

COPPER BELLS OF KACHCHH

Internship Report

Khamir CRC | IDC IIT Bombay
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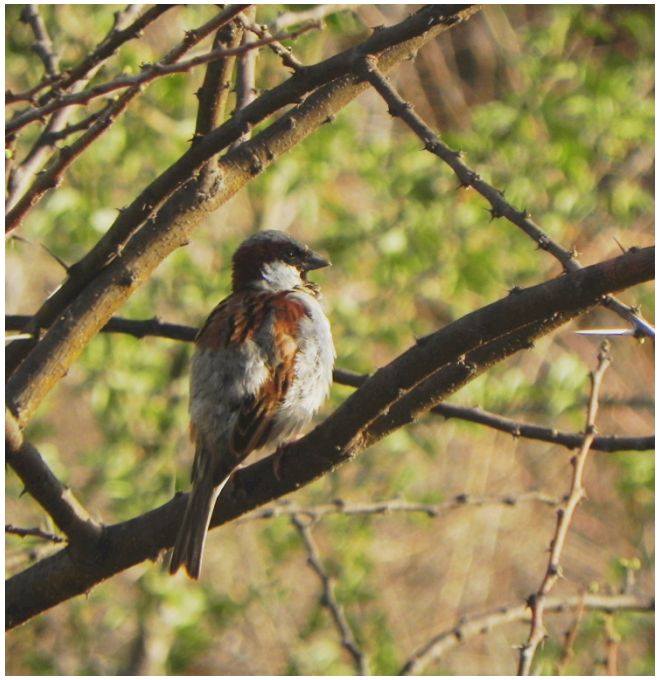
IDC
IIT Bombay

KHAMIR



Introduction

Kachchh





- Kachchh, commonly written as "Kutch,"
- **Largest district** in India and is located in Gujarat state
- Ethnic **web of inter-woven cultures**
- A land of **colorfully vibrant art** and craft heritage
- Plays host to a thriving exposition of **textiles, ornaments, living style** within a contemporary framework
- The language spoken predominantly in the Kutch district is **Kutchi** and Gujarati





- In recent decades, the traditional crafts have undergone tremendous change.
- So, local villagers seek cheaper mass produced functional wares, artisans are compelled to find new markets.
- Fortunately, sophisticated urban markets have welcomed the concept of traditional crafts.
- There are active organizations and people to enhance the craft sector and to improve artisans livelihood.





Crafts of Kachchh


Ajrakh block print


Kachchhi bandhani


Kala cotton weaving


Camel wool weaving


Embroidery


Rogan art


Mashru weaving


Metal bells


Lacquered wood


Namd

Other crafts include:
Bela printing, batik printing, kharad weaving, knife work, leather work, pottery, recycled plastic weaving, silversmithy and wood carving

Khamir CRC





Khamir craft resource center is an umbrella organization dedicated to preserving and encouraging Kachchh crafts in all their diversity. It is situated at Kukma, a village about 13 kilometers away from bhuj city.

It was **founded in the year 2005**, as a joint initiative of Kachchh Nav Nirman Abhiyan and the Nehru Foundation for Development. Today, it serves as a platform for the promotion of traditional handicrafts and allied cultural practices, the processes involved in their creation, and the preservation of culture, community and local environments.





- Sustaining traditional skills as livelihood option
- Making a craft marketable
- Creating and revitalizing markets
- Generating greater interest & visibility for Kachchh crafts
- Creating collaborative approach among artisans
- Providing a platform for artisans, buyers, designers, researchers
- Encouraging craft excellence
- Creating meaningful trader/buyer relationships
- Incorporating environmental and sustainability issues 10. Providing a knowledge resource centre 11. More value to customers, more return to artisans



Internship Brief

“ The internships brief included following broad areas of intervention, which can help the metal bell artisan community in longer run.

- Understanding and recording product process of metal bells, the technology and tools used by artisans along with final products.

- Development of new design concepts and design interventions with metal bell craft artisans of various skill sets. The design intervention can be in following directions:

i. Surface designing of bells
ii. Developing new chimes.
iii. Integrating more crafts with metal bells etc.

- Preparing a paper on the improved kilns developed by Khamir for the artisan communities with suggestions to improve the same.

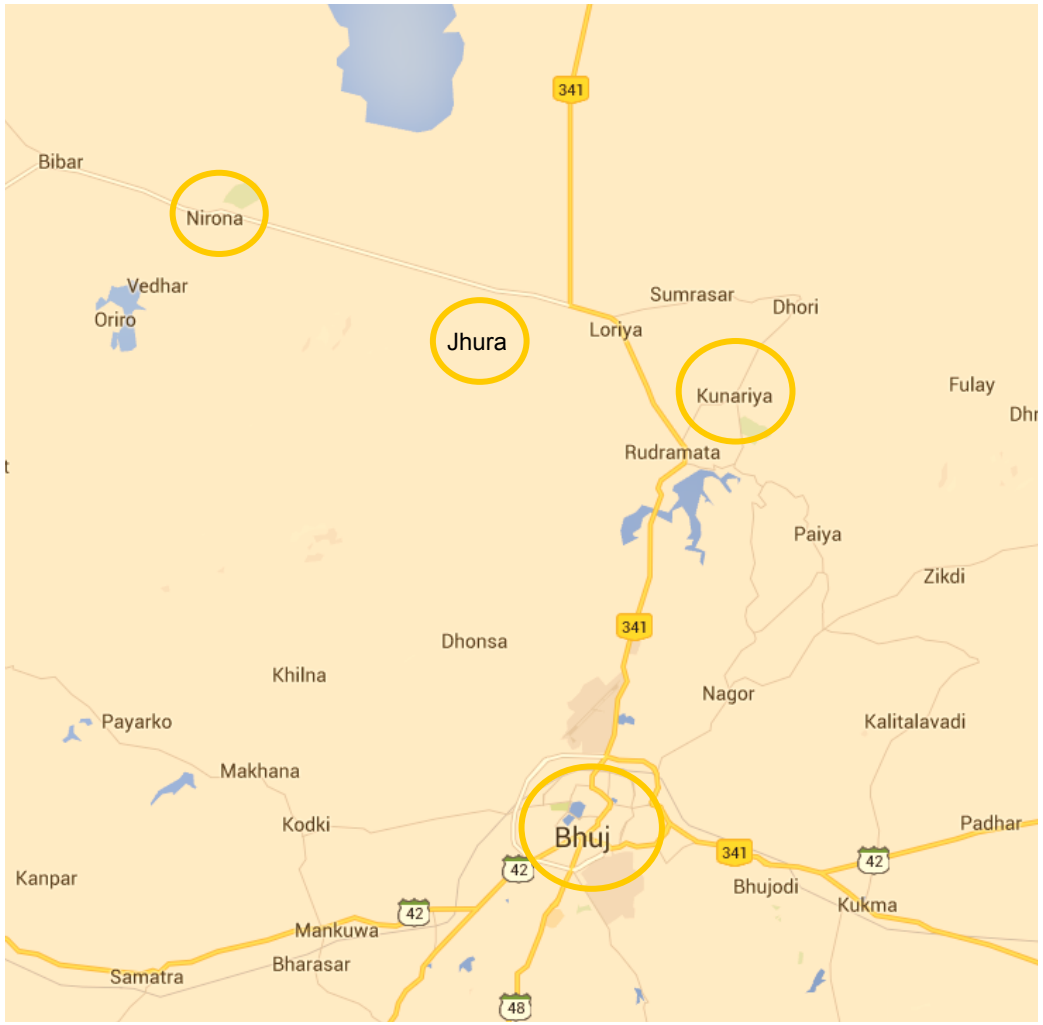
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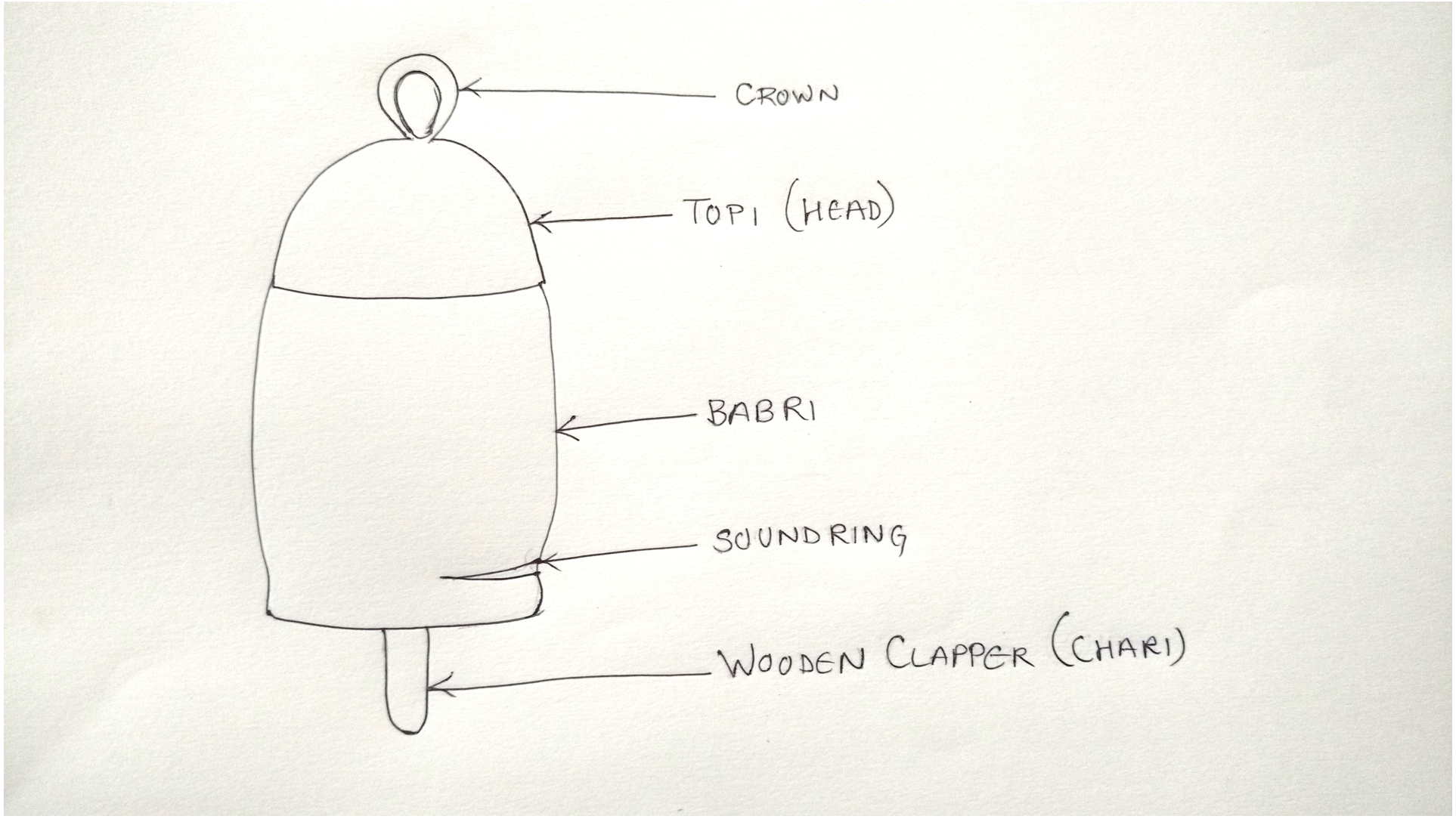
Copper bells - Overview

Background

- KHAMIR has been associated with copper bell artisans since from its inception.
- The artisan community associated with the craft is **Muslim Luhar community**.
- The main villages where craft is being practiced are **Jhura, Nirona, Kunariya and Bhuj city**.
- It is a unique craft where artisans are making bells of different **bell sizes ranging from 0 numbers to 14 numbers**.
- The bell once used to tie around the neck of cattle, are now being **exported to overseas markets** where they are **competing with Swiss cow bells**.
- The craft has recently gone through a **stable growth cycle** where **no. of artisans associated with craft has increased** and overall sector has registered stable growth. There is need to assess and consolidate the interventions done by the KHAMIR.
- Stagnant product line and **no systematic intervention** in the sector done since long.



Bell and Bell parts



Tools



Hammers, pliers, cutters and dies



Stones with made depressions used for making babri



Standard measurements of babris and topis of a range of bell numbers

Most of the tools have been in **used for generations** and all of them are readily available in the market

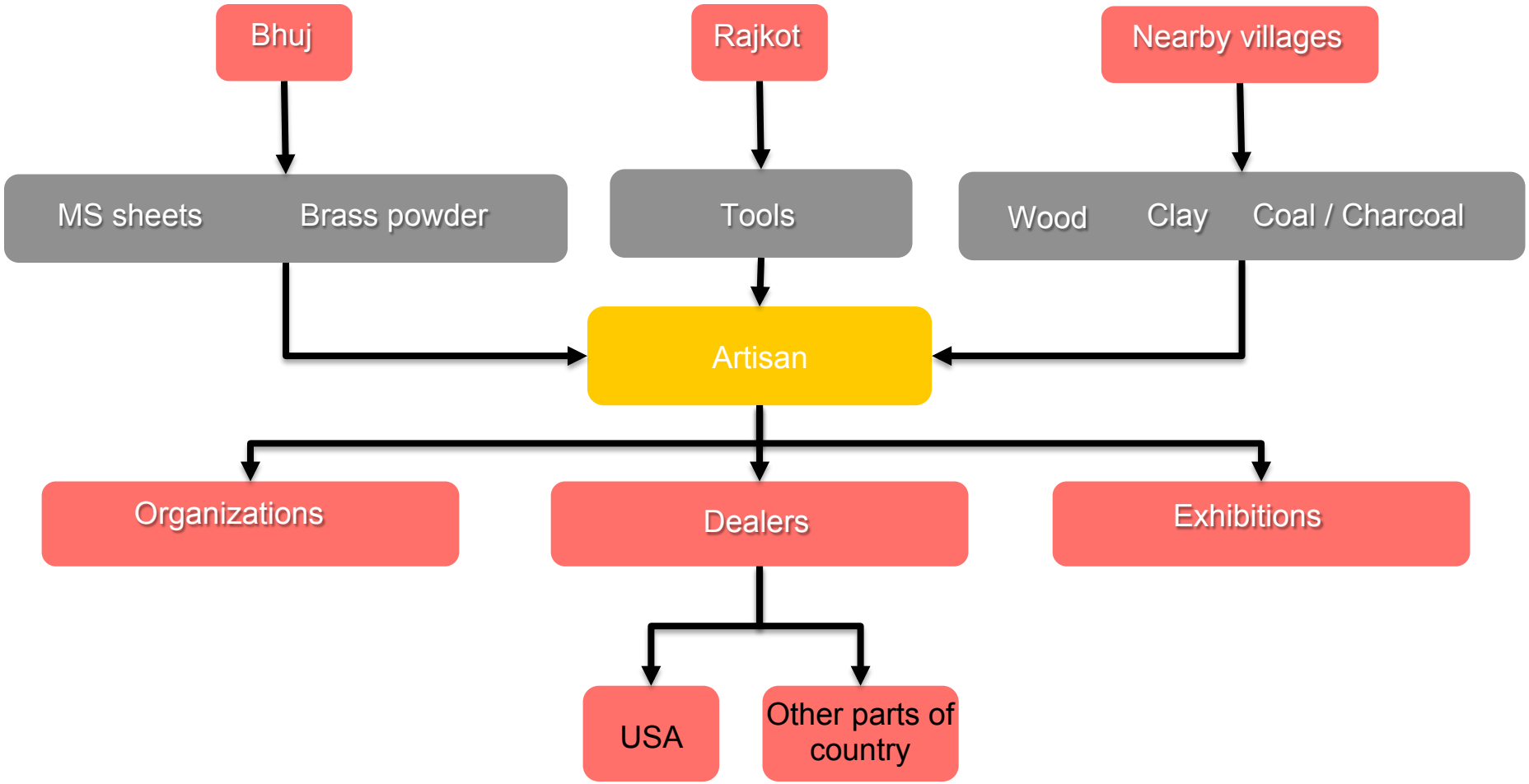


Nuts are used as a mould for making topis

Copper bell specifications

No	Description	Approx. Weight	Size in cms		Oval mouth		Crown (h*dia*thickness)			Wooden clapper
			Height	Metal gauge	Dia 1	Dia 2	Height	Dia	Metal gauge	(dia*h)
1	Copper Coated Bell No.0	10gms	02.30	23-24	02.00	02.10	00.70	00.80	23-24	Flat*03
2	Copper Coated Bell No.1	15gms	03.20	23-24	02.40	02.60	00.80	01.00	23-24	0.5*3.5
3	Copper Coated Bell No.2	20gms	03.50	21-22	02.80	03.00	01.00	01.10	21-22	0.5*4.5
4	Copper Coated Bell No.3	25gms	04.00	21-22	03.00	03.50	01.20	01.30	21-22	0.8*5.0
5	Copper Coated Bell No.4	50gms	05.00	19-20	04.00	04.50	01.50	01.60	19-20	0.8*6.0
6	Copper Coated Bell No.5	70gms	06.00	19-20	04.50	05.30	01.80	02.00	19-20	01*7.5
7	Copper Coated Bell No.6	100gms	07.00	19-20	05.00	06.00	02.00	02.10	19-20	01*8.5
8	Copper Coated Bell No.7	150gms	08.00	19-20	05.50	06.50	02.10	02.20	19-20	01*9.0
9	Copper Coated Bell No.8	235gms	09.50	19-20	06.50	07.50	02.20	02.30	19-20	1.3*12
10	Copper Coated Bell No.9	350gms	12.00	17-18	07.50	09.50	02.50	02.50	16-17	1.5*12
11	Copper Coated Bell No.10	450gms	12.50	17-18	08.50	10.00	03.30	03.30	16-17	02*18.5
12	Copper Coated Bell No.11	700gms	16.00	17-18	09.50	12.00	03.40	03.40	16-17	02*20
13	Copper Coated Bell No.12	1.200kg	19.00	16-15	11.50	14.00	03.80	04.30	13-14	2.5*23
14	Copper Coated Bell No.13	2.200kg	25.50	16-15	15.00	18.00	04.50	05.20	13-14	3*27
	Extra Box (Packing weight	2.000kg								
		7.775kg								

Trade cycle


Bhuj
Rajkot
Nearby villages
MS sheets
Brass powder
Tools
Wood
Clay
Coal / Charcoal
Artisan
Organizations
Dealers
Exhibitions
USA
Other parts of country



Bell Making - The process

Bell making process

Preparing kachcha maal

1. Making Babri (Main body)
2. Topi (Head)
3. Kadi (Loop/crown)
4. Assembly

Coating

1. Clay slurry & brass mixture
2. Mud bath
3. Sprinkling Brass powder and flux mixture
4. Covering the bell with thick roti of (Clay and cotton)

Firing

1. Firing
2. Quenching
3. Removing burnt mud

Tuning

1. Hammering to make a crease
2. Attaching wooden clapper
3. Checking the sound

Finishing

1. Using coarse flat file
2. Grinding wheel
3. Buffing







Making kaccha maal

Babri (Main body)



Cutting the MS Sheet into the rectangular shape according to size guide



Shaping by hammering on a stone mold using round hammer



Shaping it into cylindrical form by hammering it on cylindrical end of tool



Cutting the notch on babri



Technique to lock the notch



Locked notch made a cylindrical babri





Thinning of one side of the edge of babri

Topi (Head)



Cutting a circle from metal sheet for topi



Hammering it to get hollow hemispherical shape



Forged topi (Crown)



Making the edges thin by hammering



Checking the sizes by keeping topi on babri



Making a hole in the topi (Space for putting kadi)

Kadi (Hook)



Cutting the kadi from MS metal sheet



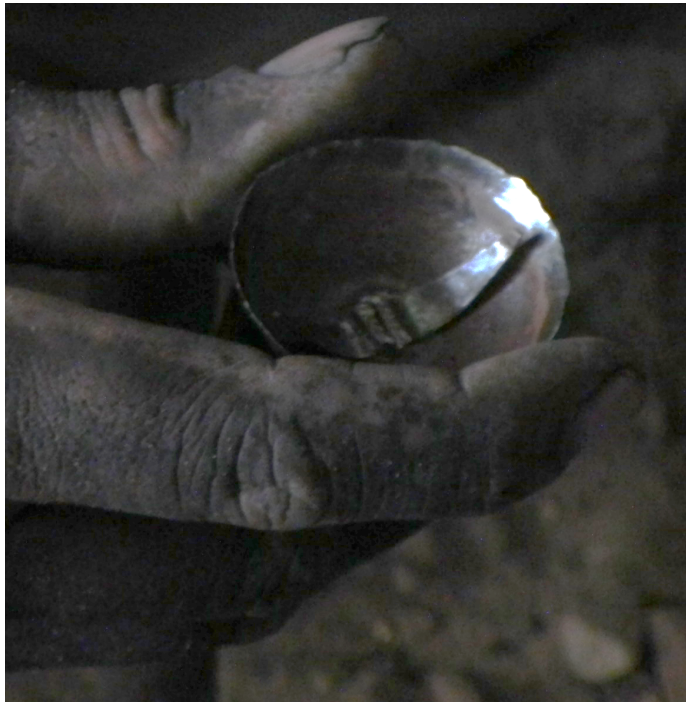
Hammering it on edges to get larger thickness and strength



Shaping the sheet into circular hook shape



Inserting the kadi in the hole pierced on the topi



Locking the ends of hook by diverging them from inside



Shaping the hook to form proper circular ring



Turning the ends to form hook from inside which will carry the wooden clapper from inside

Assembly



Inserting the kadi in the hole pierced on the topi



Locking the ends of hook by diverging them from inside



Final kachcha maal (Unfired bell)

Brass coating

Clay slurry & brass mixture



Dry clay

=



Water

+



Clay Slurry



Mixture

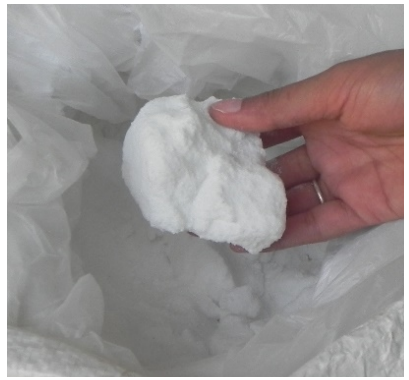
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Brass powder

(1 part)

+



Borex

(2 parts)

Mud bath & Sprinkling Brass powder and flux mixture



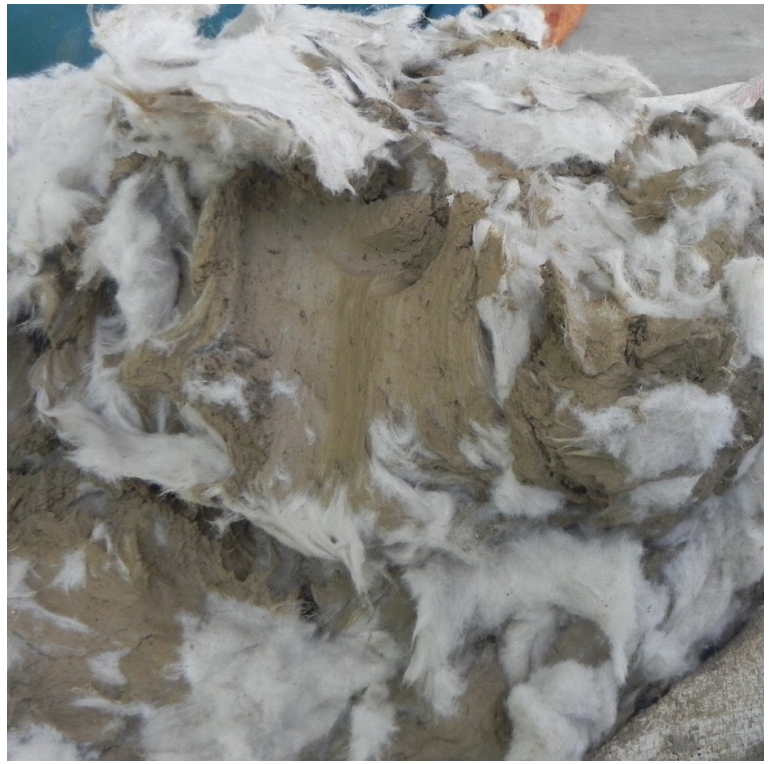
Dipping the bell into clay slurry just so that its surface becomes wet



Sprinkling the brass mixture on wet slurry dipped bell



Brass mixture coat on full body of the bell





Cotton and mud mixed together using power hammer to get a uniform mixture dough

Covering the bell with thick roti of (Clay and cotton)



Taking a lump of dough



Flattening it by paws to get a thin chapatti of 3 mm thickness



Keeping the bell on chapati



Rolling the bell body over the clay chapati



Closing the top end



Mud coated bell ready for firing

Firing



Putting the clay covered bell into the furnace to bake



Red hot baked bell



Just after getting out of the furnace



Bell just taken out of the furnace has red hot coal particles stick on its surface



Coating becomes black after keeping for sometime on room temperature

Quenching



Dipping the bell into normal water to cool it and hence quench



If it is still hot, pouring water onto it to cool the bell down



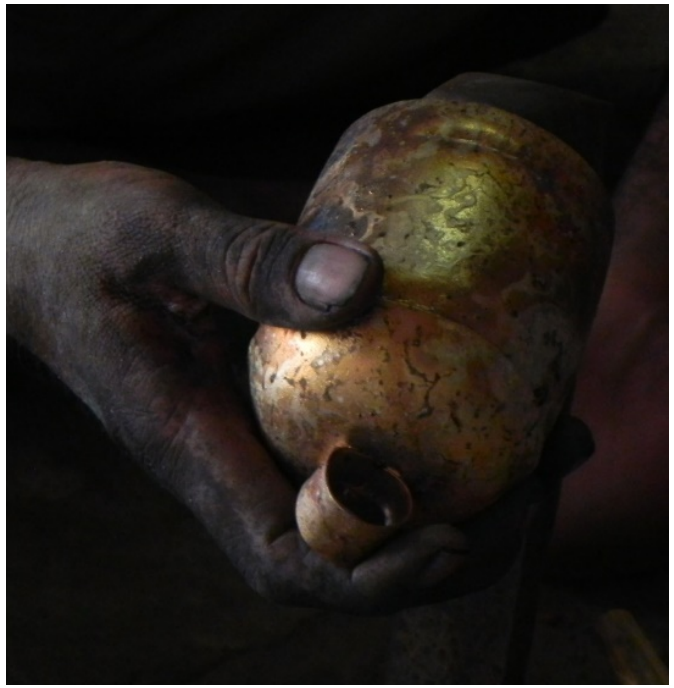
Cracking open the bell coating



Tuning



Hammering near the edges



Making a Sound ring (crease) at a distance of about 10-15mm from edge



The sound ring



Attaching the wooden clapper on the bell



Hammering the crease and checking the sound



Checking the sound



Finishing







For finishing, flat file, grinding wheel and buffing machine are used respectively





Products and Market

Existing design & product range







Product range of copper bell craft in the present scenario:

- **Bells**
- **Wall hangings (Moon, Fish, Star, Sun etc.)**
- **Key chains**
- **Table showpieces**
- **Photo frames**
- **Jhoomer(Chandelier)**
- **Trays**
- **Saregama**
- **Wind chimes**
- **Non bell products**



Bell Products













Non bell products











Design Interventions

Designing for artisans: Setting up constrains

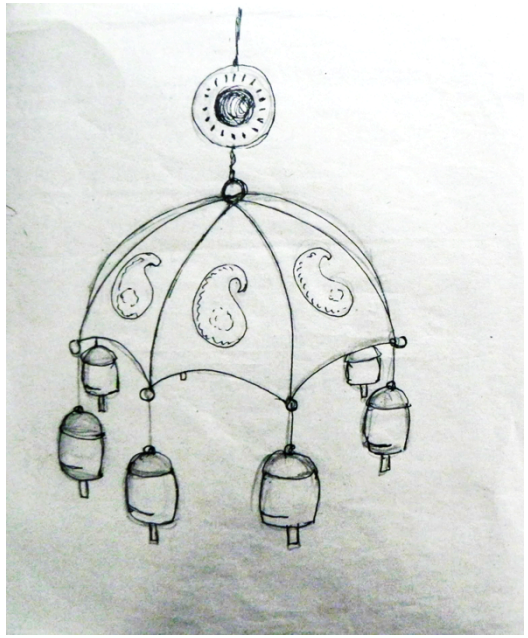


- Interventions keeping in mind the **artisan's understanding and the nature of work** they do and feel easy about it.
- Using the advantage that **every artisan is thorough with the dimensions and the process** of making the bells, not on non bell products.
- So we did set a constraint, to **using bell parts as our product parts**.
- Using **their methods**, **their standards** and **measurements**. This way, the products will be easier for them to make.

Windchime Design

- The existing designs are eye-catching and beautiful where artisan was the designer.
- Artisan thinks of any random design in his mind, makes a quick picture and he makes them within minutes with metal wires and bells
- The designs of wind chimes are all two dimensional
- They are visually imbalanced and from a designers point of view, it is to be called incomplete.

Approach #1: Designs inspired from south Indian festive exhibits



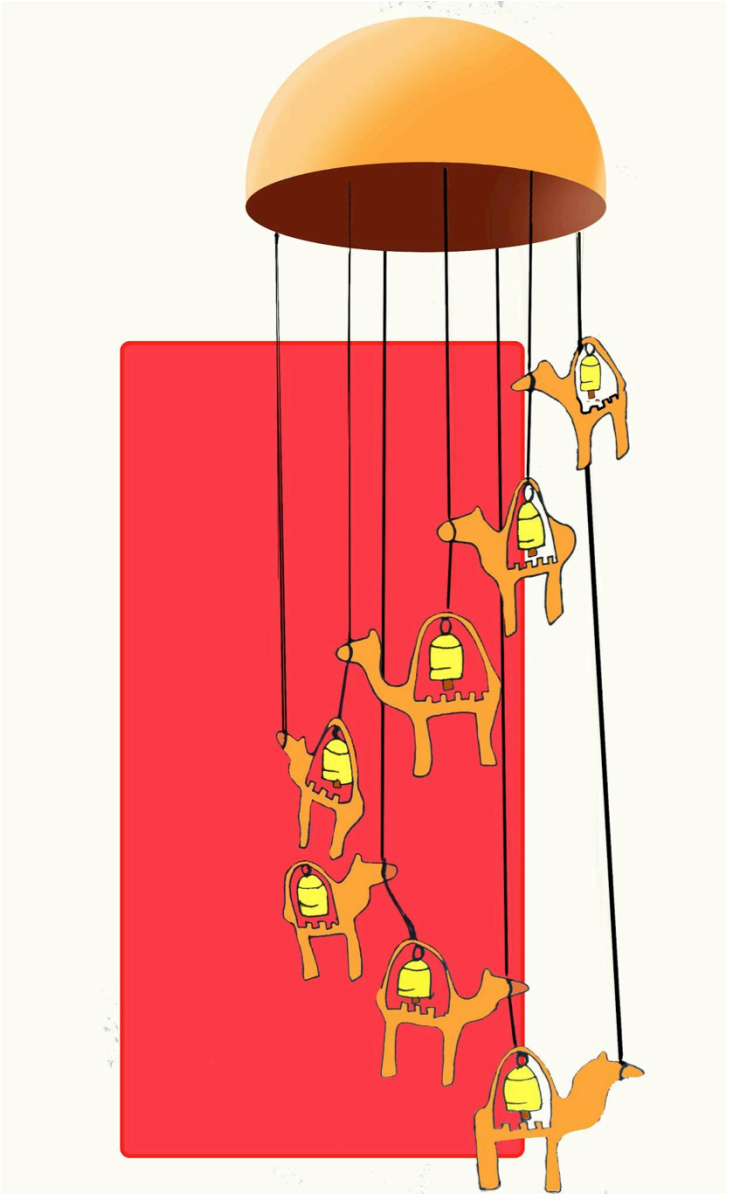


Approach #2: Camel wind chime





- Camels are one of the most important part of desert region of Kutch. Integrating and showing a camel herd which are tied to each other using a rope with bells is a thought in this design.
- Camel's hump is exaggerated here to accommodate a bell of “no.0”.
- The camels are hanging on the dome which actually is a “topi” of no.12 bell.









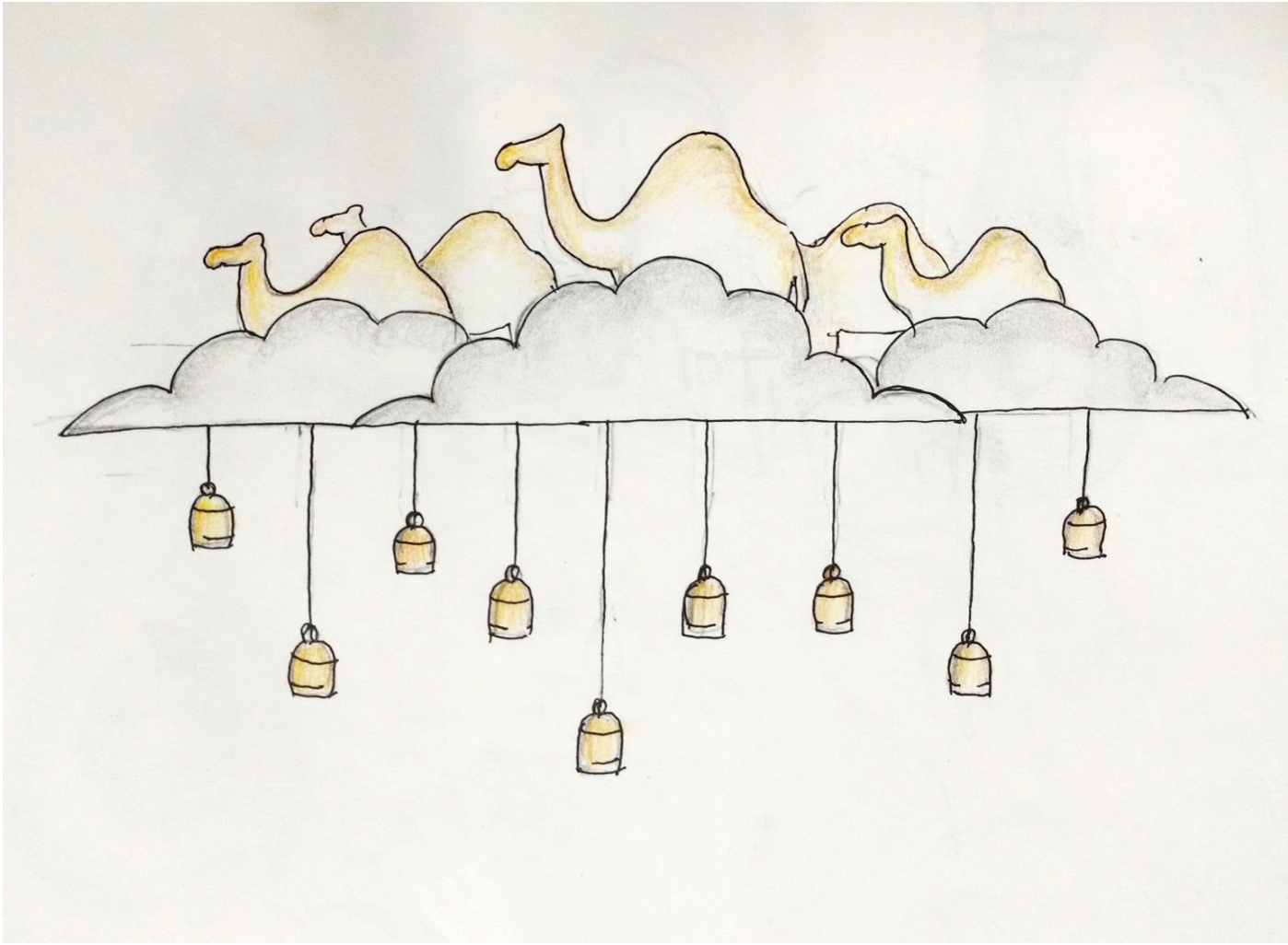
- Camel is made by cutting MS sheet by using a pair of scissors which is used to cut metal.
- The central part has been cut using hammer and chisel.
- Finally they are sanded and buffed to get smooth edges

Approach #3

Wall mounted jhumar

- Camel and clouds.

- A story of maldharis in kutch
- The wall mounted jhumar represents desert scenery & a herd of camels and the dust that spreads over.
- The bells hanging from the sand dunes represents the roots of the craft.
- Depicts the connection between maldharis and copper bells.



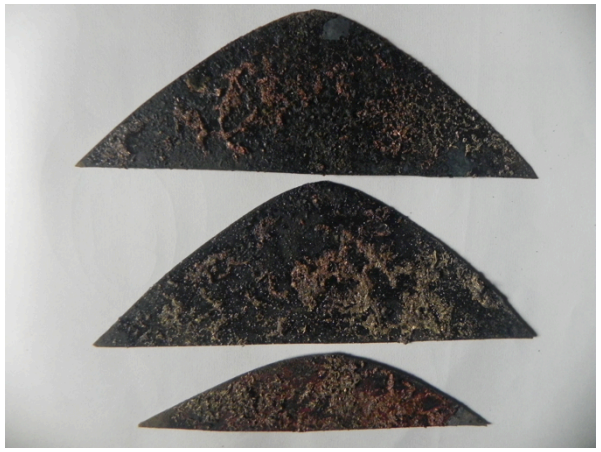


- The form was simplified to camels and sand dunes.
- To try out prototypes, a model was made consisting of 2 camels and 4 sand dunes. The model is completely made using MS sheets.

- The texture of the sand dunes were made using a new method, the sheets are to be heated in the furnace until it turns red. The sheets are then sprinkled with borax-brass powder. The powder fuses to form a black rugged surface.









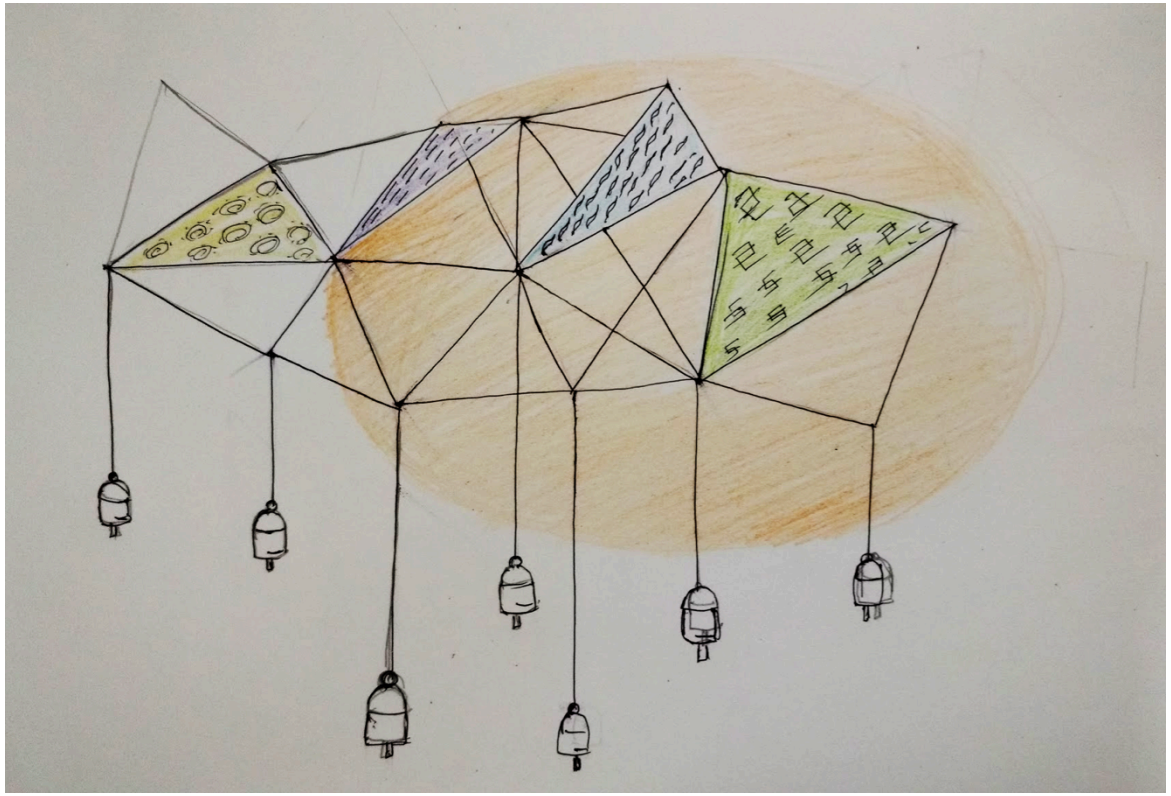
- The sheets are welded on top of a metallic hook frame (cloth hanger),

- The welds leaves a black patch on the copper layer, but this can be removed by buffing

Approach #4

DIY/Modular wind chime

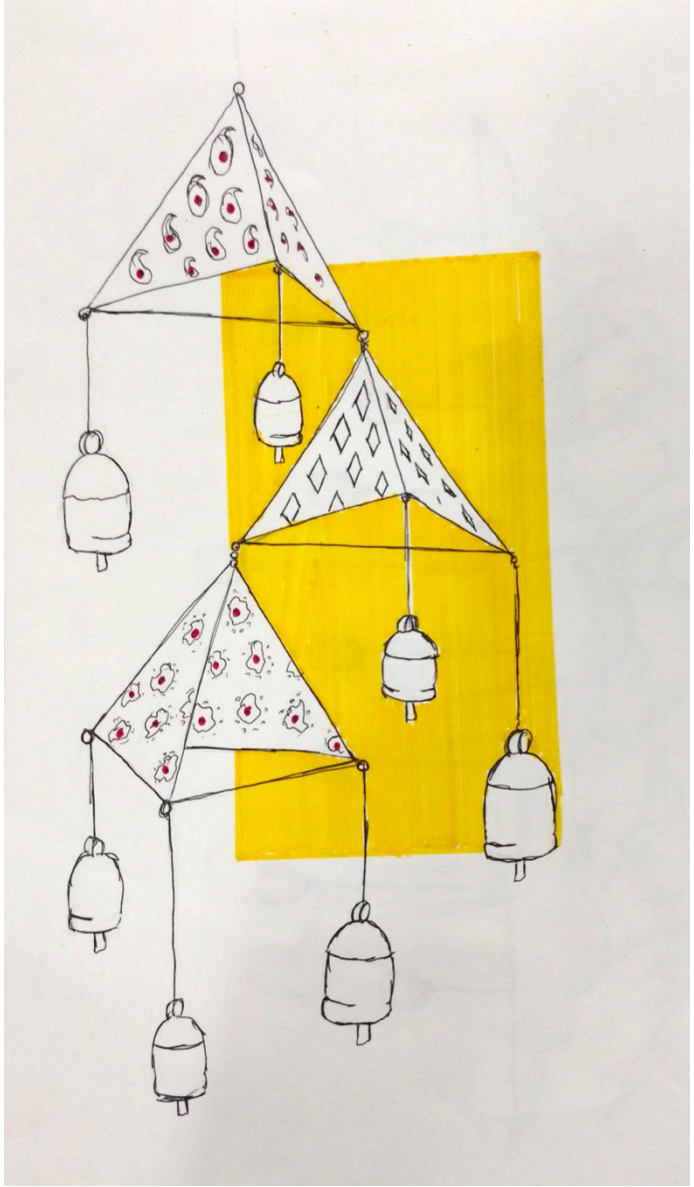
“Cloud and bells”
The individual modules join together to form a cloud. It shows geometric growth and patterns. The individual modules will be equilateral triangles of 5in side.



Approach #5

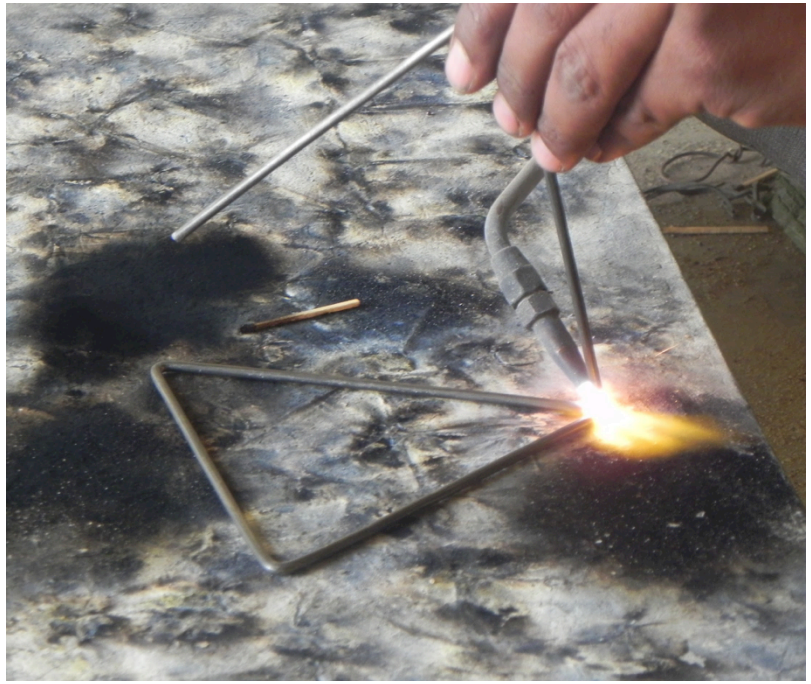
DIY/Modular wind chime

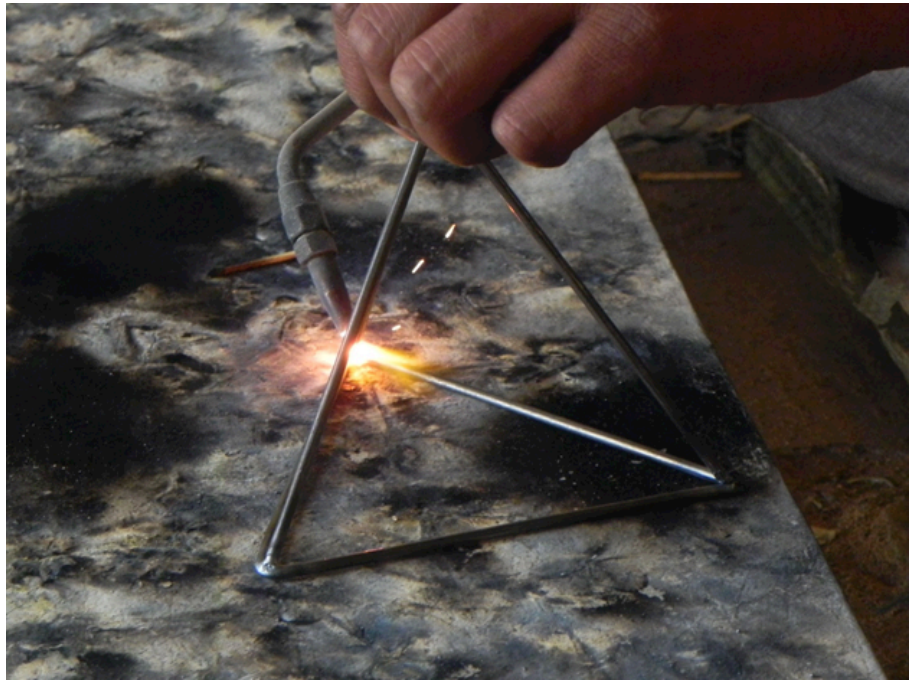


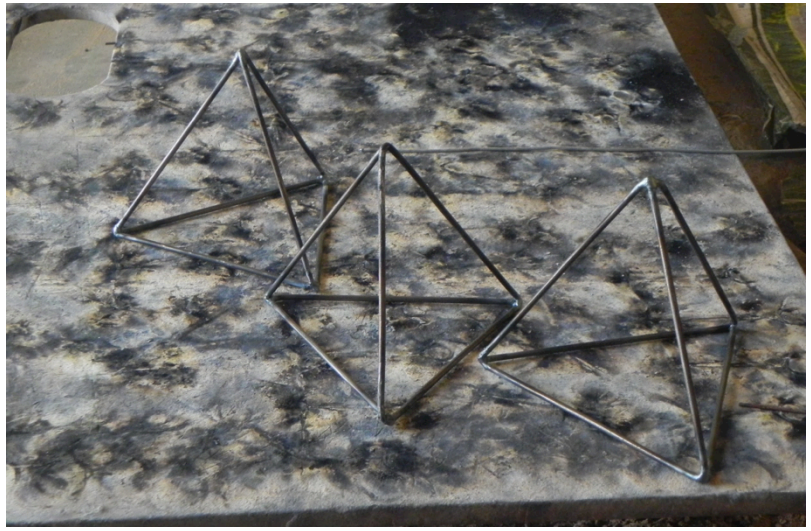


- Form inspired from tetrahedral kites

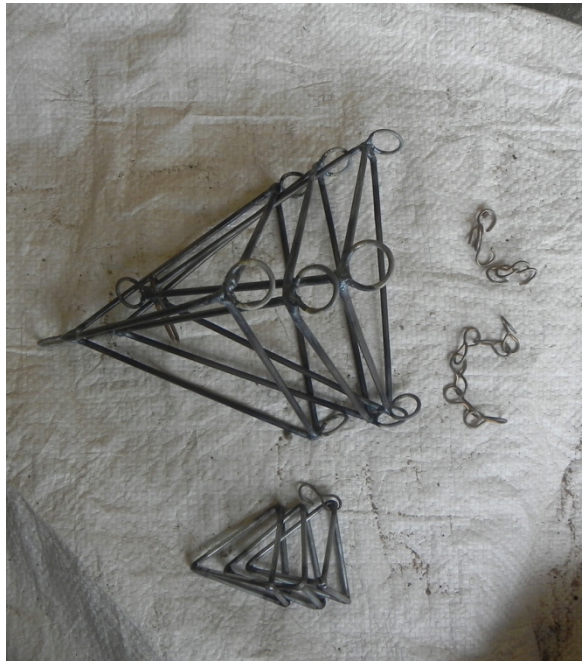
- Use of three dimensional approach, to make use of space.
- Geometrical modules
- Each module is a tetrahedron with side 6 inches.
- Dynamic shape
- Famous mashru fabric is used (Design integration)
- The design incorporates stackable modules.



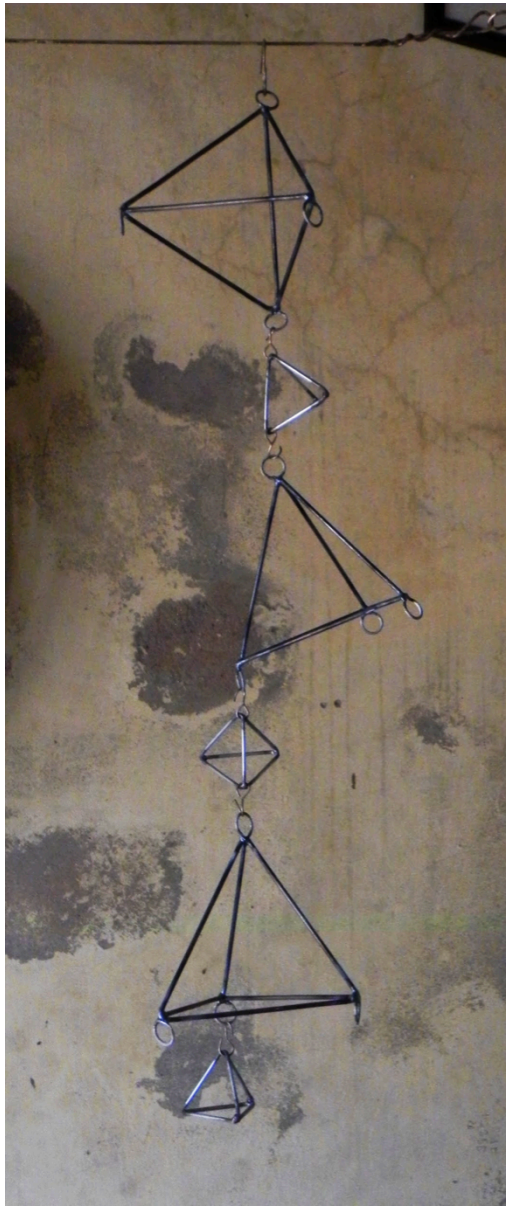








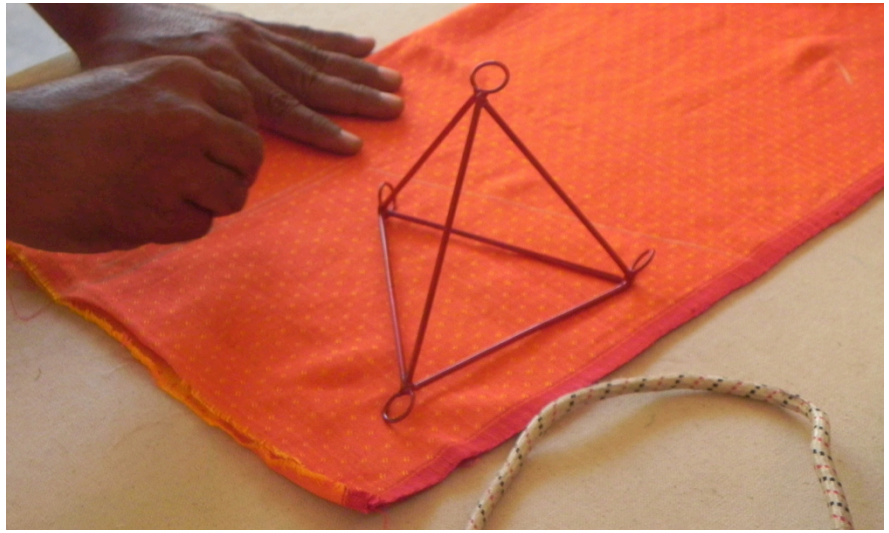




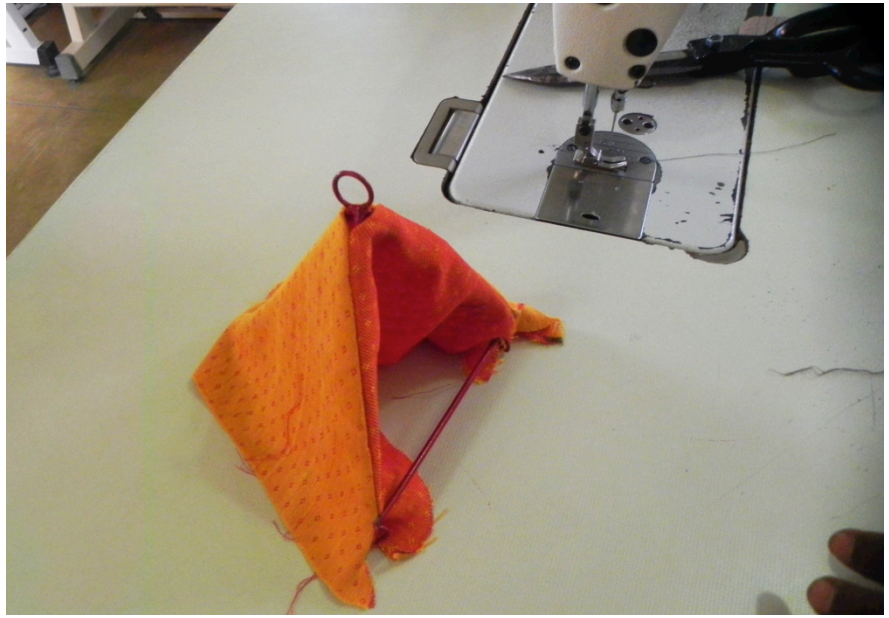
- The tetrahedral frames are made by gas welding MS wires of 3mm thickness.

- The larger ones are having length side 6 inches and smaller ones have side 2 inches.



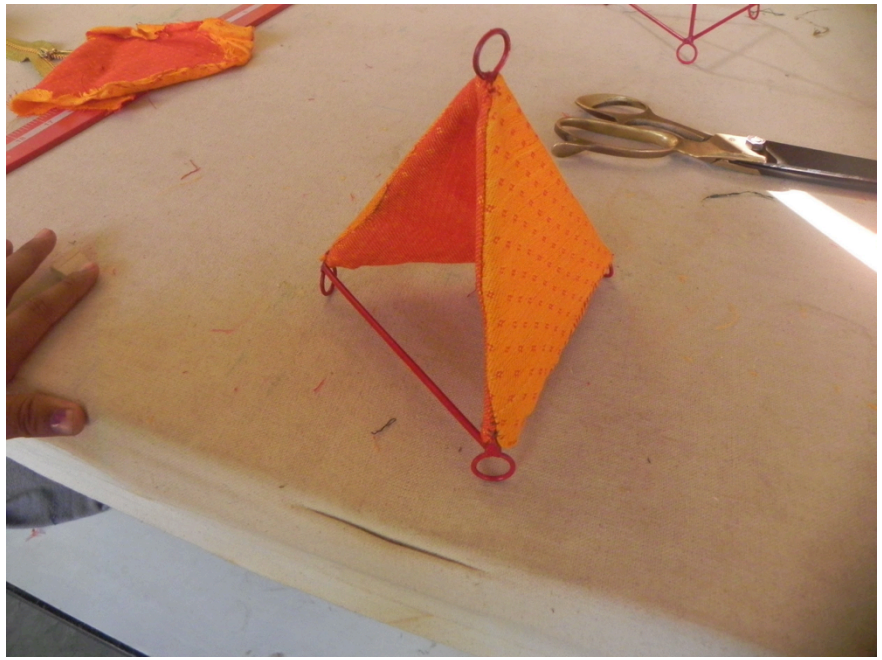







JUKI

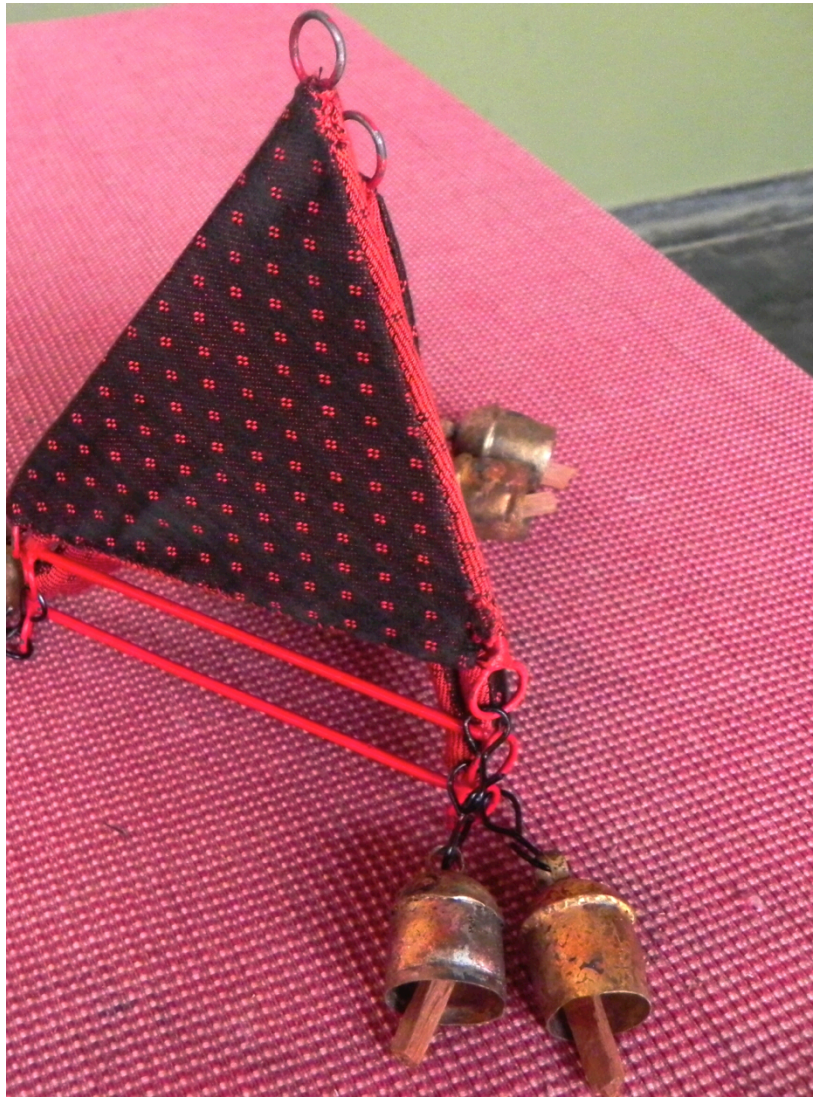










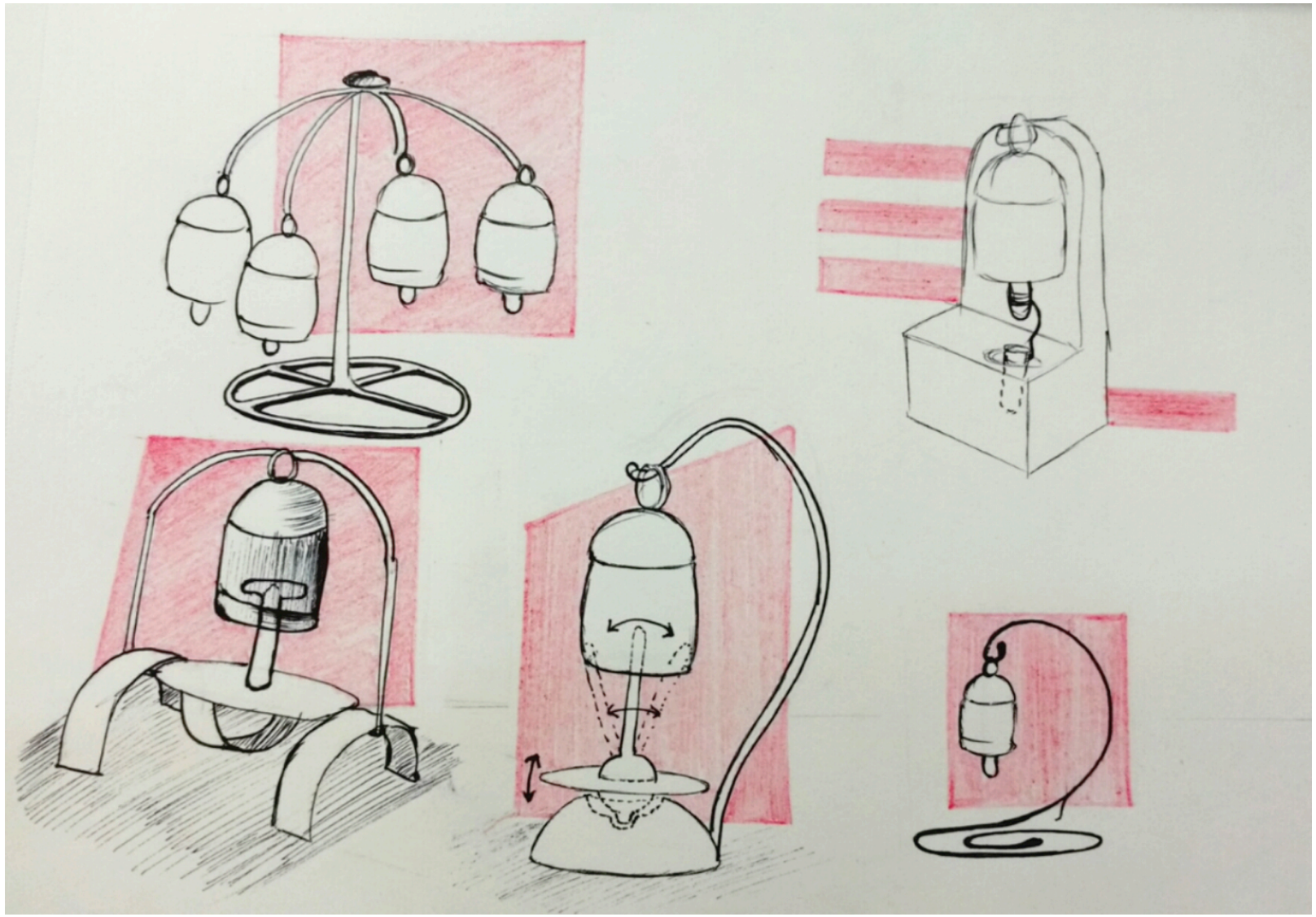








Tabletop bell





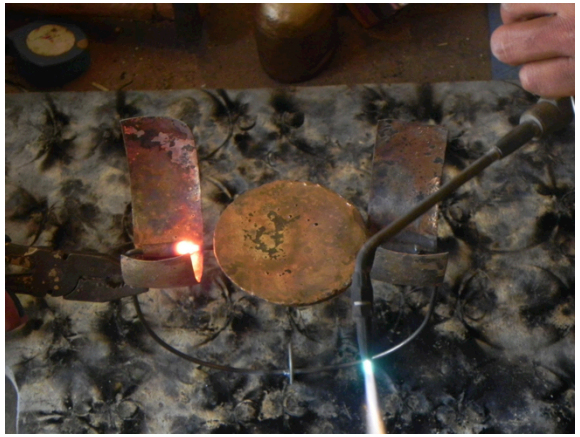




The table bell consists of a swivel base and semicircle bhabri parts. The topi base is of no. 10 and the legs are bhabri parts, having dimensions **1.5*7** inches.





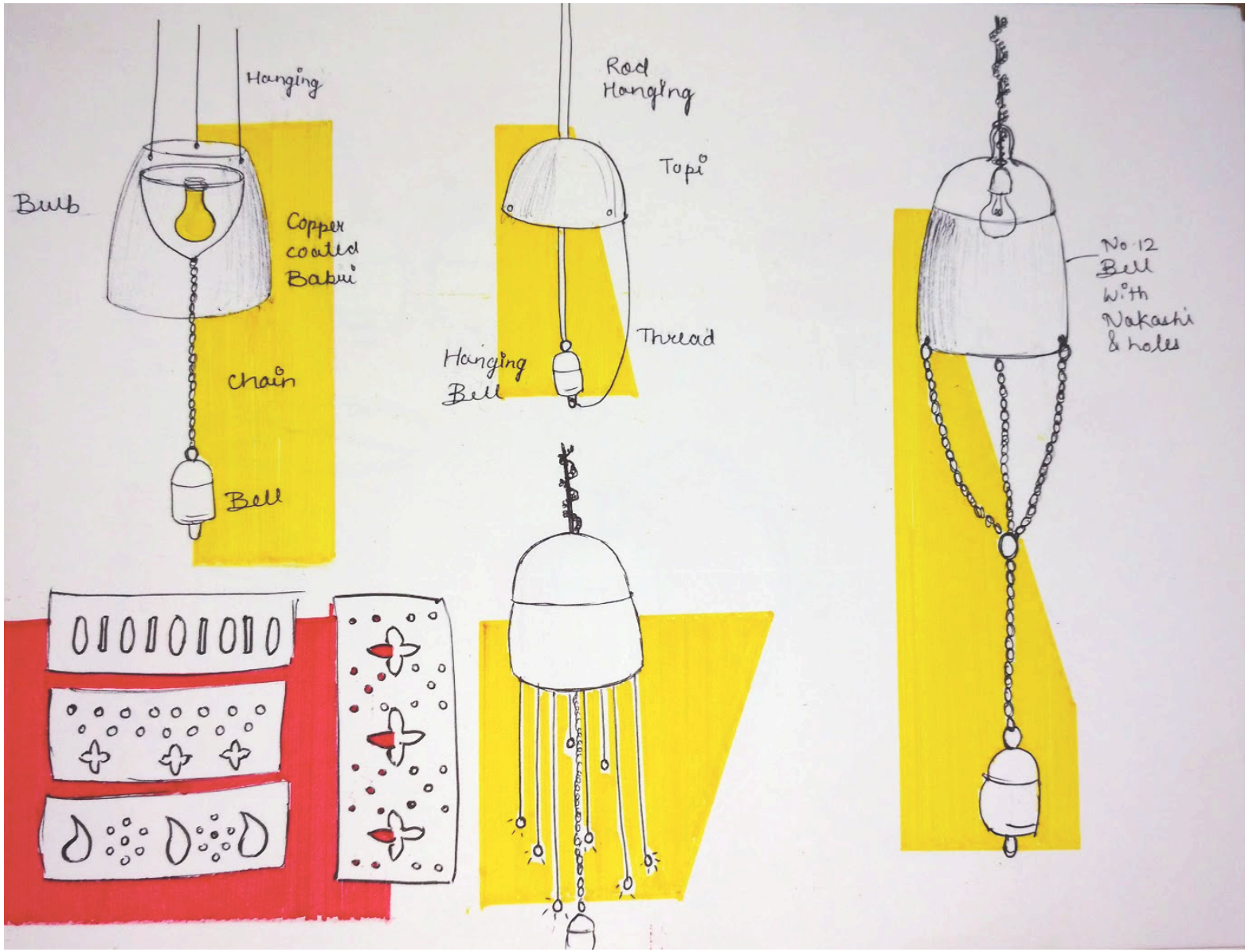






Hanging bell Lamp Shade

Concepts



























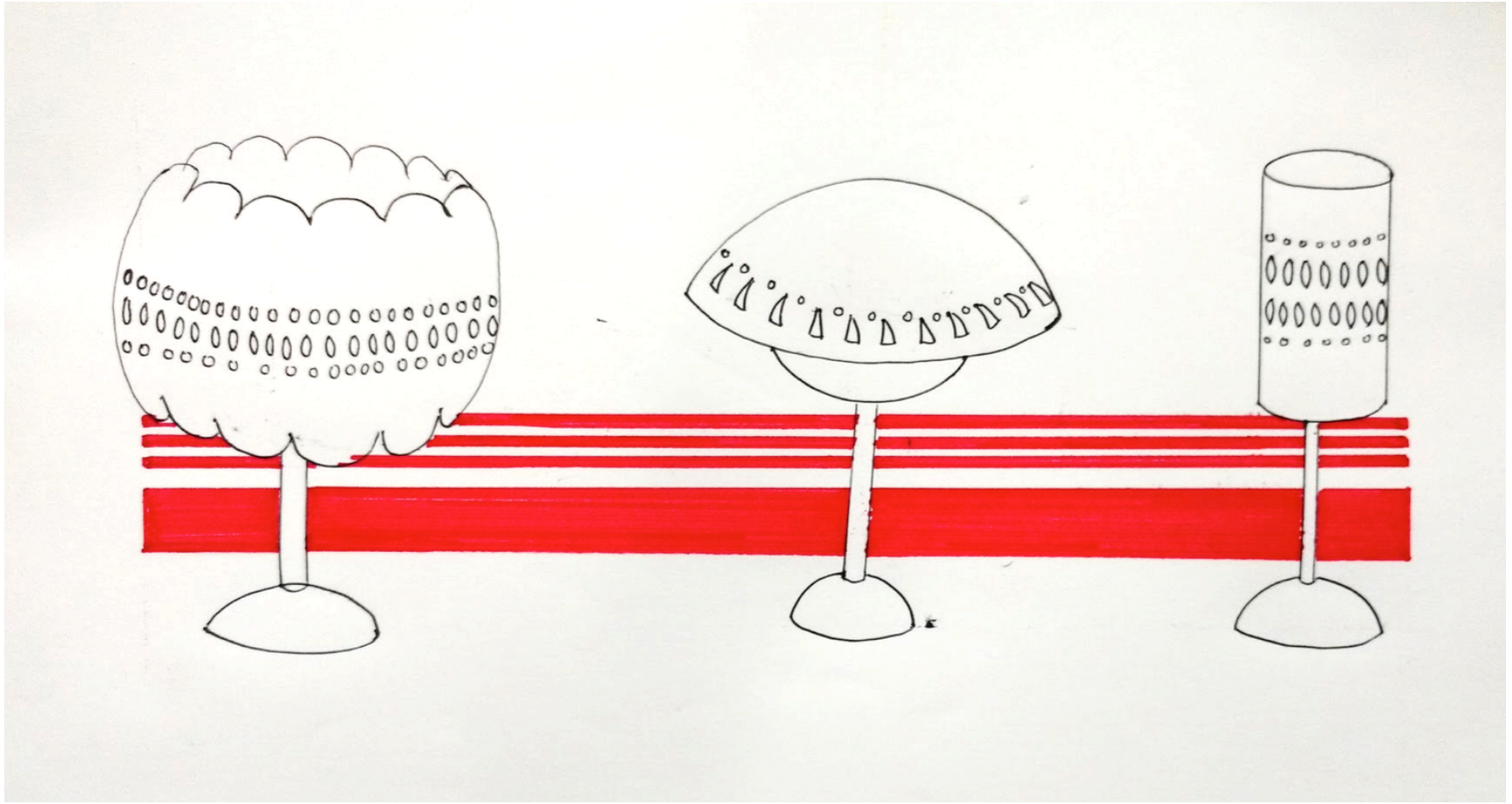


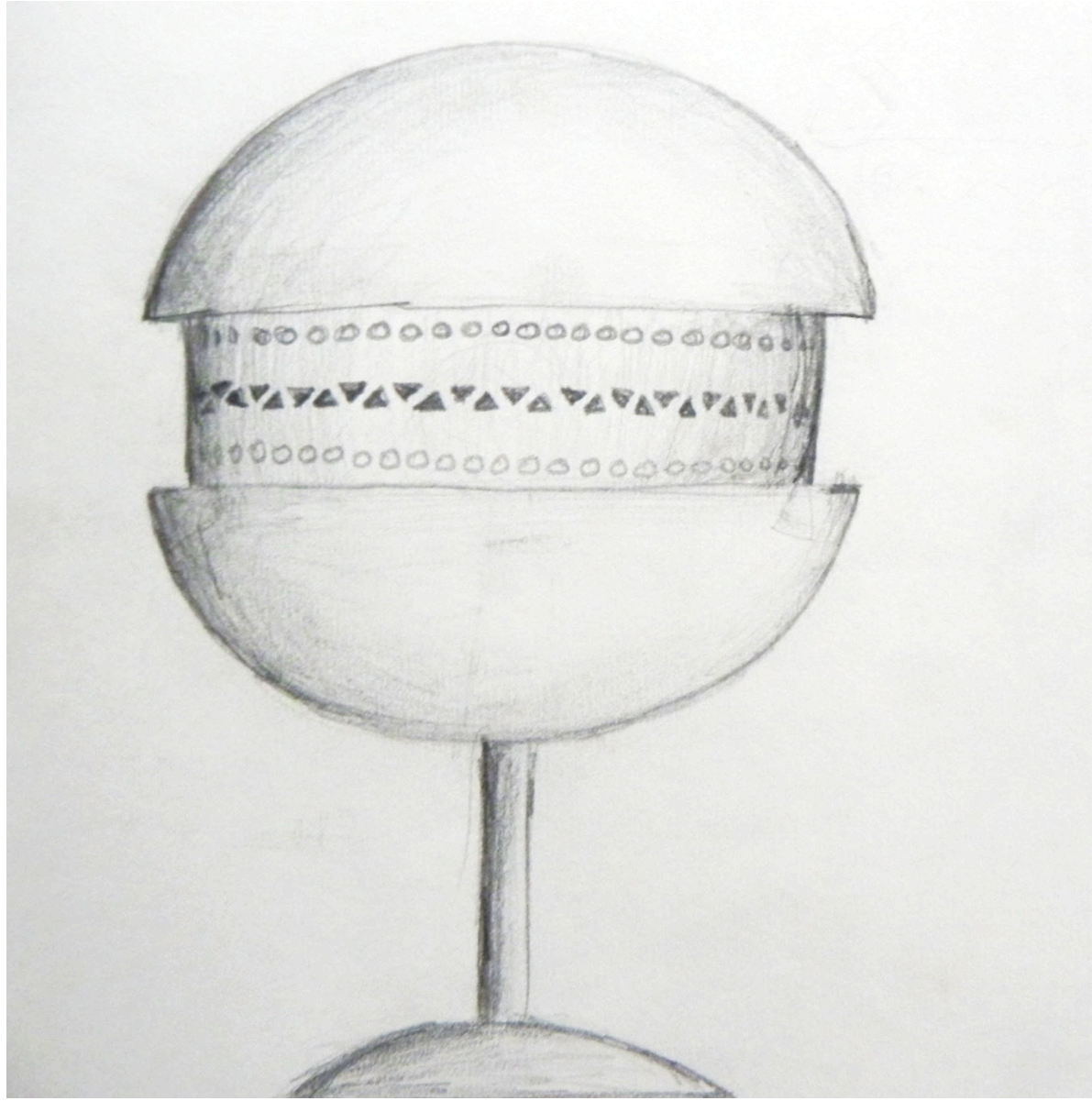






Lampshade

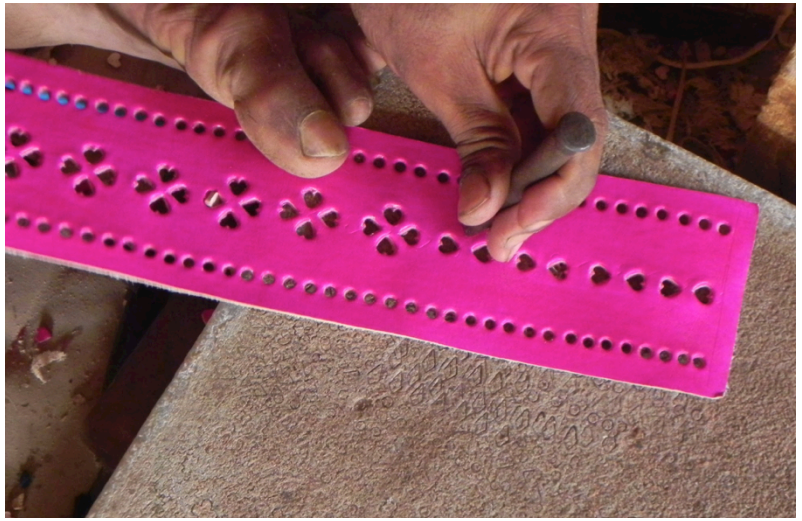


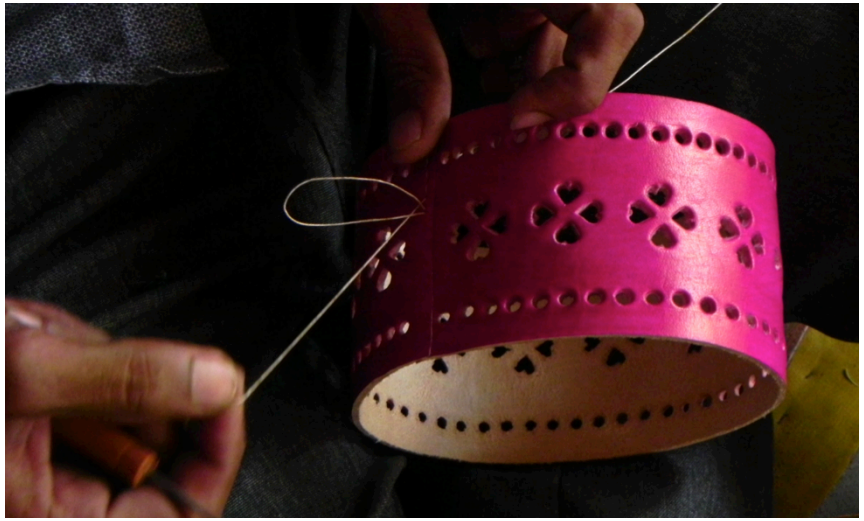


Manufacture









The lampshade consists of 6 parts 2 topis of bell no 12 for the head and another piece of topi of no. 11 for the base. The light shade is made out of leather









Parts are welded and assembled


2:06



Bookmarks











Study on Furnace design

Study and Suggestions to improve the existing furnace developed by Khamir

Old furnace



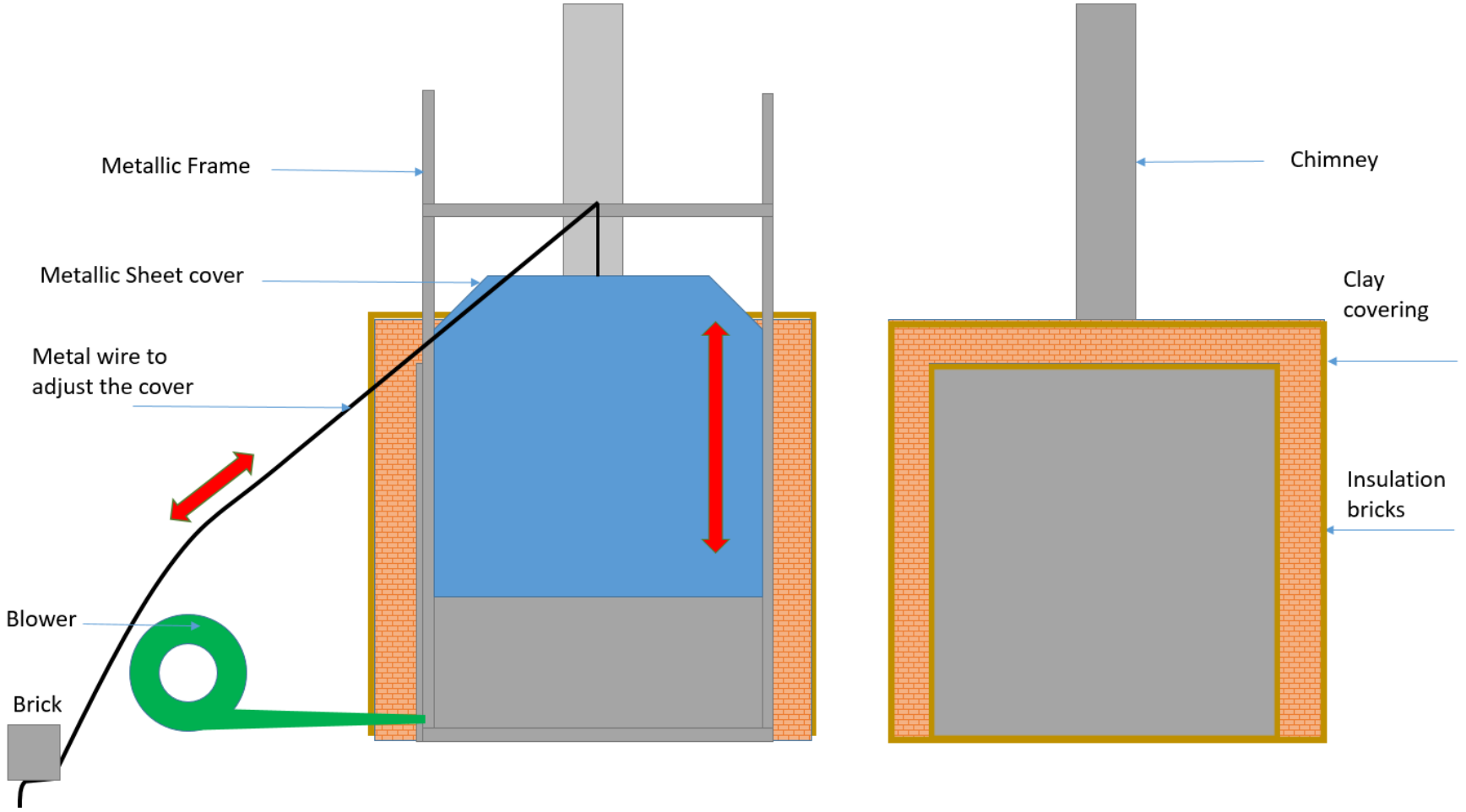
Current design



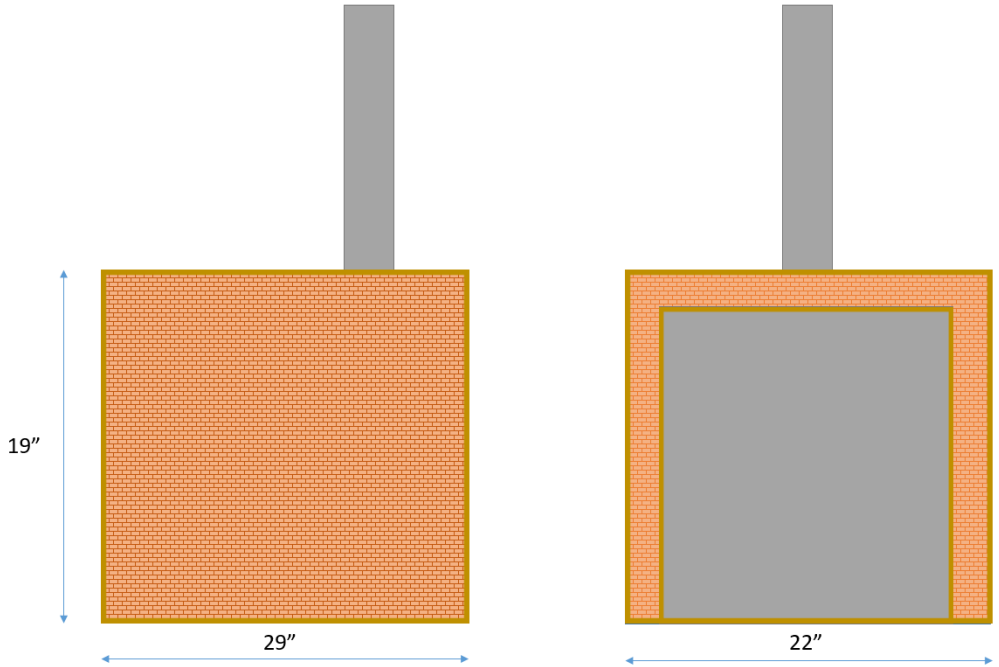
Issues in Older design

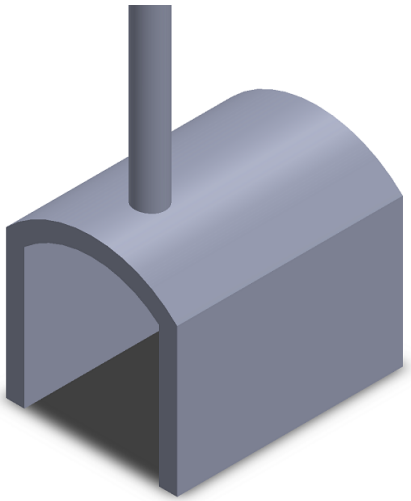
- No chimney
- Normal bricks used were breakable
- Lower life of furnace
- No sheet cover to protect the person from heat
- In some cases, lack of electric blower. Blowers used were manually operated.

Current furnace design and arrangements



Dimensions of current furnace



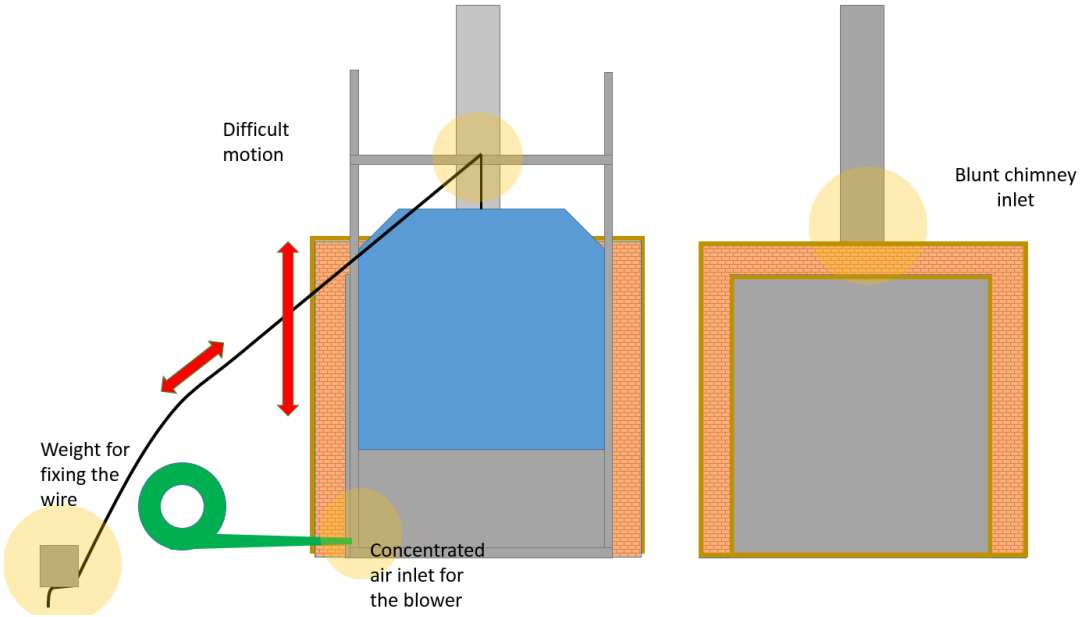


- Three walled furnace with dome shaped roof with chimney on the front of roof

Dimensions of furnace covering arrangement

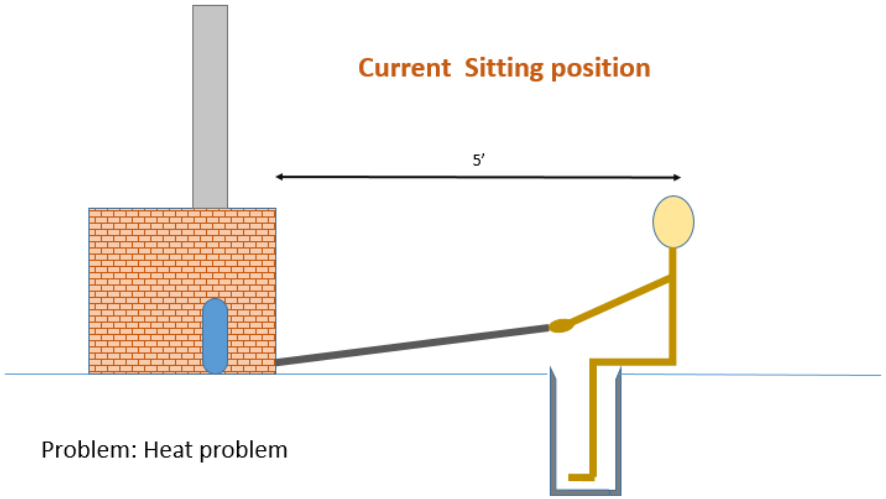


Issues in current design



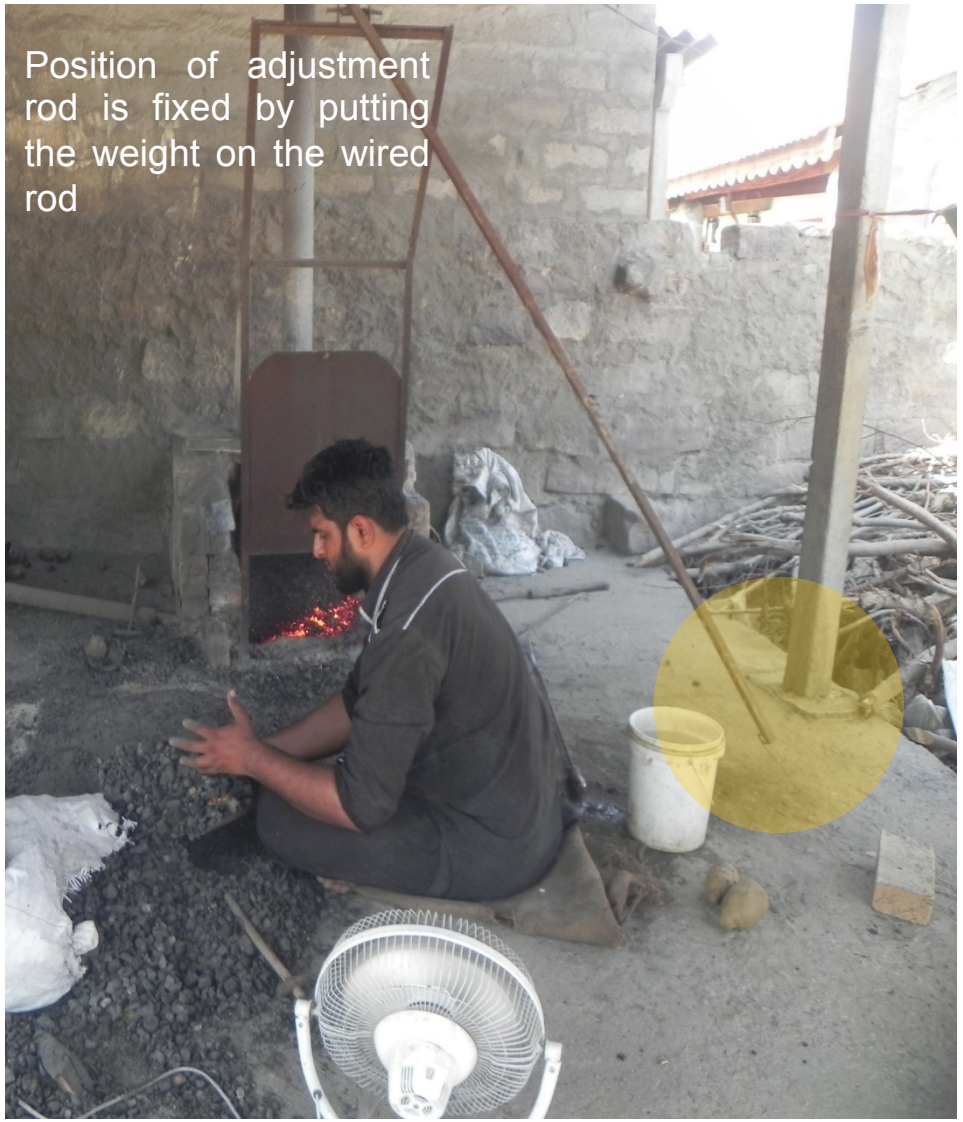
- The chimney opening at the furnace end is blunt which resists the fumes to exhaust from the system creating bad work condition.
- The air from blower is concentrated only on one side of the furnace resisting the other half to ignite properly.
- The furnace cover is stabilized in one position by wire by keeping a brick on it. Also, it is very difficult for artisan to adjust the cover position

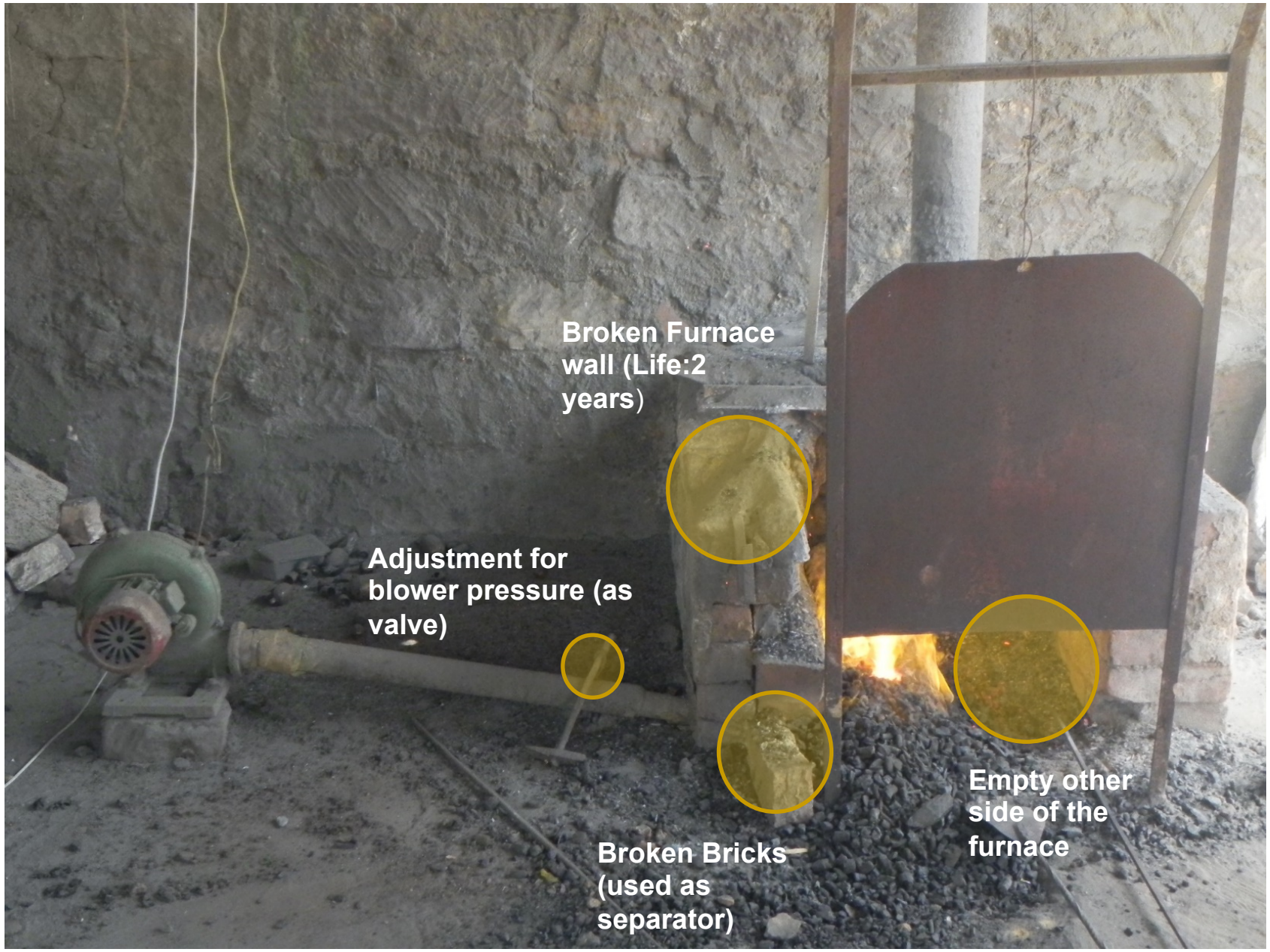
- Sitting distance of the artisan from furnace is about 5 feet.
- Due to excessive heat and fumes, artisan has to sit far away from the furnace




Only one side of the furnace is used for firing




Position of adjustment rod is fixed by putting the weight on the wired rod


Broken Furnace wall (Life:2 years)
Adjustment for blower pressure (as valve)
Broken Bricks (used as separator)
Empty other side of the furnace


Open side and top


Extra fan is needed as the work environment temp goes high

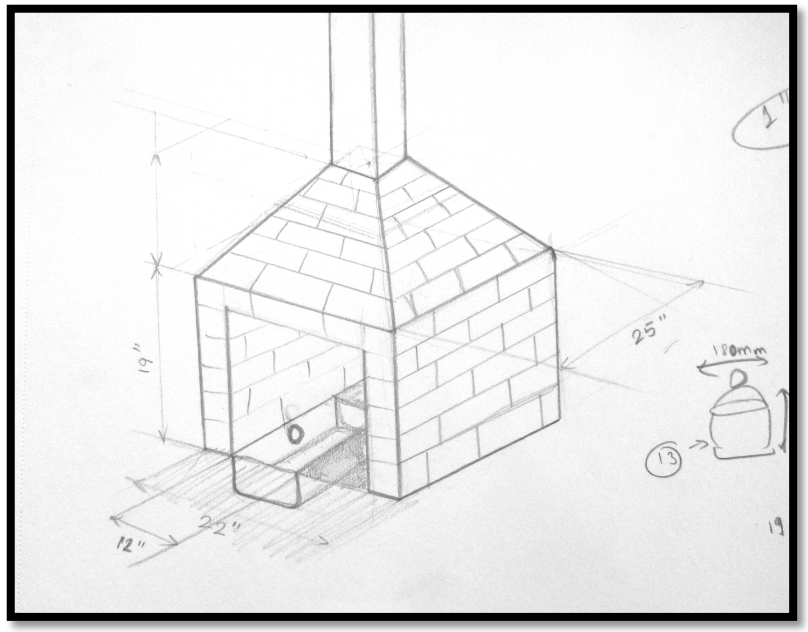

Added weight is needed to hold the adjustment rod in one place and the cover sheet in downward position

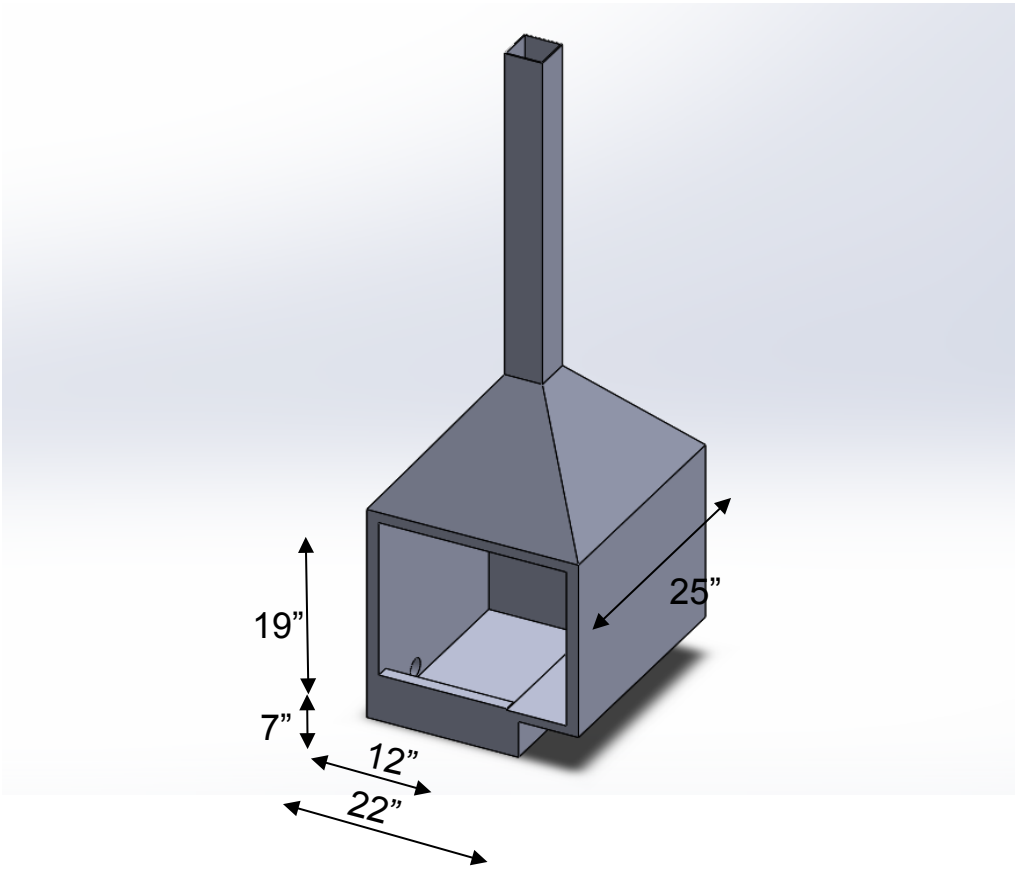

Chimney on the rare side of the furnace is of no use. So, another chimney is added by artisan to enable the heat and fume to escape from the furnace.

Design suggestions

Design suggestion 1

- The roof of the furnace is pyramidal to give direction to the flow of flue gases.
- The depression is made in underground on the floor of furnace which do not allow heat to dissipate easily from the furnace while firing bell
- The size of underground depression is such that it allows firing of all sizes of bells easily
- The need to rotate the bell while firing can be reduced
- The depth of furnace is reduced so that the wastage of heat can be reduced inside the furnace.

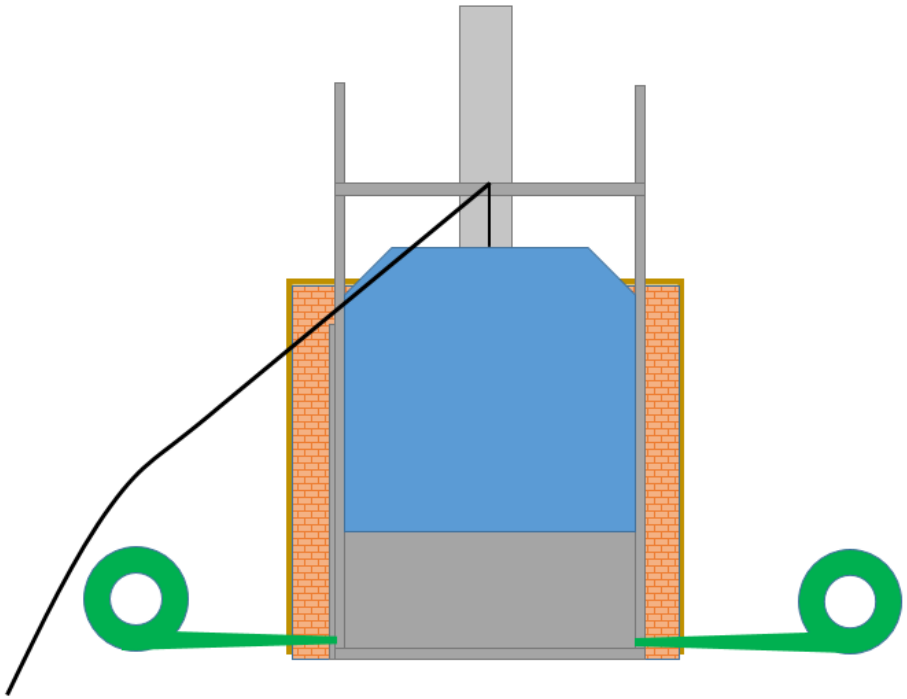




Design suggestion 2

Two Blower furnace

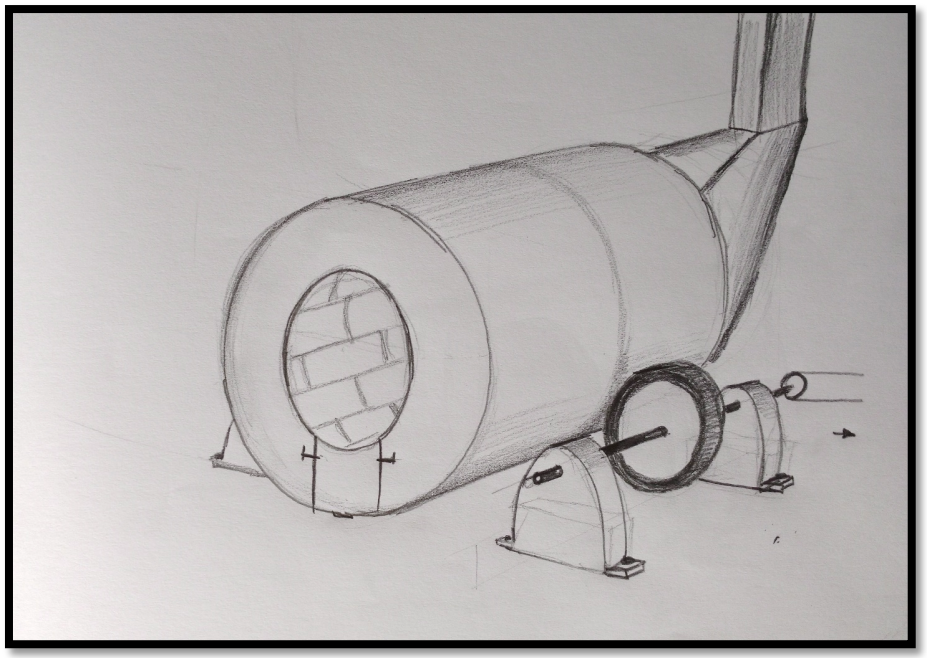
- Using two blowers from opposite sides will allow to heat the coal in less time while firing bigger bells or 1st bell provided the blower outlet reaches the firing area properly.
- One of the blower can be fixed while the other can be kept temporary and adjustable.



Design suggestion 3

Rotating drum furnace

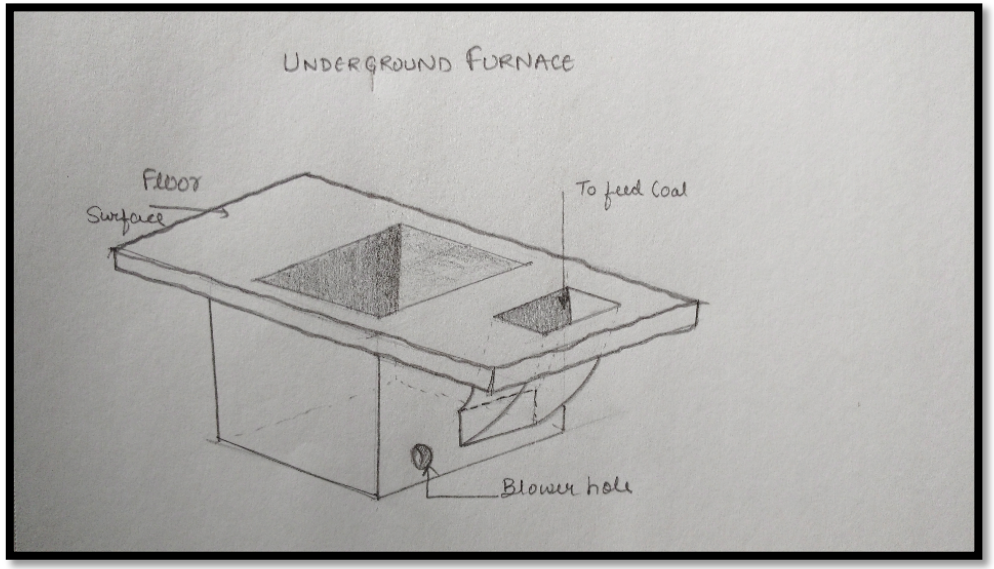
- This is a very basic idea where just like the rotating furnace drum used in industry, the same idea can be used here to fire the bells with uniform heating and without any need to rotate the bells manually.

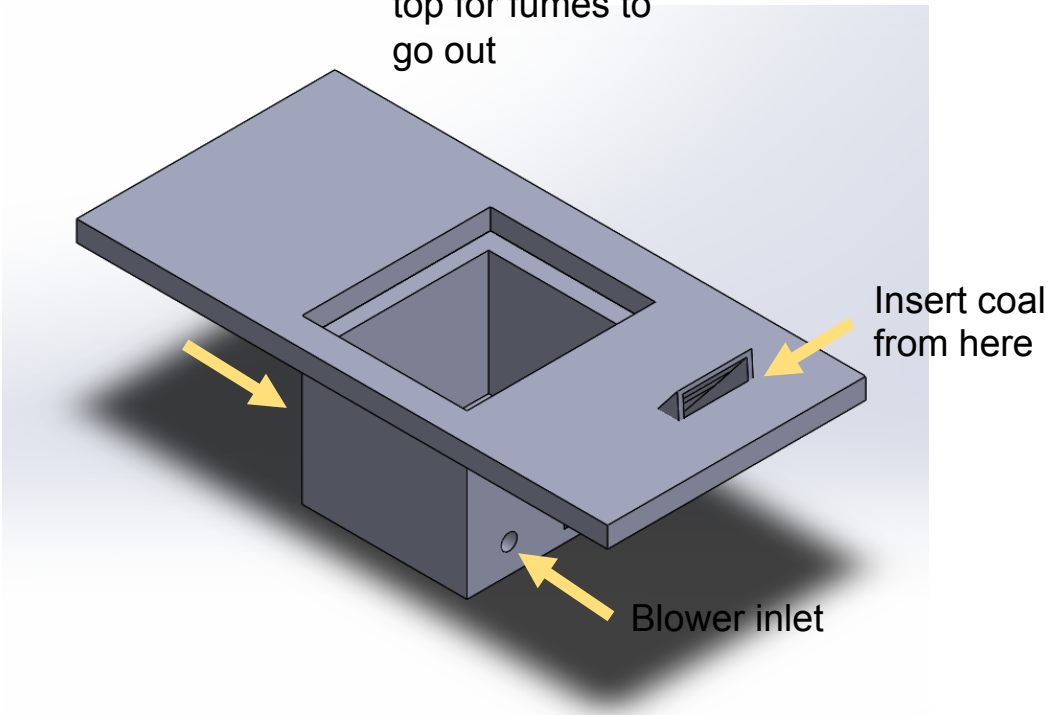


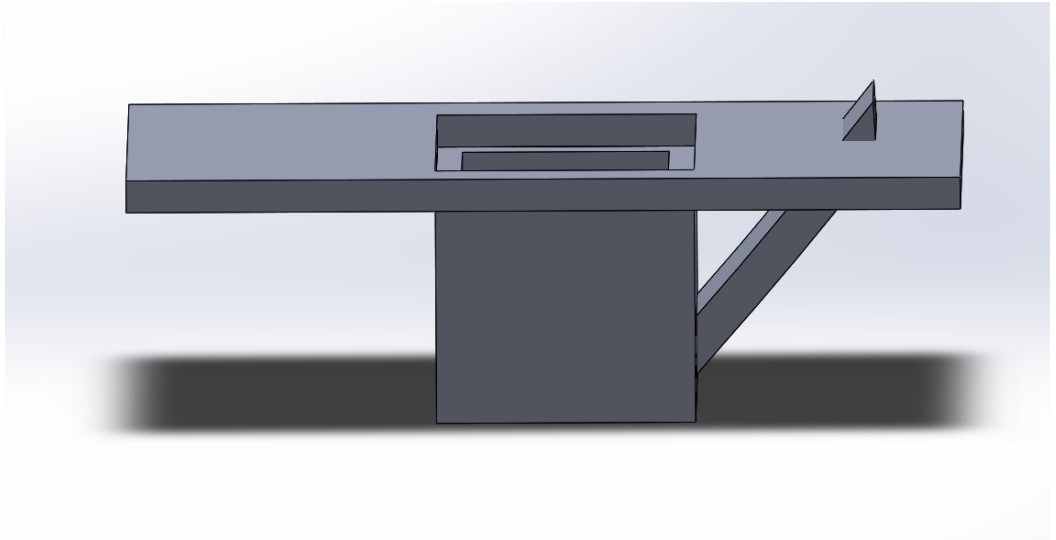
Design suggestion 4

Underground furnace design

- The furnace is build under the floor surface. It is covered from all the four vertical faces. So, heat dissipation is minimum
- The coal is fed into the furnace from the tunnel inlet from the floor surface which will fall down into the furnace.
- 2 blowers are used on 2 opposite sides to provide uniform airflow for burning of coal.







Acknowledegement

The days at khamir were delightful, there has been a lot of things to learn and unlearn. Experiencing kutch has been an amazing opportunity. Working with handicrafts were a new experience for both of us. Kutch was an entirely different way of learning design. We had to move out from what we had taught, had to get deep touch into the craft and its culture. Met a lot of interesting people at khamir and had interesting conversations and activities. We would like to mention some names we would never forget who made this possible

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Thank You!