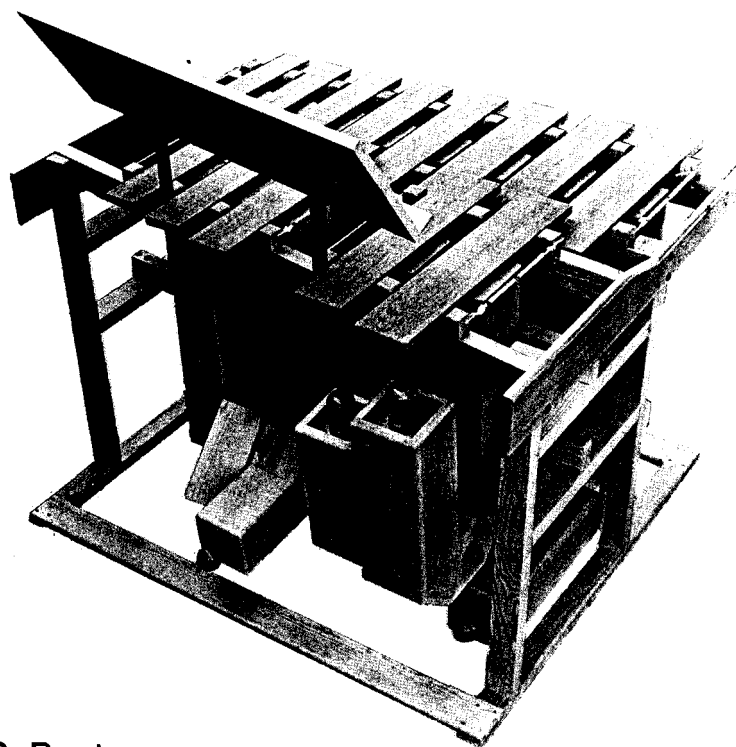


Mallet Percussion Science

BASS MARIMBA (1979)

Instrument Development Document
Revision A



Christopher C. Banta

Doc. No. CCB-1004

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	3
DESIGN CONCEPT AND DESCRIPTION	4
INSTRUMENT'S PREDECESSOR	4
EVENTS LEADING UP TO THE INSTRUMENT'S DESIGN	4
ENGINEERING DESCRIPTION OF THE CCBANT BASS MARIMBA	4
PRE-FABRICATION INFORMATION	5
SIGNIFICANT EVENTS IN THE INSTRUMENT'S DEVELOPMENT	5
PRE-FABRICATION SKETCHES AND TABLES	5
Sketch Nos. 1 thru 18	6 - 23
POST-FABRICATION INFORMATION	24
CONSTRUCTION COMPLETION DATE	24
LOCATION OF CONSTRUCTION	24
SIGNIFICANT EVENTS IN THE INSTRUMENT'S	
CONSTRUCTION AND FUNCTION	24
SUMMARY OF IMPROVEMENTS LACKING IN THE	
1973 BASS MARIMBA DESIGN	25
SUMMARY OF IMPROVEMENTS LACKING IN THE	
DEC 1979 BASS MARIMBA DESIGN	26
POST-FABRICATION PHOTOGRAPHS	26
Photo No. 1	27
Photo No. 2	28
Photo No. 3	29
Photo No. 4	30
INSTRUMENT SPECIFICATIONS	31
INSTRUMENT EXHIBIT/DISPLAY SUMMARY AND STATUS	32
INSTRUMENT EXHIBIT/DISPLAY SUMMARY	32
INSTRUMENT(S) STATUS	32

INTRODUCTION

I developed this document to describe the issues surrounding the design, development, and fabrication of a second generation class of [CCBANTA] instruments known as the "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, appearing to read "CCBanta", with a long horizontal stroke extending to the right.

Christopher C. Banta

DESIGN CONCEPT AND DESCRIPTION

INSTRUMENT'S PREDECESSOR

Bass Marimba (1973)

EVENTS LEADING UP TO THE INSTRUMENT'S DESIGN

Two primary issues lead to the design of this "second generation" Bass Marimba.

- Since the 1973 Bass Marimba was a single-octave, 8 note, diatonic scale instrument, it was my desire to create a full chromatic scaled instrument that included the *accidentals*.
- Since the 1973 Bass Marimba was fabricated in a rather crude fashion [due to the limitations of wood-working tools available to me at the time], it was my desire to "clean-up" the marimba's appearance through better workmanship and the use of smoother lines.

It was obvious that this new instrument was going to be the next evolutionary step of the 1973 Bass Marimba.

ENGINEERING DESCRIPTION OF THE CCBANTA BASS MARIMBA

This new Bass Marimba shall be a one octave, 13 note, chromatic, bar percussion musical instrument starting with the bottom pitch of C [65.4 Hz] using A-440 Hz as the pitch standard. The Bass Marimba's top note shall be C [130.8 Hz]. Each bar shall have its own corresponding quarter-wavelength resonator with an adjustable stopper at the closed. Both bars and resonators shall be held in precise alignment with each other using a support frame. The whole instrument shall be made mobile with the use of casters.

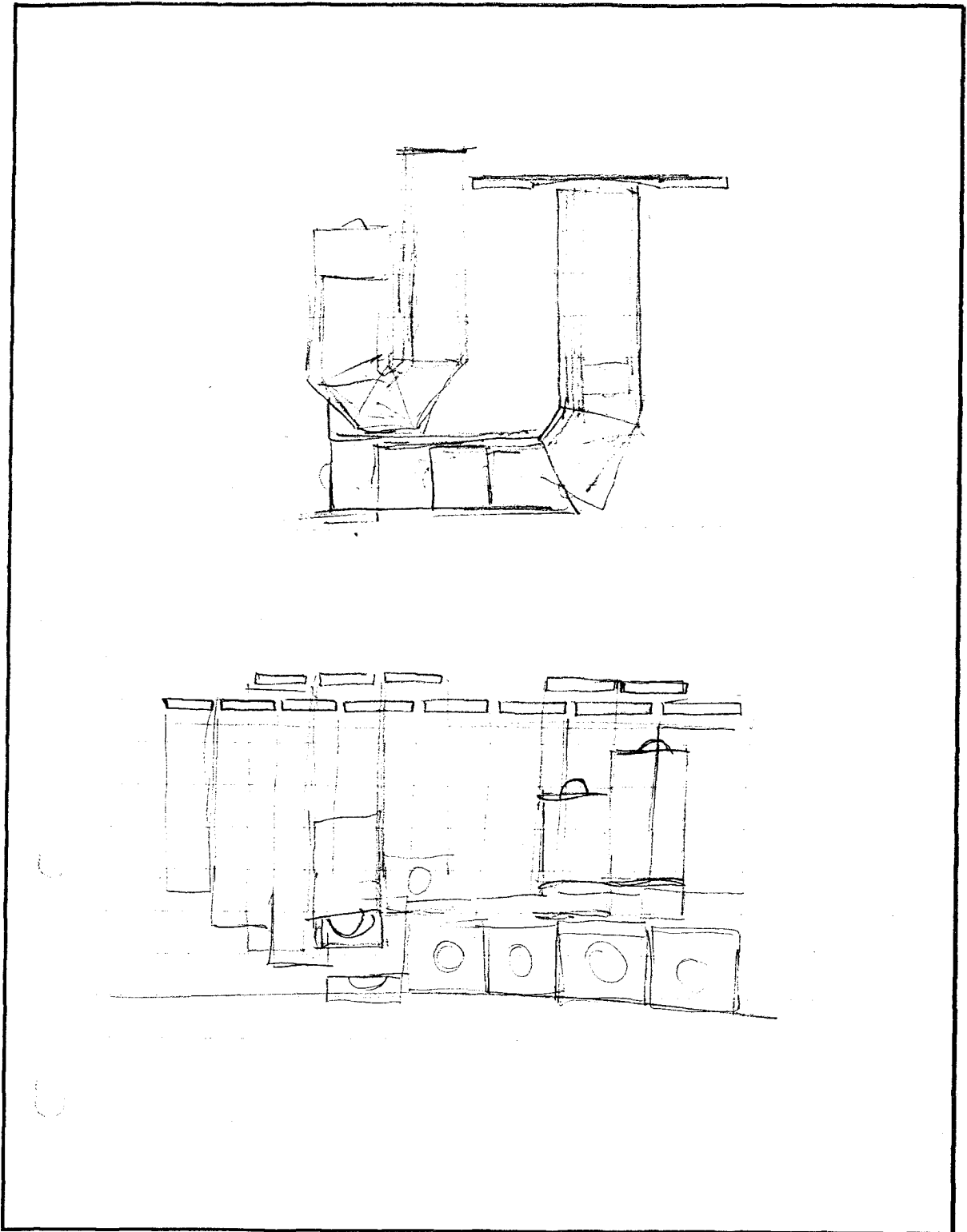
PRE-FABRICATION INFORMATION

SIGNIFICANT EVENTS IN THE INSTRUMENT'S DEVELOPMENT

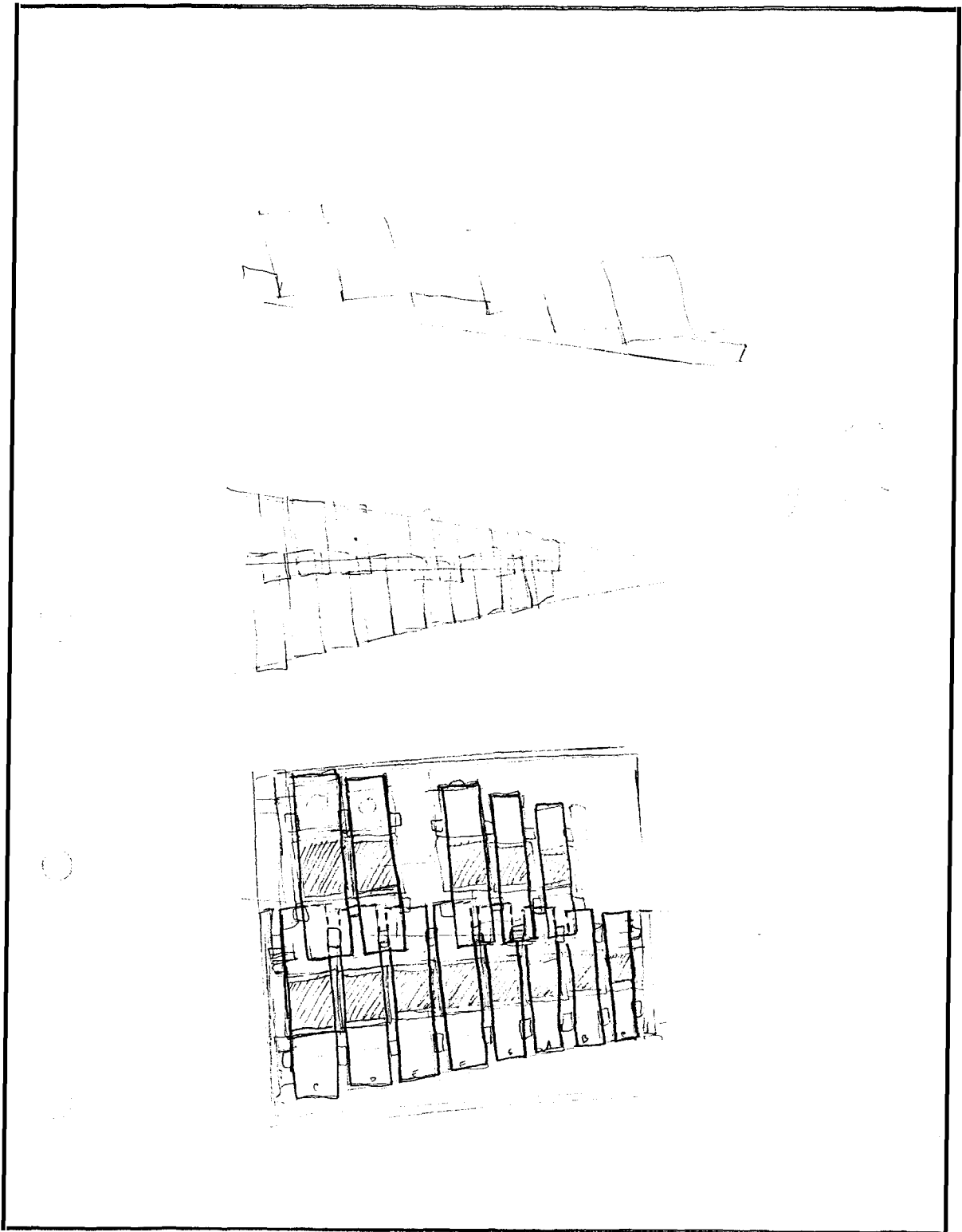
- The Bass Marimba must be designed to be at a playable height.
- Frame dis-assembly design will require careful consideration.
- Since the "accidentals" row of bars must be added, the overall frame design will require careful planning to accommodate this additional row of notes.
- The distance between the accidental bars and the lower "natural" bars will require some degree of *improvised calculation* to ensure the accidental bars will not bottom out on the natural bars when struck with a mallet.
- There will be considerable challenge to design square, column resonatorS to fit within the confines of the frame's space. Provisions must be made to add the "accidentals" row of resonators without interfering with the "naturals" resonators. (Each resonator will require careful design with attention to specific shape, and miter the resonator column as required.)

PRE-FABRICATION SKETCHES

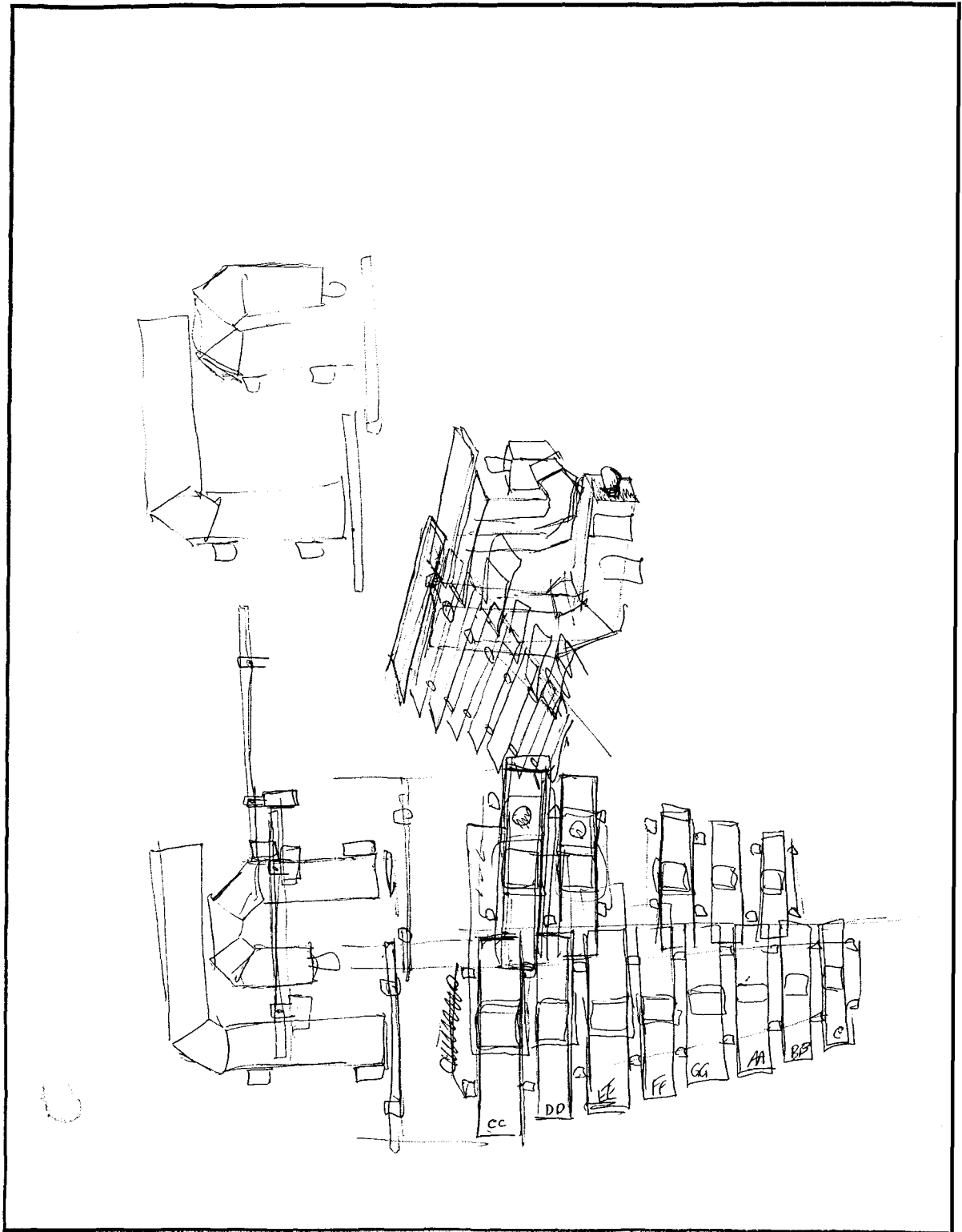
Pages 6 through 23 show my pre-fabrication design sketches.



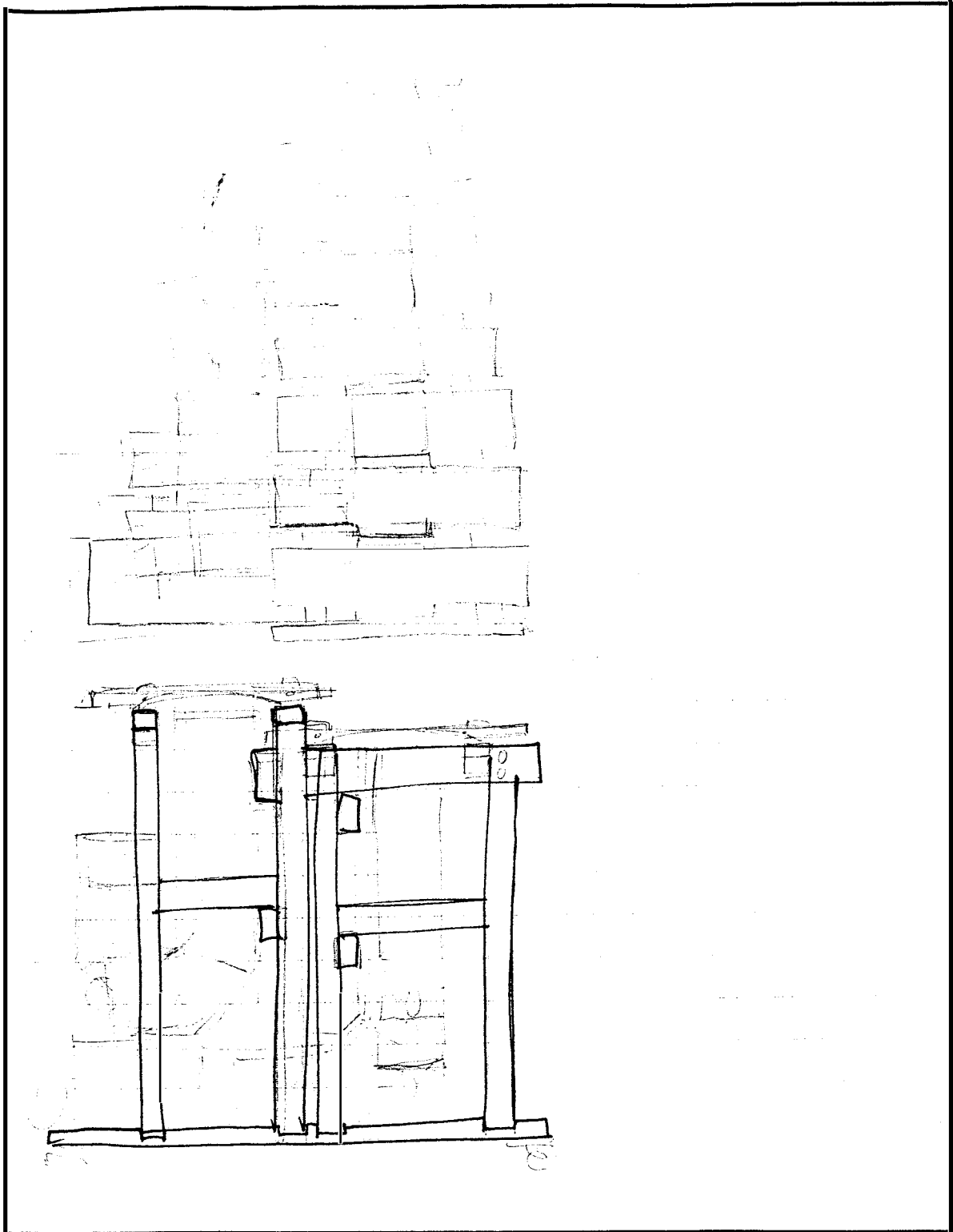
Sketch No. 1



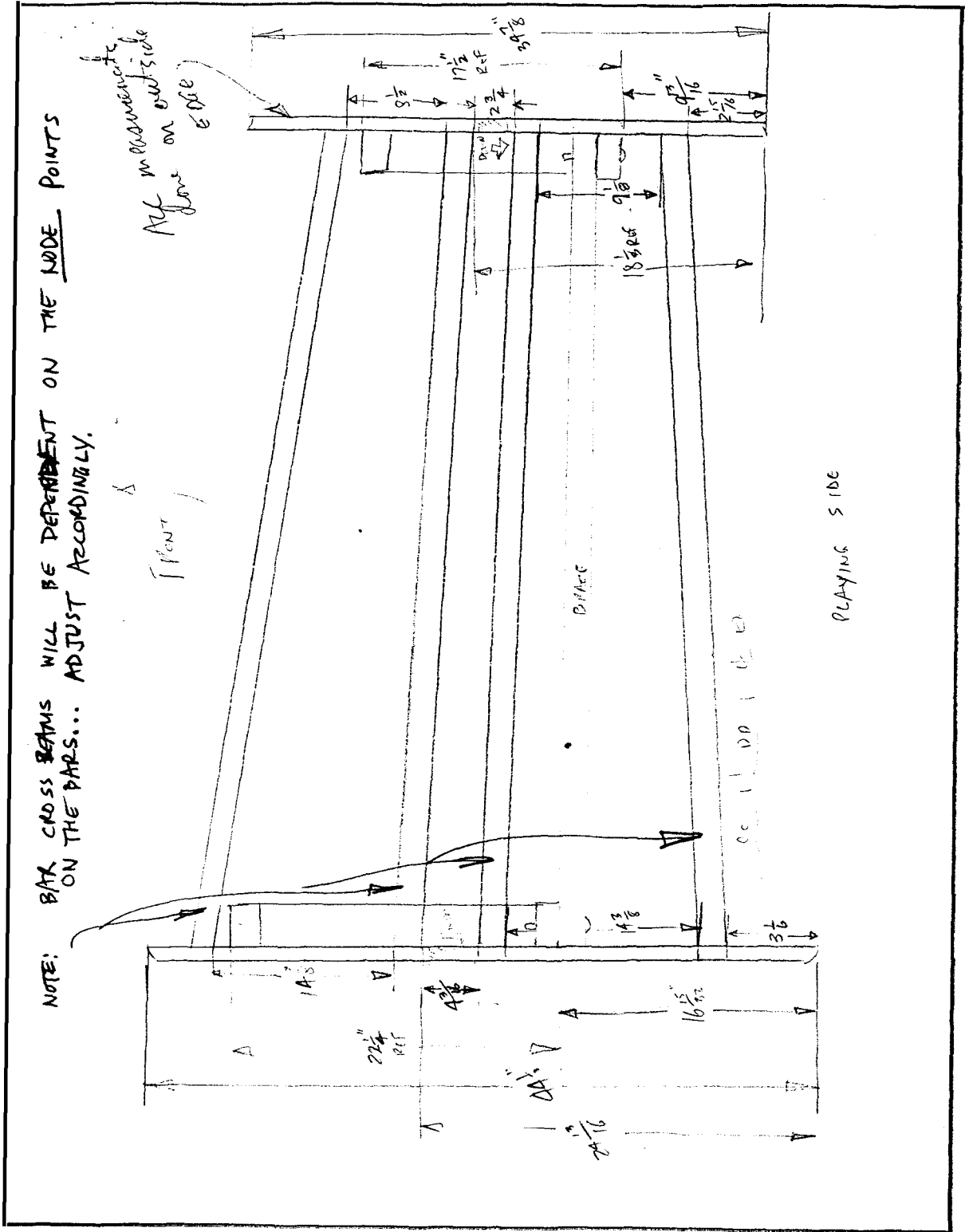
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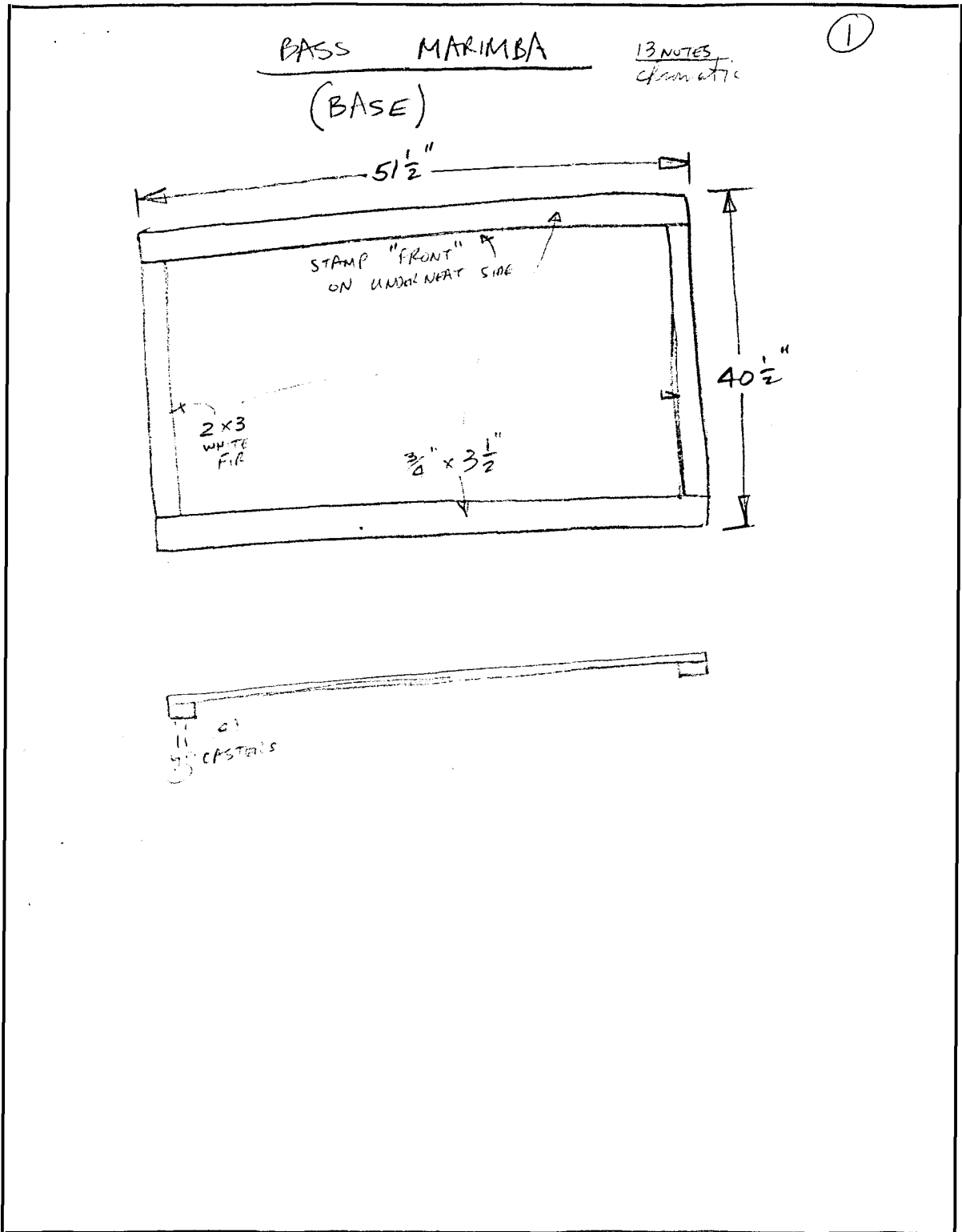
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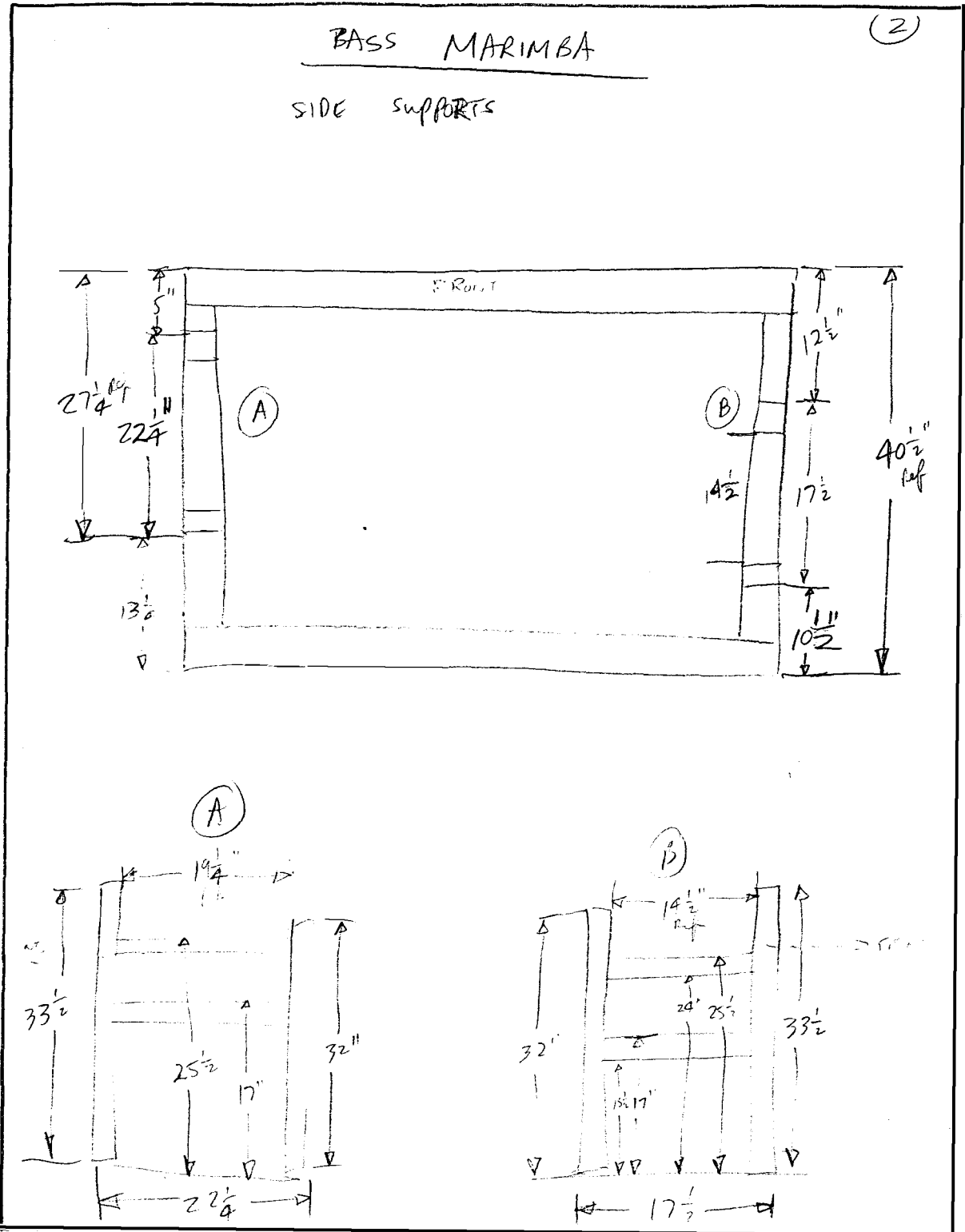
Sketch No. 4



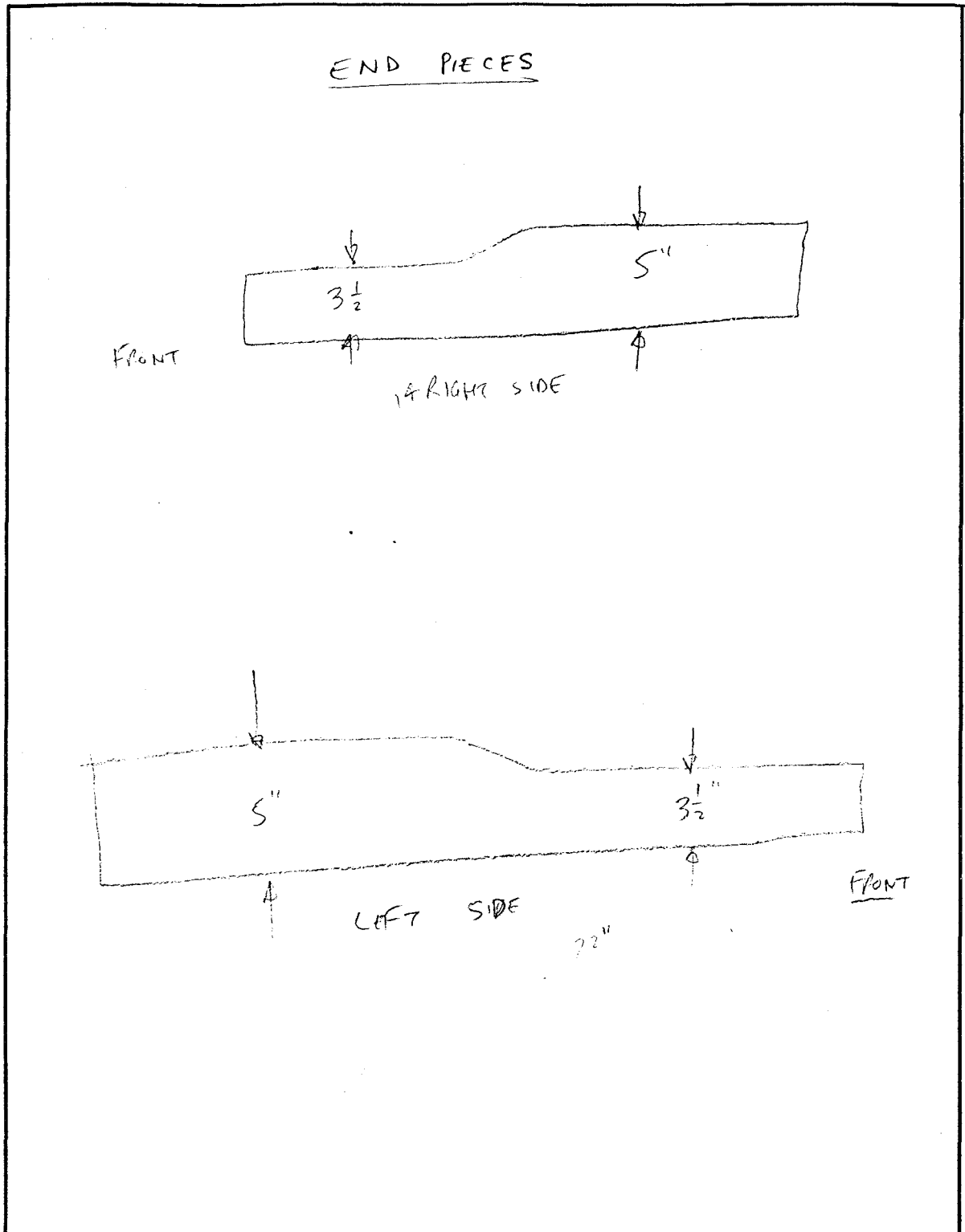
Sketch No. 5



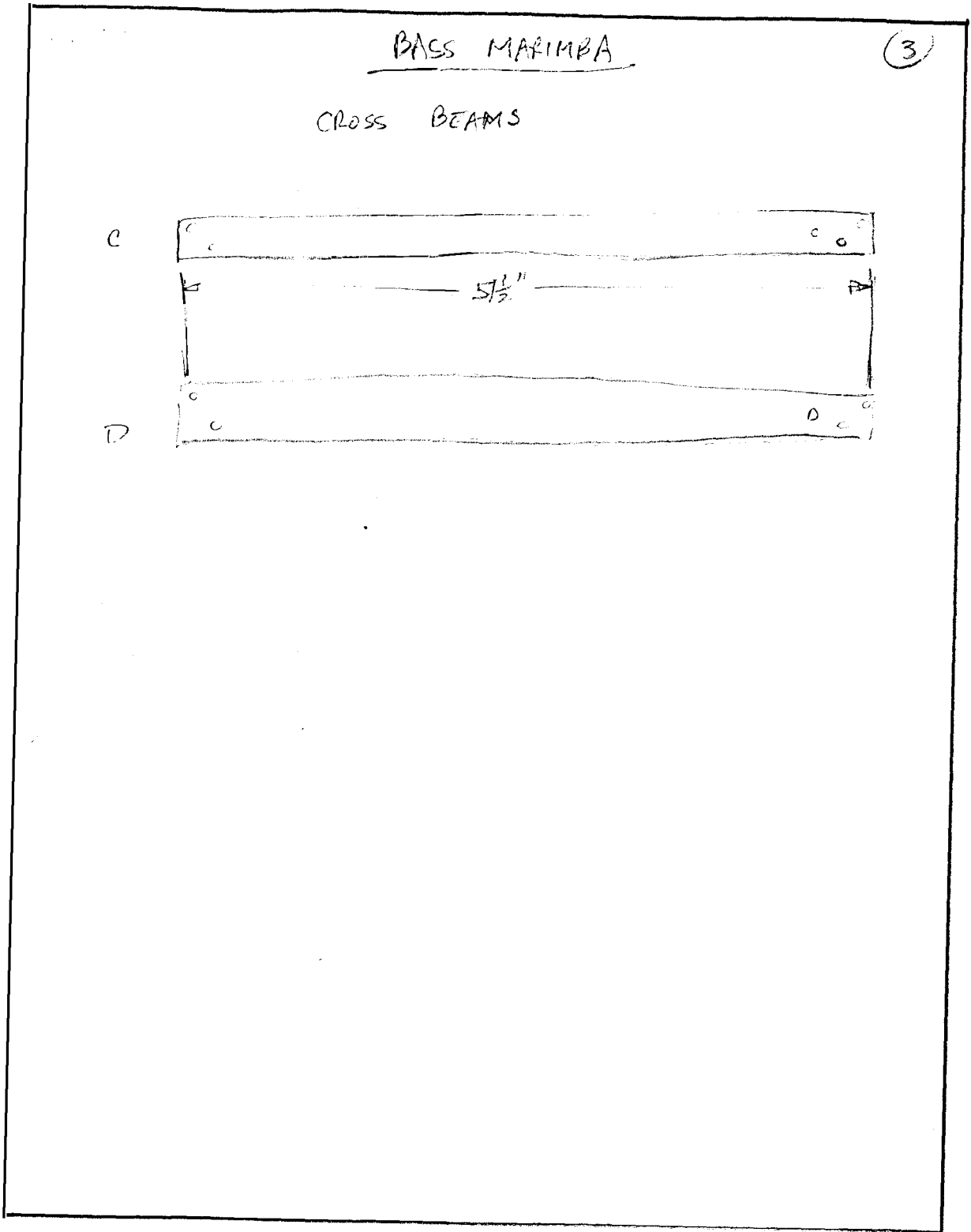
Sketch No. 6



Sketch No. 7



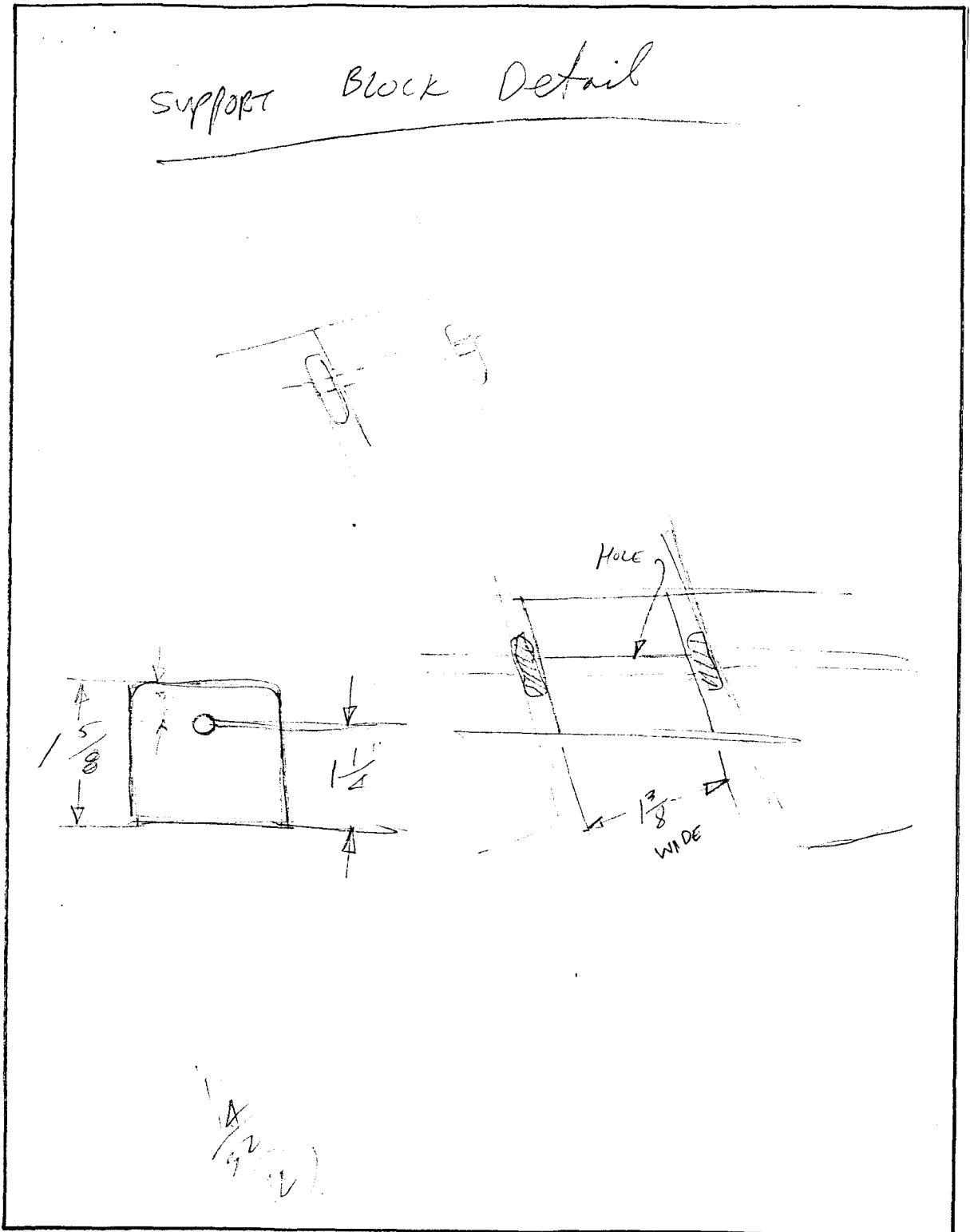
Sketch No. 8



Sketch No. 9

	BAR SIZES
4^{1st}	$\checkmark 24 \times 4 \frac{1}{2}$
5^{th}	$\checkmark 23 \frac{1}{2} \times 4 \frac{3}{8}$
6^{th}	$\checkmark 23 \times 4 \frac{1}{4}$
7^{th}	$\checkmark 22 \frac{1}{2} \times 4 \frac{1}{8}$
8^{th}	$\checkmark 22 \times 4$
9^{th}	$\checkmark 21 \frac{1}{2} \times 3 \frac{7}{8}$
10^{th}	$\checkmark 21 \times 3 \frac{3}{4}$
11^{th}	$\checkmark 20 \frac{1}{2} \times 3 \frac{5}{8}$
12^{th}	$\checkmark 20 \times 3 \frac{1}{2}$
13^{th}	$\checkmark 19 \frac{1}{2} \times 3 \frac{3}{8}$
14^{th}	$\checkmark 19 \times 3 \frac{1}{4}$
15^{th}	$\checkmark 18 \frac{1}{2} \times 3 \frac{1}{8}$
16^{th}	$\checkmark 18 \times 3$

Sketch No. 10



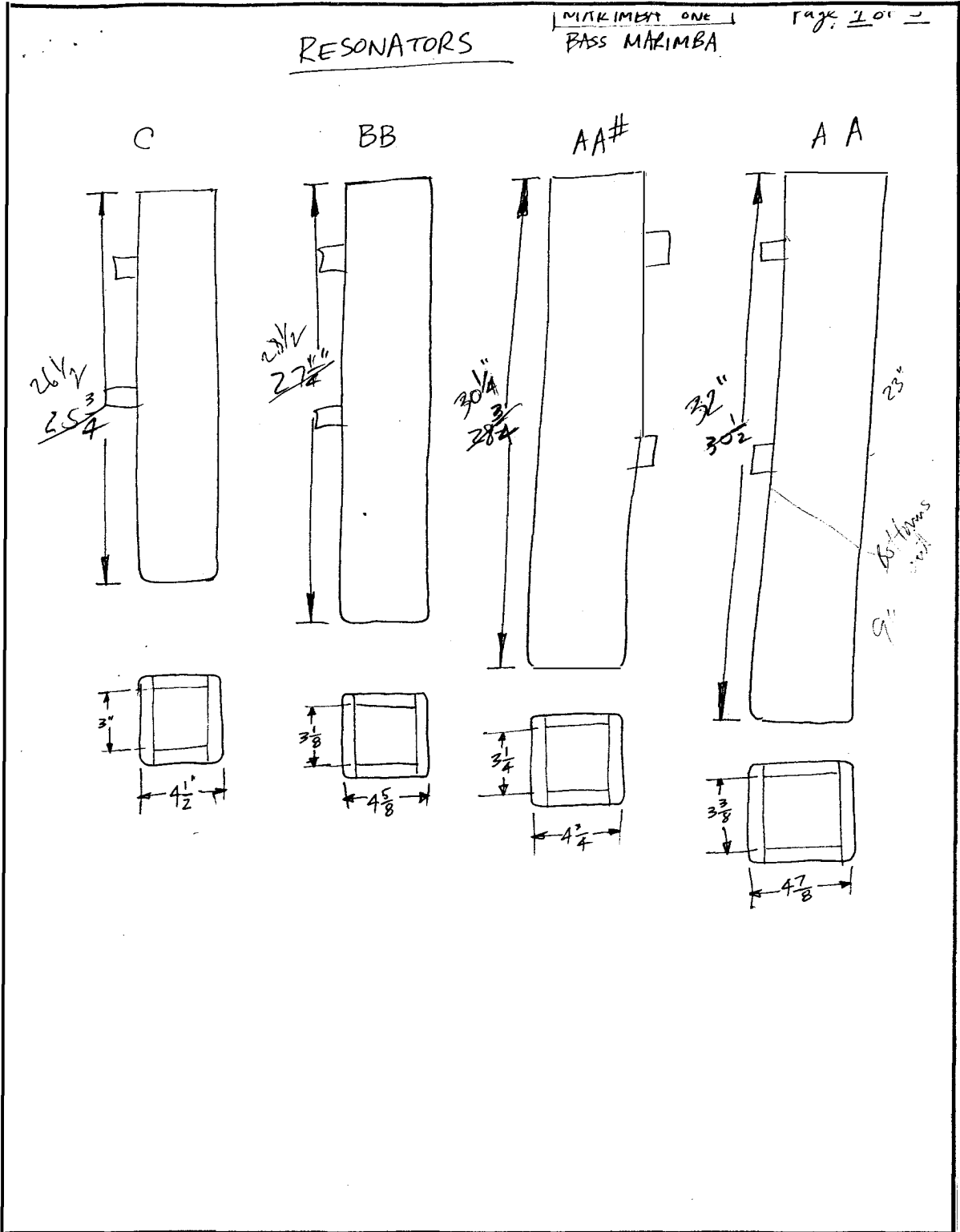
Sketch No. 11

QTY	Unassembled PARTS LIST	13 NOTE	
2	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{3}{4}$	pine	} BASE
(2)	$40\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{2}$	white fir	
(2)	$33\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$	WHITE FIR	} SIDE SUPPORTS
(2)	$32 \times 2\frac{1}{2} \times 1\frac{1}{2}$	WHITE FIR	
(2)	$19\frac{1}{4} \times 2\frac{1}{2} \times \frac{1}{2}$	WHITE FIR	
(2)	$14\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$	WHITE FIR	

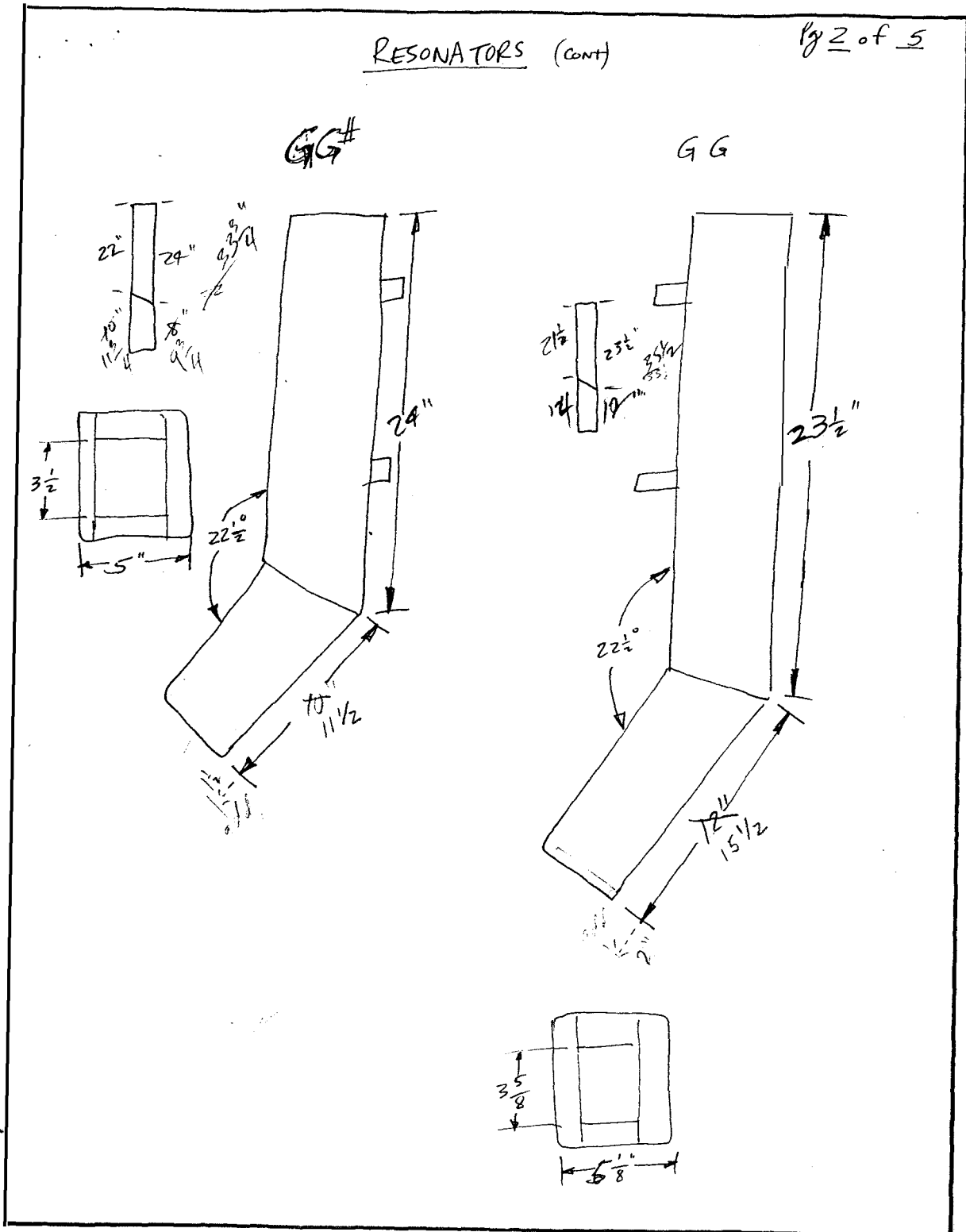
Sketch No. 12

		WOOD FR RESONATORS		all $\frac{3}{4}$ " stock
C	Qty 2	4 1/2" W X 28" L		
B	2	3" W X 28" L		
BB	2	4 5/8"		
	2	3 1/8"		
AA#	2	4 3/4"	52	
	2	3 1/4"		
AA	2	4 7/8"	50	
	2	3 3/8"		
GG#	2	5"		
	2	5 1/2"		
GG	2	5 1/8"	52	
	2	5 5/8"		
FF#	2	5 1/2"	50	
	2	5 1/4"		
FF	2	5 3/8"	52	
	2	3 2/3"		
EE	2	5 1/2"	52	
	2	4"		
DD#	2	5 5/8"	50	
	2	4 1/2"	46	
D	2	5 1/2"	50	
	2	4 1/4"	48	
CC#	2	5 1/2"	50	
	2	4 3/8"	50	
CC	2	6" X	50	
	2	5 1/2" X	52	

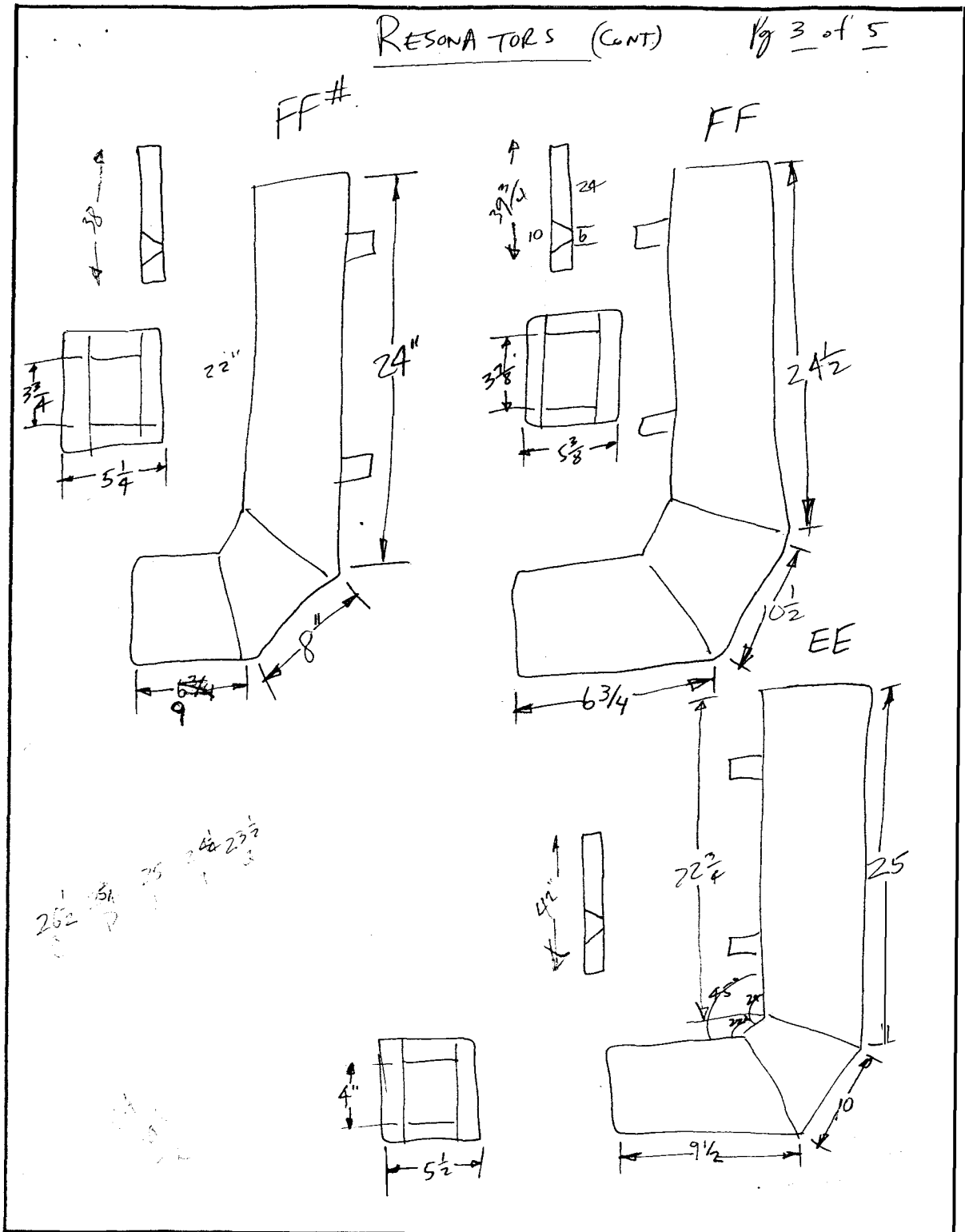
Sketch No. 13



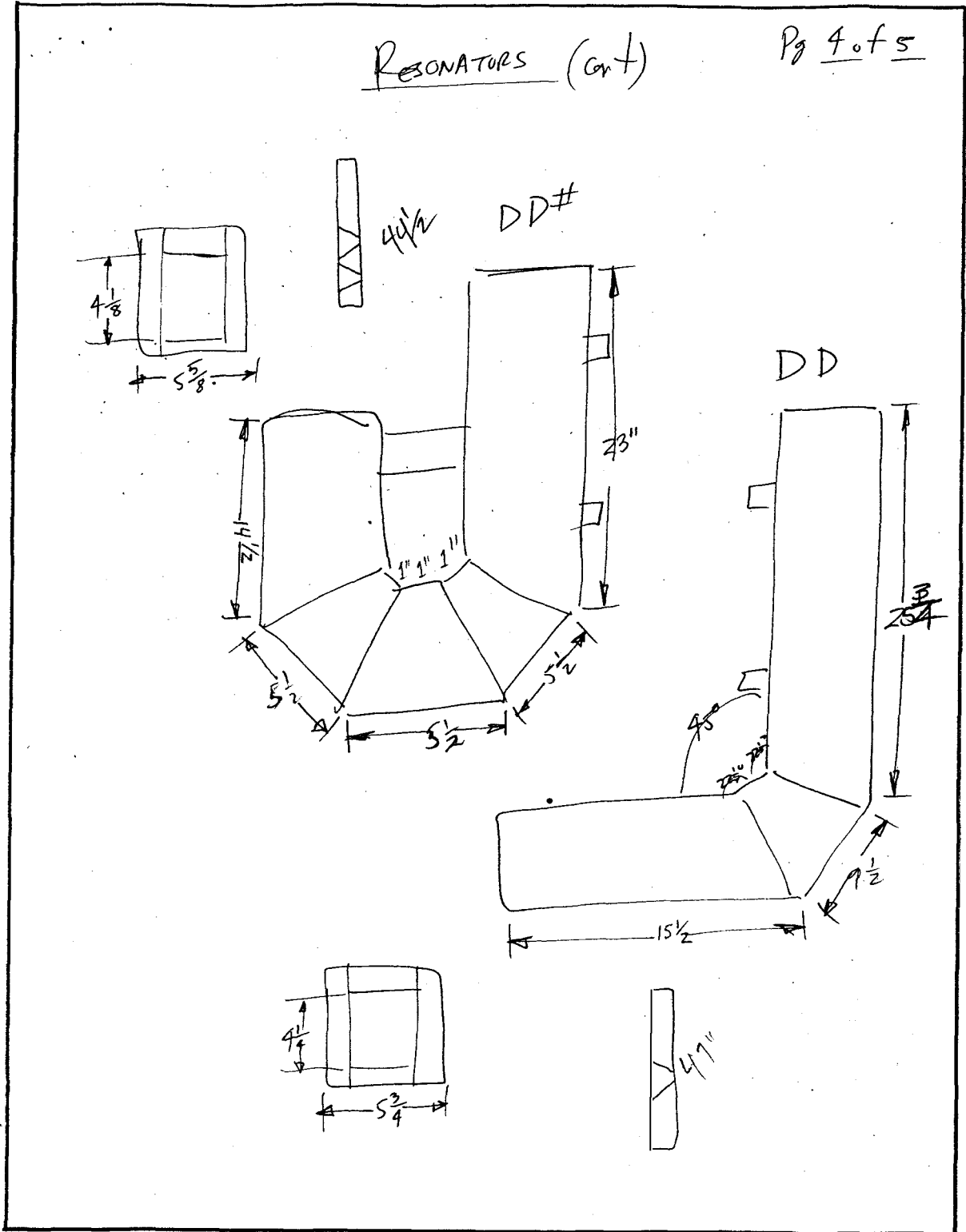
Sketch No. 14



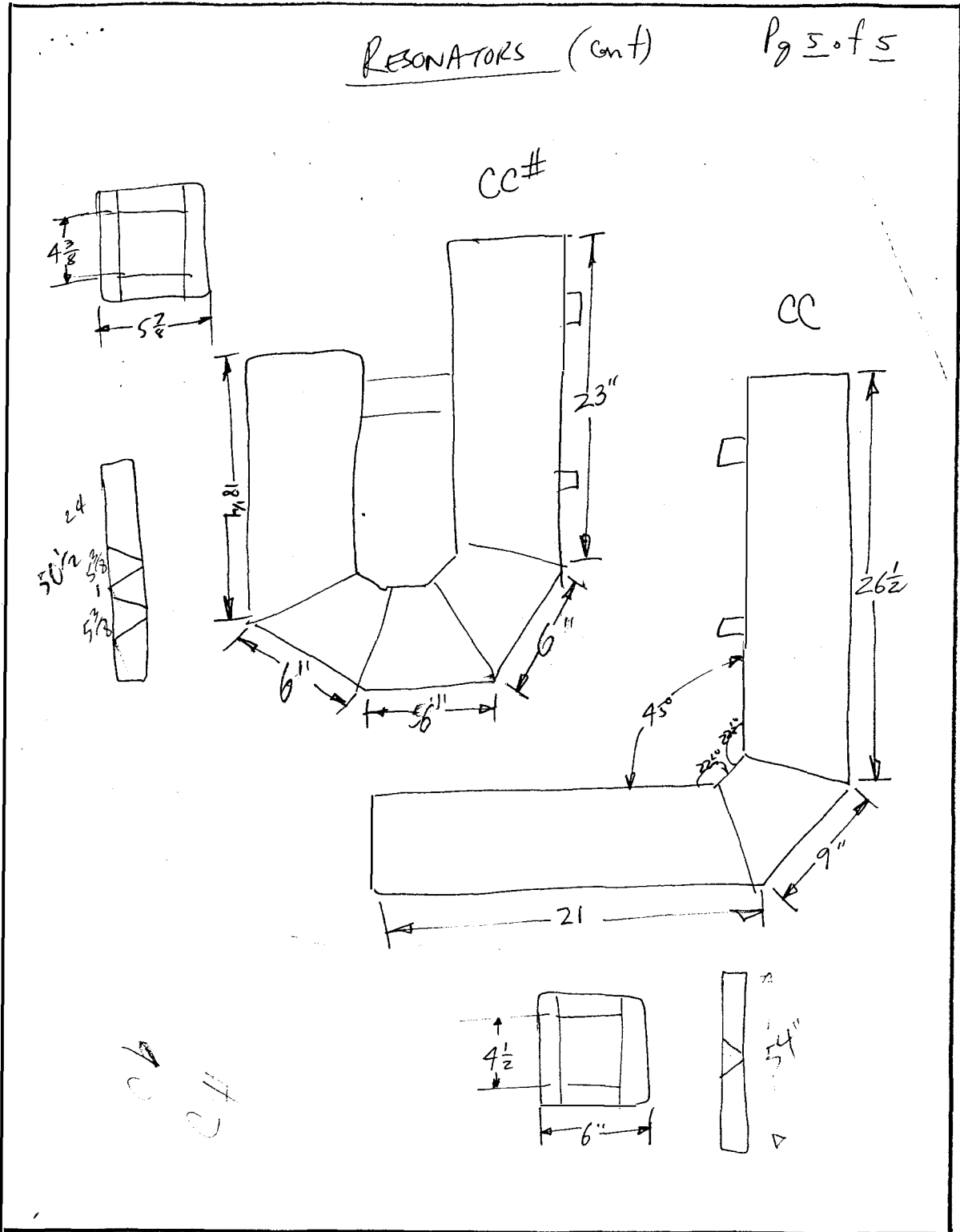
Sketch No. 15



Sketch No. 16



Sketch No. 17



Sketch No. 18

POST-FABRICATION INFORMATION

CONSTRUCTION COMPLETION DATE

Dec 1979 [Original build of the 13-note bass marimba]
Apr 1980 [Follow-on build of 2 bass marimba for Yamaha International]

LOCATION OF CONSTRUCTION

Pasadena, CA - My garage, after having been converted to a workshop from earlier bass marimba projects.

SIGNIFICANT EVENTS IN THE INSTRUMENT'S CONSTRUCTION AND FUNCTION

Dec 1979 Bass Marimba

- The instrument took approximately 2 months to design and build.
- Bars were tuned using a signal generator, amplifier, loudspeaker, and frequency counter (having resolution to one-tenth of a Hertz). Only the bar's fundamental frequency was tuned.
- Resonator columns were cut into mitered *sections* [of 45°] using a bandsaw. Each section was smoothed using a large belt sander power tool to create a *flat* interface surface for its mating part.
- Resonator sections were held together using "aliphatic resin" (yellow carpenters glue).
- Due to the mitering angle, there was an initial problem of figuring out how to hold or clamp each section of the resonator during drying. The solution was simple, as follows:

Once the glue was applied to the end-grain of a section, that section was combined with the end-grain of its mating section by applying both pressure and a swirling motion to force the air out between the mated parts. Very quickly a resistance would build up making the swirling motion difficult.

When this happened, it is just a matter of aligning both sections together to create a single cohesive joint. A wringing-wet wash cloth was used to wipe off excessive glue. Both sections were bonded almost instantaneously. The process was repeated until the sections of each resonator were fully assembled.

- Once assembled, all corners of each resonator were routed (using a 3/8" inch "round" cutting bit) to eliminate the "sharp-cornered" look.
- Resonators were tuned using the same equipment and set-up as the bars.

Apr 1980 Bass Marimbas

- Due to the second build, of the two instruments resulting from the Yamaha International order [Jan 1980], an *Instrument Assembly Manual* was created.

SUMMARY OF IMPROVEMENTS LACKING IN THE 1973 BASS MARIMBA'S DESIGN

Dec 1979 Bass Marimba

- Resonator corners were routed to eliminate the "sharp cornered" look.
- Resonators used stoppers in lieu of end-caps.
- The frame assembly was made to dis-assemble in lieu of the one piece (non-disassembly) construction method.
- High-gloss varithane was used as the Instrument's overall finish in lieu of a solid paint color.
- Bar mounting blocks were held in place with "aliphatic resin" (yellow carpenters glue) in lieu of hot glue.
- Arch contours of the bars were made smooth and gradual instead of the *stepped* fashion.

SUMMARY OF IMPROVEMENTS LACKING IN THE DEC 1979 BASS MARIMBA'S DESIGN

Apr 1980 Bass Marimbas

- Resonators were built longer to provided additional tuning control with the stoppers.
- Node point locations were established using the *sand and tapping* technique.

POST-FABRICATION PHOTOGRAPHS

Pages 27 through 30 show different views of my second generation Bass Marimba.

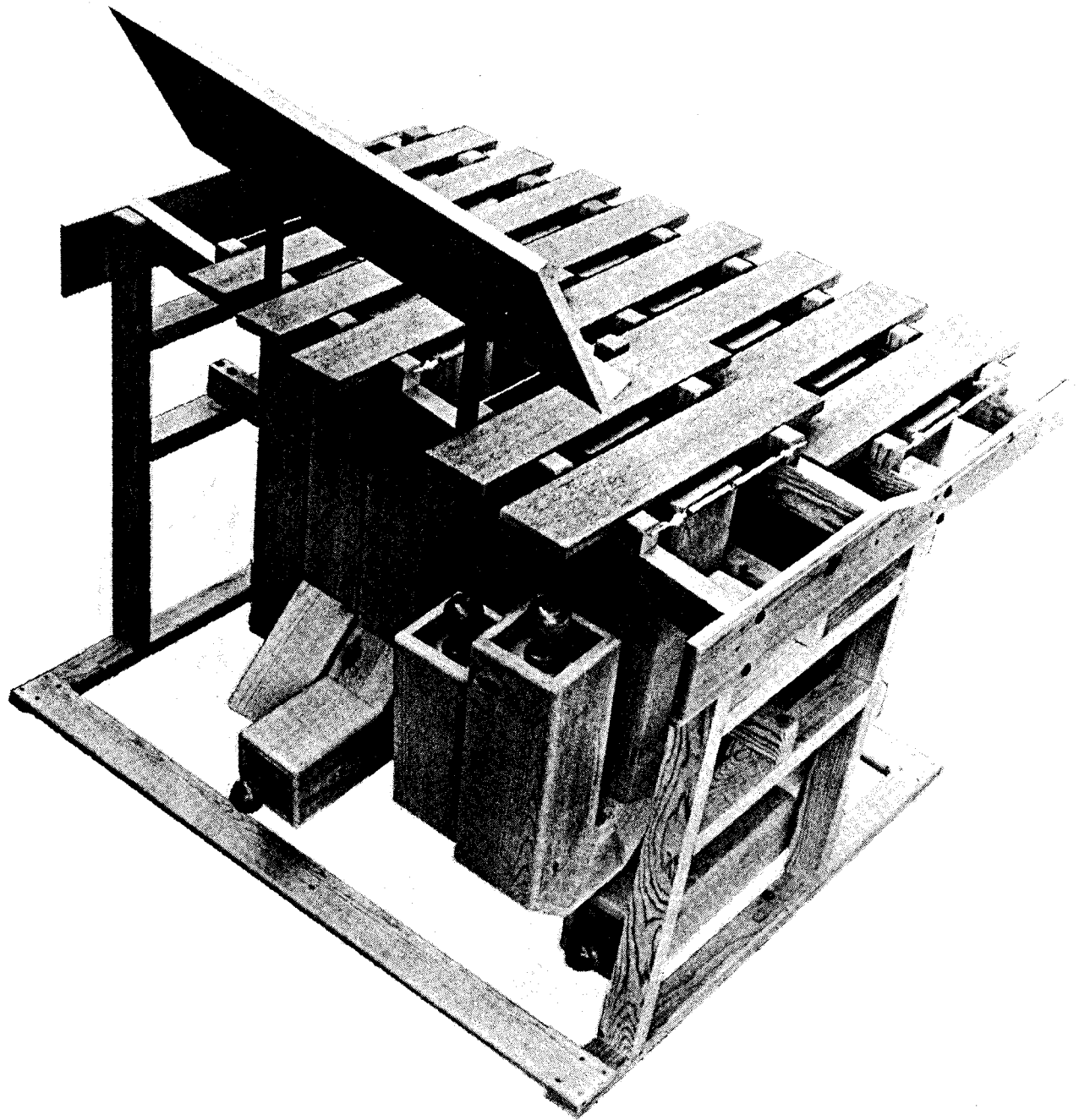


Photo No. 1

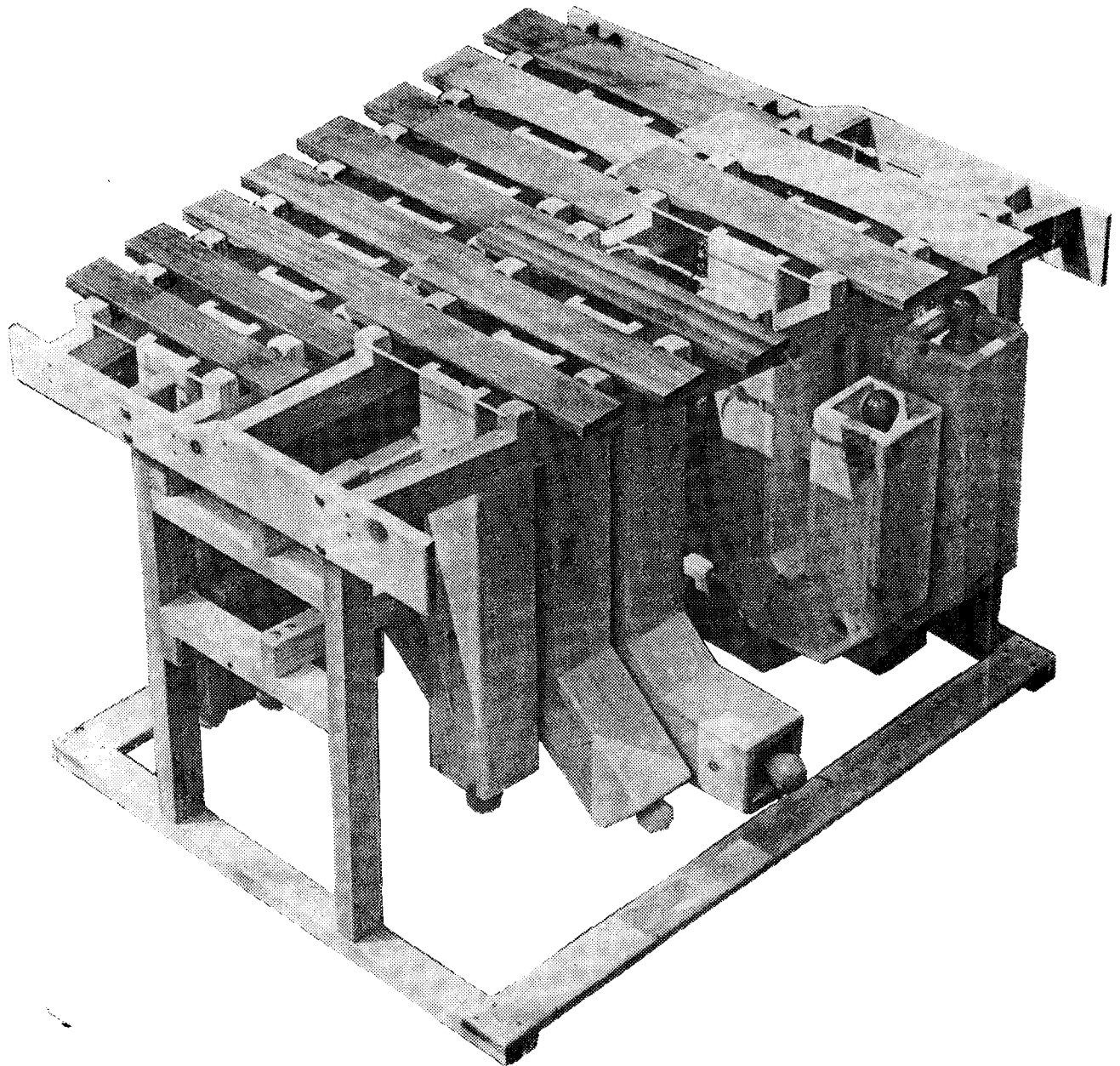


Photo No. 2

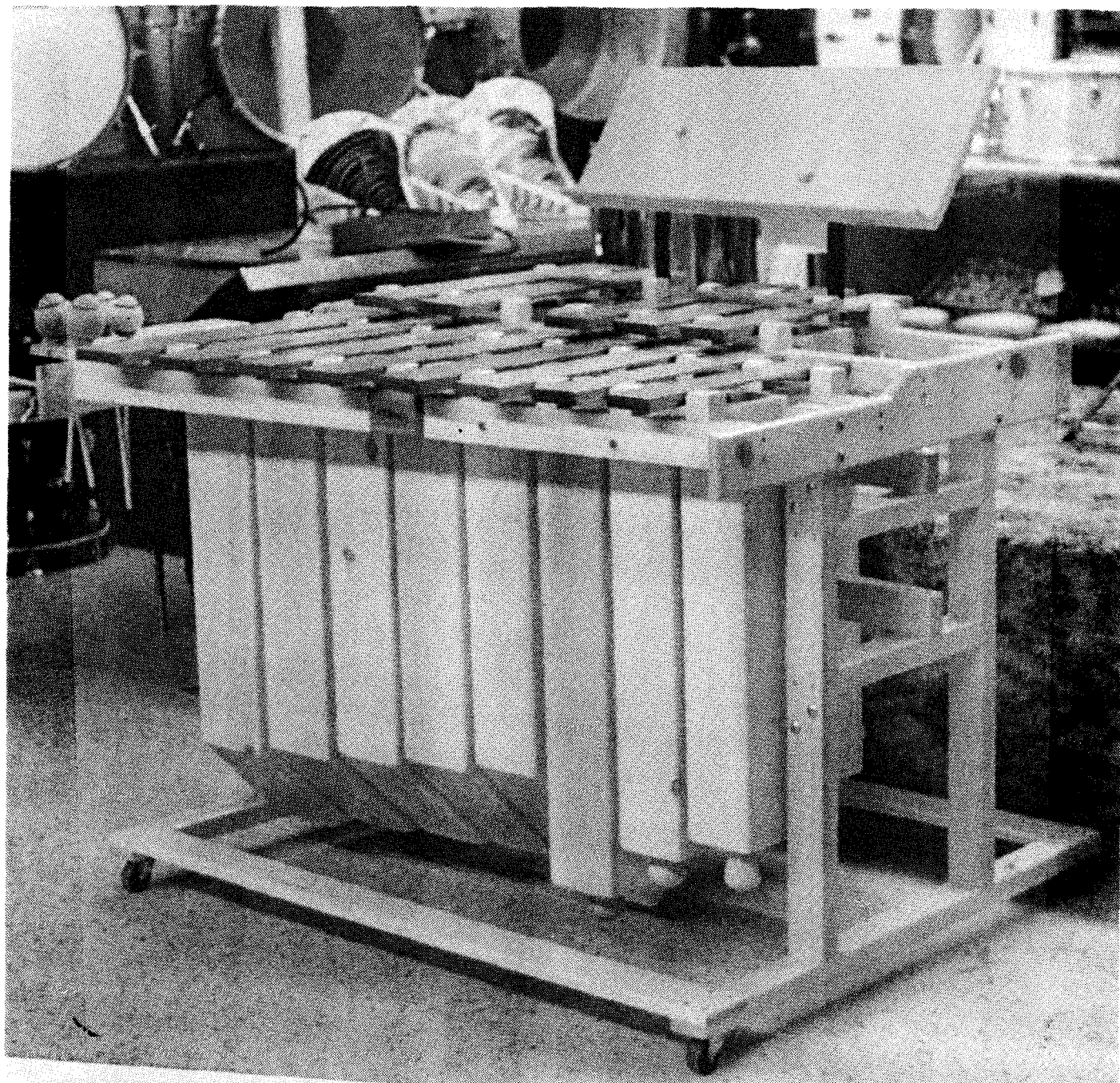


Photo No. 3

Chicago - Main showroom at Frank's Drum Shop. (1981)



Photo No. 4

Pasadena - My residence with (L to R) me, my wife Evelyn, and friends Laura and Chan. (Mar 1980)

INSTRUMENT SPECIFICATIONS

INSTRUMENT

Type: Bass Marimba
Designed and Built By: Christopher C. Banta
Year: 1979

PHYSICAL CHARACTERISTICS

Height: 37" (Naturals)
39" (Accidentals)
Depth: 44"
Width: 53"
Weight: Approximately 155 lbs.

MATERIALS

Bars: Mahogany
Resonators: White Pine
Frame: White Fir

MUSICAL CHARACTERISTICS

Number of Notes: 13
Tuning: Equal Tempered
Pitch Standard: A-440 Hz
Pitch Range: C2 to C3
Frequency Range: 65.4 Hz to 130.8 Hz
Musical Range:



INSTRUMENT EXHIBIT/DISPLAY SUMMARY AND STATUS

INSTRUMENT EXHIBIT/DISPLAY SUMMARY

Jan 1980 - I displayed this new Bass Marimba at the National Association of Music Merchants (NAMM) convention in 1980, at the Disneyland Hotel in Anaheim, California.

NOTE: The NAMM convention was a key turning point in my now established business [CCBANTA Creative Percussion Company]. First, I had received an order for two bass marimbas from the Yamaha International Company. Second, during the convention I had a lengthy conversation with Mr. Roy Webster, a worker from a percussion company in England. The nature of the conversation was "harmonic" tuning. I learned that my tuning was not "harmonic" only fundamental. From my conversation with Mr. Webster, I eventually learned to tune marimba bars to the 2nd harmonic [two octaves above the fundamental] as well as the fundamental frequency.

INSTRUMENT(S) STATUS

Since I received an order for two Bass Marimbas from Yamaha International, two Bass marimbas were fabricated with cleaner construction techniques. The exhibited bass marimba's bars were retuned harmonically (as I learned from the convention) using a newly acquired "stroboscopic tuner". The newer instrument's resonators were made a slight bit longer, since the length of the older marimba's resonators did not allow for enough tuning control. (This was evident by the stopper being too close to the opening, thus minimizing the range of tuning adjustment.) Ultimately one of the two new instruments was kept by myself. So one new marimba and the exhibited marimba were boxed and shipped to Yamaha Corporation (Southern California division). I imagine the two Bass Marimbas eventually went overseas to Japan.

The remaining instrument was sent to Frank's Drum Shop in Chicago on a consignment basis, where it was displayed on the main showroom floor. (Prior to set up the marimba apparently arrived with some broken pieces, thus requiring my presence in Chicago to make repairs.) Upon completion, the instrument looked great. A few years later, Frank's Drum Shop declared bankruptcy and the Bass Marimba was sold to a local college without my knowledge. I tried contacting Frank's owners, the bankruptcy liquidators, and the local colleges on numerous occasions. All attempts resulted in endless run-arounds that got me nowhere. I finally decided to declare the Bass Marimba a loss.