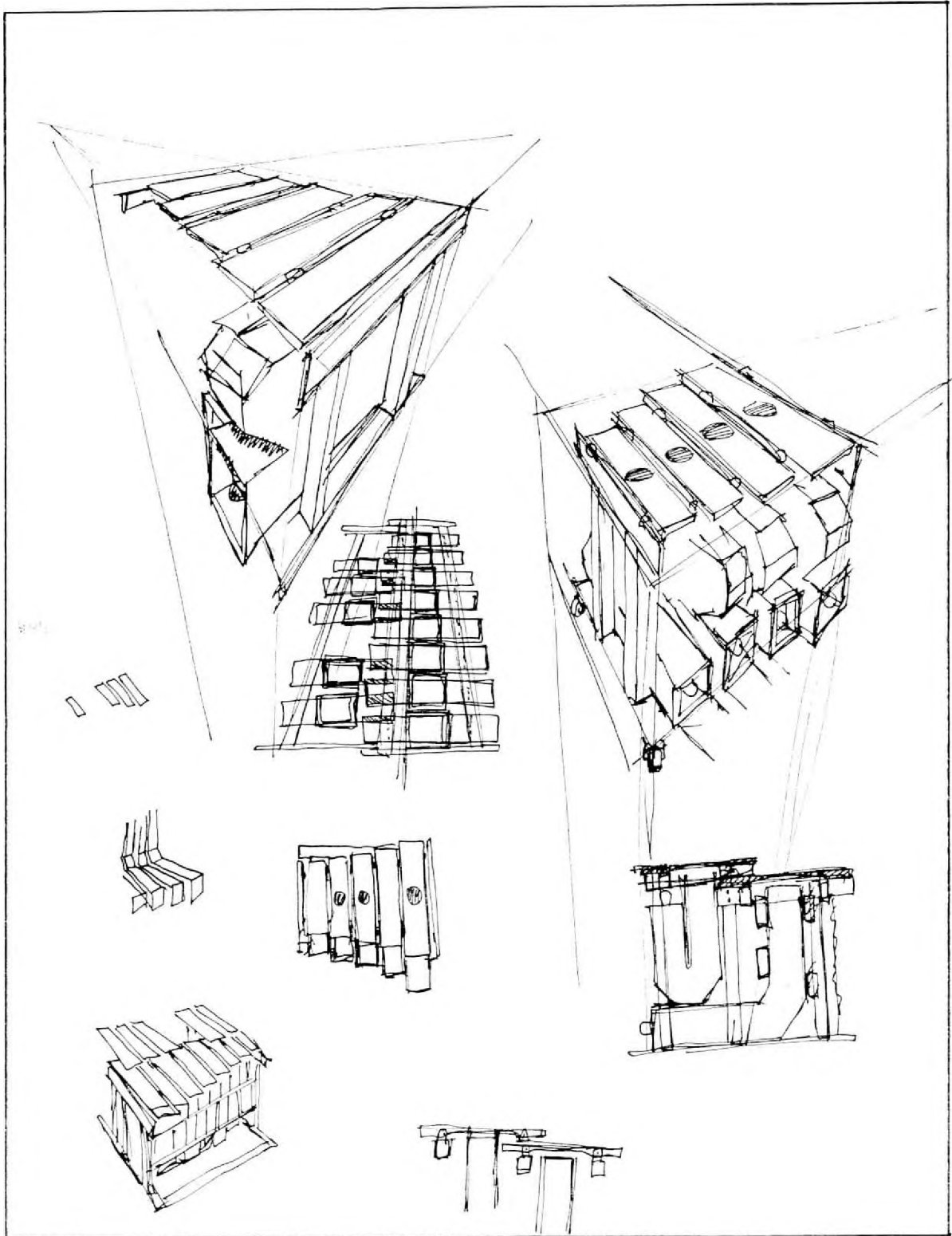
- I decided to use "switch-back" type mitering since each resonator's internal dimensions were so large. (Normally columns are cut-down from tubes to accommodate mitering.) The cavity type resonators, like the Harry Partch Marimba Eroica, were not used. I felt I could calculate a column length easier than determining an internal volume-to-frequency value of a cavity resonator.
- Resonator stoppers utilized felt for air-tight seal and large *wood-turn* handles to control stopper depth within the resonator.

### PRE-FABRICATION SKETCHES

Pages 10 through 24 show my early design sketches and tables.



Sketch No. 1



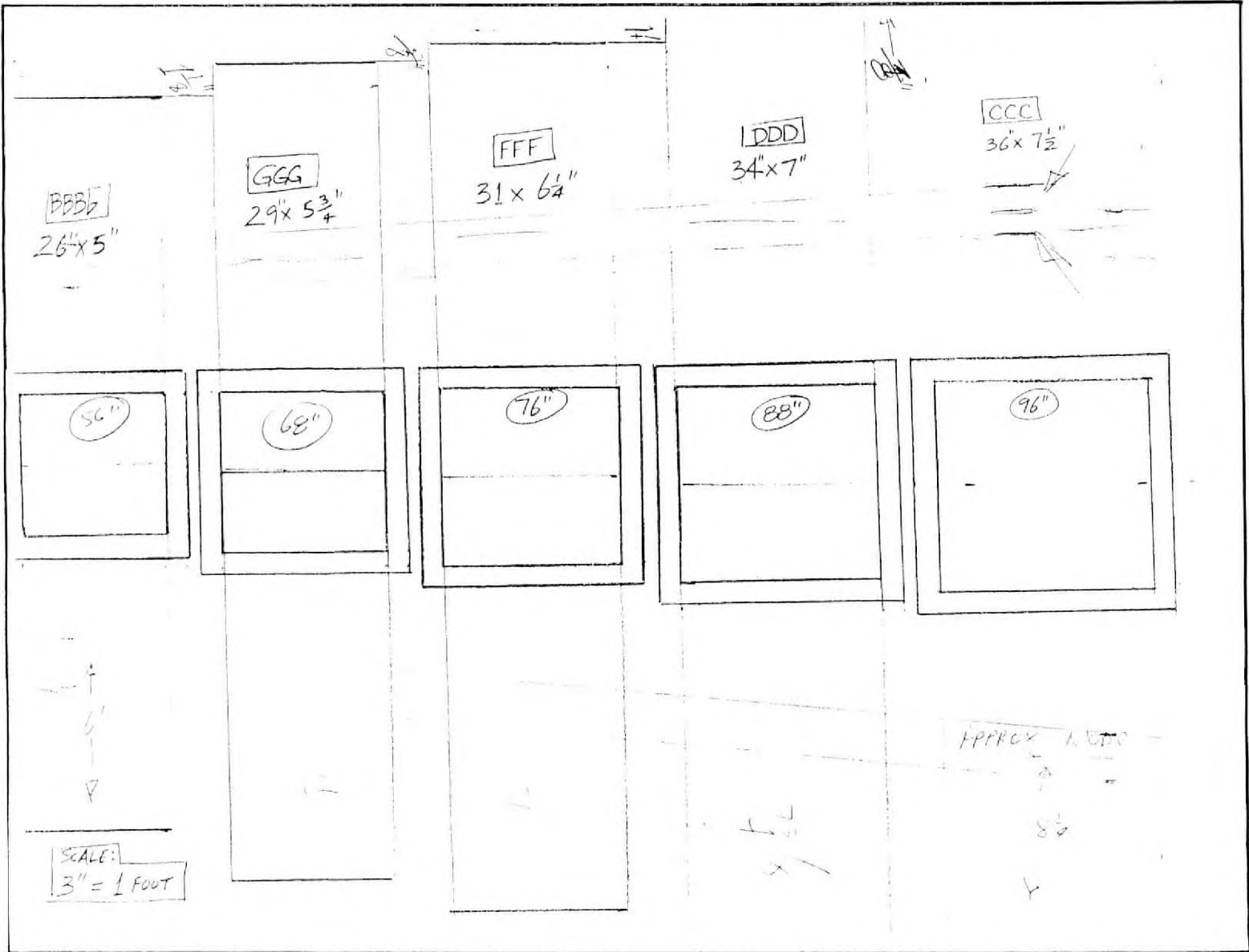
Sketch No. 2

	LENGTH	WIDTH
BBBBb	26"	5"
GGG	29"	5 $\frac{3}{4}$ "
FFF	31"	6 $\frac{1}{4}$ "
DDD	34"	7"
CCC	36"	7 $\frac{1}{2}$ "

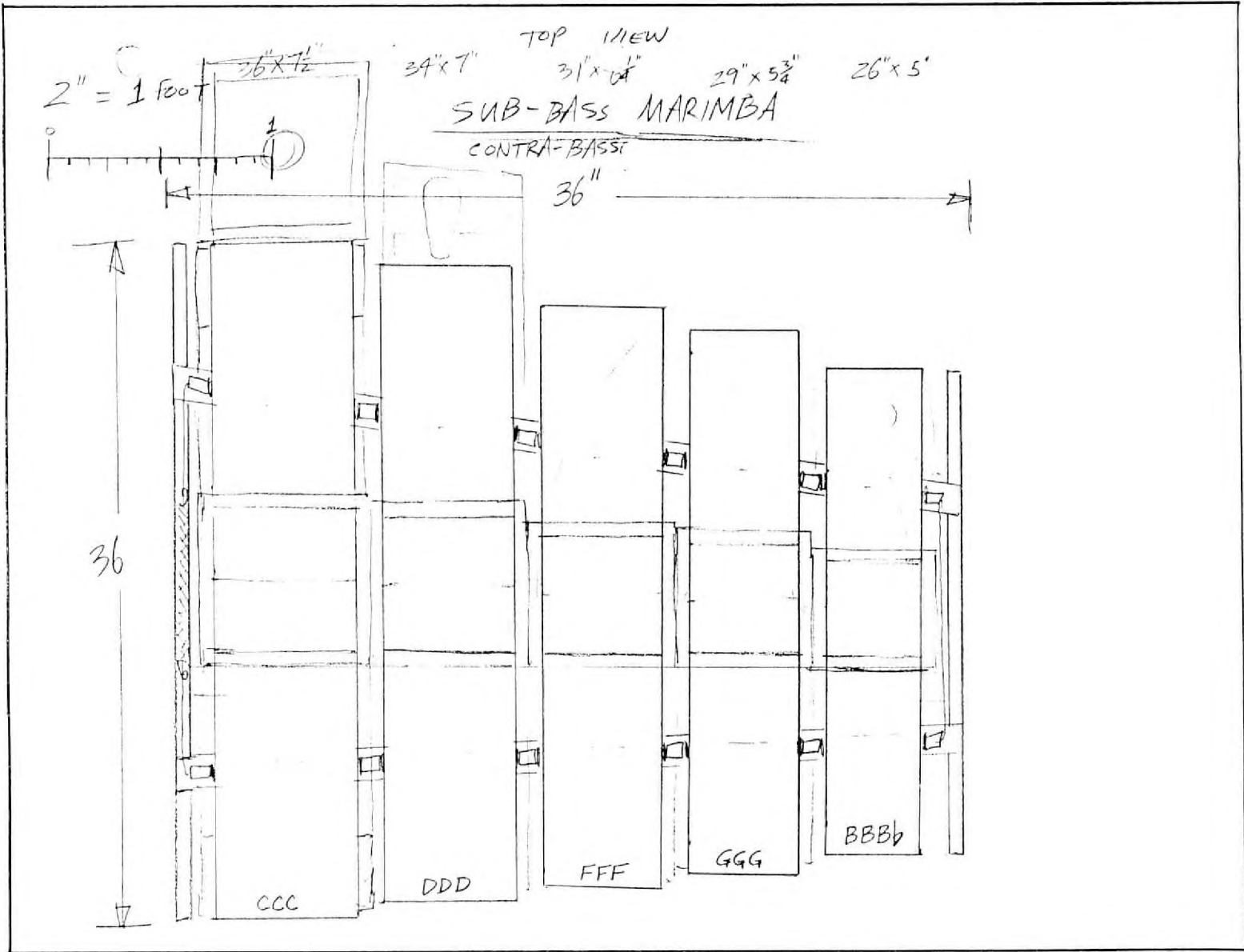
  

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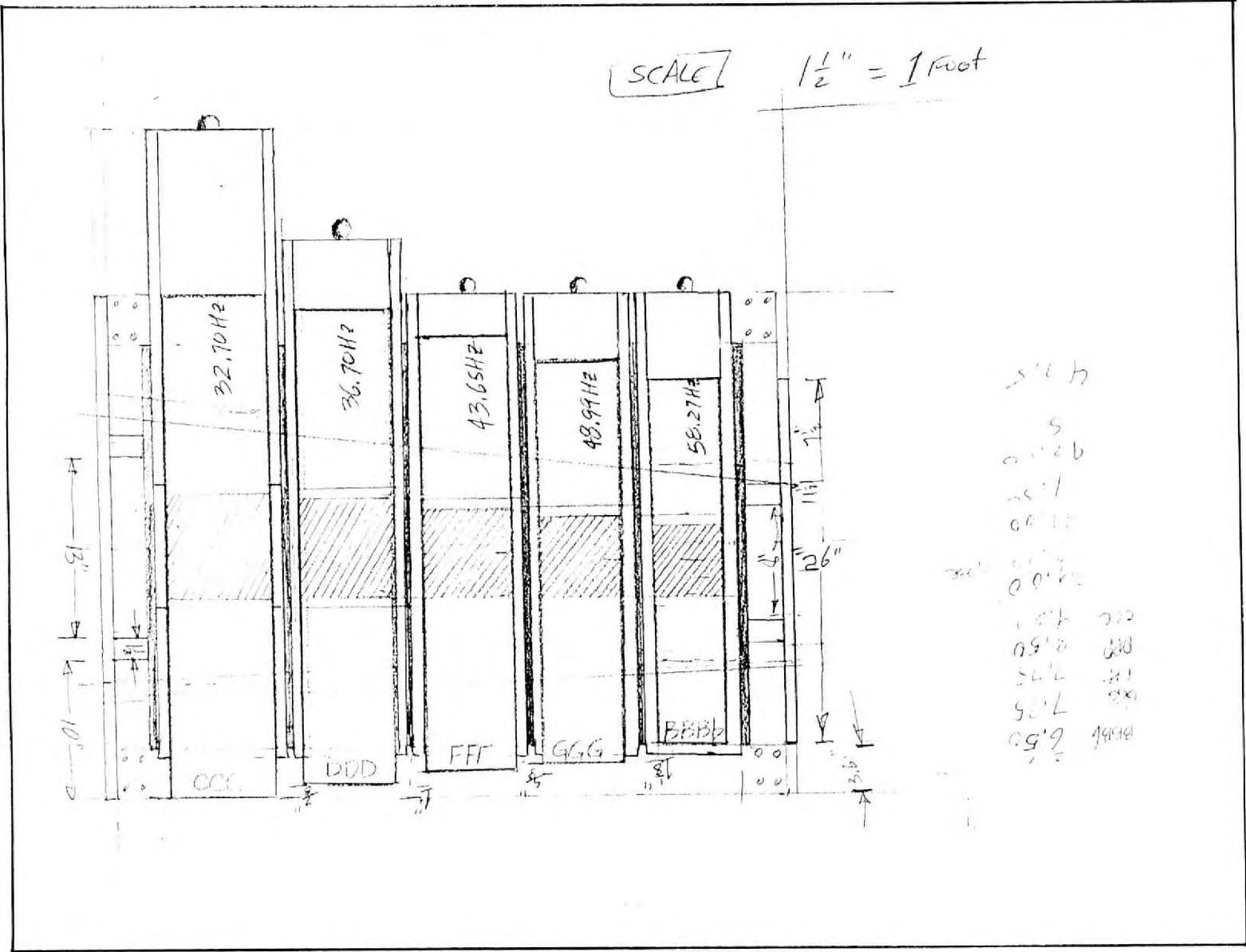
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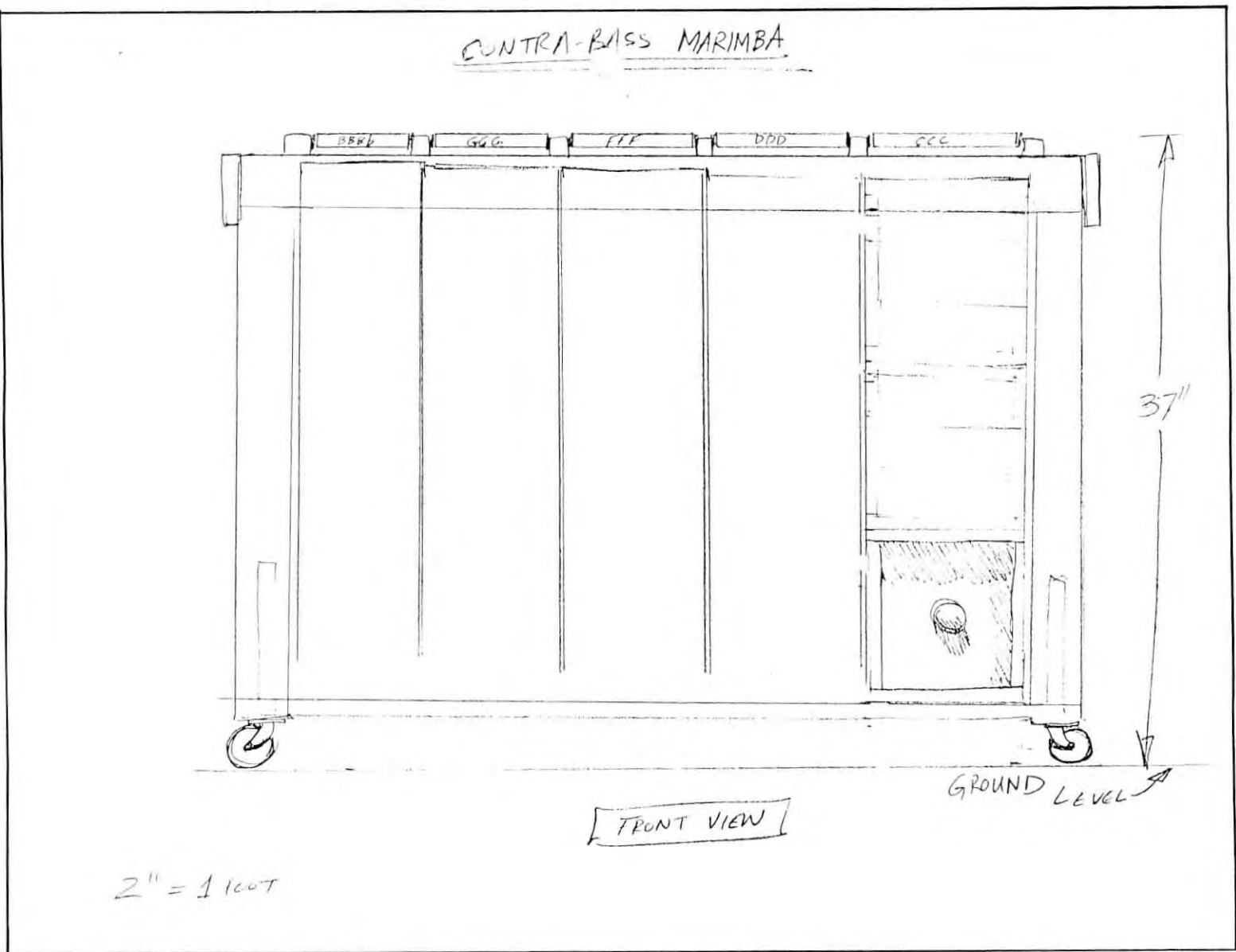


Sketch No. 5



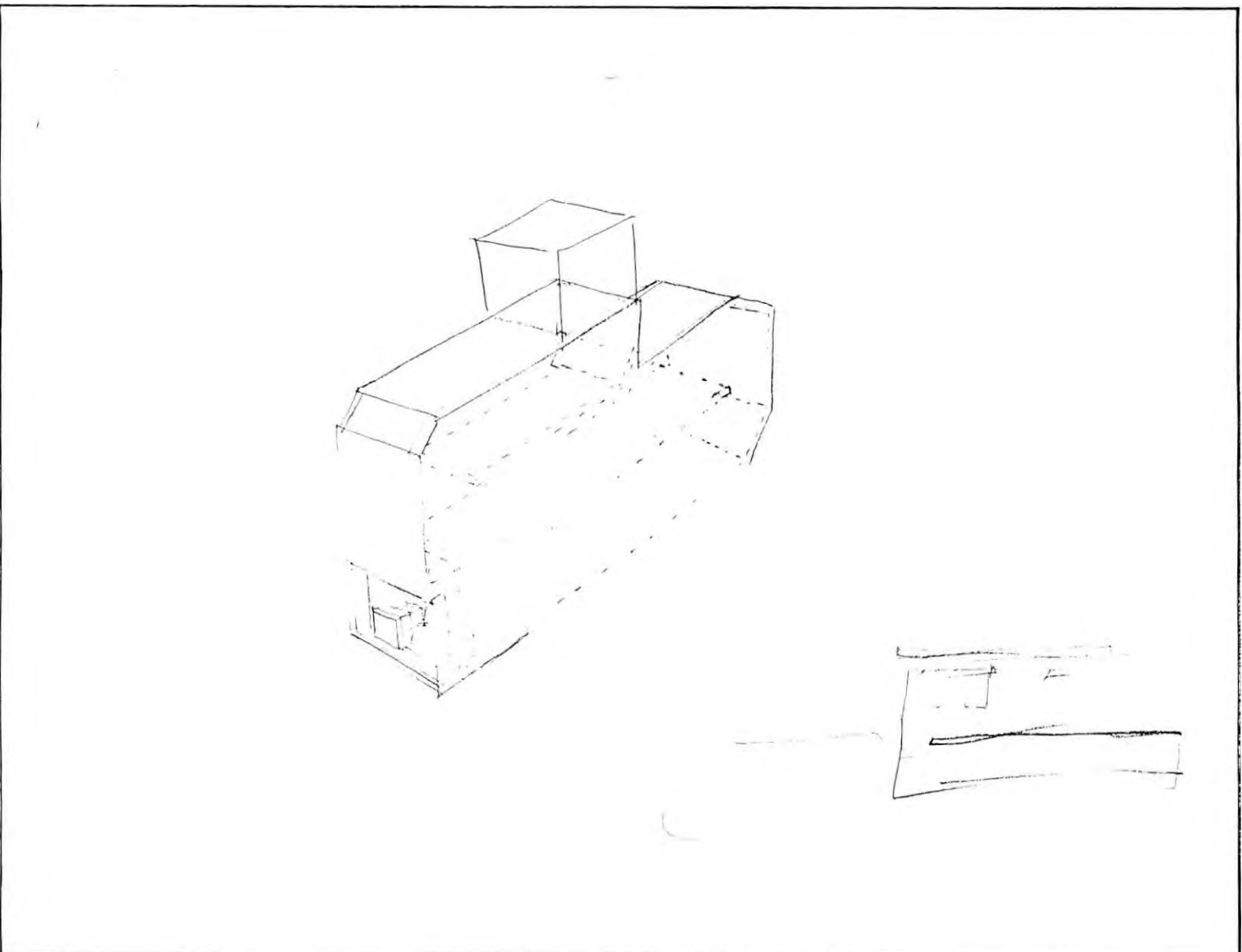
Sketch No. 6



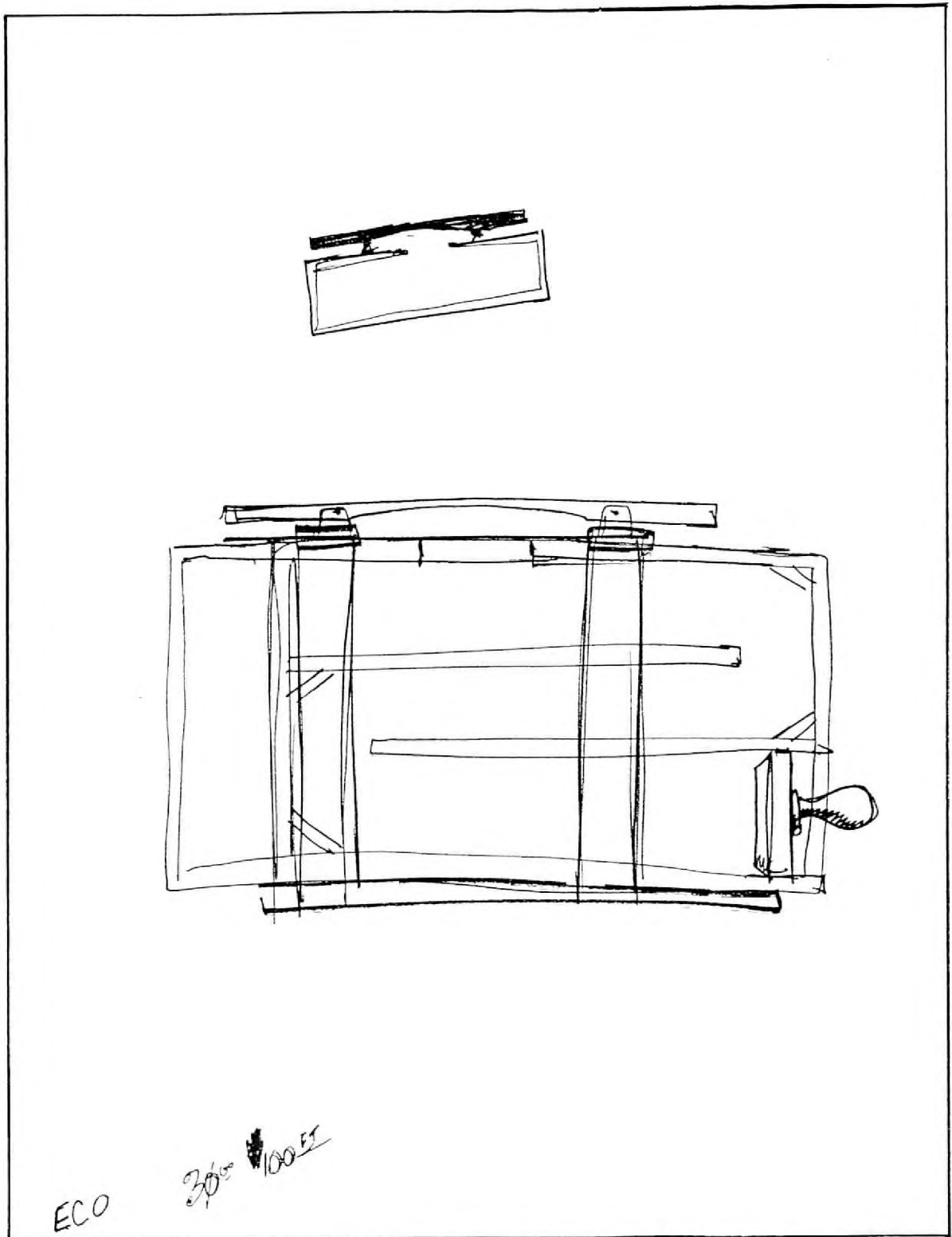


Sketch No. 7





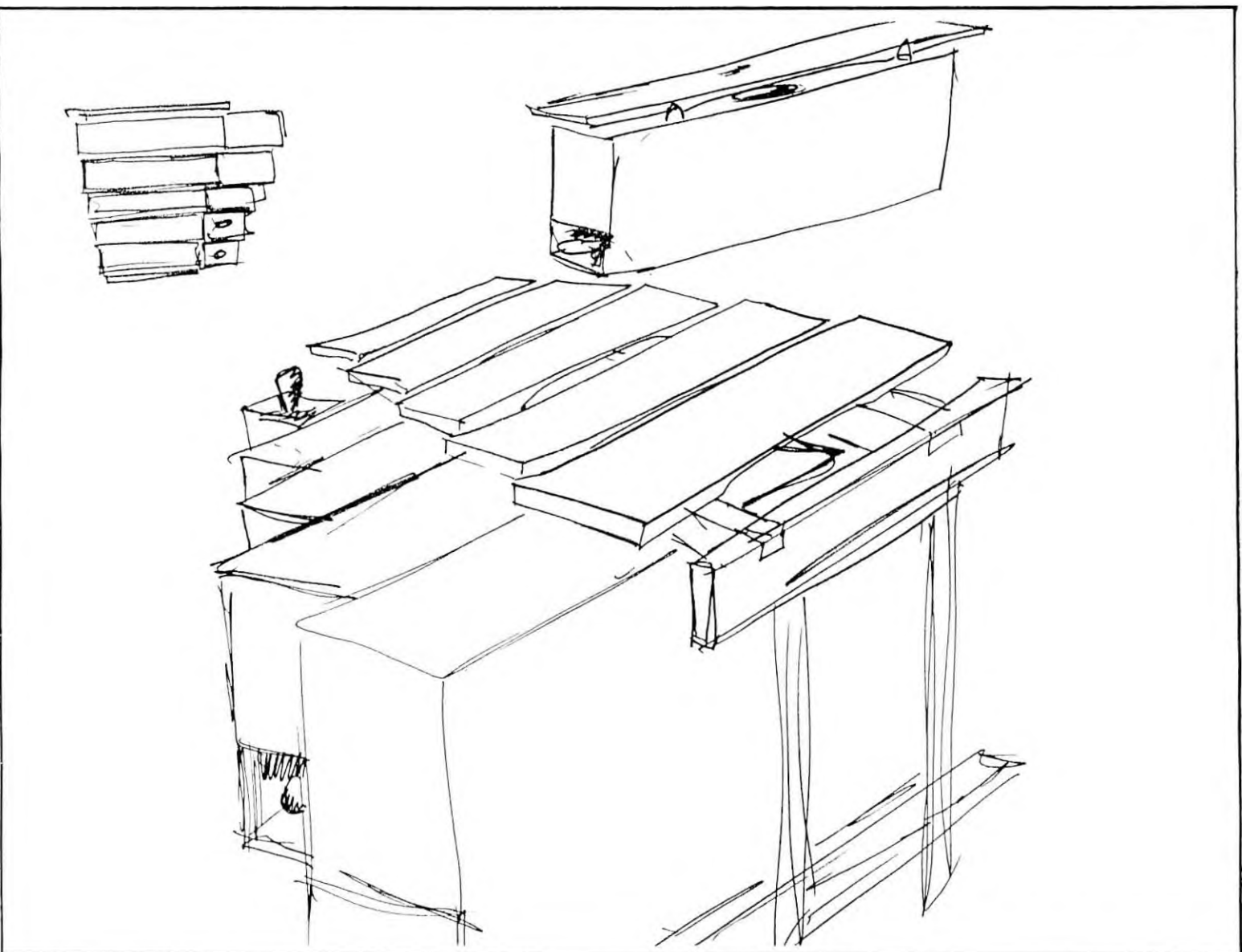
Sketch No. 8



ECO

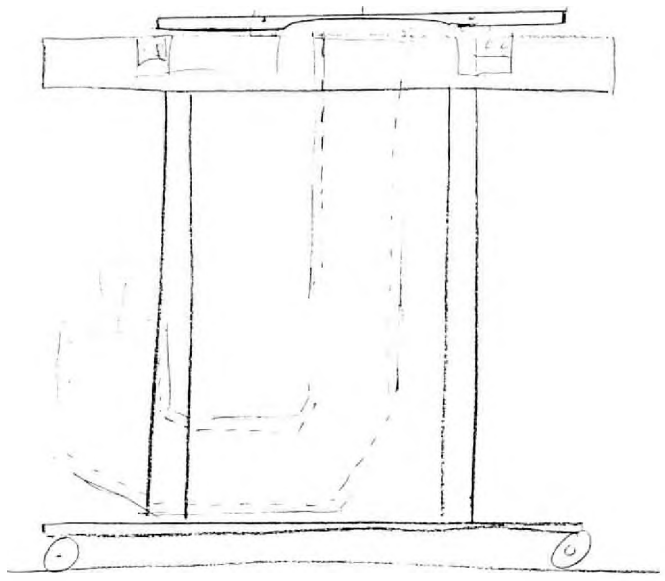
30<sup>th</sup> 100<sup>th</sup>

Sketch No. 9

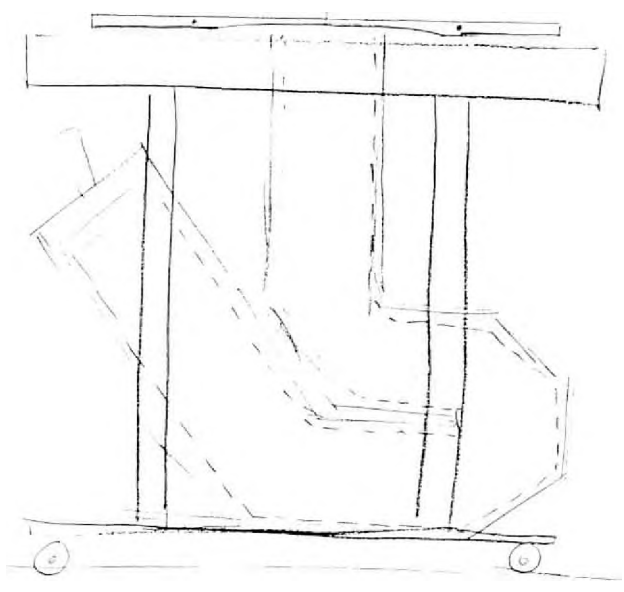


Sketch No. 10

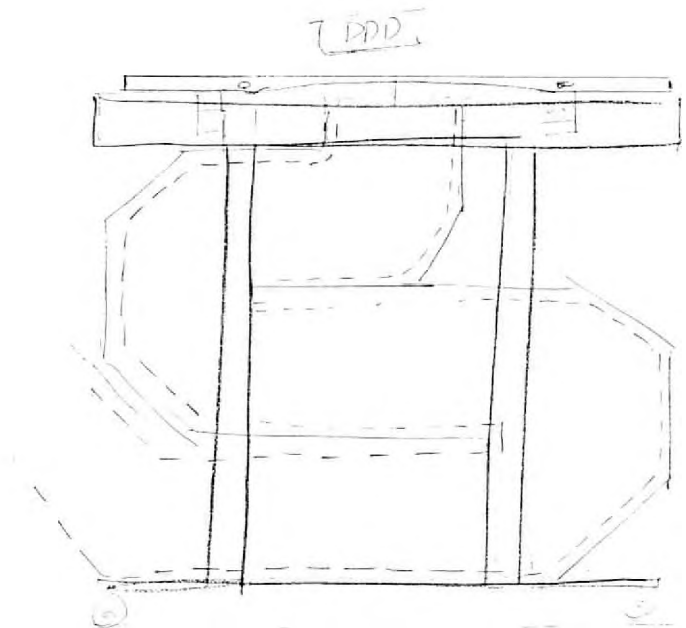
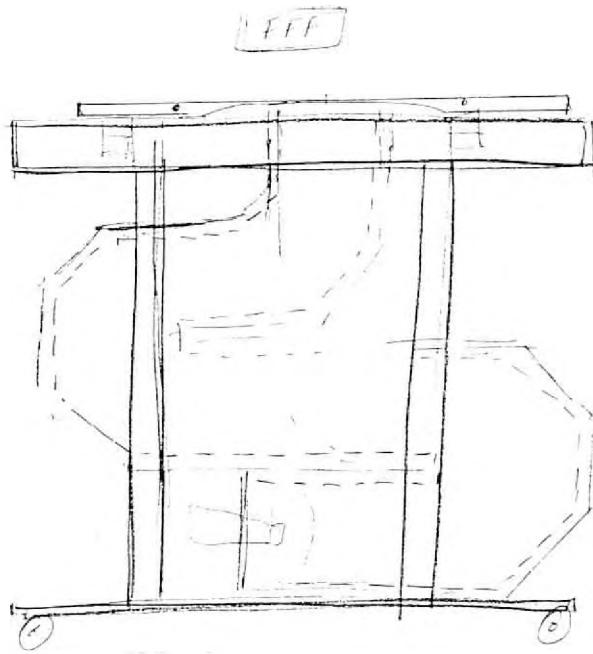
BBB



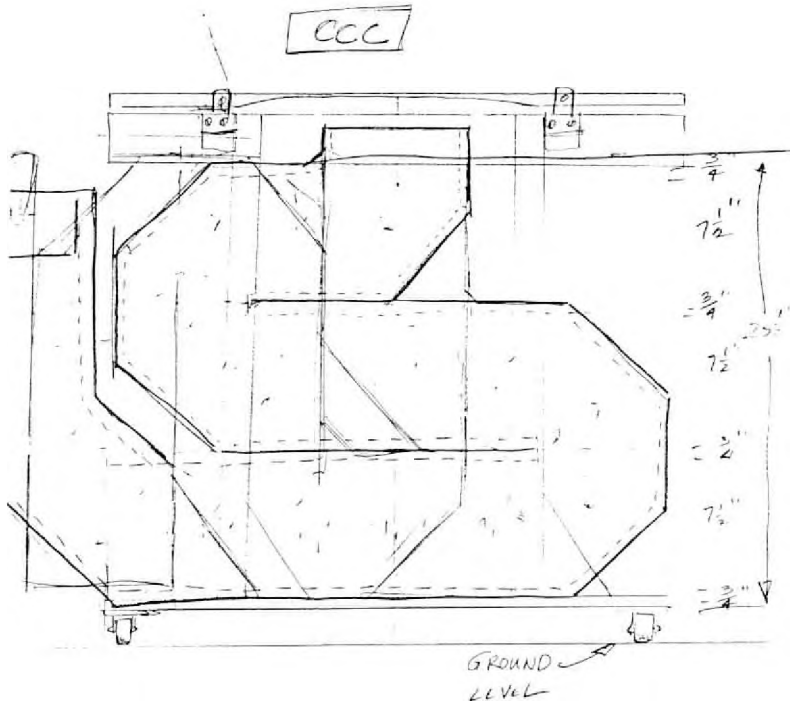
GGG



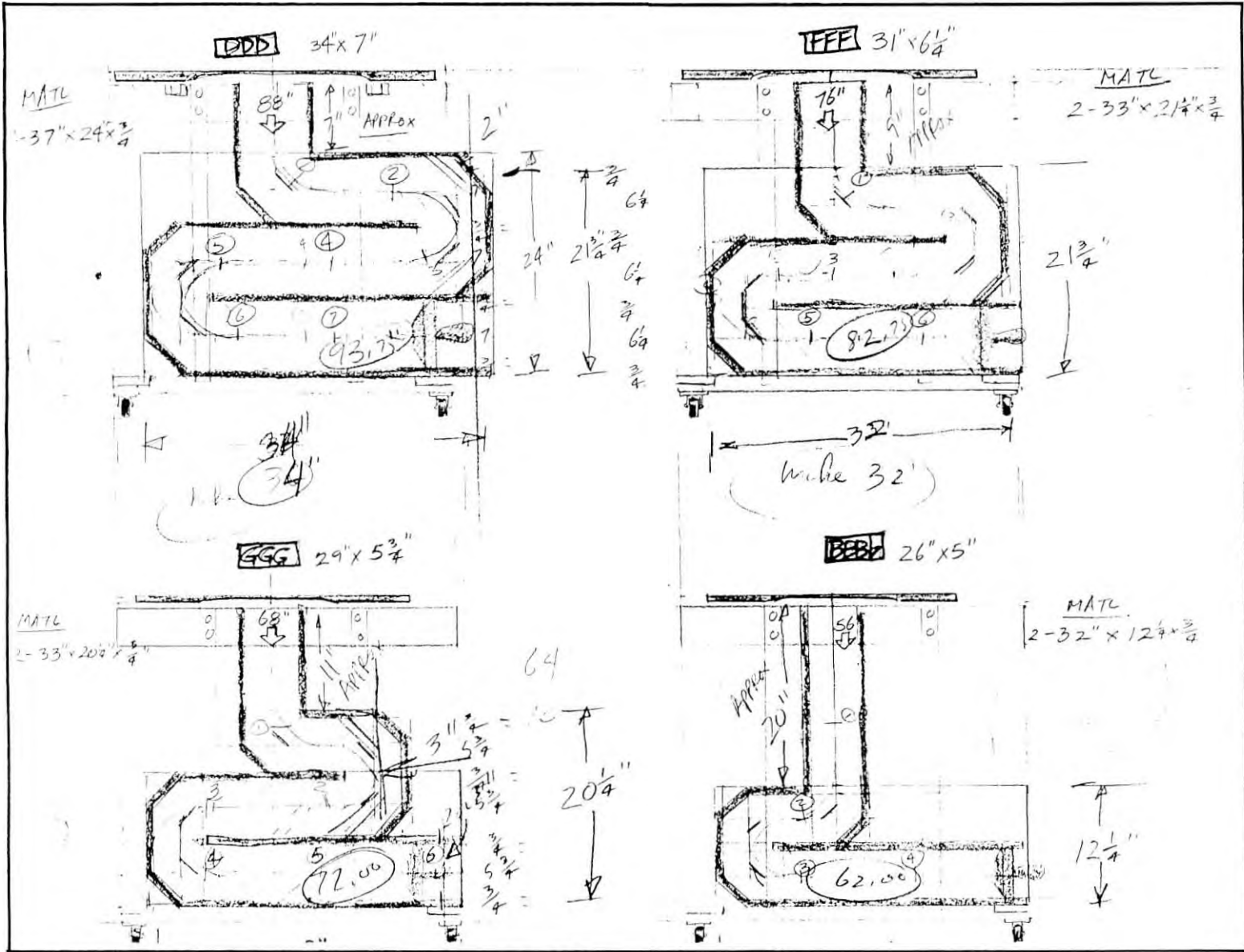
Sketch No. 11



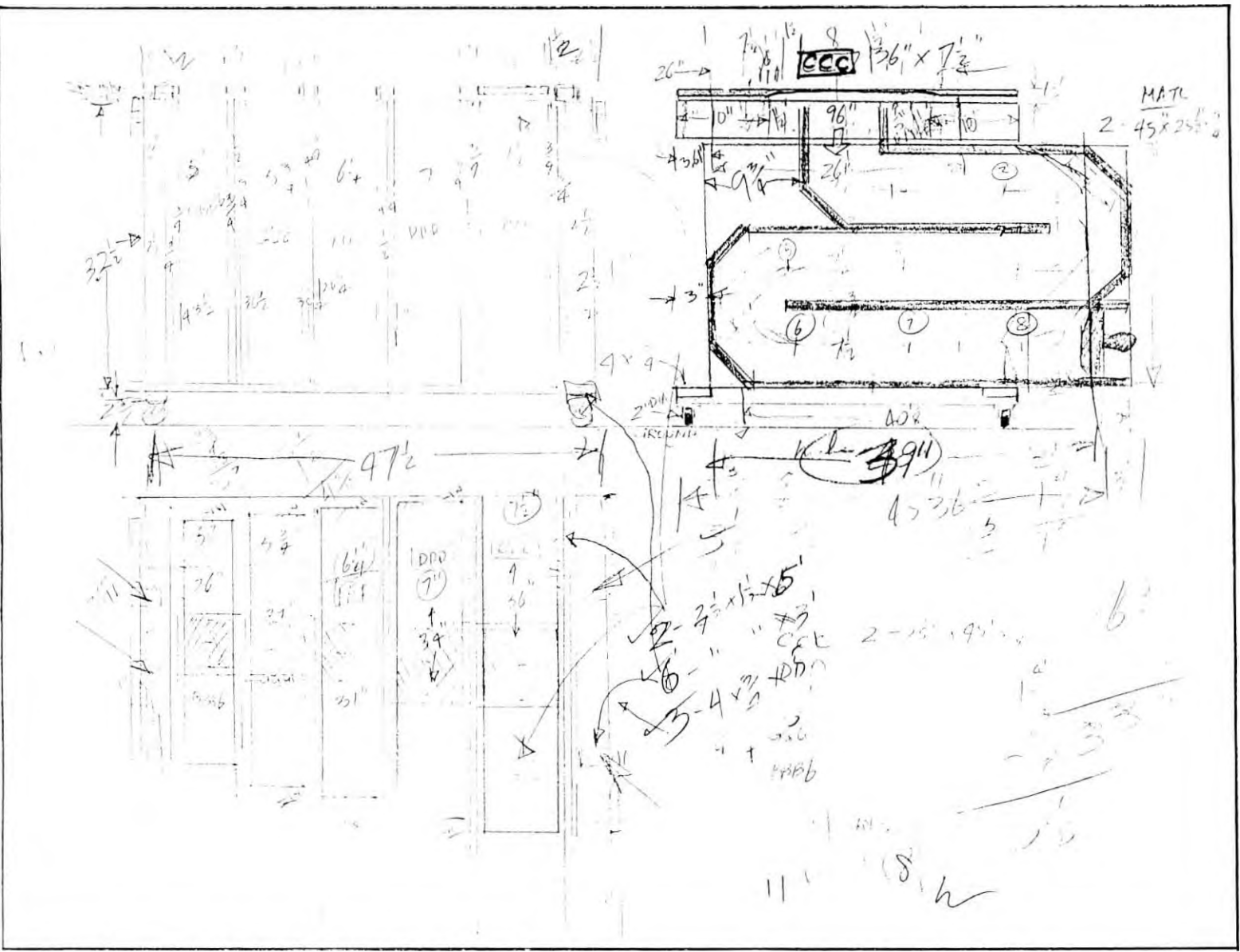
Sketch No. 12



Sketch No. 13



Sketch No. 14



Sketch No. 15



## POST-FABRICATION INFORMATION

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### CONSTRUCTION COMPLETION DATE

Nov 1974

### LOCATION OF CONSTRUCTION

California Institute of the Arts [Cal-Arts], Valencia, California, in the "Super Shop"

### SIGNIFICANT EVENTS IN THE INSTRUMENT'S CONSTRUCTION AND FUNCTION

- This was the first contra bass marimba that I ever built.
- The instrument took approximately 5 weeks to design and construct.
- Bar undercut arches were cut using a band saw, and finished with an *inflatable* drum sander to accommodate the contoured shape of the arch.
- The bars were tuned using a signal generator, amplifier, loudspeaker, and frequency counter (having resolution to one-tenth of a Hertz). However, harmonic tuning was not used.
- Resonators were assembled using plywood, white glue, and wood screws.
- Resonator stoppers were used in lieu of *end caps*
- The high B-flat resonator stopper never had a snug fit, not like the other resonator stoppers. Tuning adjustment was constantly required.
- The cord support holes were not drilled at the exact node point locations of each bar. This affected the bar's movement by not allowing them to vibrate optimally. Unfortunately the fundamental node point locations were calculated [between 1/4 and 1/5 of the bar's length], and not determined by the vibration method in which sand settles into the *non-vibration* points where the holes *should have been drilled*.

- The quality of vibration on the low G bar was marginal when compared to the surrounding notes. Although not known at the time of construction, the bar's grain direction was not "parallel" with the bar's length direction. (Any "oblique" angling of the wood grain works against the "transverse" movement of the bar during vibration.)
- The pitch of the low "D" resonator ended up sharp of the desired frequency. A section of column was fabricated and added to the existing opening to create a new stopper location.
- Special mallets, using a rubber ball and large quantities of felt wrappings, were made.
- A specific location of the instrument [within the Cal-Arts supershop] contributed to the resonance of the low "D" pitch when the bar was struck. The sound was so powerful that everyone within the shop stopped what they were doing to investigate the cause of this low frequency presence.

NOTE: Portions of the instrument's construction were filmed by Mr. Bruce Nolte in the Cal-Arts super shop. (The film was titled "In Search of the Lower Notes".)

#### SUMMARY OF IMPROVEMENTS LACKING IN THE PREDECESSOR

- Stoppers were used in lieu of end-caps to create tuning control.
- Arch contours on the bars were smooth and gradual instead of *step* fashion contours.

#### POST-FABRICATION PHOTOGRAPHS

Pages 27 through 30 show the complete build of my Contra Bass Marimba.

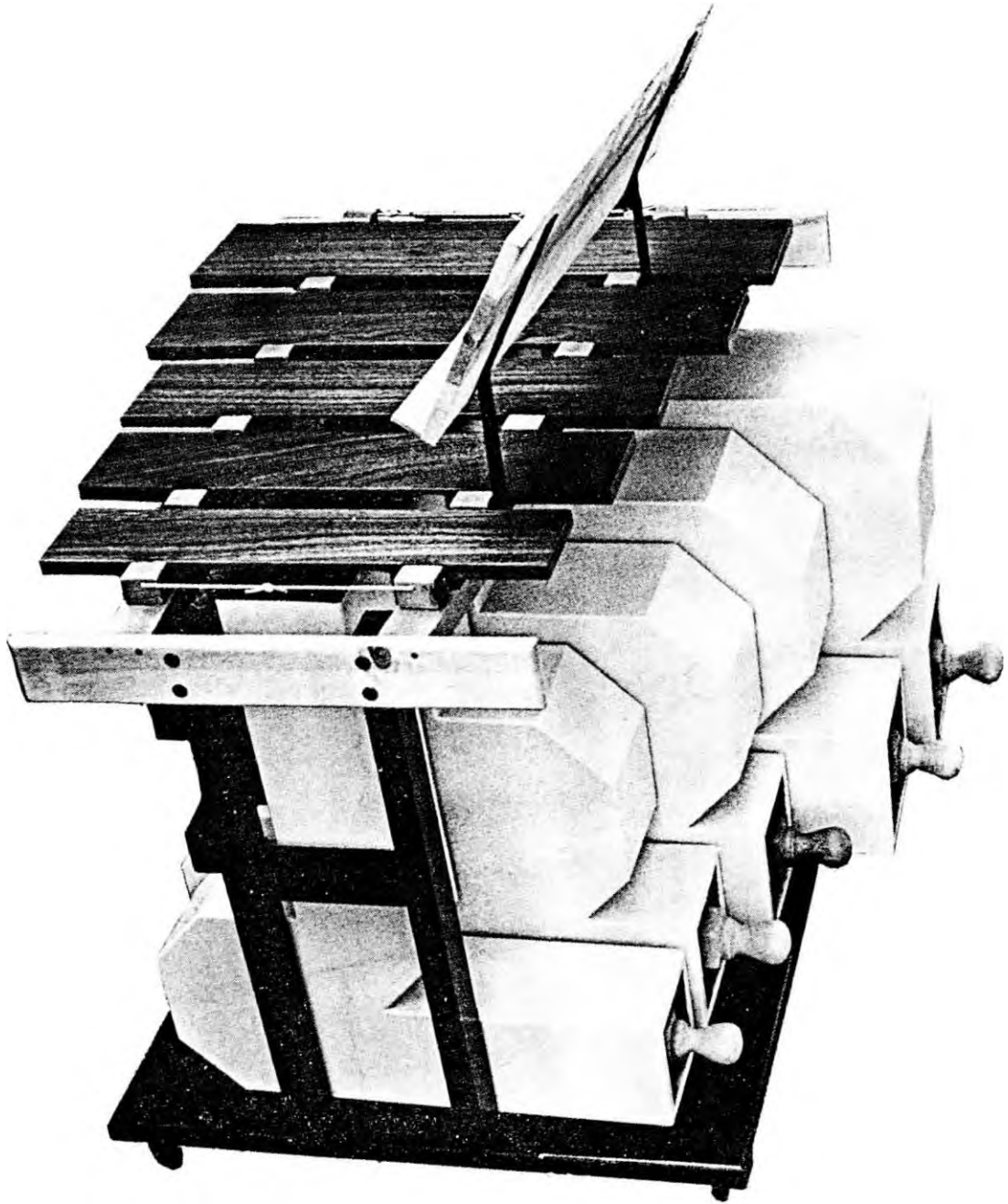


Photo No. 1

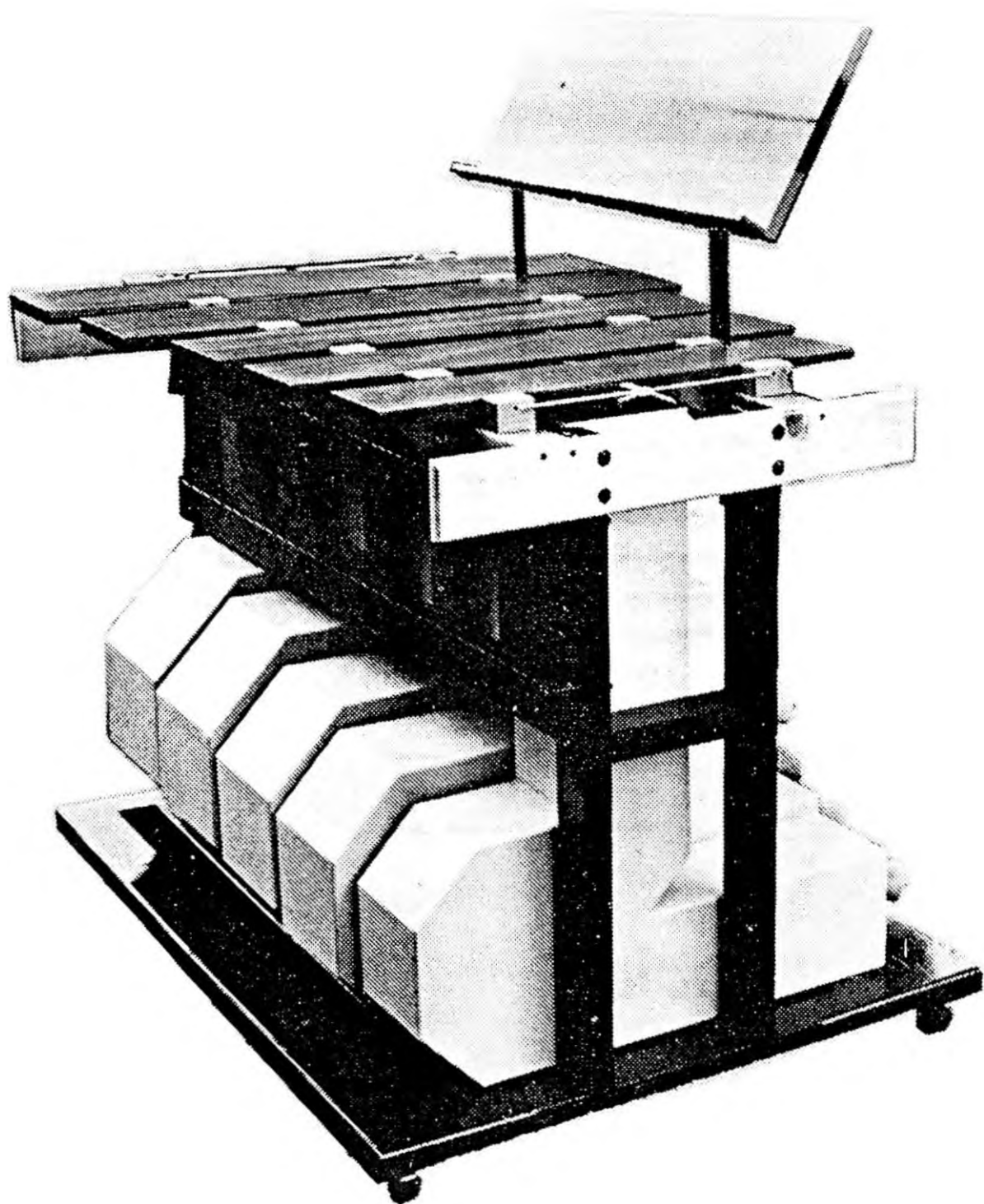


Photo No. 2

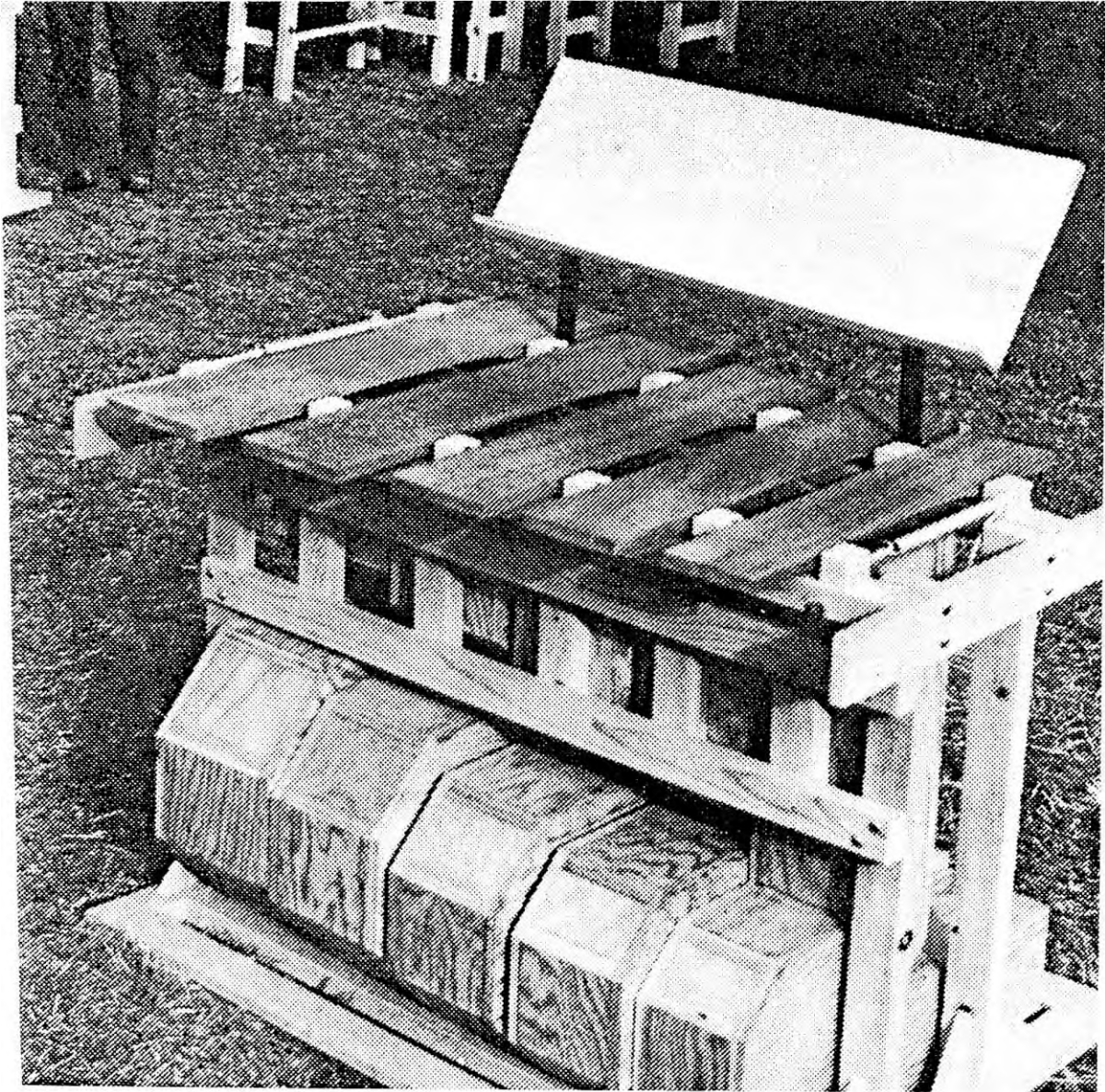


Photo No. 3

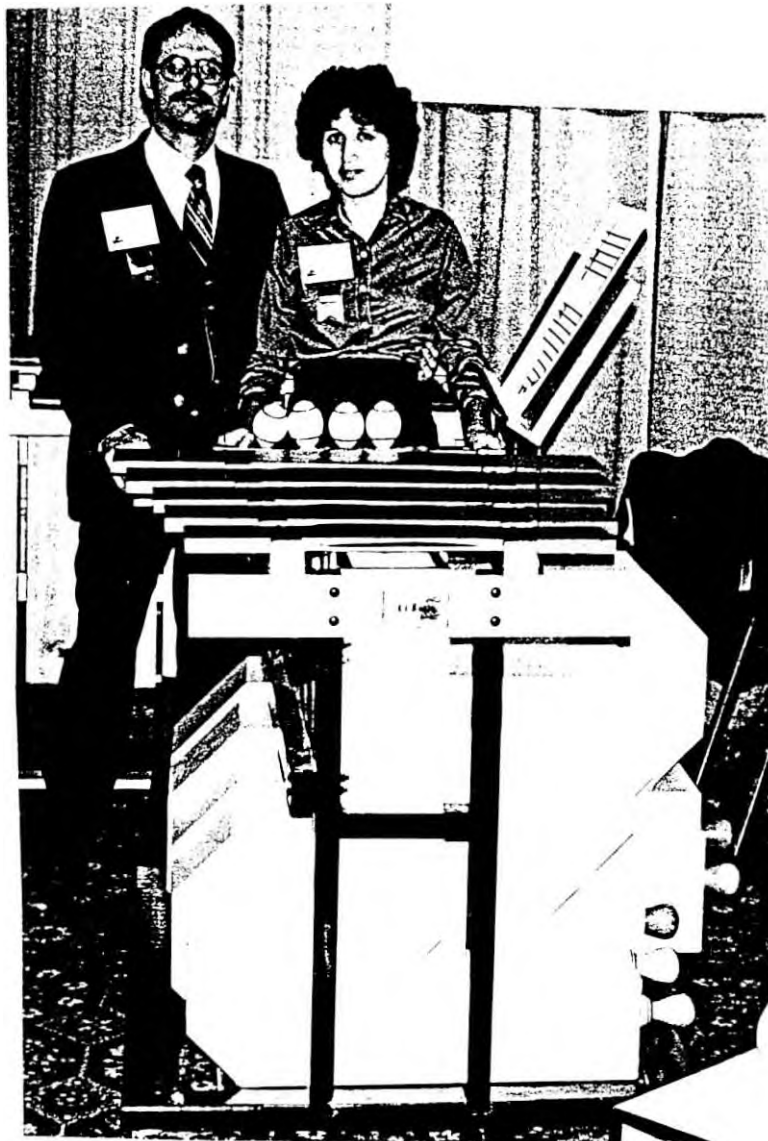


Photo No. 4

## INSTRUMENT SPECIFICATION

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### INSTRUMENT

Type: Contra Bass Marimba  
Designed and Built By: Christopher C. Banta  
Year: 1974

### PHYSICAL CHARACTERISTICS

Height: 37"  
Depth: 48"  
Width: 44"  
Weight: Approx 210 lbs.

### MATERIALS

Bars: Mahogany  
Resonators: 3/4" plywood  
Frame: White Fir

### MUSICAL CHARACTERISTICS

Number of Notes: 5  
Tuning: Equal Tempered  
Pitch Standard: A-440 Hz  
Pitch Range: C1 to B-flat 1 (CCC to BBB-flat)  
Pitches: C, D, F, G, and B-flat  
Frequencies (Hz): 32.70, 36.71, 43.65, 48.99, and 58.27  
Musical Range:



## **INSTRUMENT EXHIBIT/DISPLAY SUMMARY AND STATUS**

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### INSTRUMENT EXHIBIT/DISPLAY SUMMARY

- Dec 1974 - The Contra Bass Marimba was displayed during an open-house at California Institute of the Arts (Cal Arts), Valencia, California
- Nov 1980 - The Contra Bass Marimba was exhibited during the National Association of Music Merchants (NAMM) convention, at the Disneyland Hotel in Anaheim, California.

### INSTRUMENT STATUS

After Cal-Arts and the Namm convention, this instrument was placed in my patio-enclosure at my residence in Pasadena, CA. When the patio was turned into a living space, the marimba was loaned to my brother during his junior college years. At that time, the resonators were placed in a damp basement celler, while the bars [still attached to the frame] were left in the living room of his living space. [I'm not sure why he removed the resonators from the instrument.] After his leaving the premises, the marimba was brought back to my house where it was stored in the garage. Due to space limitations, I had to move the marimba outdoors and cover it with heavy tarps. Through numerous rain storms and leaky tarps, the plywood resonators began to split, separate at the joints, and show signs of overall deterioration. Eventually and unfortunately the whole instrument, in such a sad state, was finally taken to the Scholl Canyon landfill where it was layed to rest.