

## 1.0 PROJECT OVERVIEW

THIS WORKBOOK IS AN ATTEMPT TO DEFINE AND CAPTURE THE PHYSICAL AND TECHNICAL ASPECTS OF THE HARRY PARTCH INSTRUMENT KNOWN AS THE "MARIMBA EROICA," AND TO MAKE THIS DATA UNDERSTANDABLE FOR THE CONSTRUCTION OF A DUPLICATE INSTRUMENT.

THE GOAL IS TO BRING CLARIFICATION TO THE PROJECT BY GATHERING THE INSTRUMENT'S DETAILS USING THE HARRY PARTCH BOOK, "GENESIS OF A MUSIC," AND MOVE SUCH DETAILS INTO A MANUFACTURING-ORIENTED WORKBOOK.

THE CONTENTS OF THIS WORKBOOK, MAY IN ITSELF, BE INSUFFICIENT TO CONSTRUCT AN INSTRUMENT OF THIS MAGNITUDE BY THE NOVICE OR INTER-MEDIATE WOODWORKER.

FURTHERMORE, CREATING A DUPLICATE MARIMBA EROICA WILL NOT BE AN EASY TASK. OBVIOUSLY, LARGE PHYSICAL COMPONENTS ARE NECESSARY TO PRODUCE SUB-BASS FREQUENCIES. MANAGING THESE SYSTEMS IS NOT EASY.

A FULL KNOWLEDGE OF HOW THE MARIMBA FUNCTIONS, THE TUNING AND CORRECTION OF ITS INDIVIDUAL COMPONENTS, THE ACCURATE AND SAFE UTILIZATION OF LARGE SHOP WOODWORKING TOOLS, AND THE ABILITY TO DESIGN SUCH AN INSTRUMENT FROM SCRATCH WITHOUT THESE DETAILS IS ABSOLUTELY NECESSARY FOR THIS PROJECT TO SUCCEED.

NOTE 1: AS OF THIS WRITING, THE AUTHOR OF THIS WORK DID NOT HAVE THE BENEFIT OF VISITING THE ACTUAL MARIMBA EROICA, TO CONFIRM AND VERIFY THE DIMENSIONAL ATTRIBUTES AND PHYSICAL QUALITIES OF THE INSTRUMENT.

NOTE 2: EVERY DETAIL SPECIFIED HEREIN, WAS OBTAINED EITHER BY THE BOOK, OR BY SPECULATION FROM A MECHANICAL ENGINEERING AND WOODWORKING PERSPECTIVE. DETAILS AND FEATURES HAVING NO OBVIOUS EXPLANATION (WITHOUT VISITING THE ACTUAL INSTRUMENT) HAVE BEEN IDENTIFIED WITH A "TBD" – WHICH STANDS FOR *TO BE DETERMINED*. TBD'S MAY BE ABLE TO BE FIGURED OUT DURING THE COURSE OF CONSTRUCTION, BY FUNCTIONAL ANALYSIS, OR BY CALCULATION FROM A PERSON SKILLED IN MARIMBA DESIGN.

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# PROJECT DEFINITION AND CONSTRUCTION WORKBOOK



**WORKING DRAFT**

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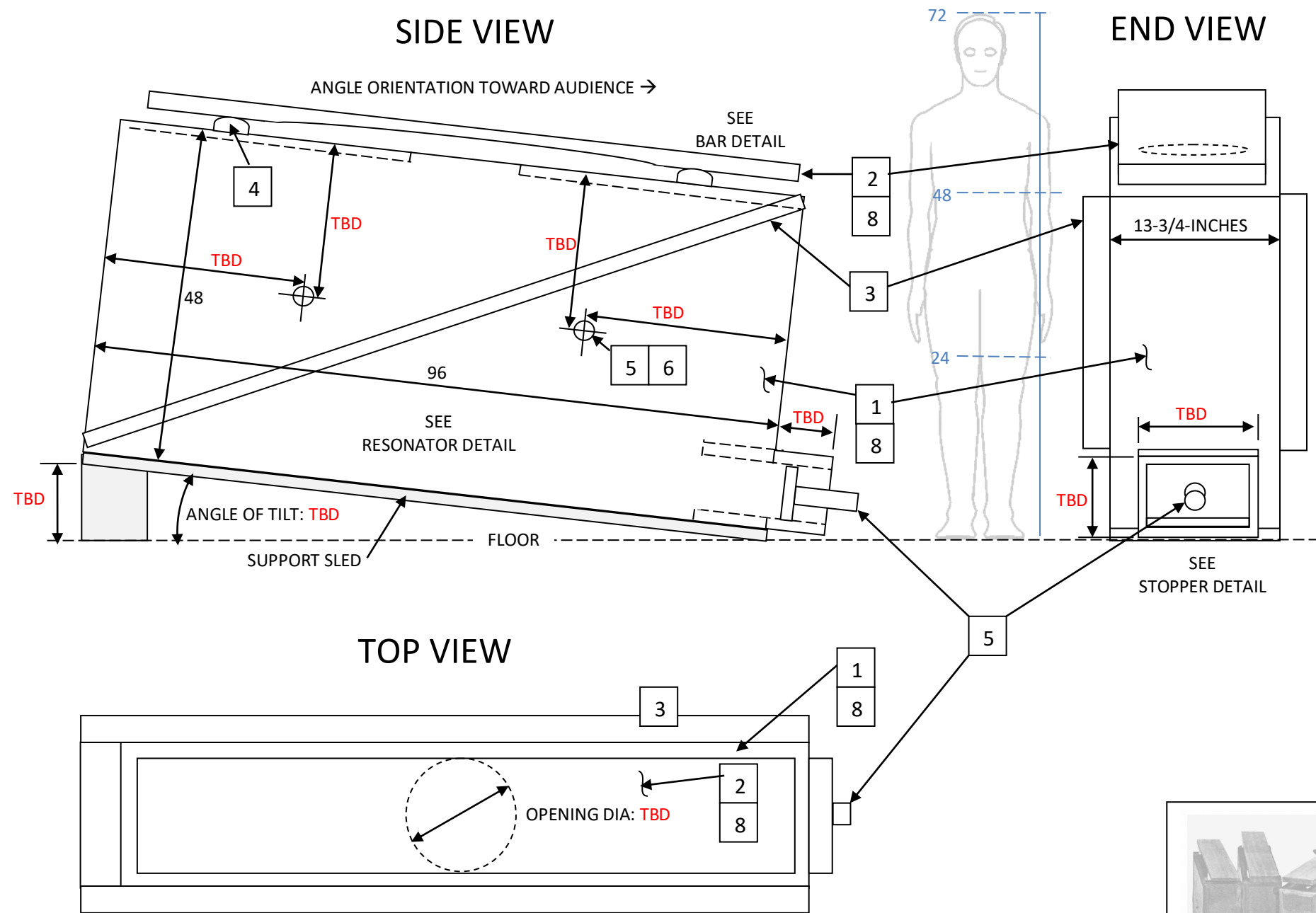
INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH  
**MARIMBA EROICA**

**1.0 PROJECT OVERVIEW**

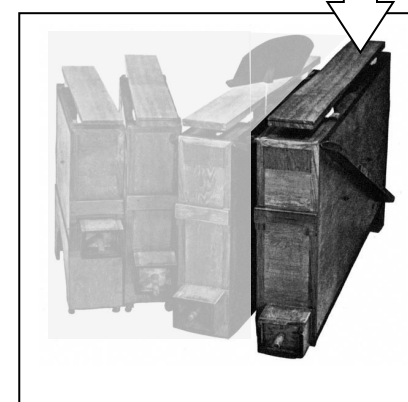
DRAWN: CHRIS BANTA    DEC 2009    SHT 1 of 18

# F



## BILL OF MATERIALS

ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 48 X 96 X 3/4-INCH, RED BIRCH, 11-PLY	BODY: SIDES, TOP, BOTTOM, ENDS, STOPPER, ANGLE SUPPORT SLED	4 PCS
2	SITKA SPRUCE (OR EQUIVALENT), 2 X 10 X 96-INCH, QUARTER-SAWN (VERTICAL GRAIN)	BAR	1 PC
3	REDWOOD, 2 X 4 X 10-FT	SIDE BRACE	2 PCS
4	FOAM BLOCK, SIZE: TBD	BAR SUPPORT	2 PCS
5	DOWEL, FIR, 1-1/2-INCH DIA.	STOPPER HANDLE, RESONATOR WALL SPACERS	36-INCHES
6	BOLT/TENSION ROD, 3/8-16, ZINC, LENGTH: TBD NUT, 3/8-16, ZINC WASHER, 3/8, ZINC	RESONATOR WALL SPACERS	2 EA
7	FELT, STICKY BACK, 9 X 12-INCHES	STOPPER GASKET	2 PC
8	POLYCRYLIC (MINWAX), CLEAR, SATIN, WATERBASE	PROTECTIVE FINISH: - - BAR - RESONATOR	AS-NEEDED



### NOTES

ALL DIMENSIONS ARE IN INCHES.  
TECHNICAL SOURCE: "GENESIS OF A MUSIC"  
ILLUSTRATION NOT-TO-SCALE

INSTRUMENT DUPLICATION PROJECT  
HARRY PARTCH  
**MARIMBA EROICA**

### 2.0 NOTE DETAIL (NO. 1)

PITCH	F
RATIO	9/5 (Cents Offset: 1017.6)
FREQ	22Hz
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# C

## BILL OF MATERIALS

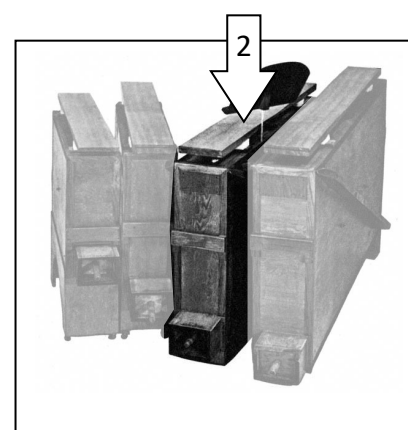
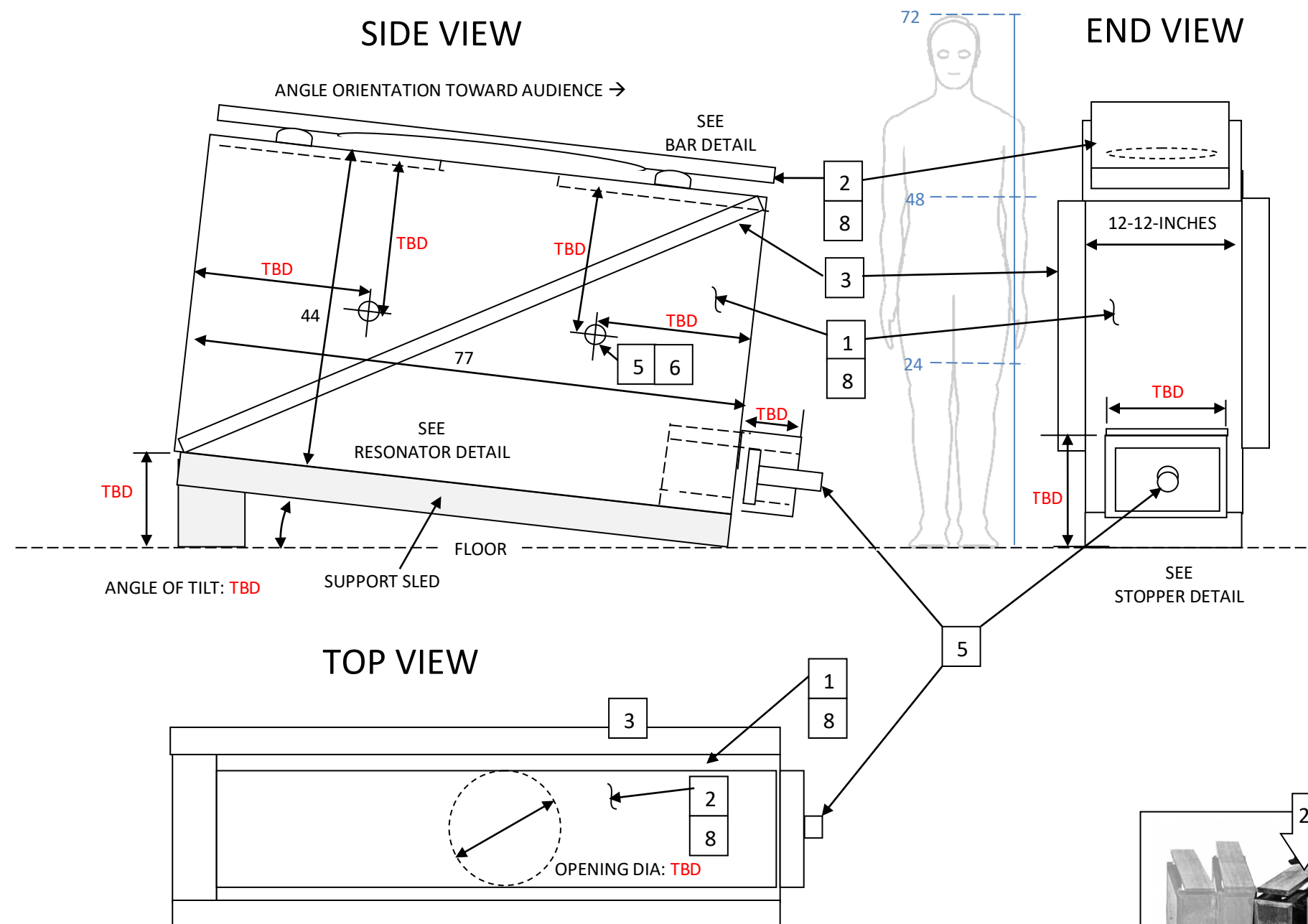
ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 48 X 96 X 3/4-INCH, RED BIRCH, 11-PLY	BODY: SIDES, TOP, BOTTOM, ENDS, STOPPER, ANGLE SUPPORT SLED	3 PCS
2	SITKA SPRUCE (OR EQUIVALENT), 2 X 10 X 84-INCH, QUARTER-SAWN (VERTICAL GRAIN)	BAR	1 PC
3	REDWOOD, 2 X 4 X 10-FT	SIDE BRACE	2 PCS
4	FOAM BLOCK, SIZE: TBD	BAR SUPPORT	2 PCS
5	DOWEL, FIR, 1-1/2-INCH DIA.	STOPPER HANDLE, RESONATOR WALL SPACERS	36-INCHES
6	BOLT/TENSION ROD, 3/8-16, ZINC, LENGTH: TBD NUT, 3/8-16, ZINC WASHER, 3/8, ZINC	RESONATOR WALL SPACERS	2 EA
7	FELT, STICKY BACK, 9 X 12-INCHES	STOPPER GASKET	2 PC
8	POLYCRYLIC (MINWAX), CLEAR, SATIN, WATERBASE	PROTECTIVE FINISH: - - BAR - RESONATOR	AS-NEEDED

### INSTRUMENT DUPLICATION PROJECT

## HARRY PARTCH MARIMBA EROICA

### 2.1 NOTE DETAIL (NO. 2)

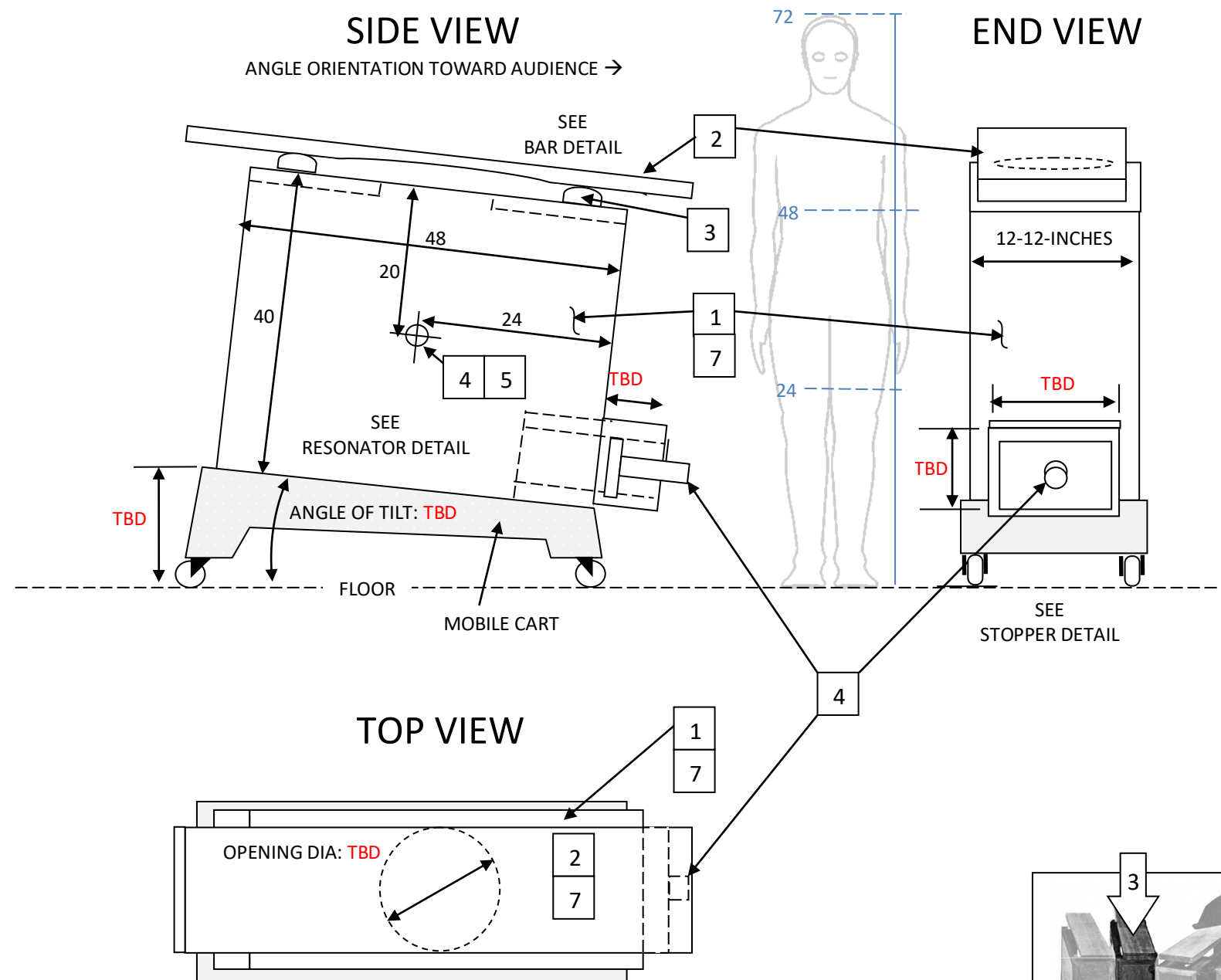
PITCH	C
RATIO	27/20 (Cents Offset: 519.5)
FREQ	33Hz
DRAWN: CHRIS BANTA	DEC 2009
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### NOTES

ALL DIMENSIONS ARE IN INCHES.  
TECHNICAL SOURCE: "GENESIS OF A MUSIC"  
ILLUSTRATION NOT-TO-SCALE

# E



## BILL OF MATERIALS

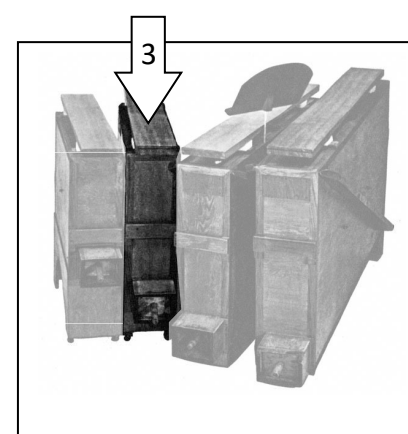
ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 48 X 96 X 3/4-INCH, RED BIRCH, 11-PLY	BODY: SIDES, TOP, BOTTOM, ENDS, STOPPER, ANGLE MOBILE CART	2 PCS
2	SITKA SPRUCE (OR EQUIVALENT), 2 X 10 X 72-INCH, QUARTER-SAWN (VERTICAL GRAIN)	BAR	1 PC
3	FOAM BLOCK, SIZE: TBD	BAR SUPPORT	2 PCS
4	DOWEL, FIR, 1-1/2-INCH DIA.	STOPPER HANDLE, RESONATOR WALL SPACERS	24-INCHES
5	BOLT/TENSION ROD, 3/8-16, ZINC, LENGTH: TBD NUT, 3/8-16, ZINC WASHER, 3/8, ZINC	RESONATOR WALL SPACERS	1 EA
6	FELT, STICKY BACK, 9 X 12-INCHES	STOPPER GASKET	2 PC
7	POLYCRYLIC (MINWAX), CLEAR, SATIN, WATERBASE	PROTECTIVE FINISH: - - BAR - RESONATOR	AS-NEEDED
8			

### INSTRUMENT DUPLICATION PROJECT

## HARRY PARTCH MARIMBA EROICA

### 2.2 NOTE DETAIL (NO. 3)

PITCH	E
RATIO	12/7 (Cents Offset: 933.1)
FREQ	42Hz
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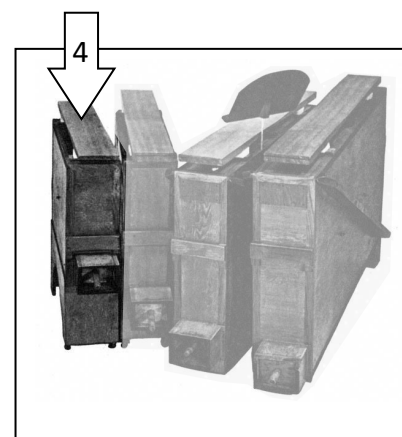
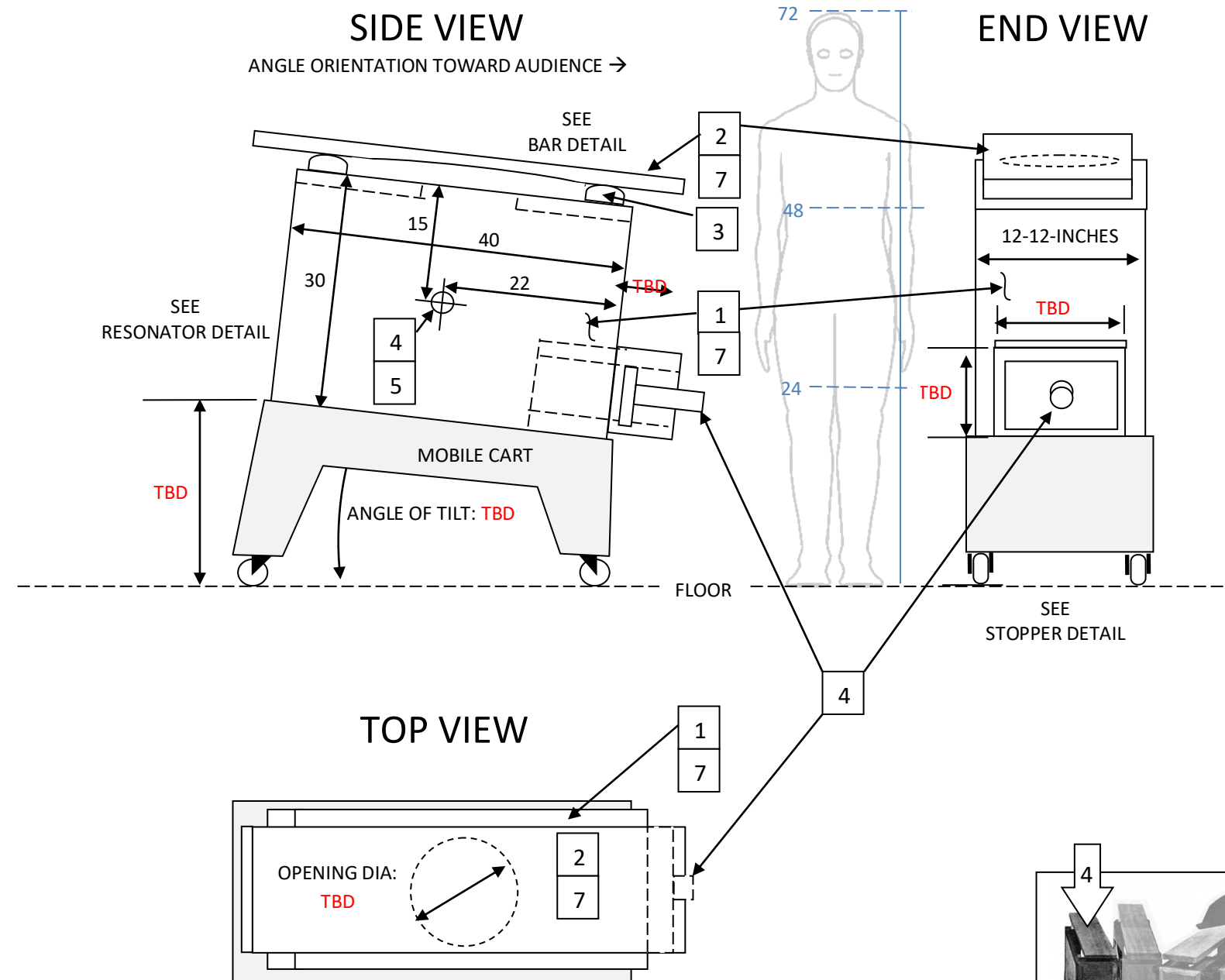
### NOTES

ALL DIMENSIONS ARE IN INCHES.  
TECHNICAL SOURCE: "GENESIS OF A MUSIC"  
ILLUSTRATION NOT-TO-SCALE

# A

## BILL OF MATERIALS

ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 48 X 96 X 3/4-INCH, RED BIRCH, 11-PLY	BODY: SIDES, TOP, BOTTOM, ENDS, STOPPER, ANGLE MOBILE CART	2 PCS
2	SITKA SPRUCE (OR EQUIVALENT), 2 X 10 X 60-INCH, QUARTER-SAWN (VERTICAL GRAIN)	BAR	1 PC
3	FOAM BLOCK, SIZE: TBD	BAR SUPPORT	2 PCS
4	DOWEL, FIR, 1-1/2-INCH DIA.	STOPPER HANDLE, RESONATOR WALL SPACERS	24-INCHES
5	BOLT/TENSION ROD, 3/8-16, ZINC, LENGTH: TBD NUT, 3/8-16, ZINC WASHER, 3/8, ZINC	RESONATOR WALL SPACERS	1 EA
6	FELT, STICKY BACK, 9 X 12-INCHES	STOPPER GASKET	2 PC
7	POLYCRYLIC (MINWAX), CLEAR, SATIN, WATERBASE	PROTECTIVE FINISH: - - BAR - RESONATOR	AS-NEEDED
8			



### NOTES

ALL DIMENSIONS ARE IN INCHES.  
TECHNICAL SOURCE: "GENESIS OF A MUSIC"  
ILLUSTRATION NOT-TO-SCALE

### INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH  
**MARIMBA EROICA**

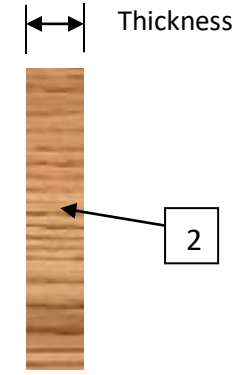
### 2.3 NOTE DETAIL (NO. 4)

PITCH	A
RATIO	8/7 (Cents Offset: 231.2)
FREQ	56Hz
DRAWN: CHRIS BANTA	DEC 2009
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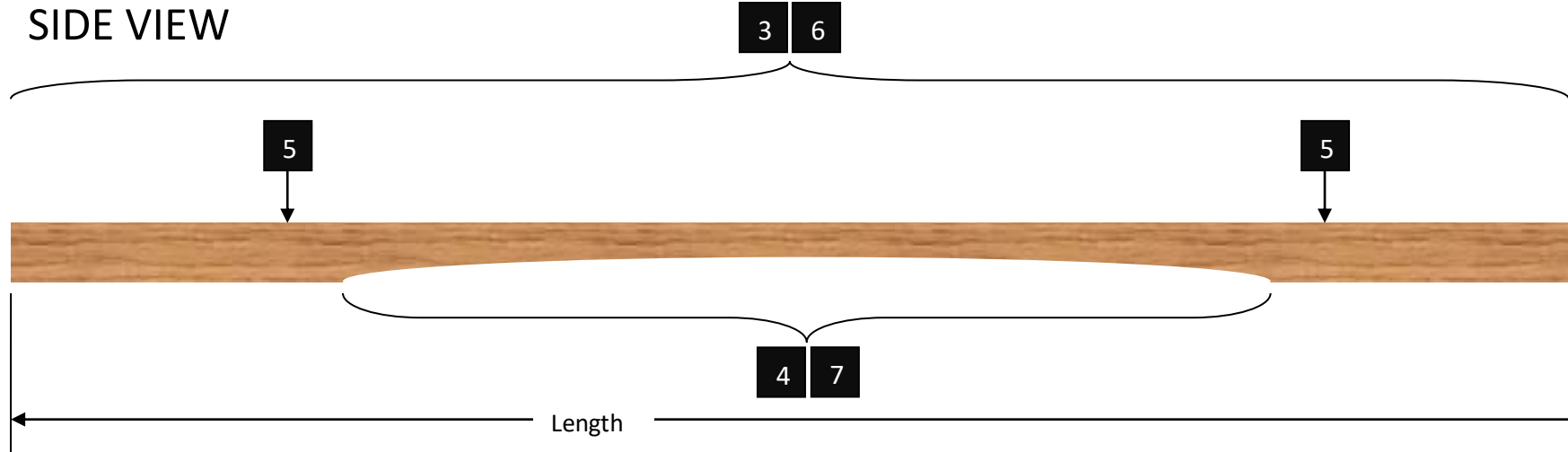
### TOP VIEW



### END VIEW



### SIDE VIEW



### CENTS OFFSET\*

NOTE	FREQUENCY	OCTAVE	AMOUNT OF OFFSET (CENTS)
F	22 HZ	F0	+13.7
C	33 HZ	C1	+15.6
E	42 HZ	E1	+33.1
A	56 HZ	A1	+31.2

Adding the offset amount to note setting on the strobe tuner will exactly yield the frequency.

Source: <http://www.petersontuners.com/index.cfm?category=15>

### BAR CHART

NOTE	FREQUENCY	RATIO	LENGTH	WIDTH	THICKNESS
F	22 HZ	9/5	90-1/2"	9-7/8"	1-7/8"
C	33 HZ	27/20	77"	10"	1-3/4"
E	42 HZ	12/7	65"	8-8/7"	2-1/8"
A	56 HZ	8/7	55-1/4"	8-3/4"	2"

Source: "Genesis of a Music"

### NOTES

#### MATERIAL

HARRY PARTCH UTILIZED "SITKA SPRUCE" FOR THREE OF THE NOTES AND "REDWOOD" FOR ONE NOTE.

RECOMMENDED WOOD HAVING STRAIGHT GRAIN CHARACTERISTIC IS "AFRICAN PADUAK."

#### THICKNESS

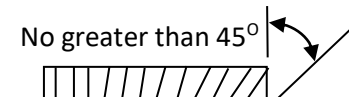
MINIMUM THICKNESS SHALL BE 8/4 (2-INCH) ROUGH, AND WILL BECOME 1-3/4" WHEN SURFACED (FINISH PLANED).

OPTION: LAMINATE THREE 4/4 (1-INCH), POST PLANING IS 3/4". FINAL THICKNESS WILL BE 2-1/4". PLANE TO FIT SPECIFIED THICKNESS.

#### WOOD QUALITY

- (TOP VIEW) STRAIGHT GRAIN – GRAIN MUST BE PARALLEL TO THE RIP OF THE WOODEN BAR. CURVINESS OR GRAIN DIRECTIONS THAT ARE CONTRARY TO THE LENGTH ARE NOT ACCEPTABLE.
- (END VIEW) VERTICAL GRAIN – (A.K.A. AS "QUARTER-SAWN") GRAIN MUST BE PERPENDICULAR TO THE BOARD LAYING FLAT ON THE GROUND.

NOTE: SOME DEVIATION FROM THE VERTICAL DIRECTION IS ACCEPTABLE. BUT THE ANGLED GRAIN CANNOT EXCEED 45°



#### TUNING / FINISHING

- FINISH SAND ENTIRE SURFACE PRIOR TO TUNING.
- TUNE FUNDAMENTAL FREQUENCY BY REMOVING MATERIAL FROM UNDERSIDE. LEAVE PITCH 1/8<sup>TH</sup> STEP SHARP
- LOCATE "NODE POINTS" USING SALT
- APPLY PROTECTIVE "CLEAR COAT" USING SATIN, WATERBASE (POLYCRYLIC).
- FINE TUNE UNTIL TARGET PITCH IS MET

NOT TO ANY SCALE

### INSTRUMENT DUPLICATION PROJECT

## HARRY PARTCH MARIMBA EROICA

### 3.0 BAR DETAIL

DRAWN: CHRIS BANTA    DEC 2009    SHT 6 of 18

### 3.0 BARS

#### 3.1 DEFINITION:

IN THIS CONTEXT, THE BAR IS SIMPLY THE FREQUENCY SOURCE FOR THE NOTE. IT MUST BE ABLE TO PROVIDE A QUALITY OF VIBRATION SUITABLE TO TRIGGER OR EXCITE THE RESONATOR AND BRING IT TO A STATE OF RESONANCE.

#### 3.2 MATERIAL

HARRY PARTCH CITES “SITKA SPRUCE” AS THE PREFERRED MATERIAL, EVENTHOUGH THE 4<sup>TH</sup> NOTE IS MADE OUT OF REDWOOD.

**[POTENTIAL PROBLEM]** THE AVAILABILITY OF 2-INCH THICK PROFILE SITKA SPRUCE WILL BE VERY CHALLENGING IN LOCATING THIS PARTICULAR WOOD.

**[RECOMMENDATION]** THERE IS ANOTHER OPTION. UTILIZE “AFRICAN PADAUK” WHICH IS ABSOLUTELY SUPERB IN ITS PERCUSSIVE AND SONIC CHARACTERISTICS. IT IS A HARD ROBUST MATERIAL, AVAILABLE IN BOTH STRAIGHT LENGTH-WISE AND VERTICAL GRAINS. (SEE 3.4)

#### 3.3 THICKNESS

HARRY PARTCH HAS CREATED THE THICKNESS IN THE FOLLOWING NOTES:

- NOTE 1 (F) = 1-7/8”
- NOTE 2 (C) = 1-3/4”
- NOTE 3 (E) = 2-1/8”
- NOTE 4 (A) = 2”

**[POTENTIAL PROBLEM]** DUE TO THE FINISH PLANING THICKNESS OF WOODS TODAY, THESE THICKNESSES WOULD NOT BE POSSIBLE. THE NEAREST AVAILABLE THICKNESS IS 8/4 (“EIGHT/QUARTERS”), WHICH EQUALS ABOUT 1-3/4 INCH SURFACED OR FINISH PLANED.

TO OBTAIN A TRUE 2-INCH THICK BAR, TWO OPTIONS ARE AVAILABLE:

- OPTION 1) LAMINATE THREE 3/4-INCH PIECES (WHICH EQUALS 2-1/4 INCHES), AND THEN PLANE TO CORRECT THICKNESS.
- OPTION 2) **[RECOMMENDED]** ACCEPT THE 8/4 (1-3/4 INCH) THICKNESS FOR ALL FOUR BARS.

NOTE: THIS MINUTE DIFFERENCE IN THICKNESS WILL NOT AFFECT THE QUALITY OF VIBRATION ON THE FINISHED PITCH.

#### 3.4 GRAIN QUALITY

THERE ARE TWO GRAIN QUALITIES THAT MUST BE FACTORED INTO MARIMBA BAR DESIGN: LENGTH-WISE GRAIN AND VERTICAL GRAIN

- LENGTH-WISE GRAIN  
LENGTH-WISE “STRAIGHTNESS” IS THE RULE IN THE MARIMBA BAR. CURVINESS OF GRAIN AND CONTRARY CHANGES OF DIRECTION (FROM STRAIGHT) ADVERSLY AFFECT THE “TRANSVERSE MOTION” OF THE BAR. TO GOAL IS TO OBTAIN LONG RING TONES FROM THE BAR. STRAIGHT GRAIN WOODS INCREASE THE LIKELYHOOD OF SUCCESS.
- VERTICAL GRAIN  
THIS IS ACTUALLY REFERED TO AS “QUARTER SAWN” – IN WHICH THE GROWTH RINGS ARE IN VERTICAL DIRECTION WITH THE BOARD LAYING FLAT. THIS IS ABSOLUTELY THE BEST GRAIN ORIENTATION FOR MARIMBA BARS, AS IT STRUCTURALLY ROBUST IN RESISTING REPEATED Mallet BLOWS WITHOUT GRAIN SEPARATION.

#### 3.5 TUNING

PER HARRY PATCH, ONLY THE FUNDAMENTAL (A.K.A. THE 1<sup>ST</sup> HARMONICA) WAS TUNED. NO HARMONIC OR OVERTONE TUNING. A Mallet OF SUFFICIENT SIZE AND SOFTNESS MUST BE USED [PG XXX], AS THIS SUPPRESSES UPPER HARMONICS FROM RINGING FORTH. THE GOAL IS FOR ONLY THE FUNDAMENTAL TO RADIATE FORTH IN THE MOST POWERFUL MEANS POSSIBLE. IT IS THE FUNDAMENTAL THAT “THICKENS THE AIR” AND PROVIDES A SENSE OF FEELING FOR THE LISTENER.

#### 3.6 PROTECTIVE COATING/FINISH

[QUESTION]: MR. PARTCH DOES NOT SPECIFY IF OR HOW THE BARS ARE FINISHED. IDEALLY, THE UNFINISHED BAR WILL SOUND IN THE PUREST WAY. HOWEVER, THIS INVITES PROBLEMS DOWN THE ROAD – MOST NOTABLY MOISTURE ABSORPTION, WHICH CAN LEAD TO WARPING AND/OR SPLITS IN THE GRAIN. THE UNFINISHED BAR CAN ACTUALLY SHRINK WITH REPEATED MOISTURE/DRYING CYCLES, WHICH MAY AFFECT TUNING, THE NODE POINT LOCATIONS, AND THE LONG TERM VIABILITY OF THE BAR. BEST SOUNDING OR PROTECTED FROM Mallet BLOWS AND MOISTURE ABSORPTION.

**[RECOMMENDATION]** APPLY MINIMUM FOUR COATS OF CLEAR, SATIN, POLYCRYLIC WATER BASE (MADE BY MINWAX). THIS COATING NOT ONLY PROTECTS THE BAR FROM MOISTURE ABSORPTION, BUT PROVIDES A BARRIER RESISTANCE TO THE PHYSICAL STRIKES OF THE Mallet.

NOTE: OILING THE WOOD IS NOT RECOMMENDED, AS THIS INTRODUCES A “MOISTURE MASS” WHICH PENETRATES THE WOOD, AND COULD AFFECT TUNING. FURNITURE THAT IS

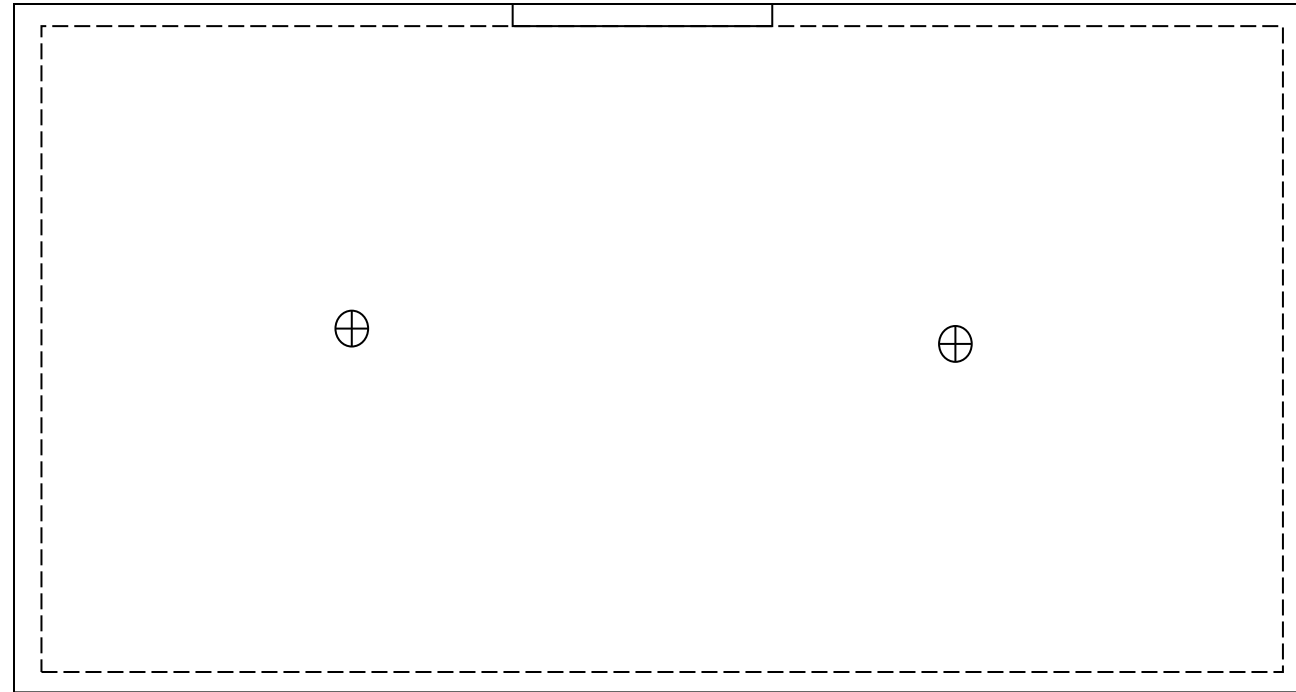
## INSTRUMENT DUPLICATION PROJECT

# HARRY PARTCH MARIMBA EROICA

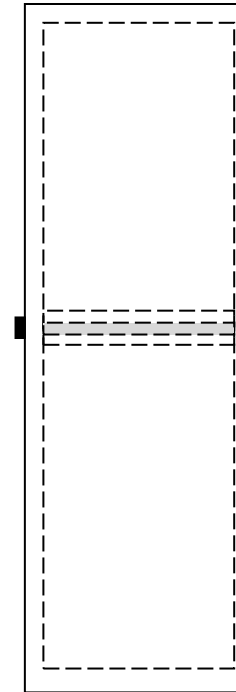
### 3.0 BAR DETAIL (CONT'D)

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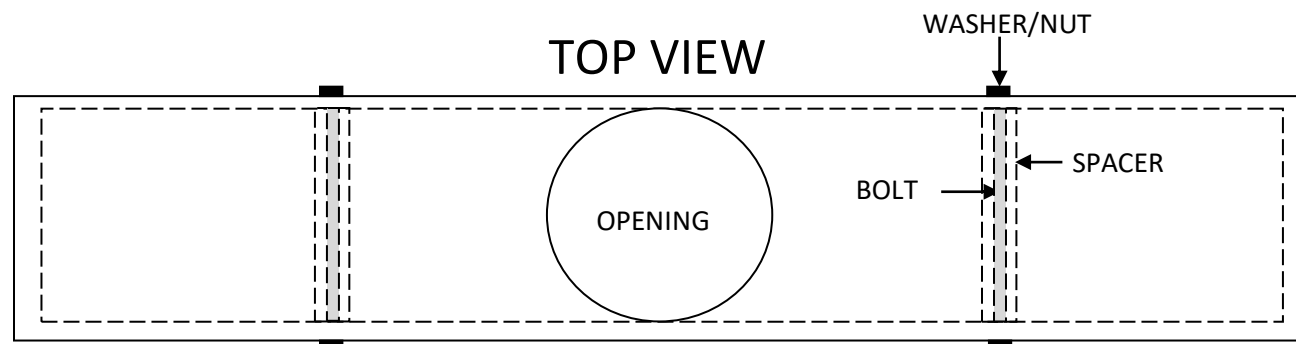
### SIDE VIEW



### END VIEW



### TOP VIEW



### RESONATOR CHART

NOTE	FREQUENCY	NOTE RATIO	LENGTH	WIDTH	HEIGHT	RESONATOR RATIO (CENTS)
F	22 HZ	9/5	96"	13-3/4"	48"	5/3 (884.4)
C	33 HZ	27/20	77"	12-1/2"	44"	14/11 (417.5)
E	42 HZ	12/7	48"	12-1/2"	40"	8/5 (813.7)
A	56 HZ	8/7	44"	12-1/2"	30"	11/10 (165.0)

Source: "Genesis of a Music"

### NOTES

#### MATERIAL

HARRY PARTCH CITES 5-PLY PLYWOOD (3/4-INCH). RED BIRCH, 11-PLY PLYWOOD, 3/4-INCH, THAT IS VOID FREE IS STRUCTURALLY MORE ROBUST.

#### WALL RIGIDITY

WALL RIGIDITY IS ENHANCED WITH THE USE OF SPACERS BETWEEN THE TWO LARGEST PLANES. THIS PREVENT THE WALLS FROM "BREATHING", WHICH IS CONSIDERED A FUNCTIONAL LOSS FOR THE SYSTEM.

#### TUNING / FINISHING

- 3 FINISH SAND ENTIRE SURFACE PRIOR TO TUNING.
- 4 TUNE FUNDAMENTAL FREQUENCY BY REMOVING MATERIAL FROM UNDERSIDE. LEAVE PITCH 1/8<sup>TH</sup> STEP SHARP
- 5 LOCATE "NODE POINTS" USING SALT
- 6 APPLY PROTECTIVE "CLEAR COAT" USING SATIN, WATERBASE (POLYCRYLIC).
- 7 FINE TUNE UNTIL TARGET PITCH IS MET

### INSTRUMENT DUPLICATION PROJECT

## HARRY PARTCH MARIMBA EROICA

### 4.0 RESONATOR DETAIL

DRAWN: CHRIS BANTA    DEC 2009    SHT 8 of 18



## 4.0 THE RESONATOR

### 4.1 DEFINITION:

DUE TO ONE SIDE OF THE BAR ALWAYS BEING OUT OF PHASE WITH ITS OTHER SIDE, IT IS INCAPABLE OF EXERTING ENOUGH ENERGY INTO THE LISTENING SPACE.

THE RESONATOR PROVIDES A SECONDARY RESONATION SOURCE THAT MATCHES THE FREQUENCY OF THE BAR. THE RESULT IS A POWERFUL RESONANT TONE CAPABLE OF PROJECTING ENERGY INTO THE LISTENING SPACE.

### 4.2 PROPERTIES OF THE "CAVITY" RESONATOR

BOUNDARIES –

INTERNAL VOLUME –

OPENING AREA –

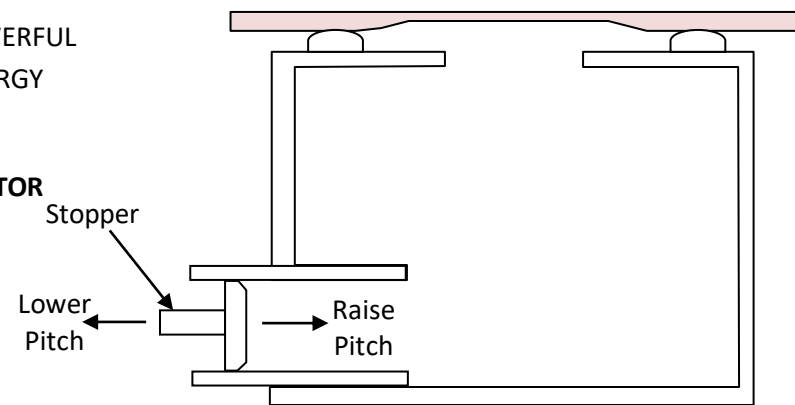
### 4.3 WALL STIFFNESS

WALL RIGIDITY IS ENHANCED WITH THE USE OF SPACERS BETWEEN THE TWO LARGEST PLANES. THIS PREVENTS THE WALLS FROM "BREATHING" DURING RESONANCE. FLEXING WALLS CREATES A FUNCTIONAL LOSS FOR THE SYSTEM.

PLYWOOD THAT IS A MINIMUM OF 3/4-INCH THICK SHALL BE USED.

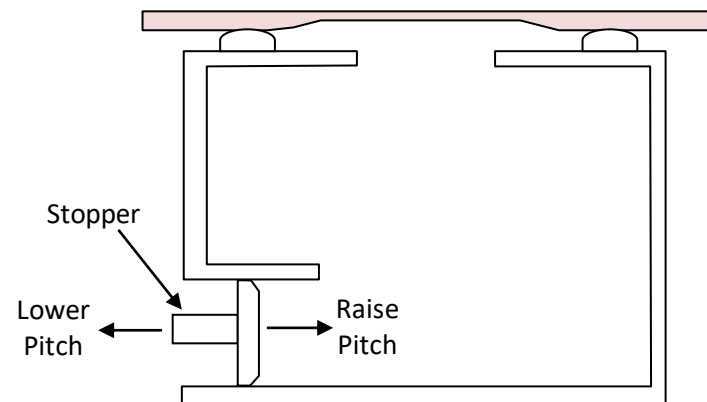
### 4.4 TUNING CONTROL

HARRY PARTCH HAS INSERTED SHORT LENGTHS OF ORGAN PIPE INTO THE LOWER CORNER OF THE RESONATOR. THIS CREATES A TUBE INTO THE CAVITY. THE STOPPER, HAVING AN AIRTIGHT FIT, IS THEN INSERTED.



THE STOPPER CAN BE MOVED INTO THE CAVITY TO RAISE FREQUENCY, OR OUTWARD TO LOWER FREQUENCY. THIS METHOD ONLY OFFERS A LIMITED AMOUNT OF TUNING CONTROL.

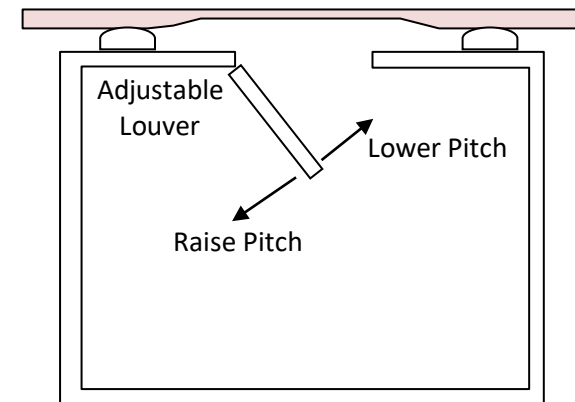
A MODERATE IMPROVEMENT ON THIS METHOD WOULD BE THE INCORPORATION OF THE STOPPER TUNING TUBE INTO THE RESONATOR'S WALLS, AS SHOWN BELOW.



**[RECOMMENDATION]** THE BETTER METHOD FOR TUNING A CAVITY RESONATOR IS IN USING AN INTERNAL LOUVER. THE LOUVER IS PRESSED UP AGAINST ONE SIDE OF THE OPENING FOR AN AIR-TIGHT FIT. IT CAN BE MOVED BACK AND FORTH LIKE A WINDSHIELD WIPER.

MOVING THE LOUVER TOWARD THE OPENING CAUSES THE RESONANT FREQUENCY TO LOWER. MOVING THE LOUVER AWAY FROM THE OPENING CAUSES THE RESONANT FREQUENCY TO RAISE.

THE FREQUENCY TUNING RANGE IS GREATLY EXPANDED OVER THAT OF THE STOPPER METHOD.



### 4.5 PROTECTIVE COATING/FINISH

HARRY PARTCH DOES NOT SPECIFY IF OR HOW THE RESONATORS ARE FINISHED. WOOD SURFACES SHOULD TO PROTECT THE SURFACE FROM MOISTURE ABSORPTION..

**[RECOMMENDATION]** BARE WOODED SURFACES SHOULD NEVER BE EXPOSED TO THE ELEMENTS, EVEN INDOORS. APPLY MINIMUM FOUR COATS OF CLEAR, SATIN, POLYCRYLIC WATER BASE (MADE BY MINWAX). THIS COATING NOT ONLY PROTECTS THE BAR FROM MOISTURE ABSORPTION, BUT PROVIDES A BARRIER RESISTANCE TO THE PHYSICAL STRIKES OF THE Mallet.

STAIN – NOT RECOMMENDED.

INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH

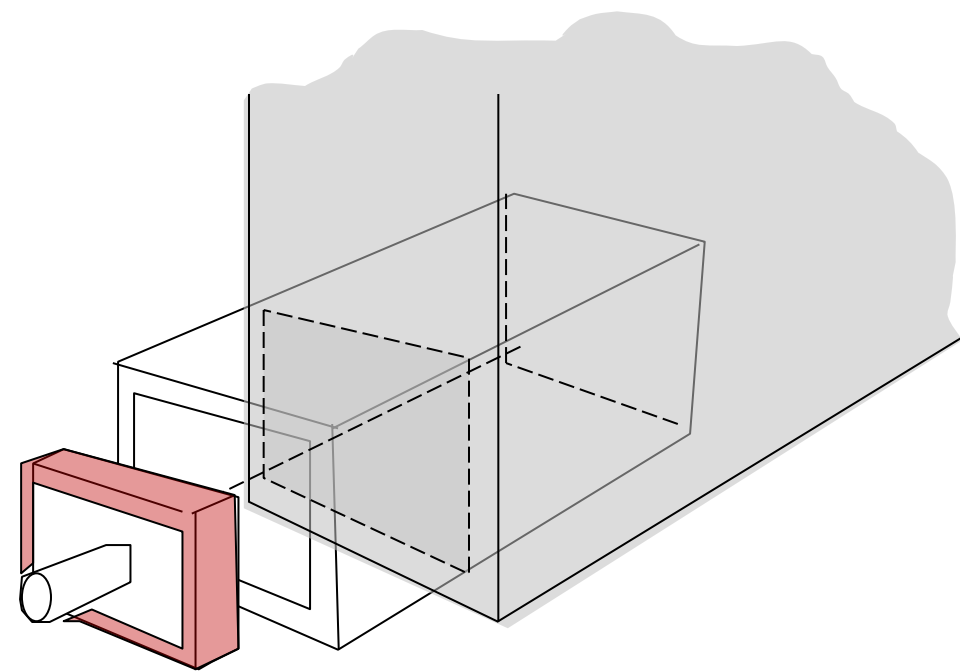
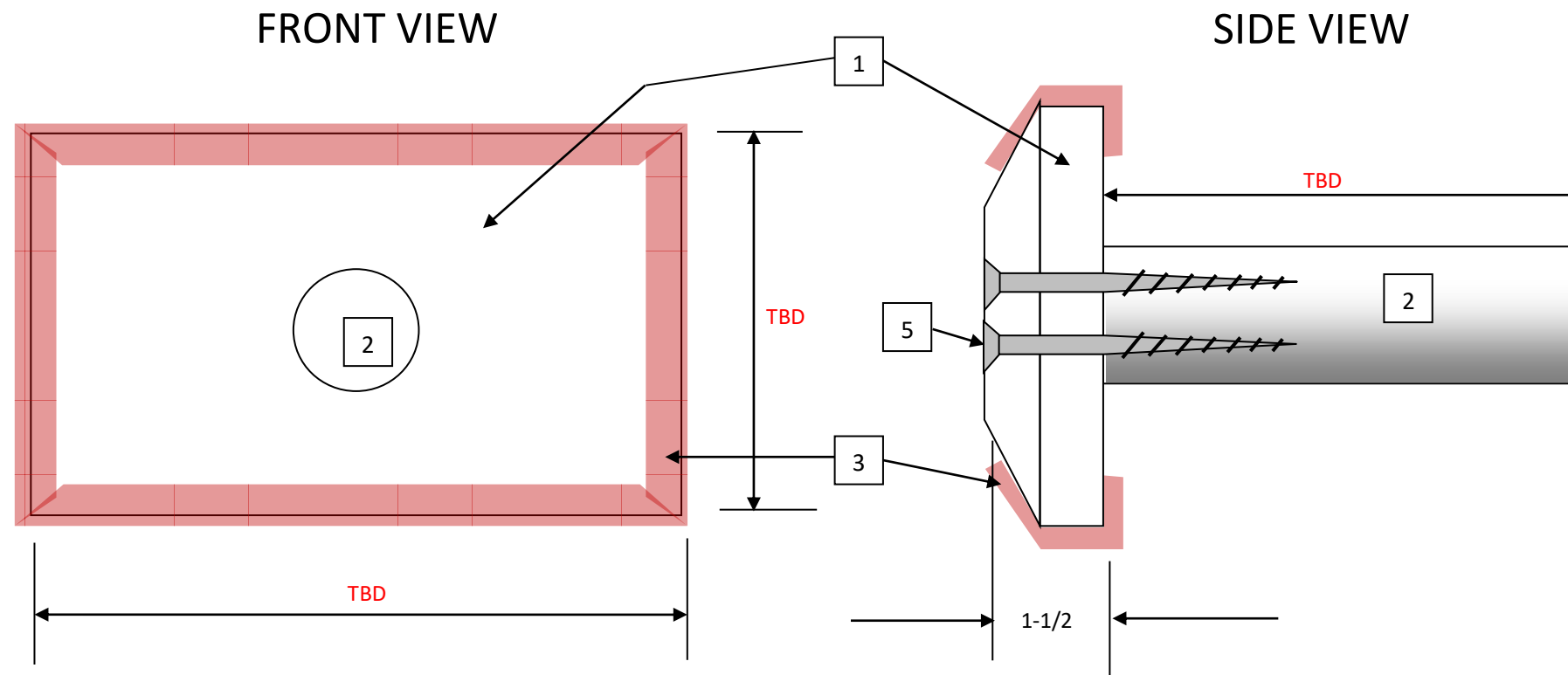
**MARIMBA EROICA**

**4.0 RESONATOR DETAIL (CONT'D)**

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### BILL OF MATERIALS

ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 48 X 96 X 3/4-INCH, BALTIC BIRCH, 15-PLY	BODY: SIDES, TOP, BOT, ENDS, STOPPER, ANGLE SUPPORT	3 PCS
2	DOWEL	BAR	1 PC
3	GASKET	SIDE BRACE	2 PCS
4	GLUE	BAR SUPPORT	2 PCS
5	DECK SCREW	BAR SUPPORT	2 PCS

INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH

**MARIMBA EROICA**

### STOPPER DETAIL

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## 5.0 BAR-RESONATOR COUPLING

**5.1 DEFINITION** – COUPLING IS THE INTEGRATING OF BOTH BAR AND RESONATOR IN SUCH A WAY THAT THEY ACT AS A SINGLE FUNCTIONAL SONIC SYSTEM. CORRECT COMPONENT FREQUENCY AND ALIGNMENT WILL YIELD A RESONANT PITCH WITH PUNCH AND POWER.

MR. PARTCH REFERS TO HIS TUNING PROCESS OF UTILIZING “BOOM TONES” – A METHOD WHICH RAISES THE RESONATOR OFF OF THE FLOOR AND GENTLY DROPS IT TO EXCITE THE INTERNAL CAVITY WHICH IN TURN PRODUCES A RESONATING TONE

**5.2 RESONATOR FREQUENCY IS BELOW THE BAR’S FREQUENCY** – [PG 281] IN TYPICAL RESONANCE ADJUSTMENTS OF THE RESONATOR, IT IS TUNED SLIGHTLY SHARP TO ALLOW FOR THE PROXIMITY EFFECT THE BAR CREATES BY BEING SO CLOSE TO THE RESONATOR OPENING. AS THE OPENING IS APPROACH BY ANY OBJECT, THIS CAUSES THE RESONANT FREQUENCY TO FLATTEN. THE IDEAL SCENARIO IS FOR THE RESONATOR TO RESONATE AT THE EXACT SAME FREQUENCY AS THE TUNED BAR, WITH THE BAR IN ITS END USE POSITION. COMPENSATING THE RESONATOR TUNING MAKES THIS POSSIBLE.

**5.3 A MORE ACCURATE METHOD** – BASS MARIMB DESIGNER, CHRIS BANTA, HAS DEvised AN ACCURATE TECHNIQUE TO MEASURE THE QUALITY OF BAR-RESONATOR COUPLING. DUE TO THE ELUSIVE NATURE OF LOW FREQUENCIES, TEST EQUIPMENT MUST BE UTILIZED. THE ENTIRE PROCESS IS DETAILED IN A PAPER TITLED, “HOW TO ACCURATELY MEASURE AND ASSESS THE TUNING AND RESONANCE QUALITY OF THE MARIMBA BAR / RESONATOR COMBINATION TO ACHIEVE A PERFECT ACOUSTIC COUPLING.”

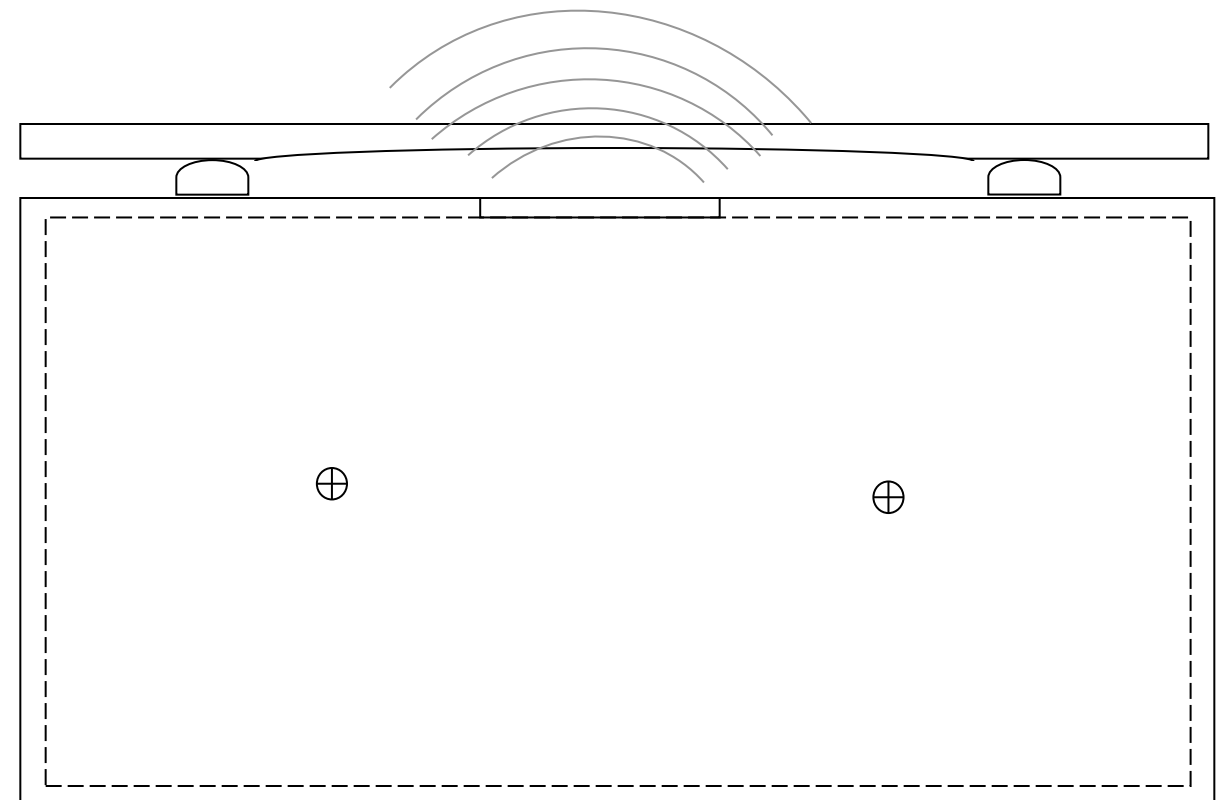
THIS IS AVAILABLE AS A PDF DOWNLOAD FROM THE DANDEMUTANDE ORGANIZATION LINK, AT: <http://www.dandemutande.org/Magazine/How-to-Measure-Resonators-C-C-BANTA.pdf>

NOTE: THIS TECHNIQUE WORKS FOR:

- SUB-CONTRA-BASS FREQUENCY RANGE (STARTING AT C0 = 16.35HZ)
- CONTRA-BASS FREQUENCY RANGE (STARTING AT C1 = 32.7HZ)
- BASS FREQUENCY RANGE (STARTING AT C2 = 65.4HZ)

NOTE: ONLY MECHANICAL ROTATING DISC STROBE TUNERS ARE USED IN TUNING AND COUPLING VERIFICATION. THEIR ABILITY TO INSTANTANEOUSLY DISPLAY ACTUAL PITCH IS CRUCIAL TO ACCURATE PITCH ASSESSMENT.

DIGITAL TUNERS AND THEIR DISPLAYS ARE PROBLEMATIC IN VERIFYING TUNING ACCURACY, AS THEIR DISPLAYS DON’T ALWAYS TRACK OR REGISTER THE ACTUAL CONDITION OF THE PITCH.



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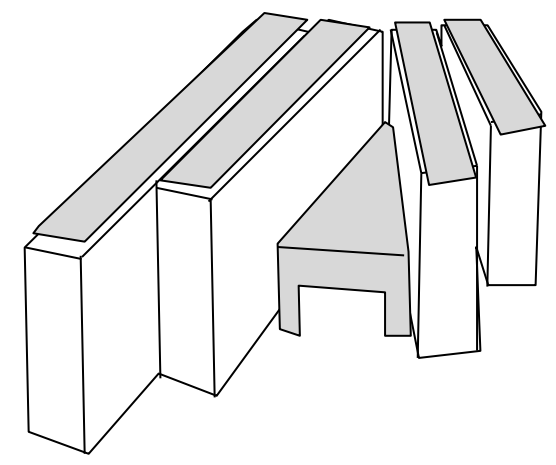
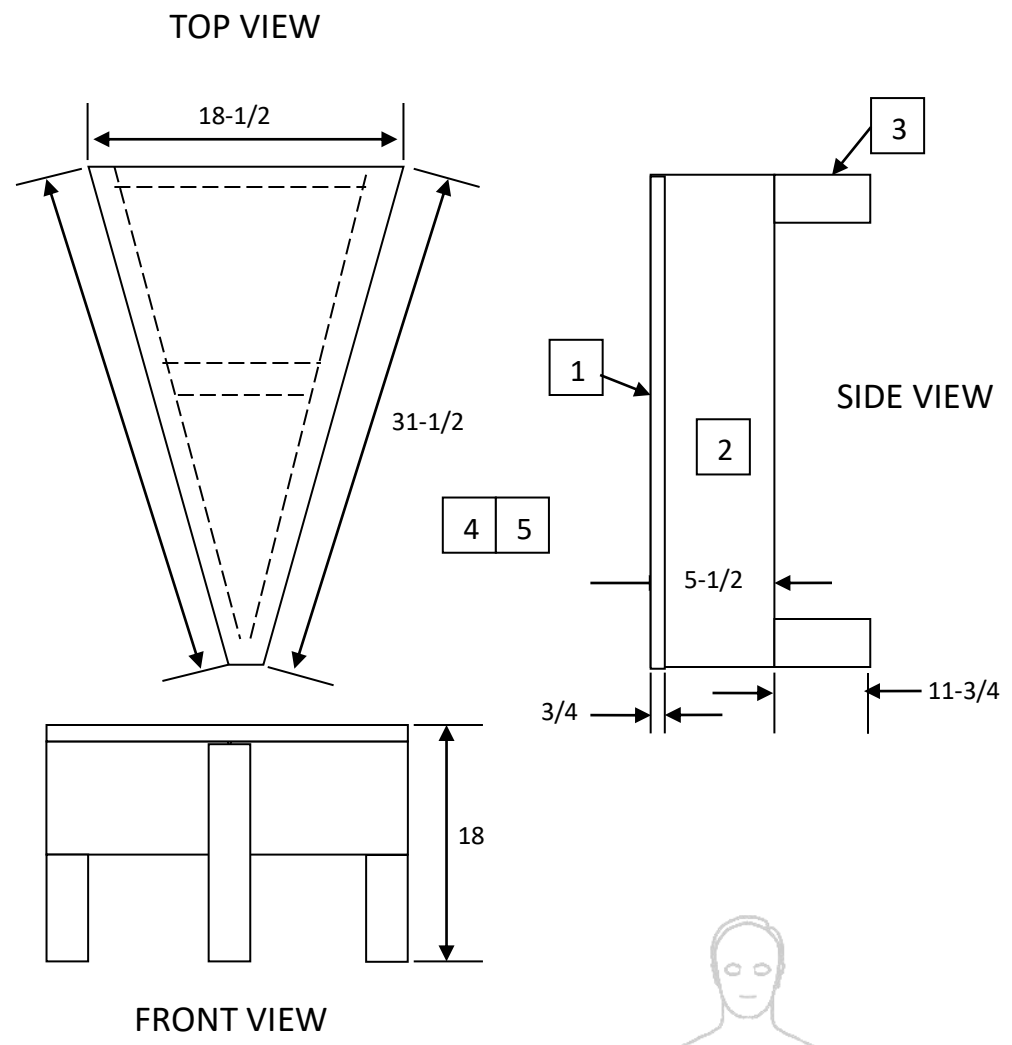
**MARIMBA EROICA**

**5.0 BAR – RESONATOR COUPLING**

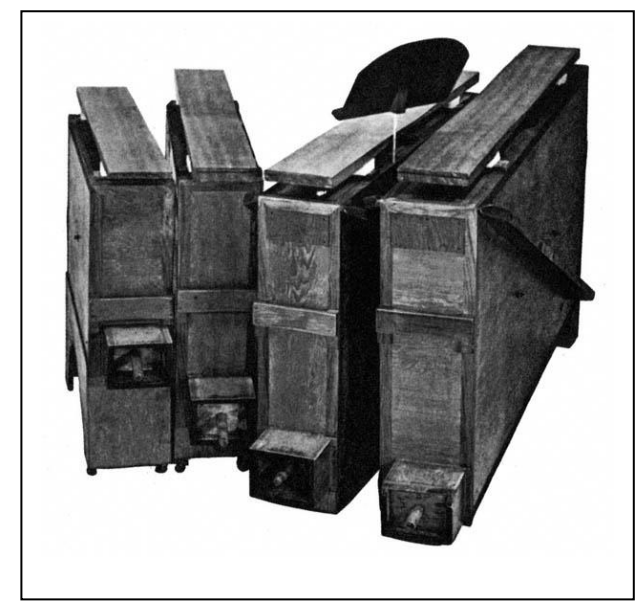
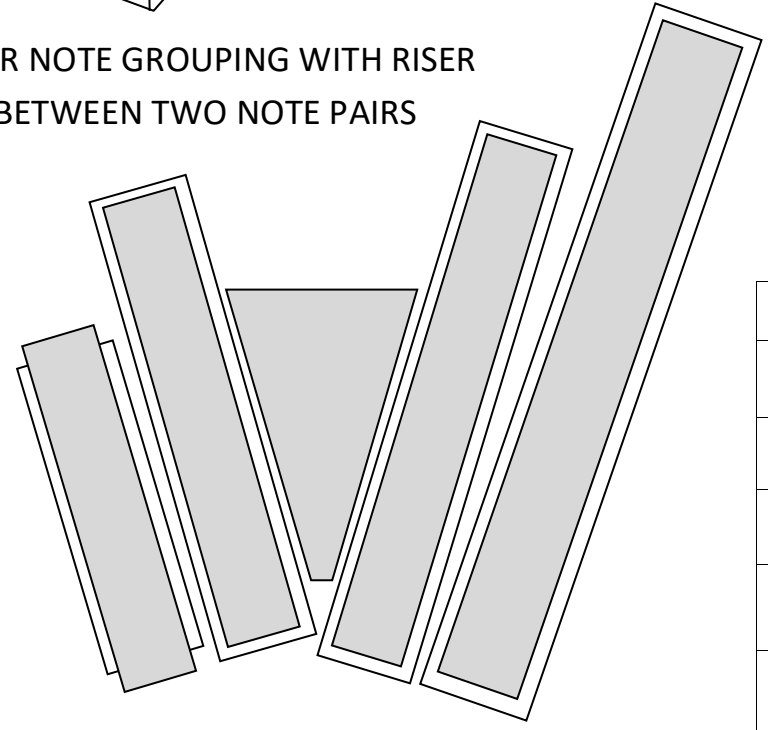
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FOUR NOTE GROUPING WITH RISER BETWEEN TWO NOTE PAIRS



**BILL OF MATERIALS**

ITEM	DESCRIPTION	USED ON	QTY
1	PLYWOOD, 3/4" X 24" X 48" RED BIRCH	TOP	1 PC
2	FIR, 2" X 6" X 96"	STRUCTURE FRAMING	1 PC
3	FIR 4" X 4" X 72"	LEGS	1 PCS
4	1 GLUE	ASSEMBLY	AS NEEDED
5	DECK SCREW, 3" X 8	FASTNERS	AS NEEDED

**NOTES**

ALL DIMENSIONS ARE IN INCHES.  
 TECHNICAL SOURCE: "GENESIS OF A MUSIC"  
 ILLUSTRATION NOT-TO-SCALE

INSTRUMENT DUPLICATION PROJECT

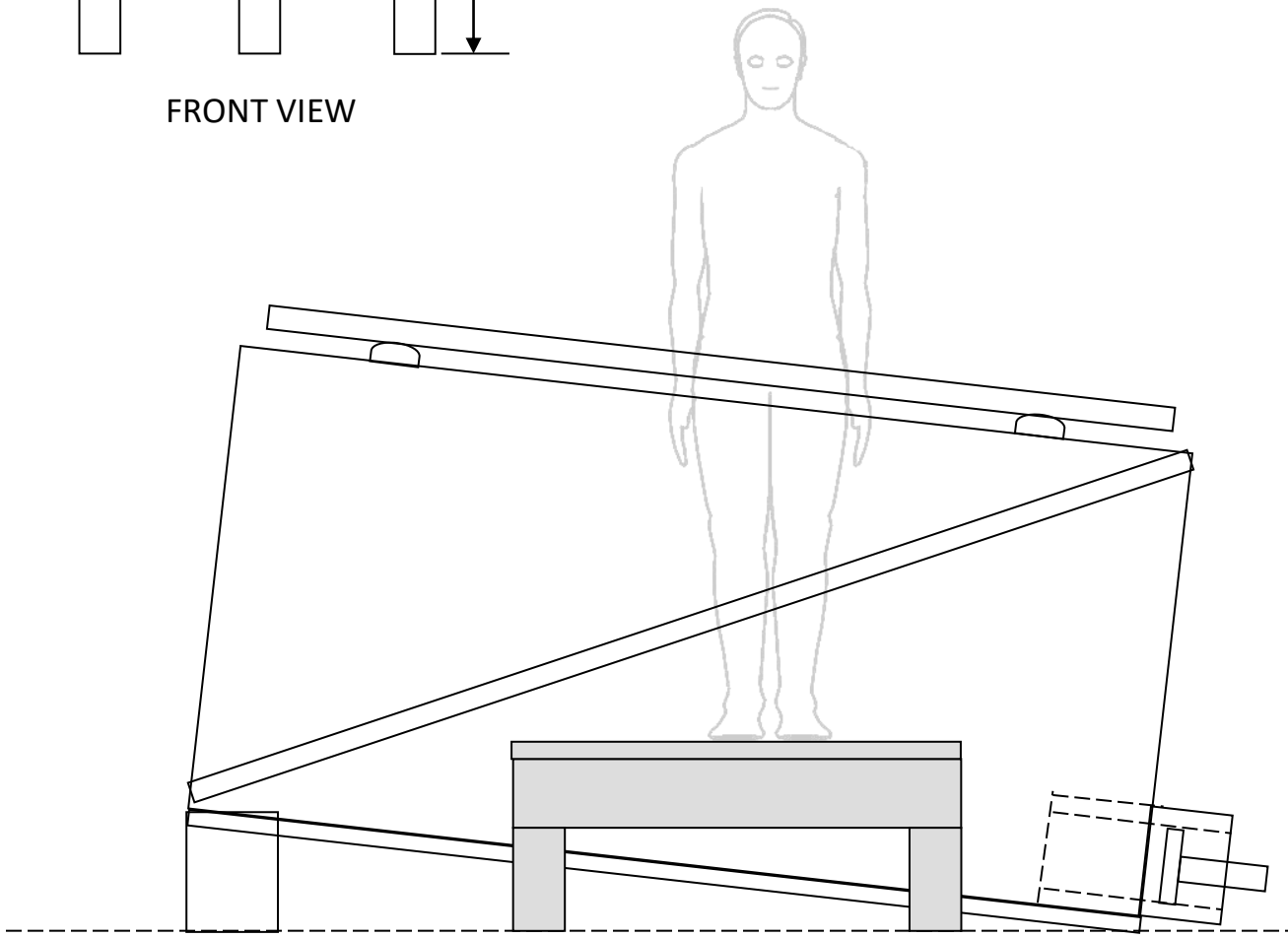
HARRY PARTCH

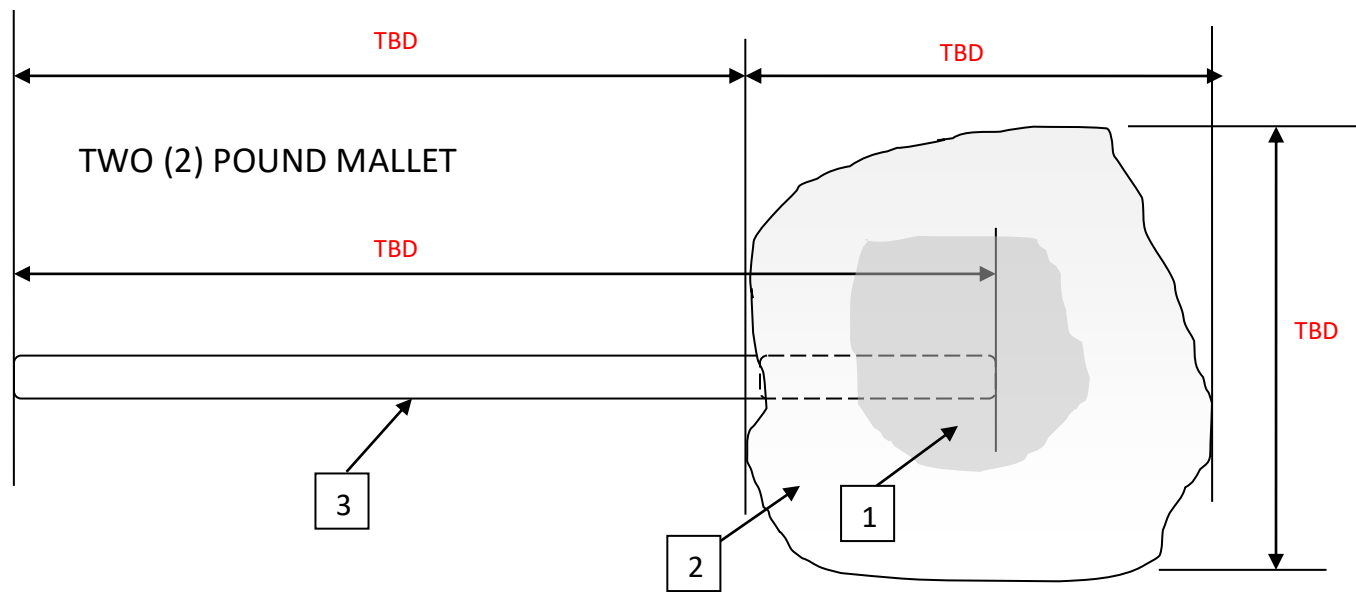
**MARIMBA EROICA**

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**6.0 PERFORMER'S RISER DETAIL**

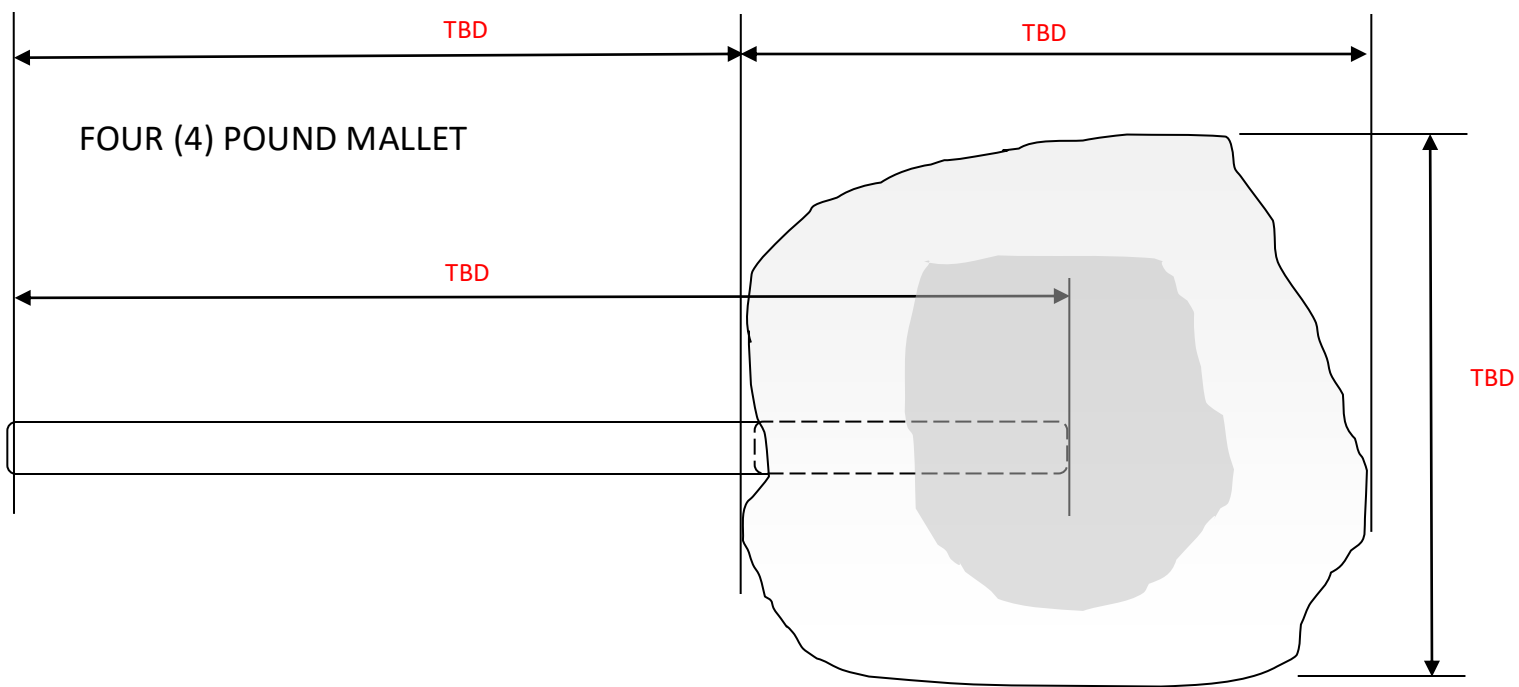
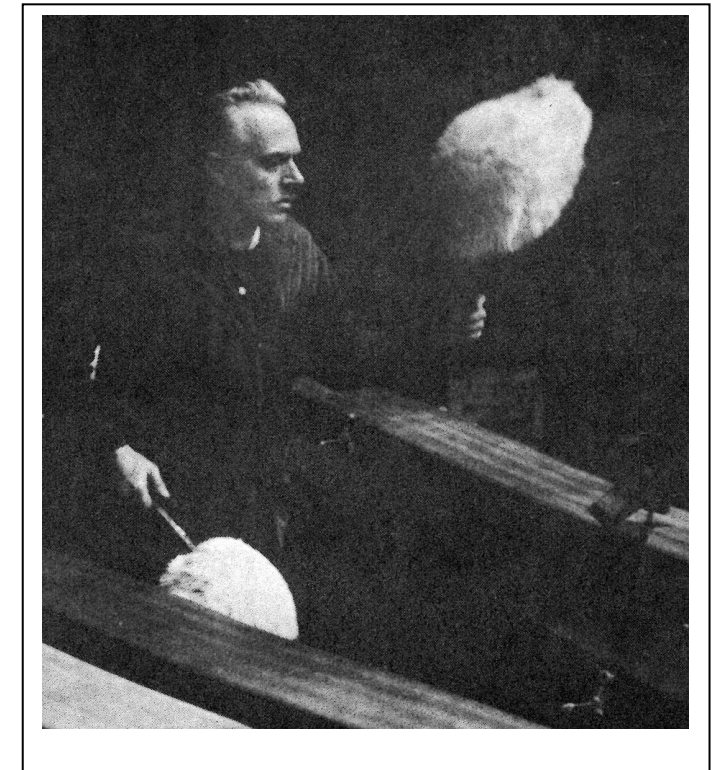

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GOAM\* – DESCRIPTION [PG 282]

LARGEST MALLET MADE FOR NUMBER 1 WEIGHS 4 LBS. NEXT SMALLEST WEIGHS 2 LBS.



### BILL OF MATERIALS

ITEM	DESCRIPTION	USED ON	QTY
1	CORE MATERIAL TBD	BULK	2 PC
2	COVERING MATERIAL TBD (FUR?)	CONTAINS THE CORE MATERIAL	TBD SQ FT
3	DOWEL, BIRCH, 1-INCH DIA.	HANDLE	1 PCS

### INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH  
**MARIMBA EROICA**

### 7.0 MALLETS

\* "GENESIS OF A MUSIC"

## 1.0 VISUAL APPEAL

MATCHING THE ORIGINAL LOOK VS. CONSTRUCTING A FUNCTIONAL INSTRUMENT USING MODERN MATERIALS AND CONSTRUCTION TECHNIQUES.

## 6.0 IN CONCLUSION...

THE ABOVE RECOMMENDATIONS WILL CREATE A NOTICEABLE DEPARTURE FROM THE ORIGINAL LOOKS OF THE PARTCH MARIMBA EROICA. WHAT MIGHT BE QUESTIONED IS WHAT'S BETTER IN THE END, LOOKS OR FUNCTION? IDEALLY BOTH – BUT, ONLY IF IT IS PRACTICAL. IT IS IMPORTANT TO KEEP IN MIND, THIS IS NOT THE 1951-1955 ERA IN WHICH THE ORIGINAL INSTRUMENT WAS BUILT. IN 2010, THE MARIMBA EROICA WILL BE APPROXIMATELY 55+ YEARS OLD.

NEW CONSTRUCTION TECHNIQUES, FINISHING, AND TUNING TECHNIQUES, ALL UNDER THE SUPERVISION OF CHRIS BANTA WILL YIELD A NEW “MARIMBA EROICA,” WHOSE LOOK, SIZE, AND SOUND IS JUST AS IMPRESSIVE AS THE HARRY PARTCH ORIGINAL.

## 3.0 BAR MOUNTING

**3.1 FOAM BLOCK HELD IN PLACE WITH ADHESIVE**  
- [PG XX] BAR HELD ONTO FOAM WITH ADHESIVE.

[RECOMMENDATION] ADHESIVE HAS LIMITED STRENGTH. SHOULD THE BAR BE BUMPED OR MOVED IN A WAY THAT IS CONTRARY TO THE FOAM SUPPORT, THE ADHESIVE OR FOAM COULD TEAR. A BETTER SOLUTION WOULD BE THE HOLDING OF THE BAR IN PLACE (ON TOP OF THE FOAM) USING A CORD CONTAINMENT SYSTEM. This

## LIST OF “TBD’S”

RESOLUTION:

- 1) REQUIRES INSPECTION OF ORIGINAL INSTRUMENT.
- 2) CAN BE DETERMINED DURING CONSTRUCTION OR BY CALCULATION. RESULT MAY NOT VISUALLY MATCH ORIGINAL, YET WILL BE FULLY FUNCTIONAL.

**DIMENSIONAL:**

INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH

**MARIMBA EROICA**

ASSUMPTIONS, TBD’S, QUESTIONS,  
AND RECOMMENDATIONS

DRAWN: CHRIS BANTA

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**1. WILL THE DUPLICATE EXACTLY MATCH THE LOOK OF THE ORIGINAL?**

NOT LIKELY. DUE TO THE ADVANCES IN MATERIALS, CUTTING AND FABRICATION TECHNIQUES, IMPROVEMENTS IN ACCURACY AND CONTROLLING LOW FREQUENCY RESONANCE, IN BOTH EQUIPMENT AND METHODOLOGY, IT IS REASONABLE TO EXPECT SOME LEVEL OF STYLISTIC CHANGE.

THE GOAL OF THE MARIMBA EROICA, AS EVIDENT BY HARRY PARTCH'S DESIGN, IS (1) FREQUENCY, AND (2) QUALITY OF VIBRATION.

THE DUPLICATE HAS TO ABSOLUTELY MATCH THESE TWO CRITERIA. ACOUSTIC FUNCTION MUST BE PRESERVED USING THE MARIMBA-CAVITY RESONATOR METHODOLOGY TO CREATE THE FOUR PITCHES OF F, C, E, AND A (WHOSE FREQUENCIES ARE 22HZ, 33HZ, 42HZ, AND 56HZ RESPECTIVELY).

**2. CAN THE EXACT BAR MATERIAL (SITKA SPRUCE) BE LOCATED?**

NOT LIKELY. SOME INTIAL RESEARCH WITH LOCAL HARDWOOD SUPPLIERS CAME UP EMPTY. THIS IS TO BE ANTICIPATED AND NOT UNEXPECTED. THE MARIMBA HAS COME A LONG WAY SINCE THE 1950-1955 YEAR OF CONSTRUCTION OF THE ORIGINAL EROICA.

ALTERNATIVE WOOD TYPES ARE READILY AVAILABLE THAT MEET THE STRAIGHT-GRAIN, QUARTER-SAWN CRITERIA, AS DESCRIBED IN SECTION 3.0.

**3. WHAT ARE THE DIFFICULTIES INVOLVED IN DUPLICATING THE MARIMBA EROICA?**

IN A NUTSHELL, *SIZE* AND THE *SUB-BASS NOTES*. MR. PARTCH IN HIS EXPLORATION FOR THE PURITY OF THE MICRO-TONAL SYSTEM DID NOT STOP AT THE SCALE. HIS INSTRUMENT DESIGNS, TO SUPPORT THE MUSIC, ARE WITHOUT A DOUBT ONE OF THE MOST CREATVIE ENDEAVORS BY AN INDIVIDUAL. IN HIS ARSENAL OF INSTRUMENTS, SIZE AND CHARACTER OBVIOUSLY DIDN'T MATTER. THEIR EXISTENCE FOR THE BENEFIT OF THE MUSIC, DID.

BUT, TO ANSWER THE QUESTION...

SIZE – LARGE RESONATORS ARE PHYSICALLY DRIVEN TO THAT SIZE BY THE PHYSICS OF MUSICAL ACOUSTICS. LOW FREQUENCIES HAVE LONG WAVE LENGTHS AND THE COMPONENTS MUST BE APPROPRIATELY SIZED TO ACCOMOMDATE SUCH WAVES. LARGE SIZE EQUATES TO HEAVY AND CUMBERSOME, WHICH PLACES ADDITIONAL BURDENS ON THE BUILDER. SPECIAL HANDLING EQUIPMENT AND DOLLIES WHICH ARE NECESSARY TO MOVE AND PROTECT THE PIECES DURING CONSTRUCTION, TUNING, FINISHING, AND FINAL ASSEMBLY WHEN THE BAR IS MOUNTED.

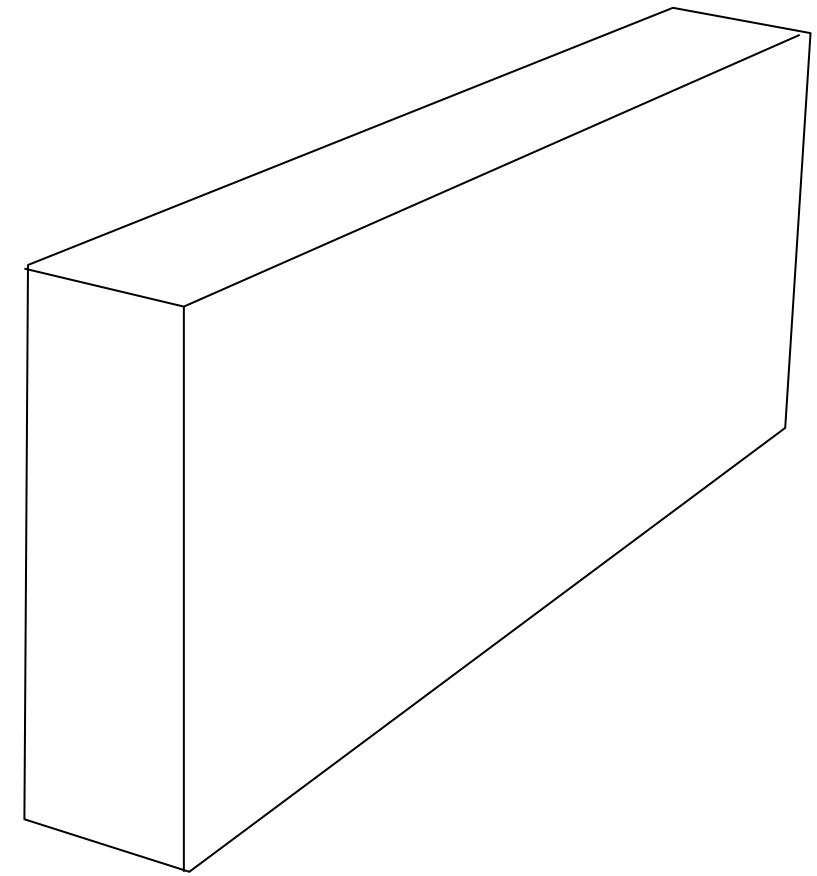
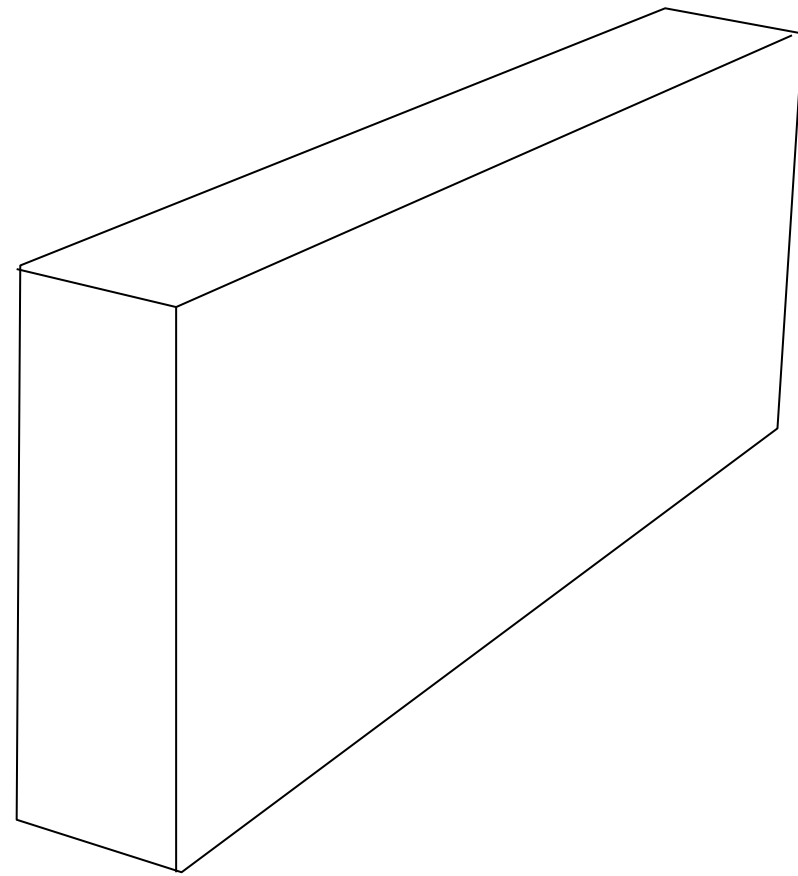
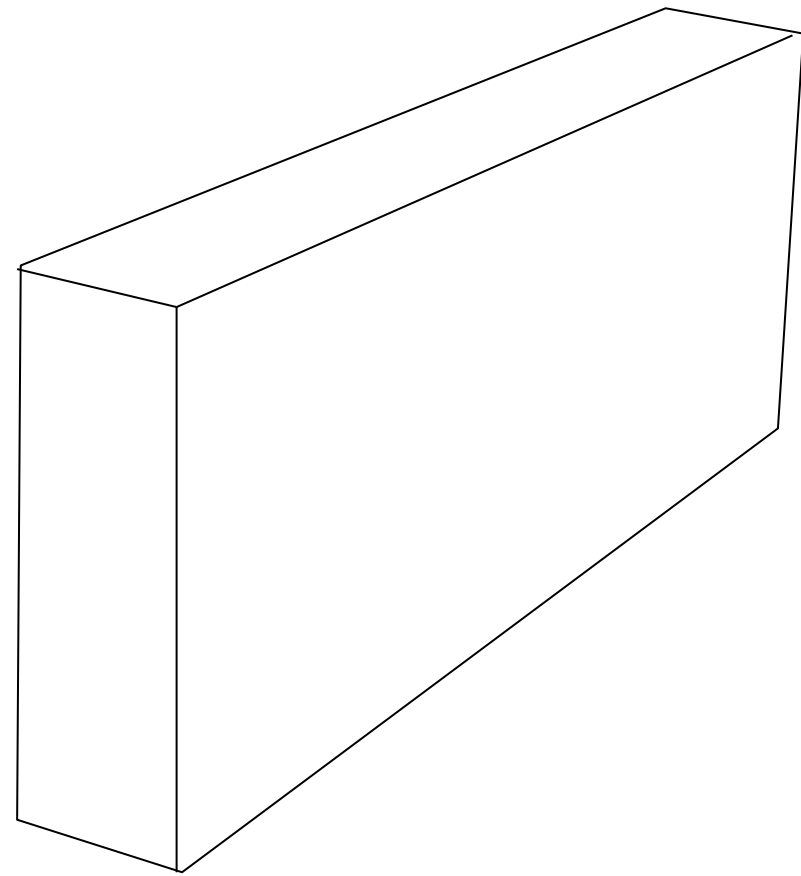
SUB-BASS NOTES – LOW PITCHES PRESENT AN EXTRAORDINARY CHALLENGE IN THAT THEIR FREQUENCIES ARE VERY DIFFICULT TO MEASURE AND ASSESS FOR ACCURACY. THE TWO COMPONENTS OF THE MARIMBA BAR AND RESONATOR MUST BE ABSOLUTELY PRECISE. THEN COMES THE TIME TO “MARRY THE TWO” WHICH, IN ITSELF, PRESENTS AN INTEGRATION CHALLENGE OF COUPLING (OR ACOUSTIC INTERACTION) BETWEEN THE TWO TO CREATE PERFECT RESONANCE.

**INSTRUMENT DUPLICATION PROJECT**

**HARRY PARTCH  
MARIMBA EROICA**

**ANTICIPATED QUESTIONS,**

<b>DRAWN: CHRIS BANTA</b>	<b>DEC 2009</b>
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INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH

# MARIMBA EROICA

BANTA DESIGN OPTION

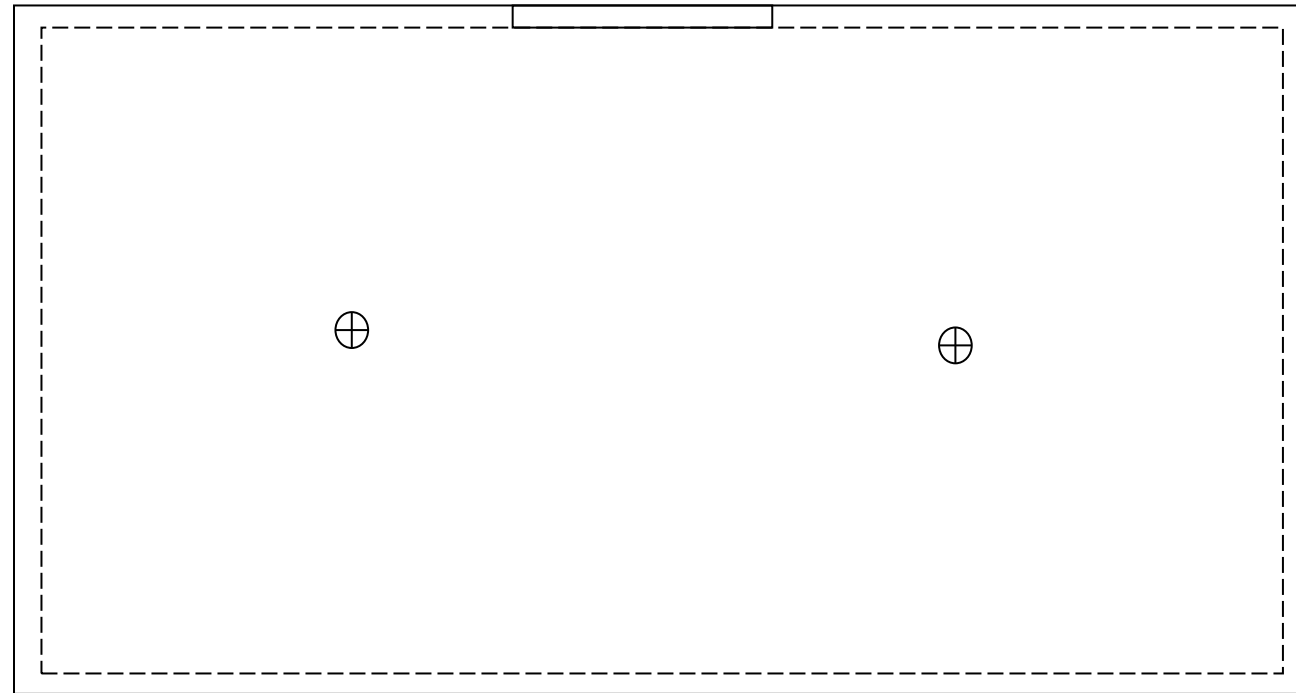

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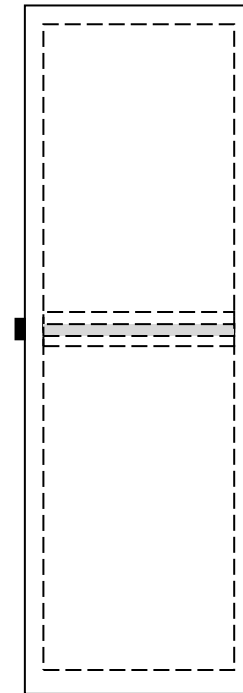
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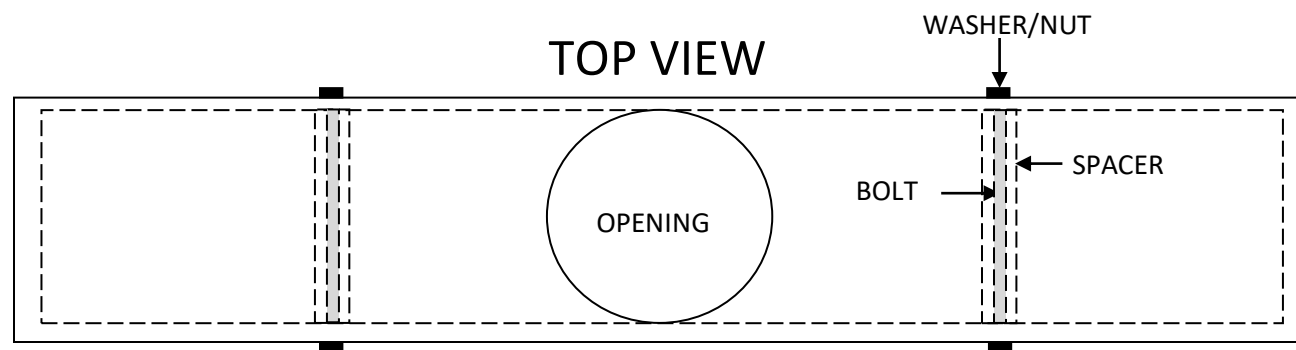
SIDE VIEW



END VIEW



TOP VIEW



**NOTES:**

THE TEST RESONATOR IS NECESSARY FOR VERIFYING THE RESONANT FREQUENCY OF A LARGE WIDE PANELLED RECTANGLE.

THIS IS A PROTECTIVE MEASURE TO ENSURE THE RESONATORS OF THE DUPLICATED INSTRUMENT WILL IN FACT FUNCTIONALLY BEHAVE AS INTENDED – KIND OF LIKE TEST DRIVING A CAR BEFORE PURCHASING IT.

THE RESONATOR WILL BE OUTFITTED WITH A STOPPER ASSEMBLY, OPENING SLIDER, AND AN INTERNAL LOUVER.

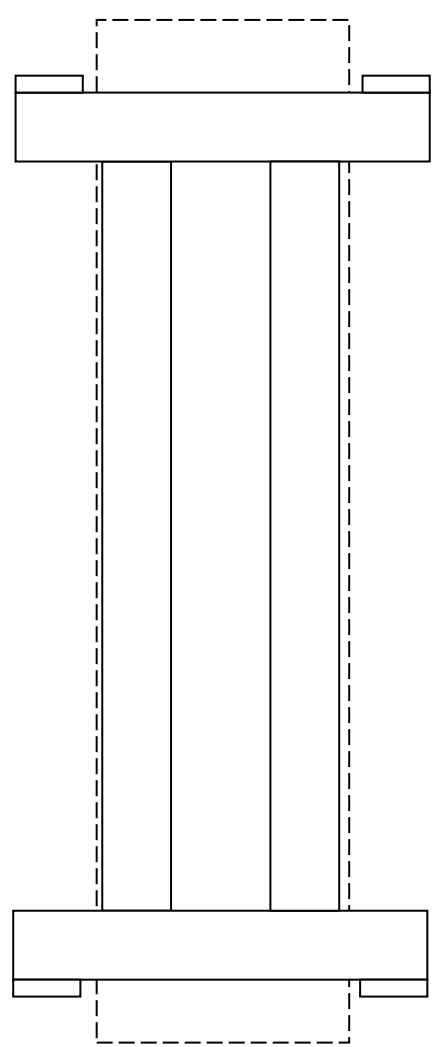
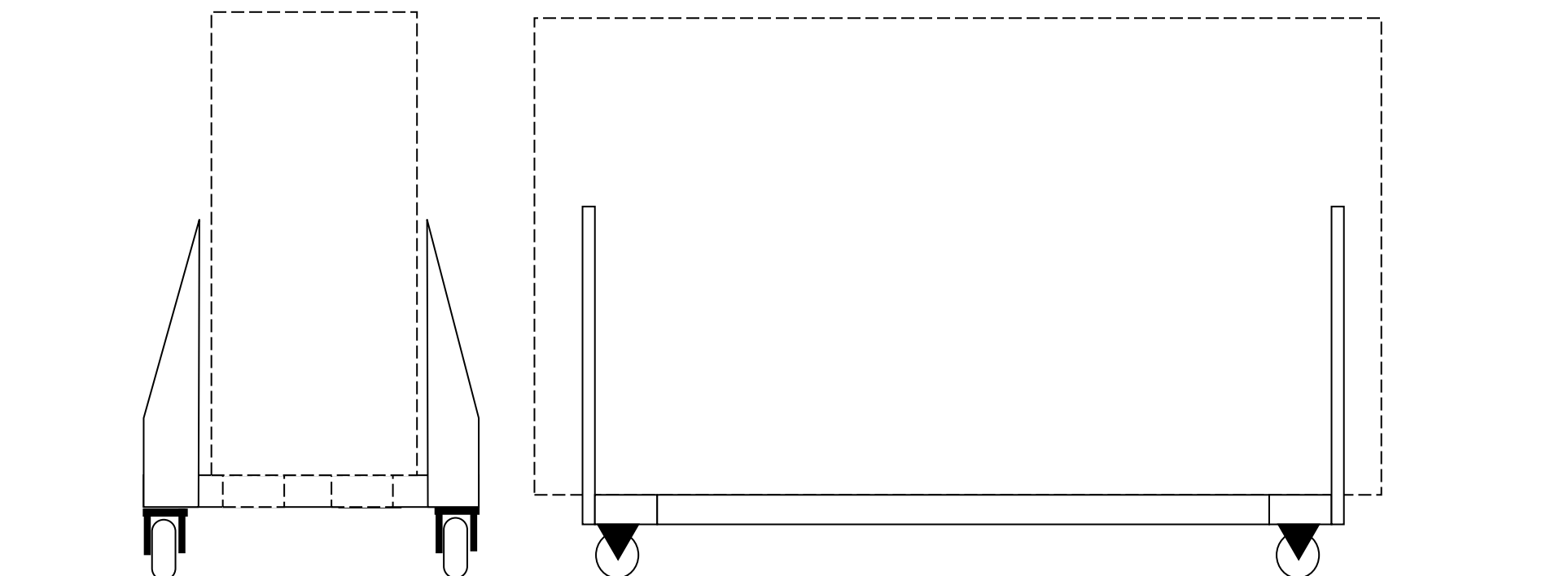
MATERIALS

INSTRUMENT DUPLICATION PROJECT

HARRY PARTCH

**MARIMBA EROICA**

TOOL: TEST RESONATOR



**NOTES:**

TWO DOLLIES ARE REQUIRED AND ARE NECESSARY TO PROTECT THE RESONATORS DURING THE FABRICATION, TUNING, AND FINISHING PROCESSES.

ONE FOR THE LARGEST LOW "F" PITCH, AND ONE FOR THE "C" PITCH.

F = 72-INCHES IN LENGTH

C = 60-INCHES IN LENGTH

THE "E" AND "A" PITCHES CAN BE ROLLED AROUND ON FLAT FURNITURE DOLLIES.

**MATERIALS:**

2 X 4 FIR STOCK.

A CARPET WILL BE ADDED TO BOTTOM STRUTS AND SIDE PIECES TO PROTECT THE RESONATOR.

INSTRUMENT DUPLICATION PROJECT		
HARRY PARTCH		
<b>MARIMBA EROICA</b>		
TOOL: MOBILITY DOLLY		
DRAWN: CHRIS BANTA	DEC 2009	SHT 18 of 18