# COPPER BELLS OF KACHCHH

## Internship Report

Khamir CRC | IDC IIT Bombay
May - June 2016

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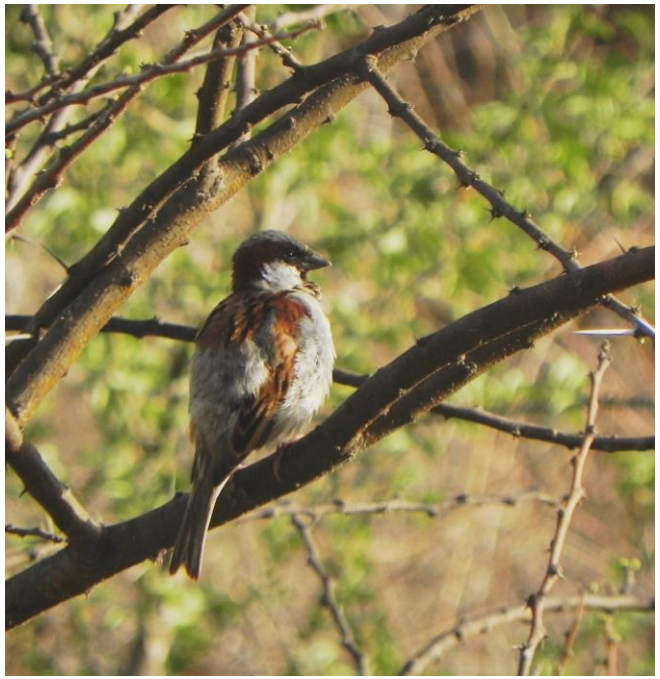
IDC
IIT Bombay

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.

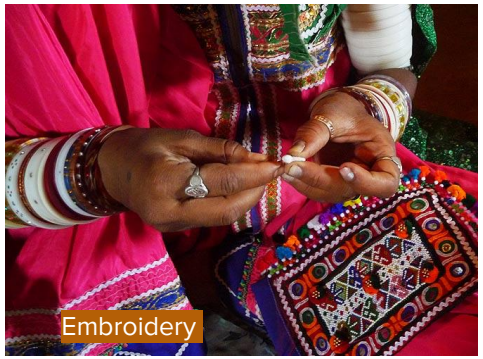
# Crafts of Kachchh


Ajrakh block print


Kachchhi bandhani


Kala cotton weaving


Camel wool weaving


Embroidery


Rogan art


Mashru weaving


Metal bells


Lacquered wood


Namda

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:

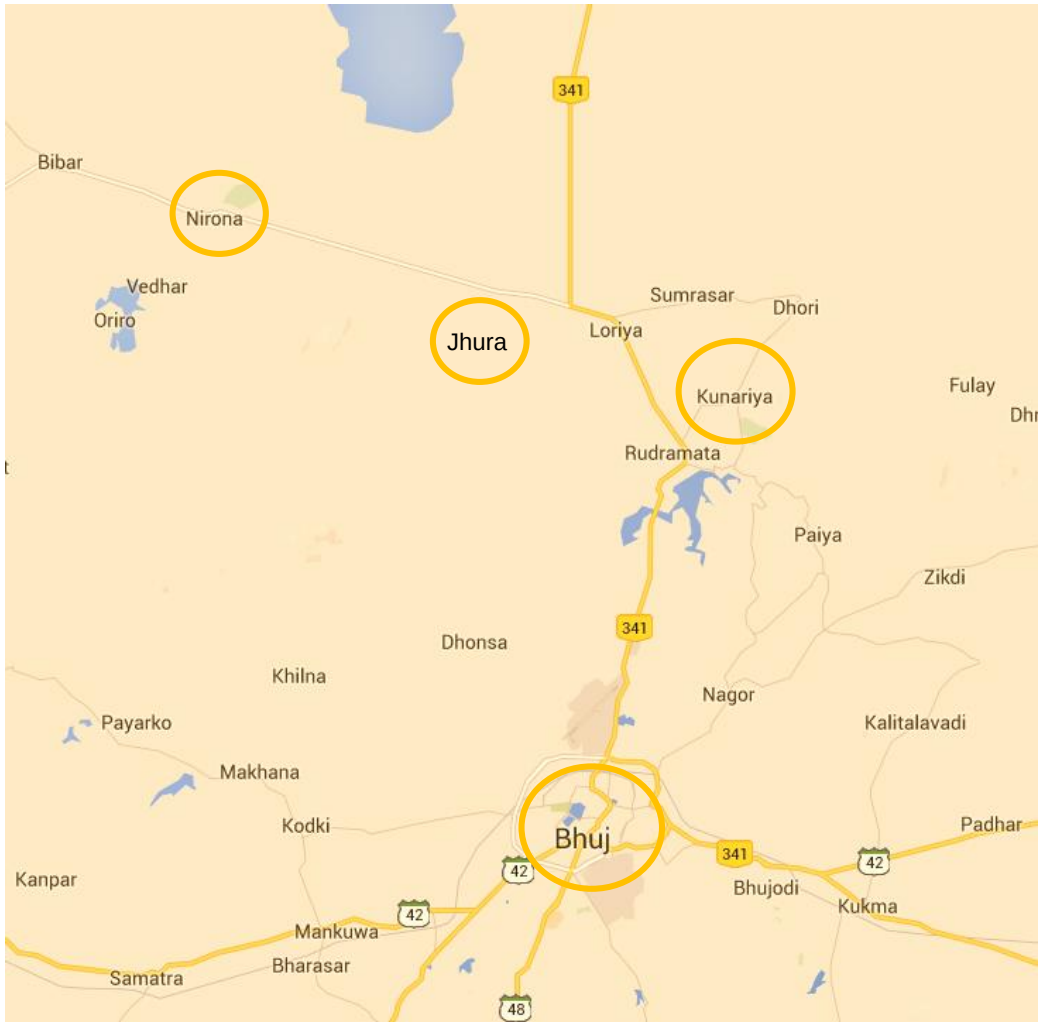
i. Surface designing of bells
ii. Developing new chimes.
iii. Integrating more crafts with metal bells etc.

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

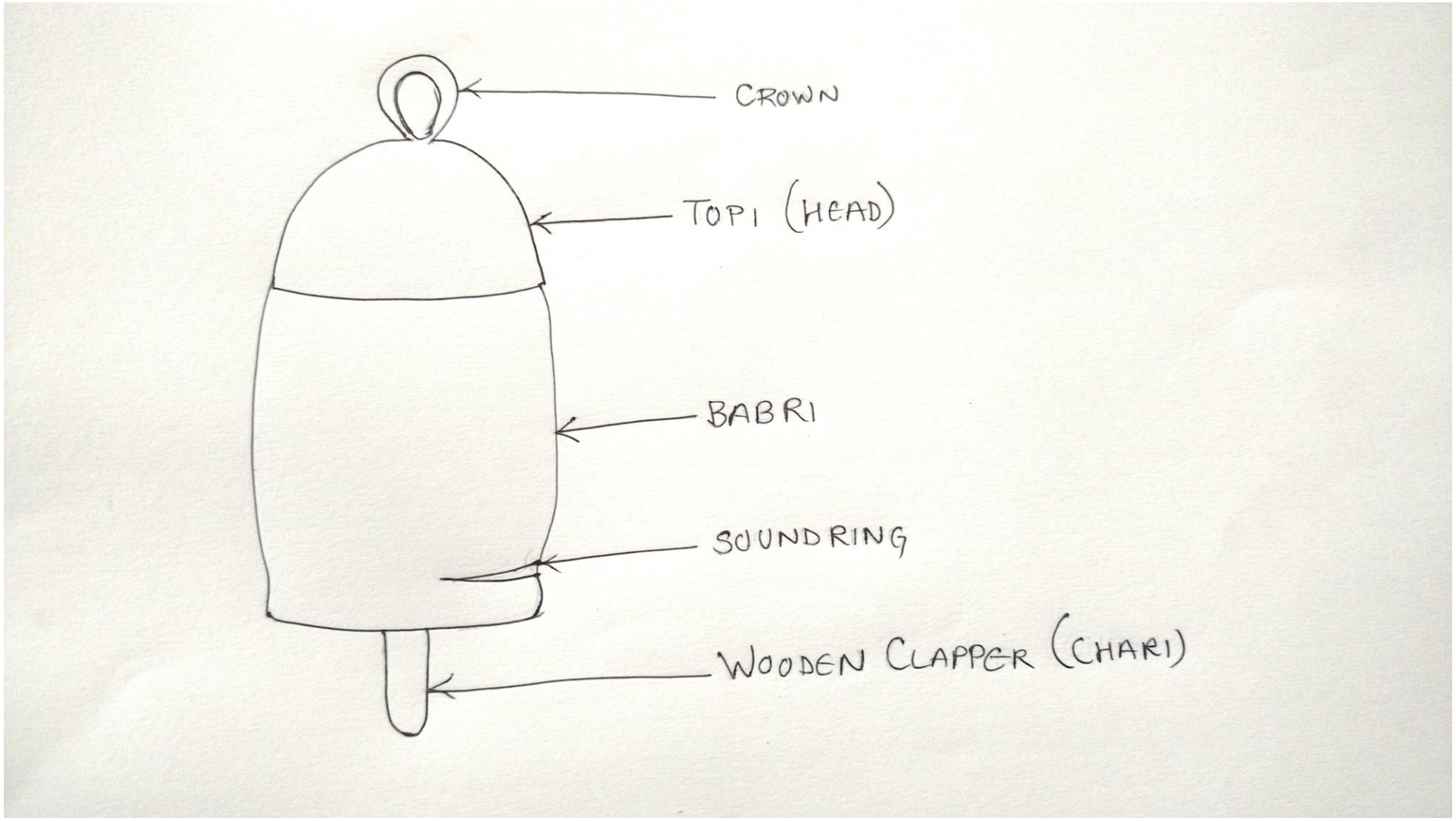
Copper bells - Overview

# Background

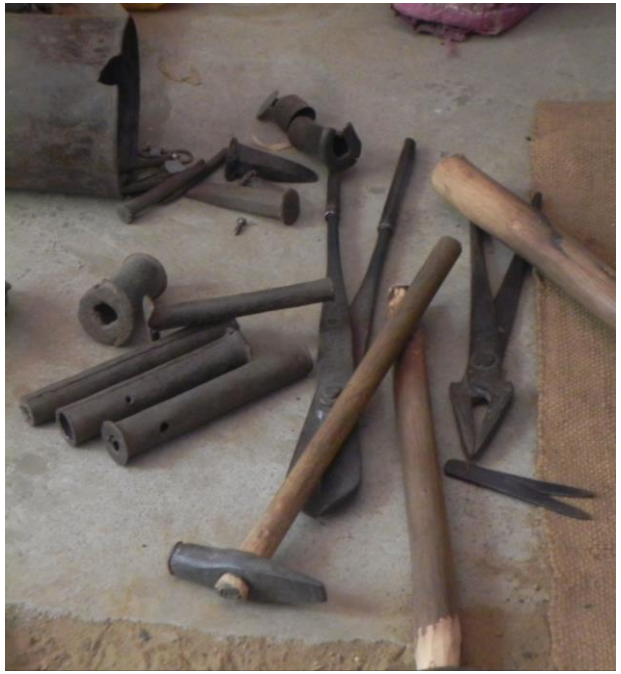
- KHAMIR has been associated with copper bell artisans since from its inception.
- The artisan community associated with the craft is **Muslim Luhar community**.
- The main villages where craft is being practiced are **Jhura, Nirona, Kunariya and Bhuj city**.
- It is a unique craft where artisans are 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.



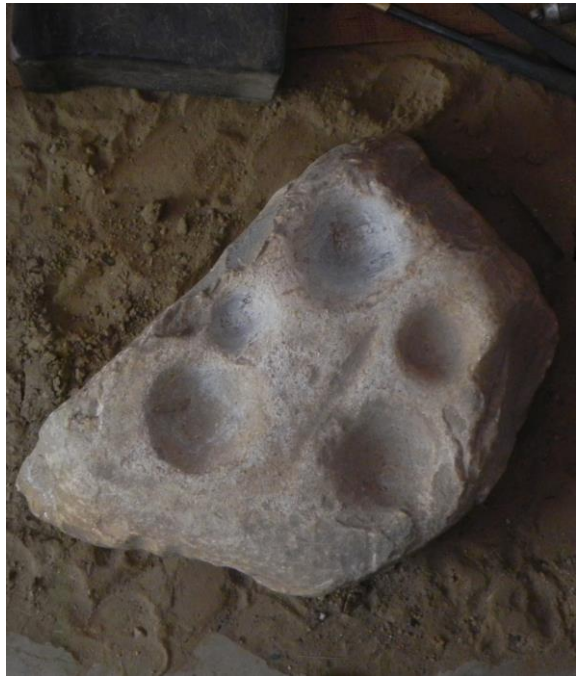
# Bell and Bell parts



## 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**

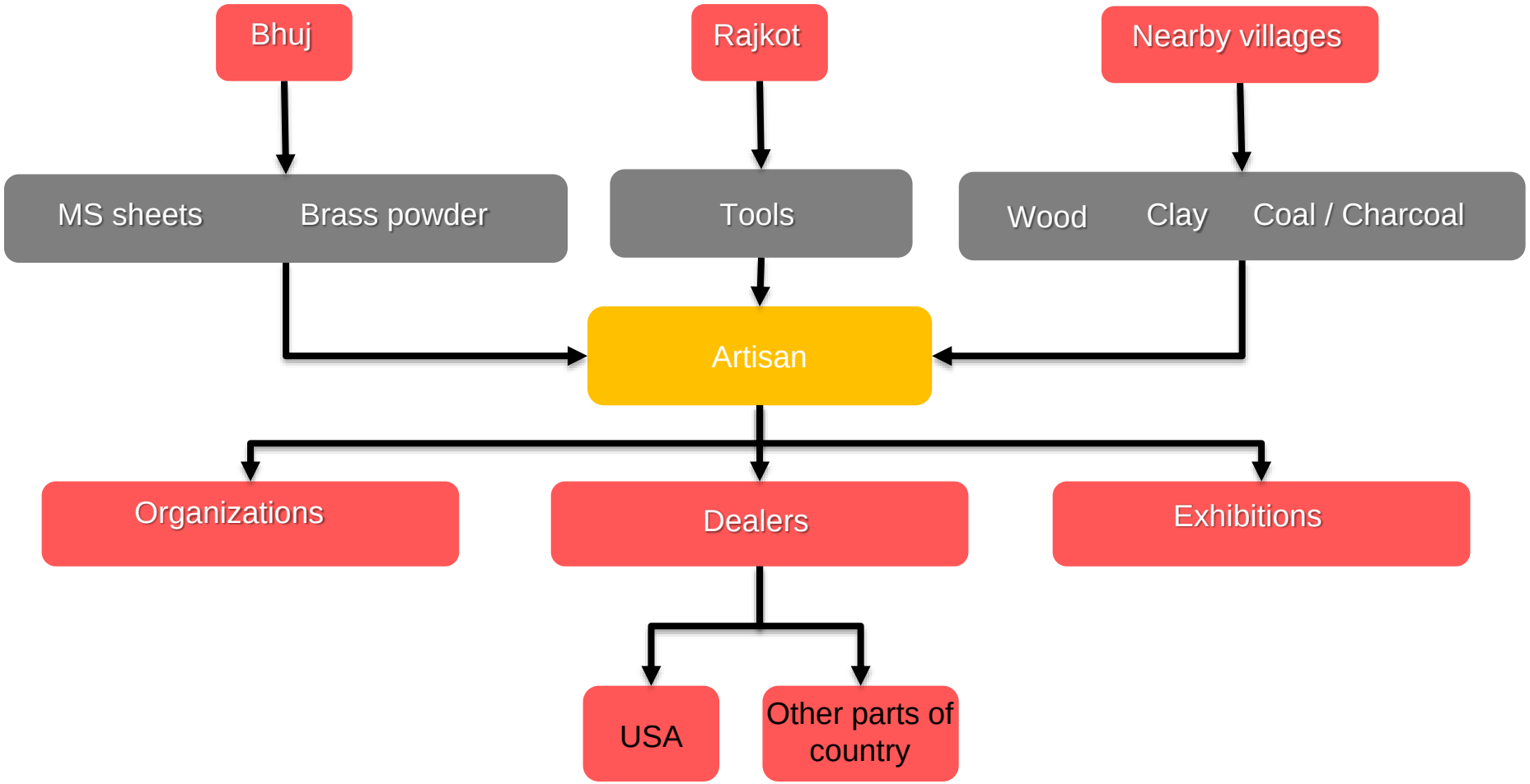
Most of the tools have been in **used for generations** and all of them are readily available in the market

**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

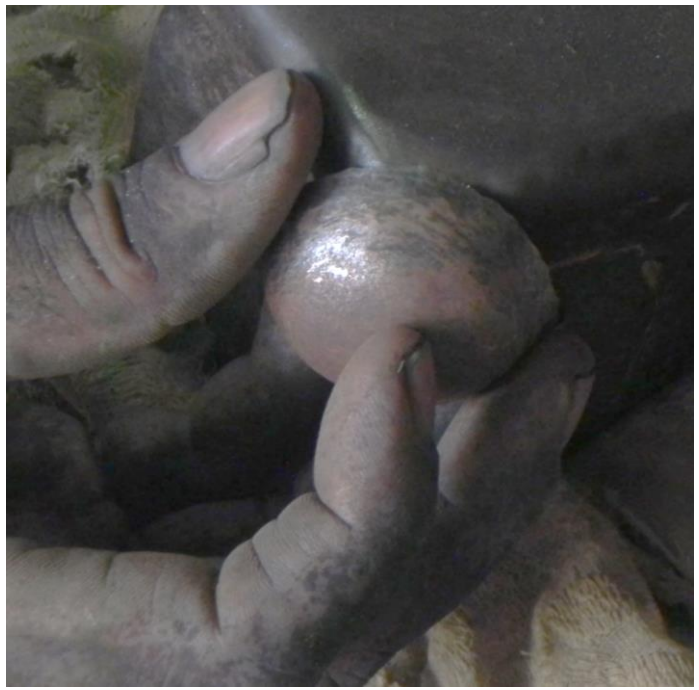
Thinning of one side of the edge of babri

## 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)

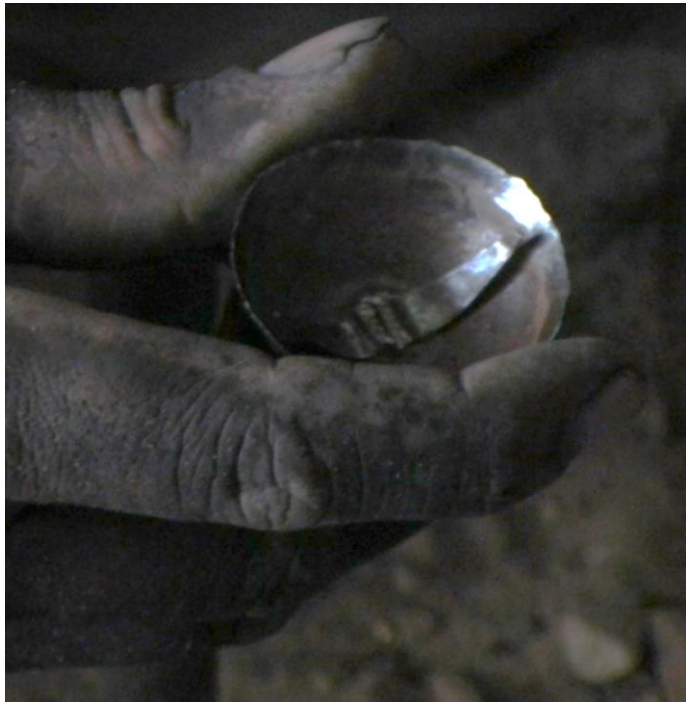
## Kadi (Hook)

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

=

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

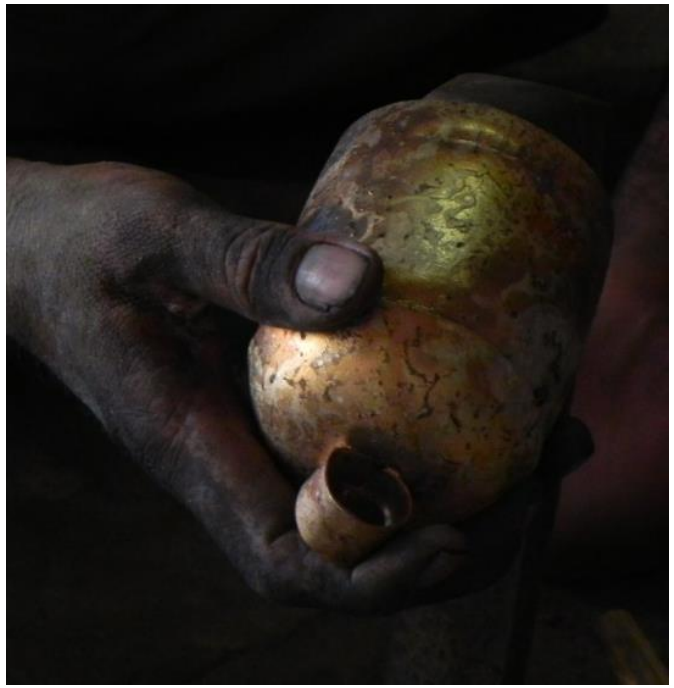
Dipping the bell into normal water to cool it and hence quench

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

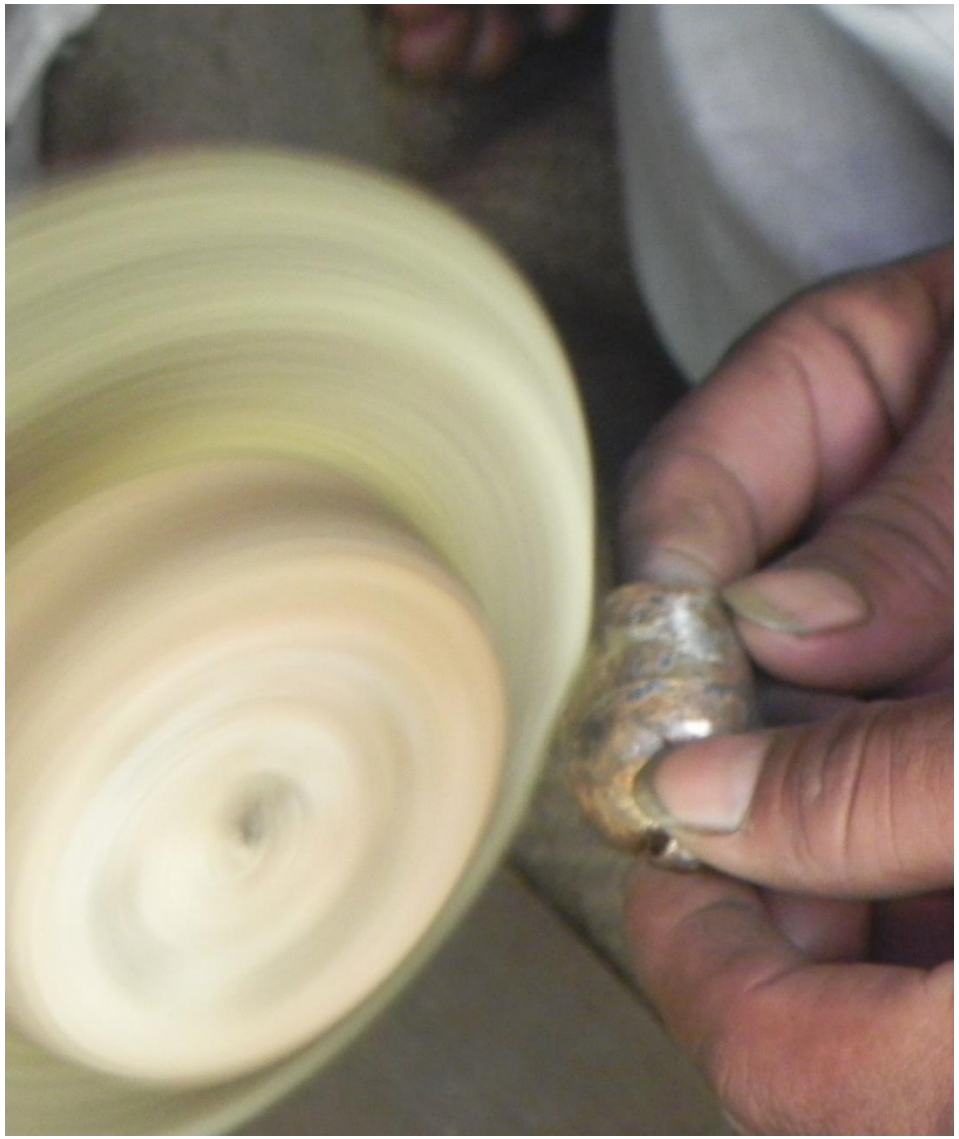
The sound ring

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

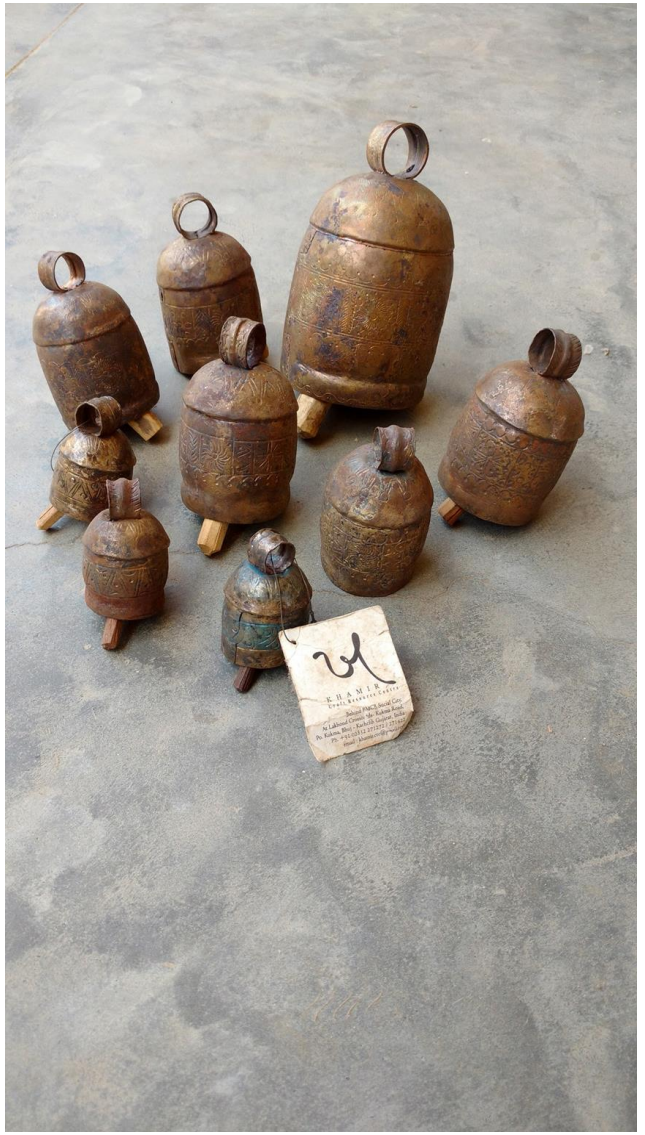
Products and Market

# 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

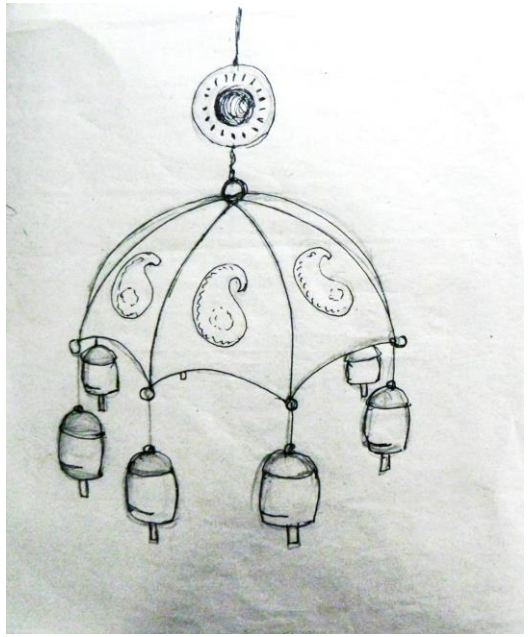
## Designing for artisans: Setting up constrains

- 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

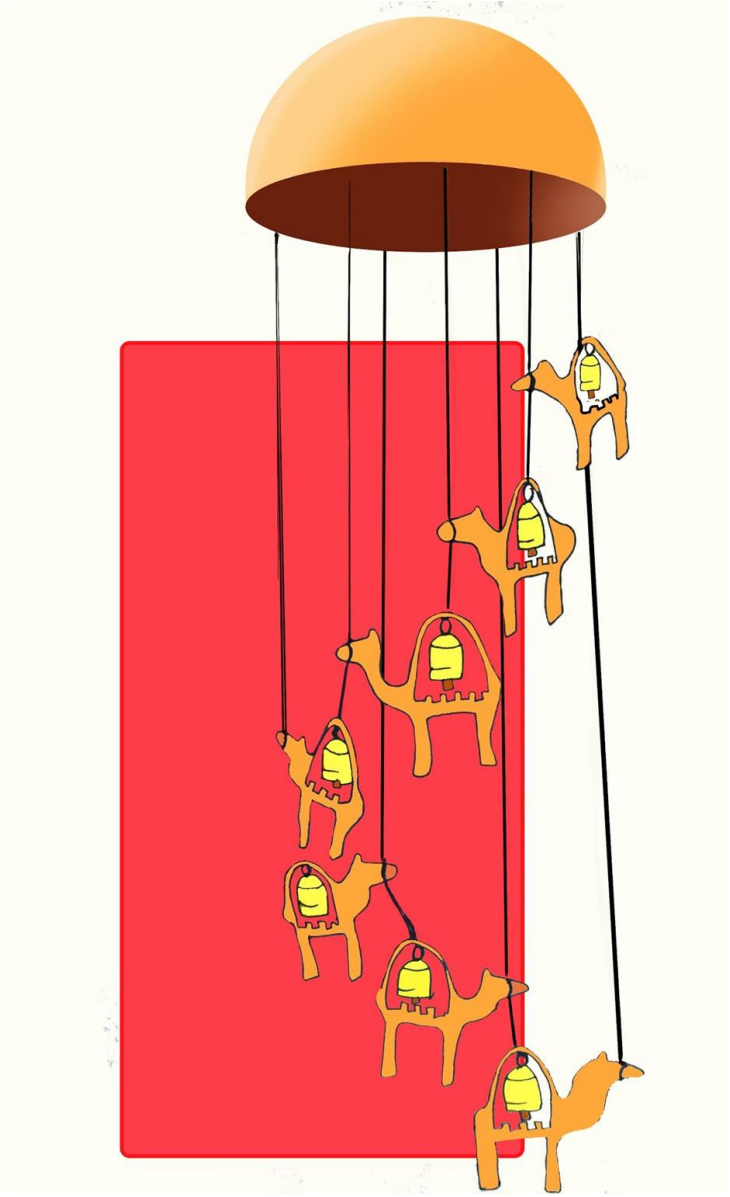
- The existing designs are eye-catching and beautiful where artisan was the designer.
- Artisan thinks of any random design in his mind, makes a quick picture and he makes them within minutes with metal wires and bells
- The designs of wind chimes are all two dimensional
- They are visually imbalanced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



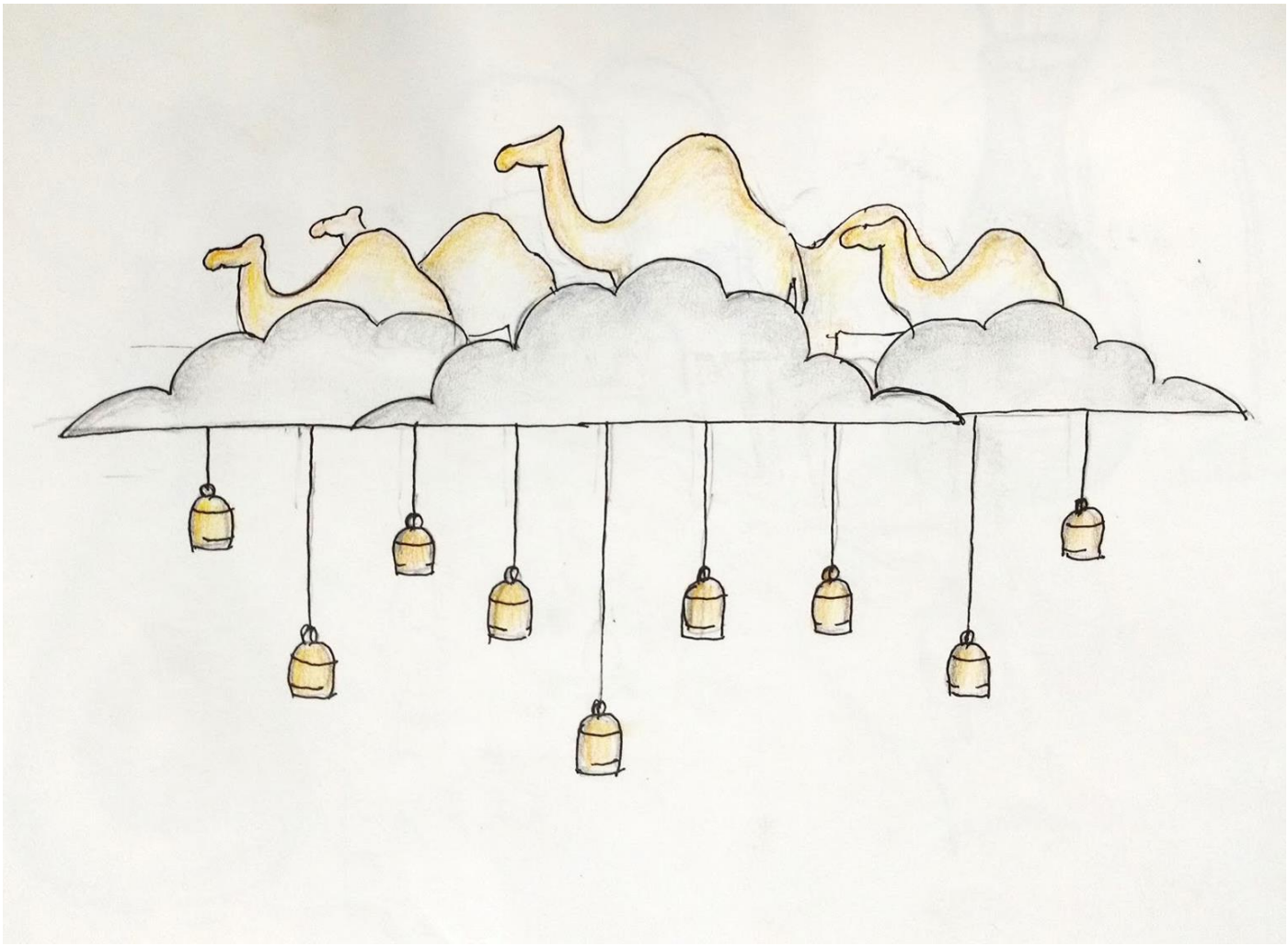
- Camel is made by cutting MS sheet by using a pair of scissors which is used to cut metal.
- The central part has been cut using hammer and chisel.
- Finally they are sanded and buffed to get smooth edges

## Approach #3

Wall mounted jhumar

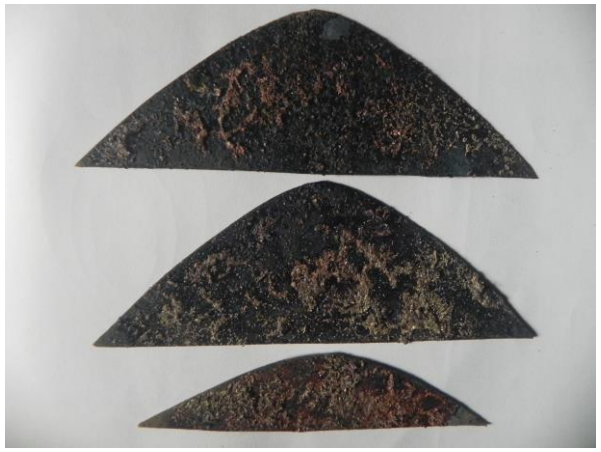
- Camel and clouds.

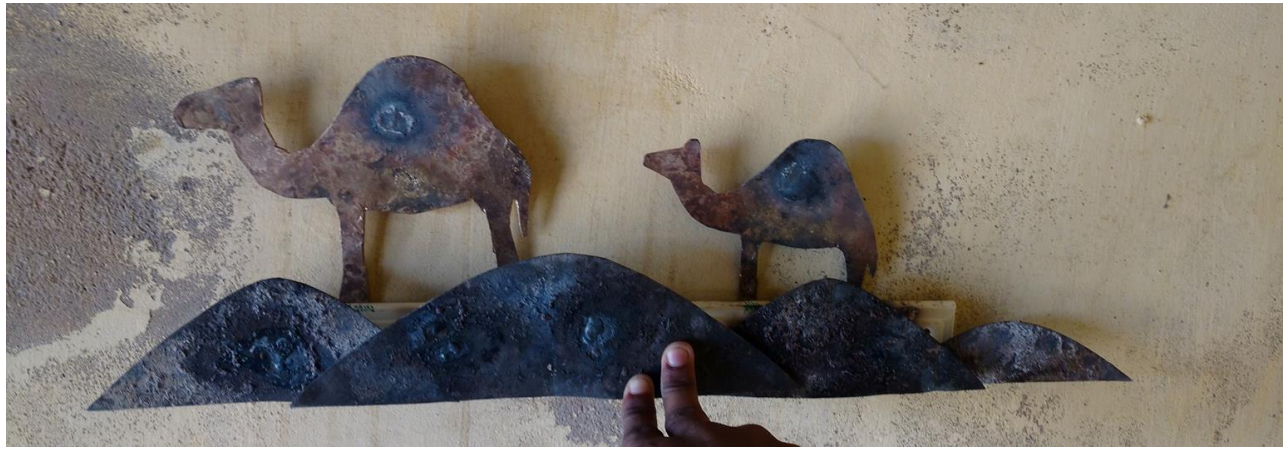
- A story of maldharis in kutch
- The wall mounted jhumar represents desert scenery & a herd of camels and the dust that spreads over.
- The bells hanging from the sand dunes represents the roots of the craft.
- Depicts the connection between maldharis and copper bells.



- 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.





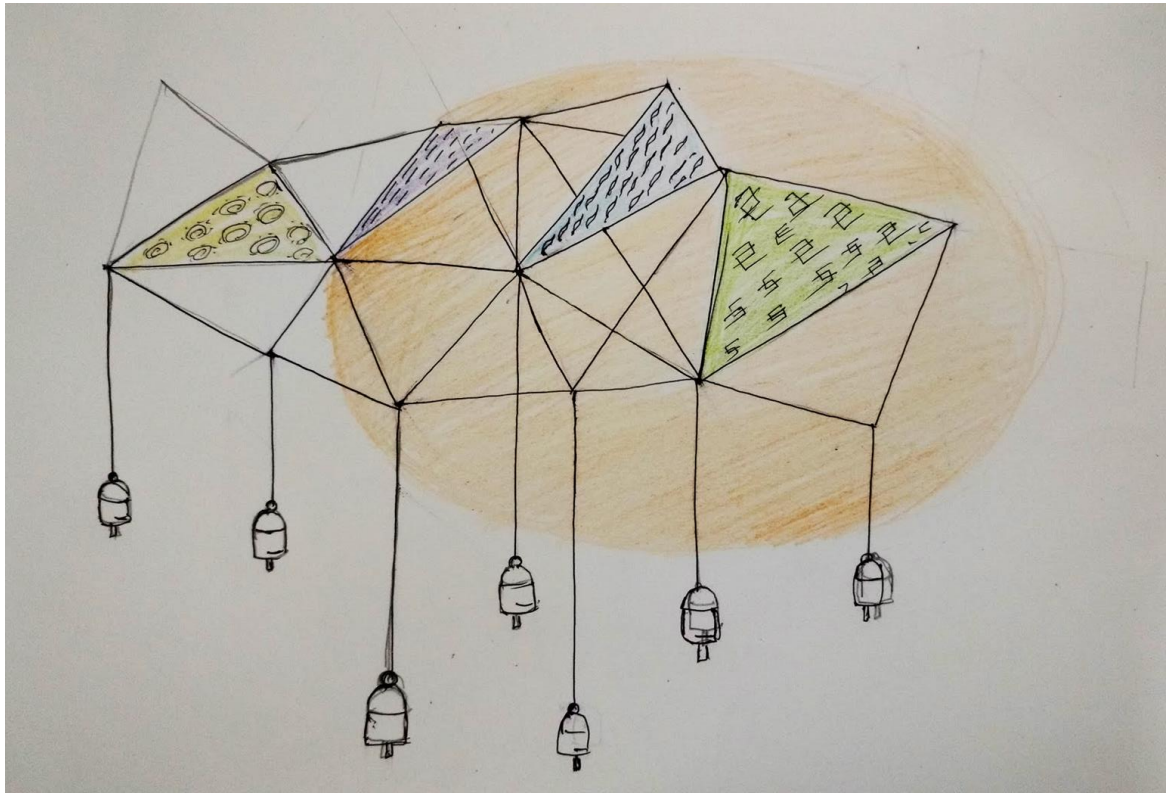
- The sheets are welded on top of a metallic hook frame (cloth hanger),

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

## Approach #4

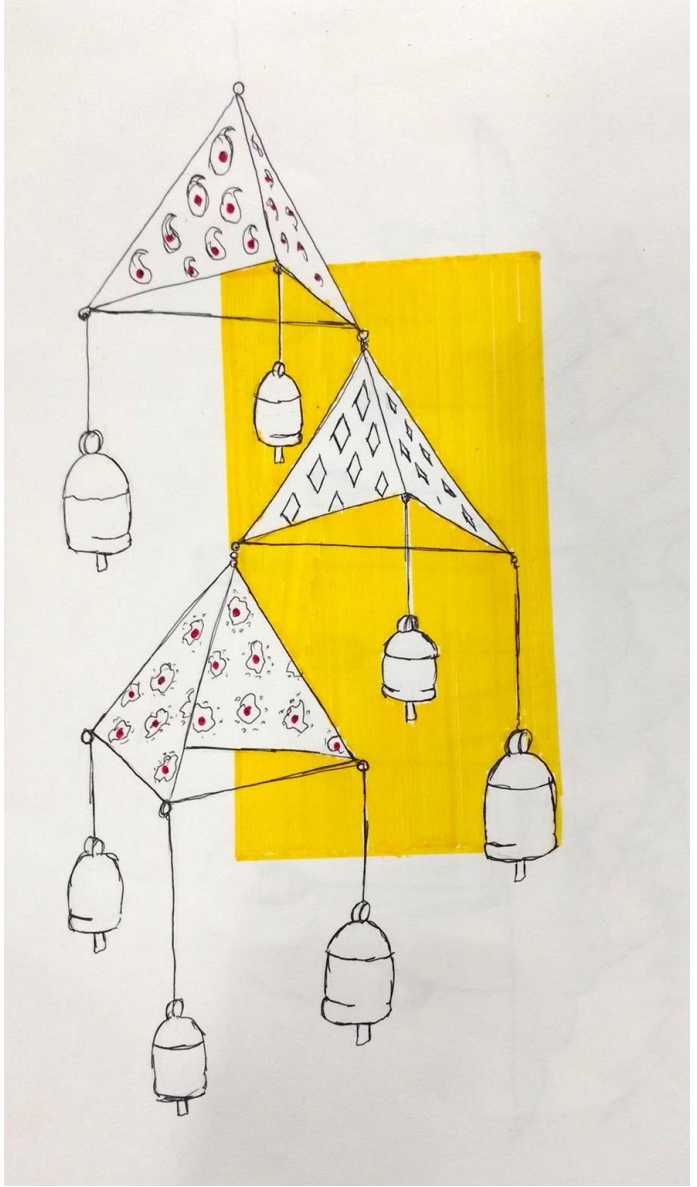
DIY/Modular wind chime

“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.



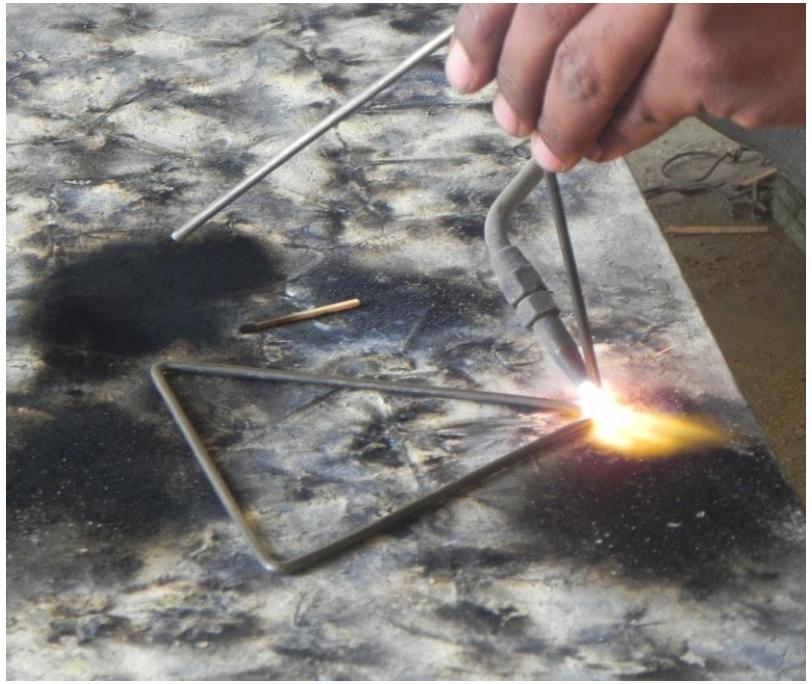
## Approach #5

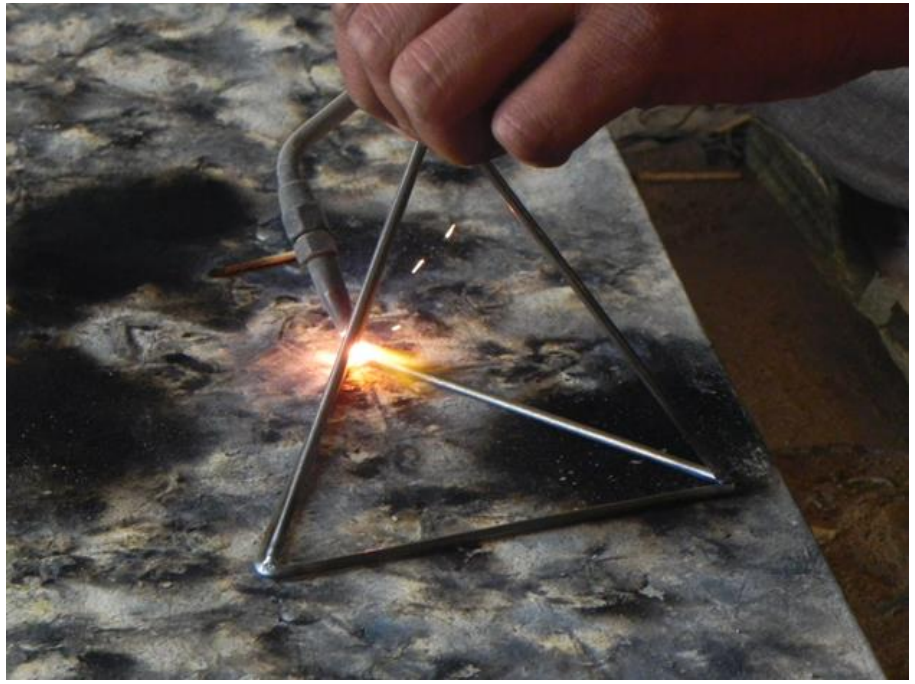
DIY/Modular wind chime

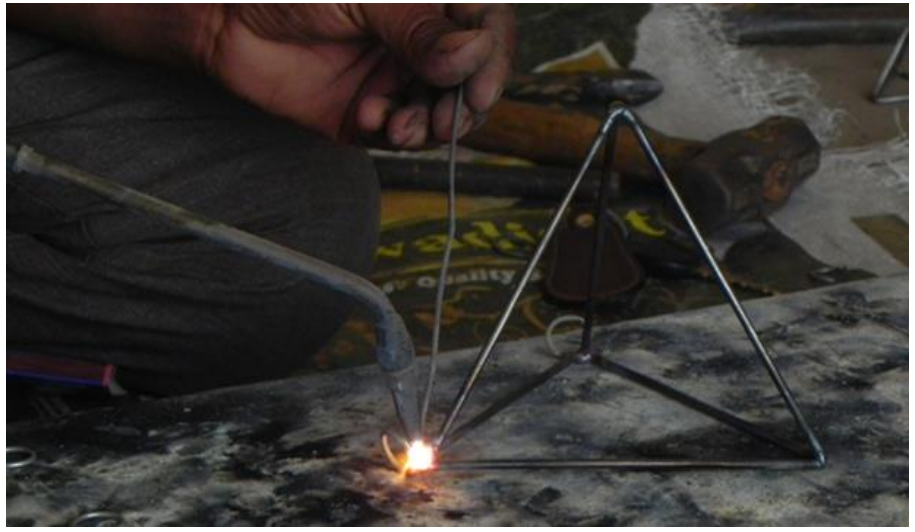


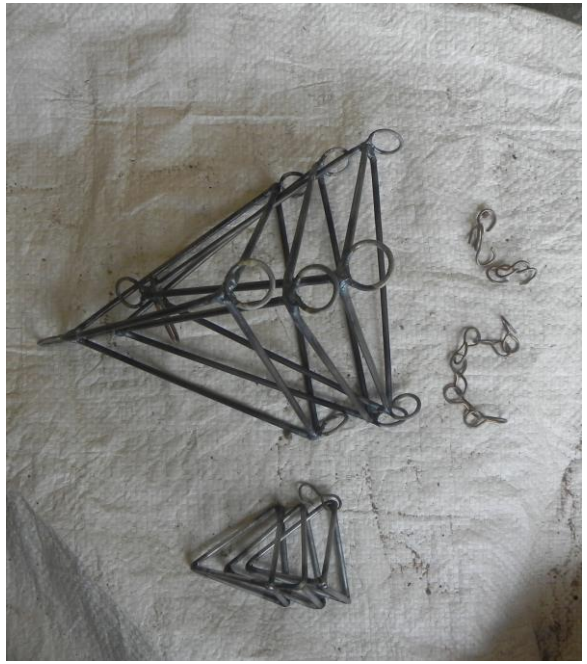
- Form inspired from tetrahedral kites

- 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.



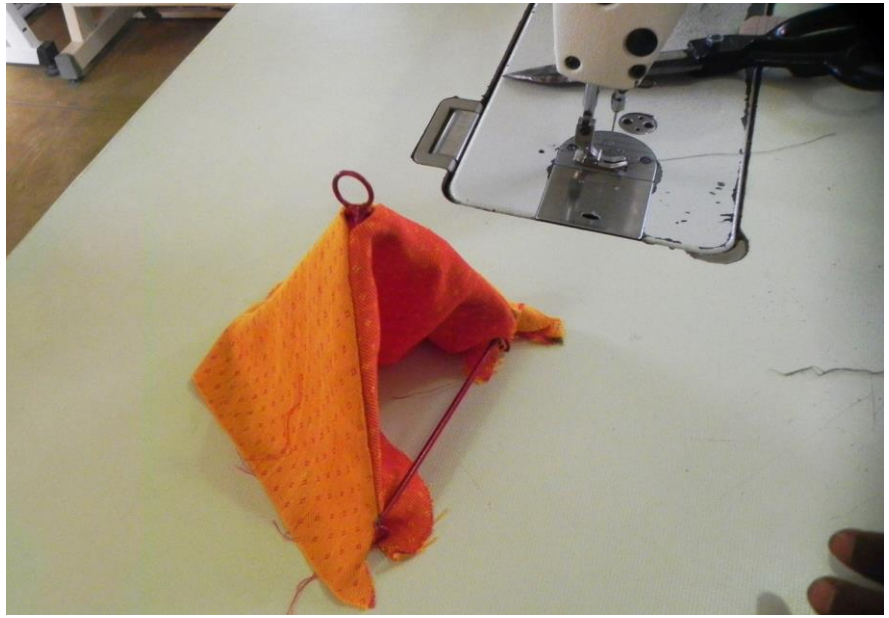




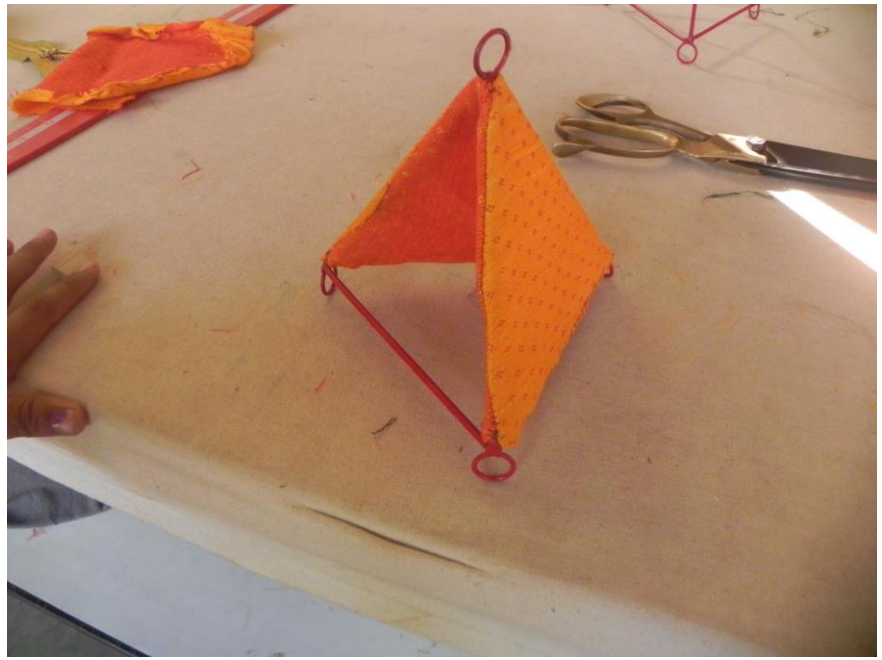


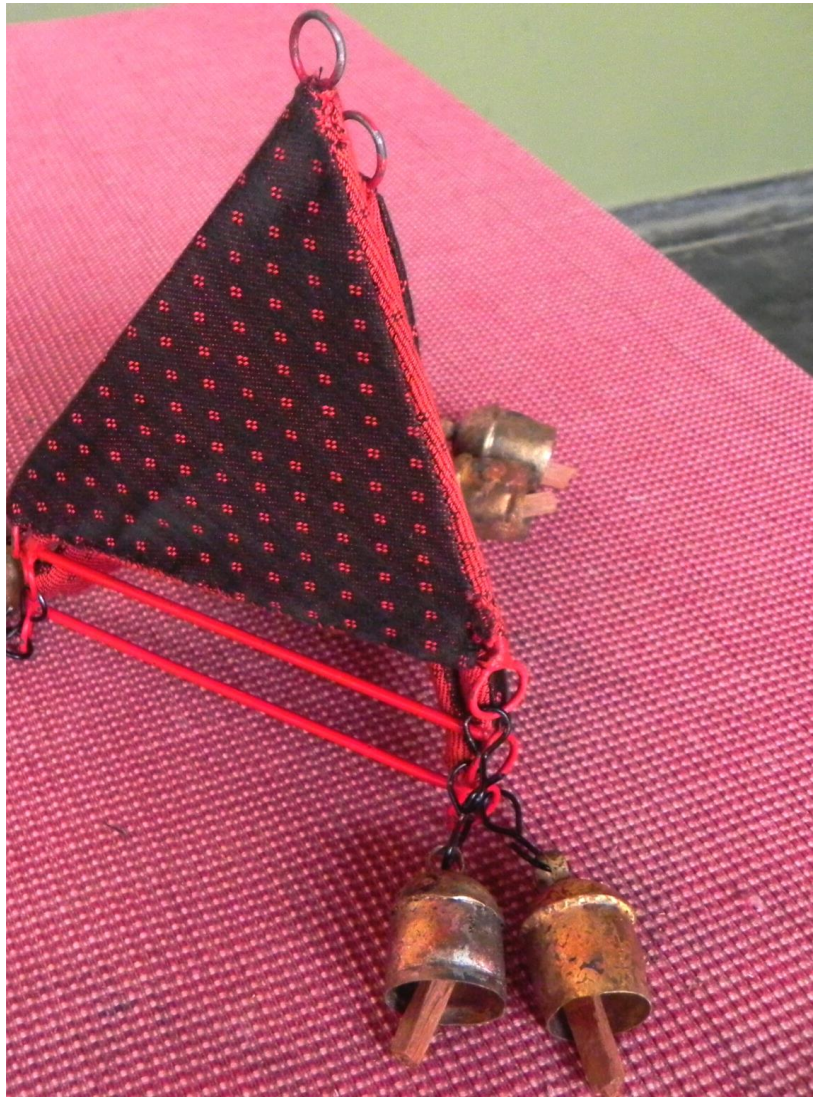
- The tetrahedral frames are made by gas welding MS wires of 3mm thickness.

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

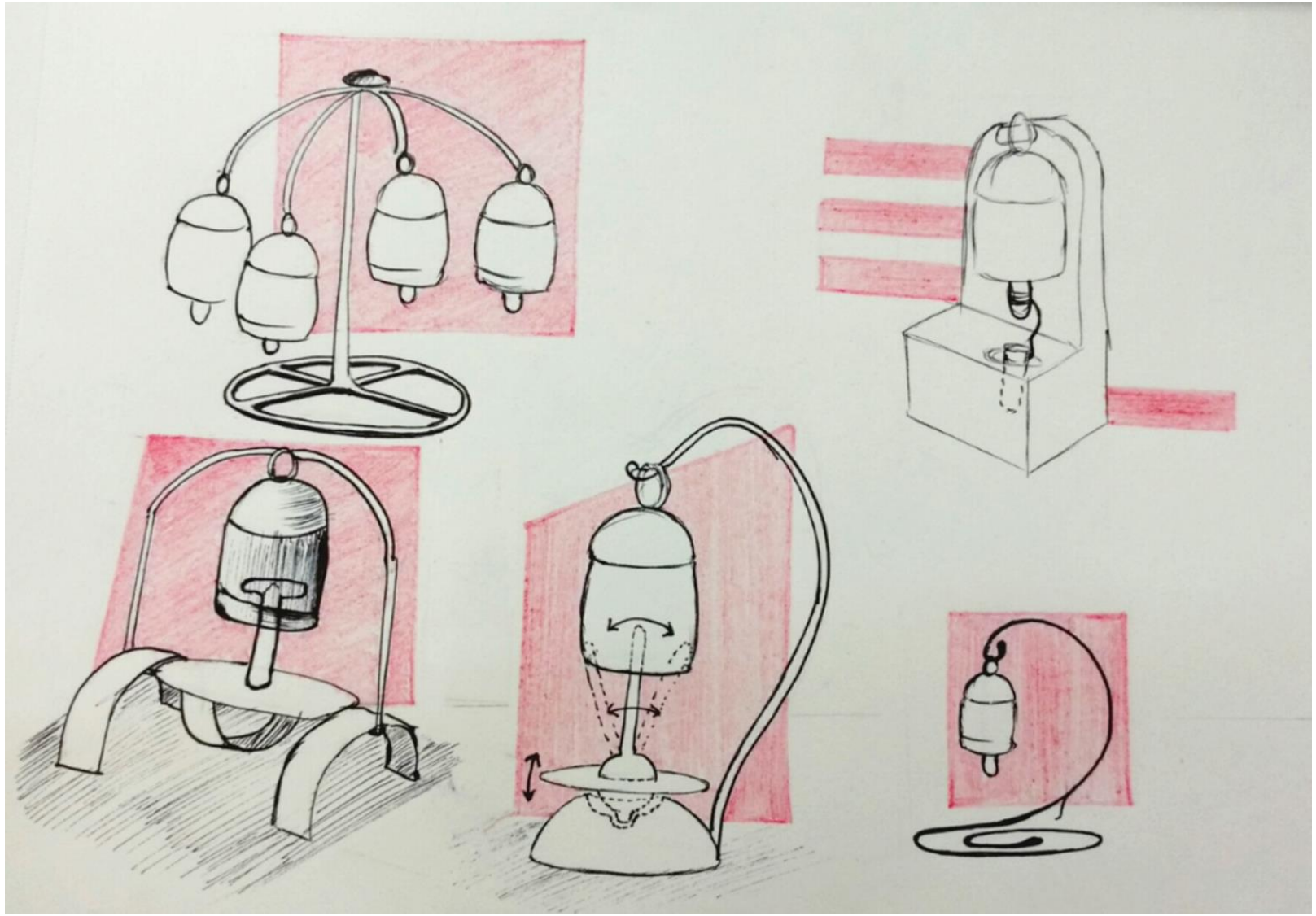



JUKI





# Tabletop bell

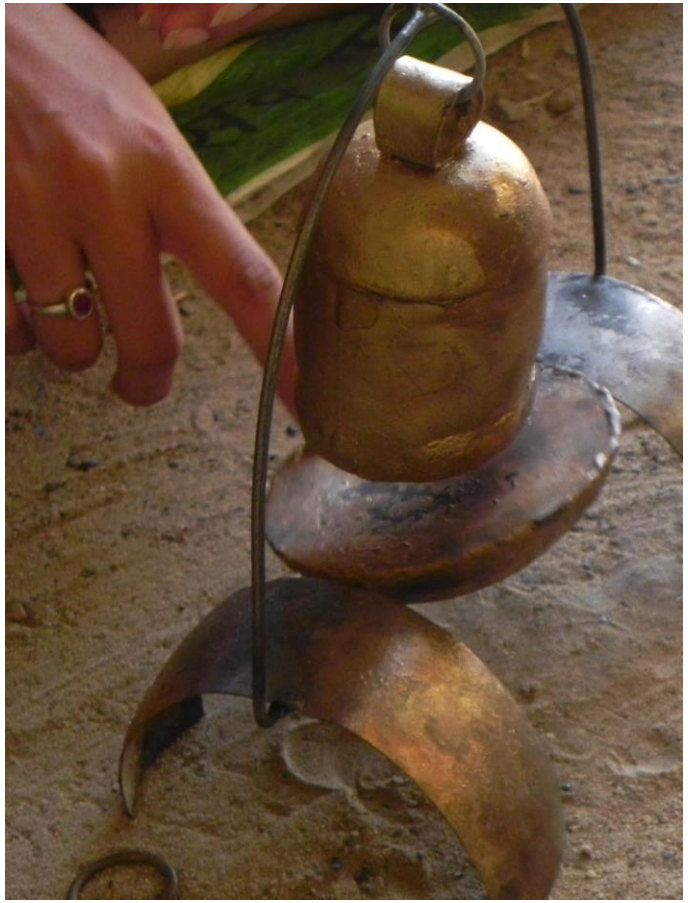


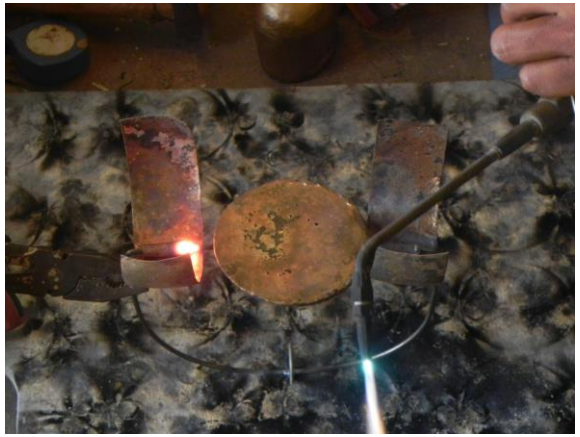




The table bell consists of a swivel base and semicircle bhabri parts. The topi base is of no. 10 and the legs are bhabri parts, having dimensions **1.5*7** inches.

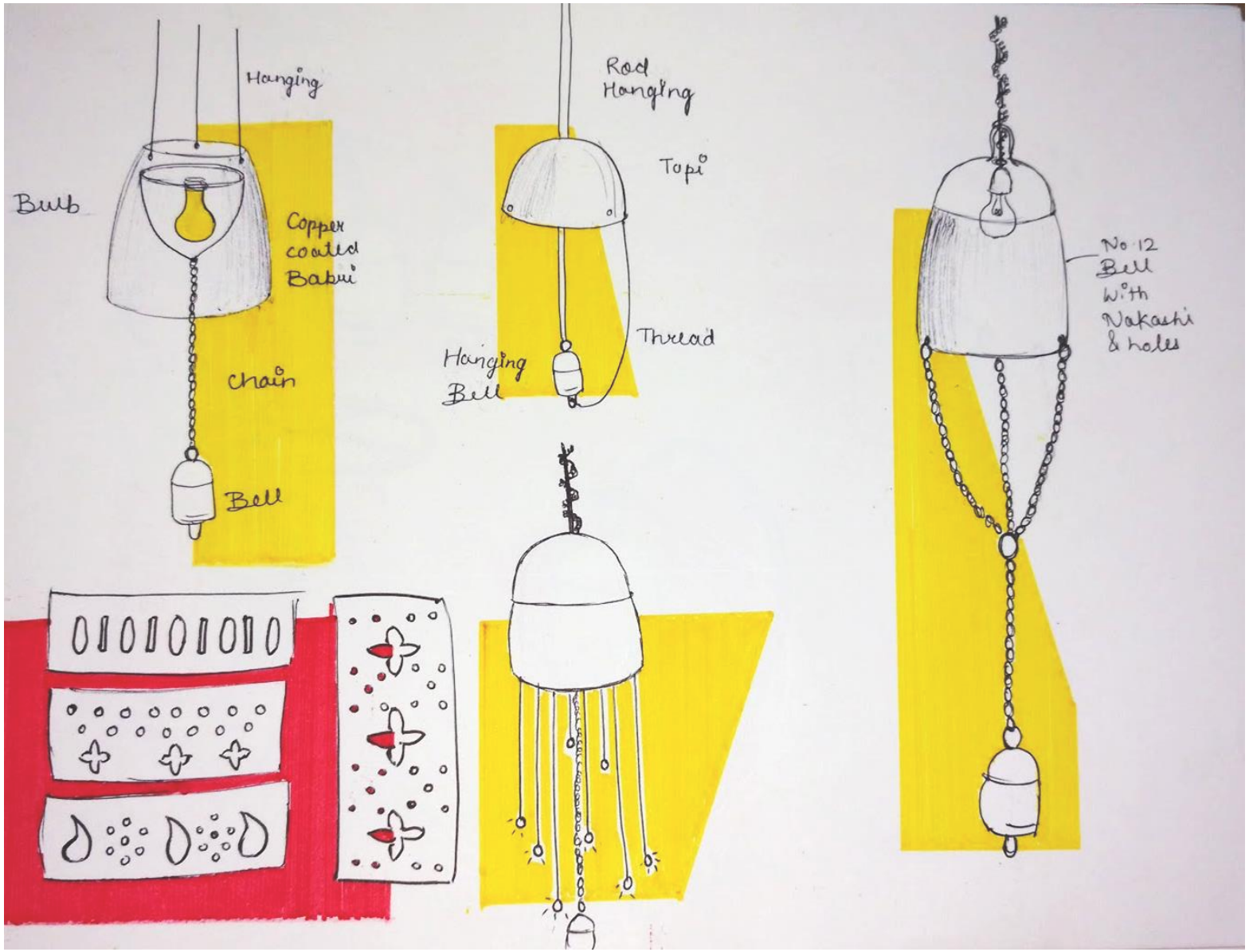




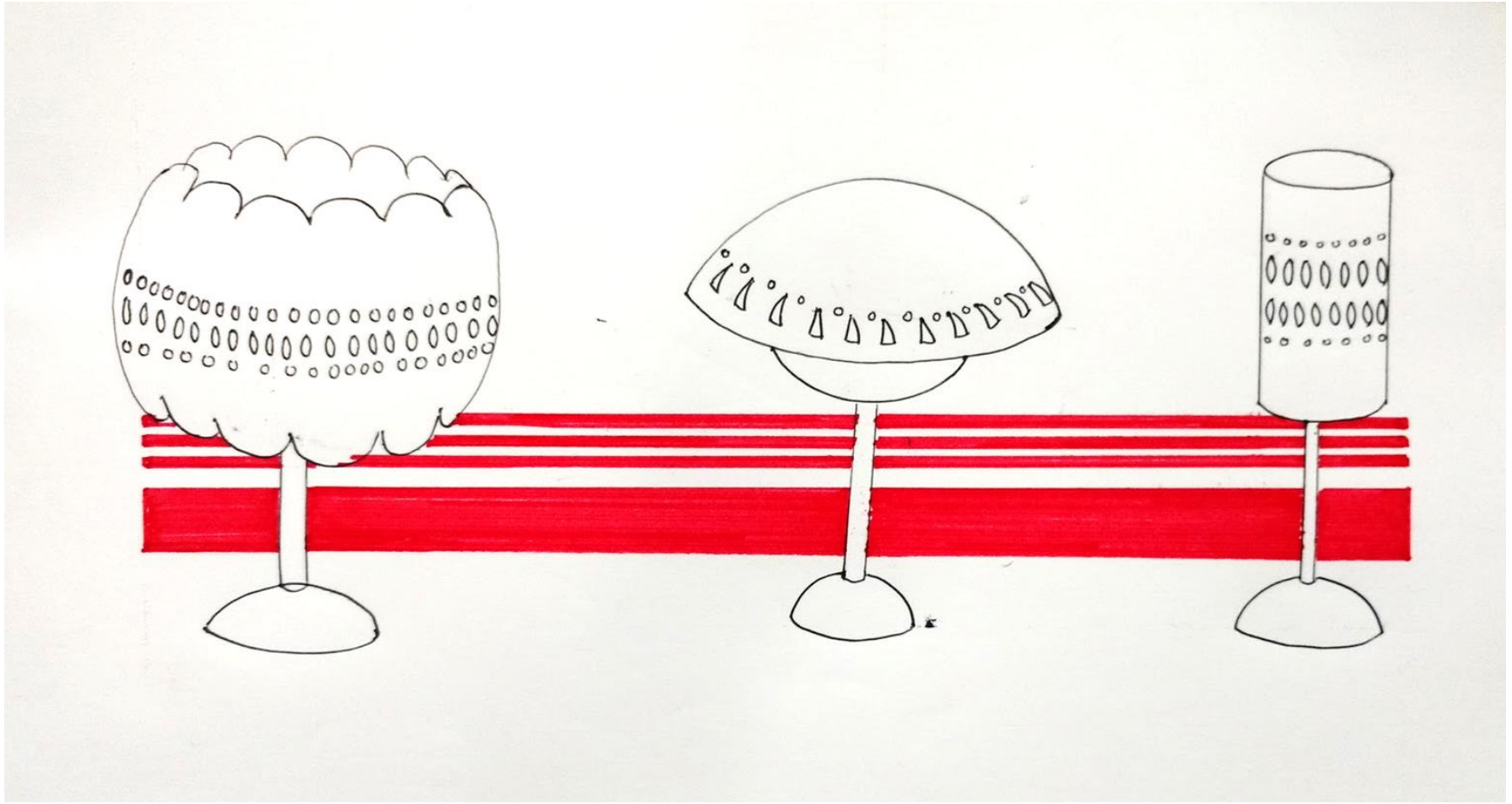


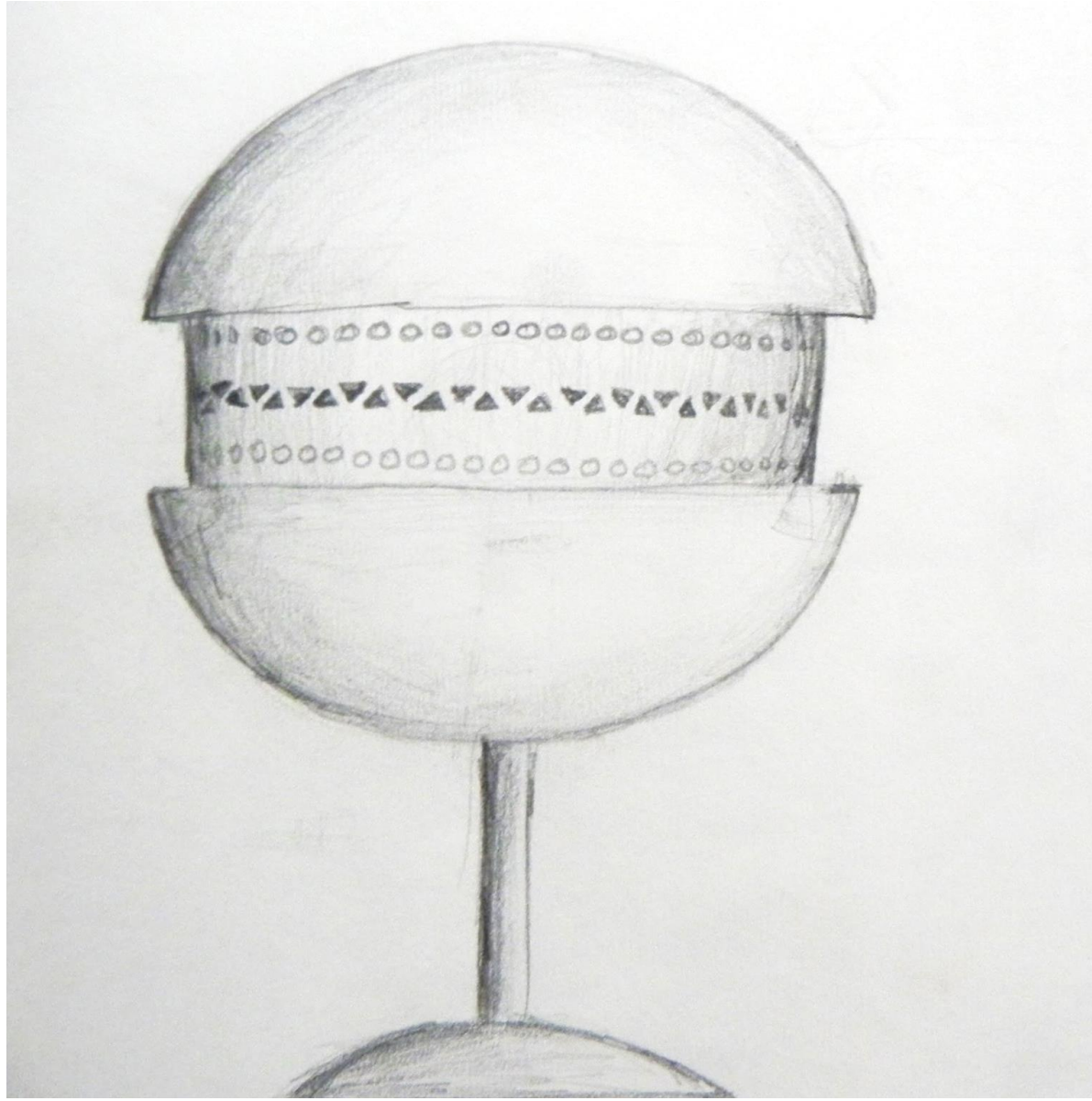
# Hanging bell Lamp Shade

## Concepts

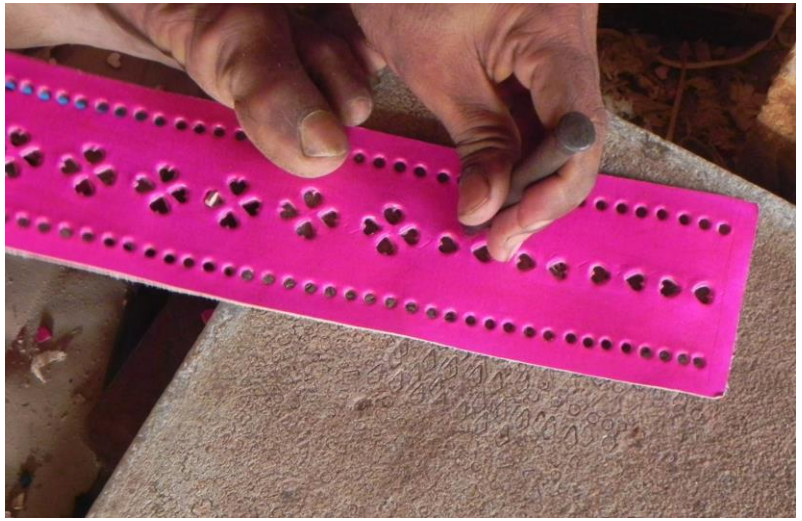


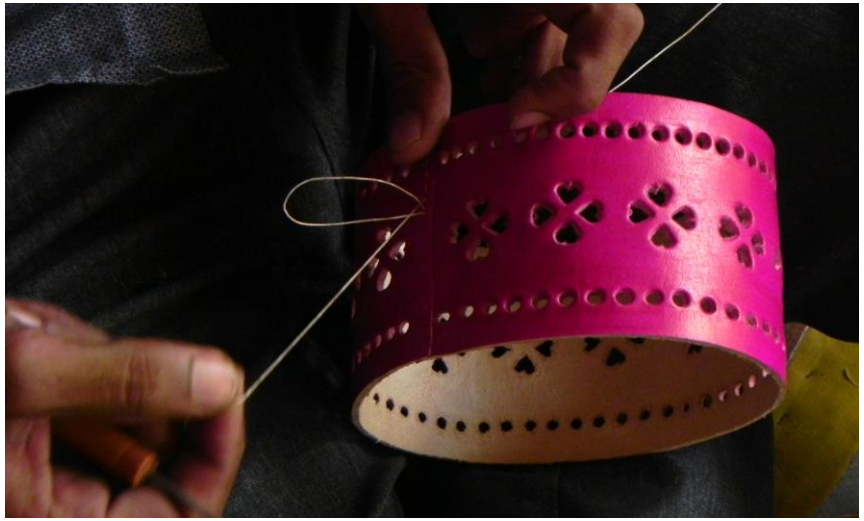
# Lampshade





## 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

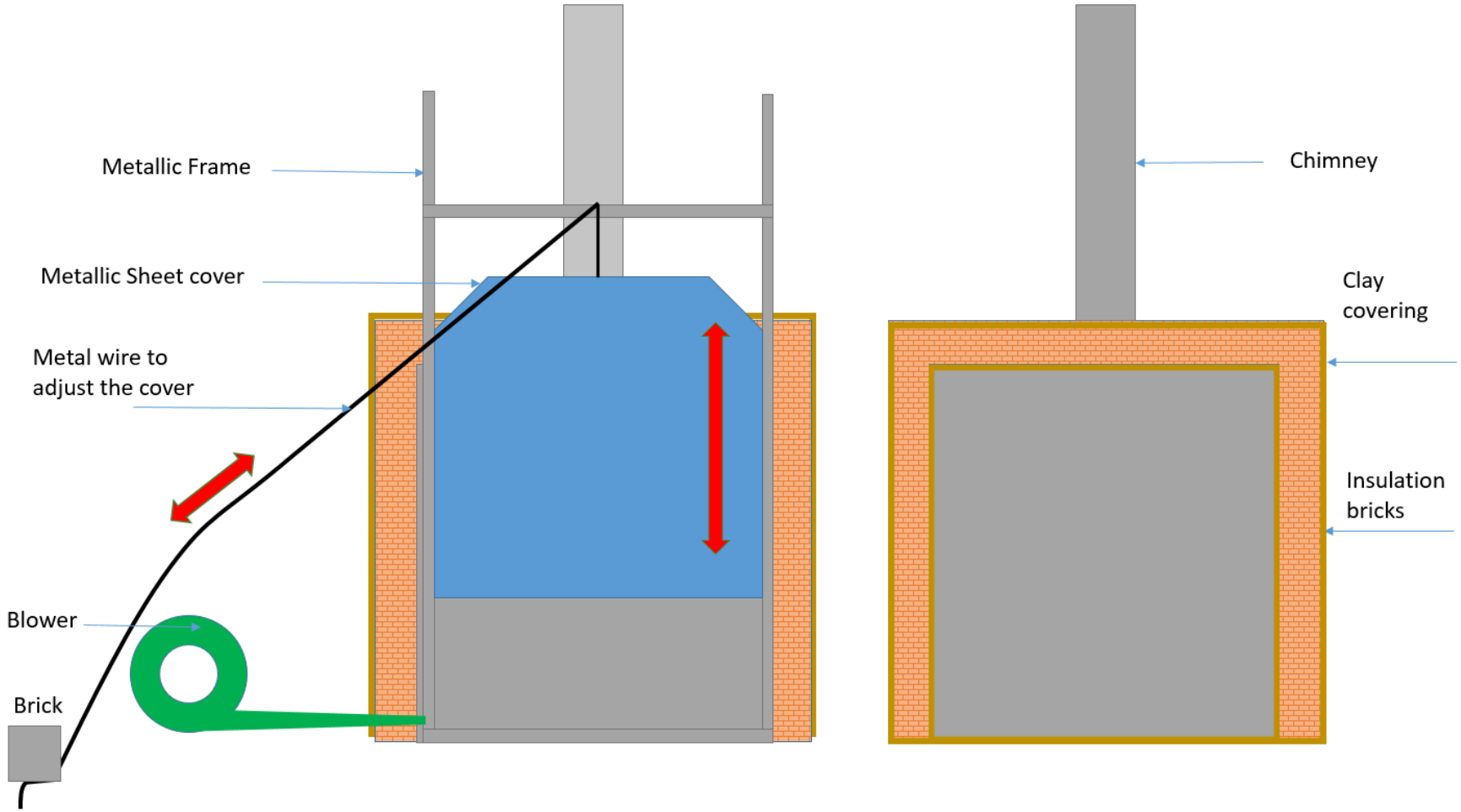
## Old furnace

## Current design

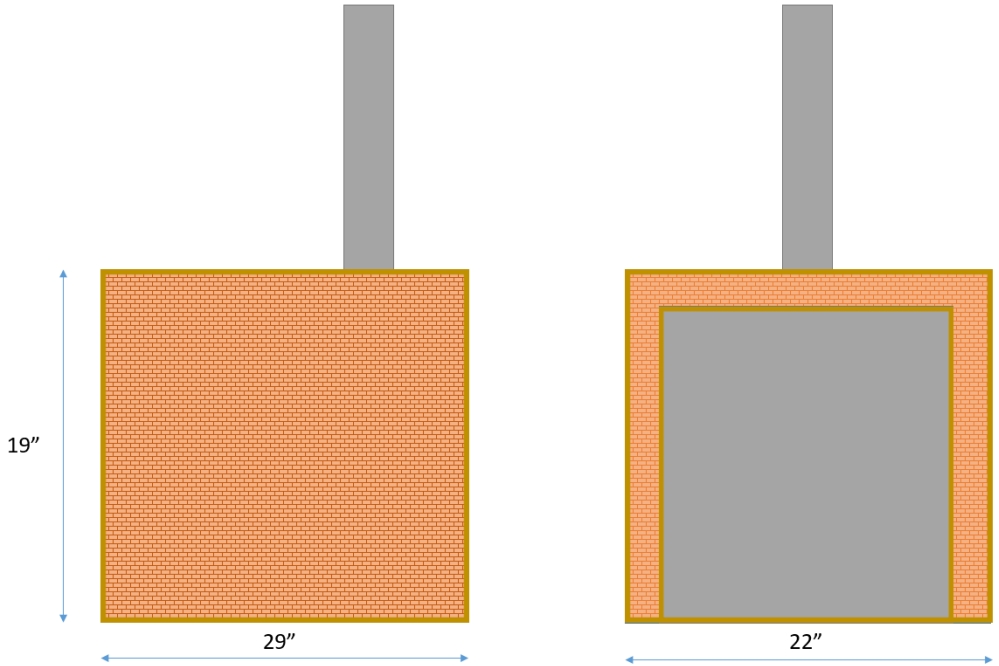
### Issues in Older design

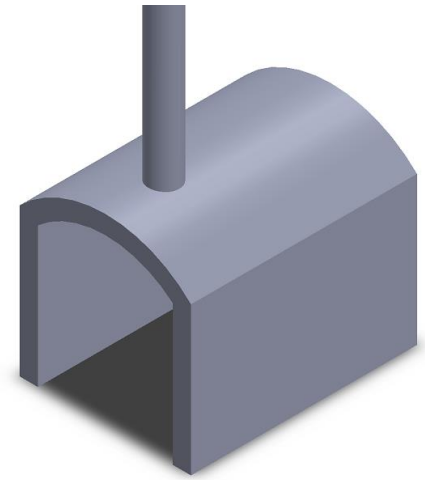
- No chimney
- Normal bricks used were breakable
- Lower life of furnace
- No sheet cover to protect the person from heat
- In some cases, lack of electric blower. Blowers used were manually operated.

# Current furnace design and arrangements



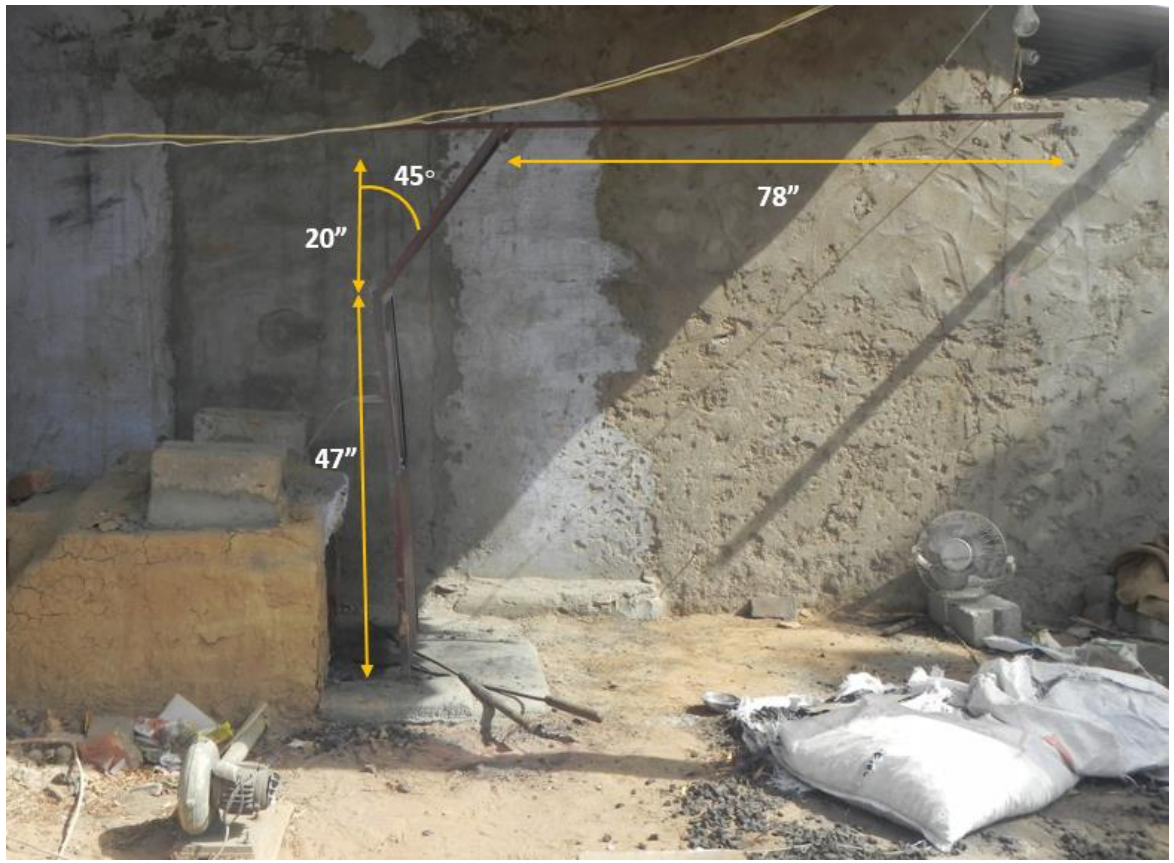
## Dimensions of current furnace



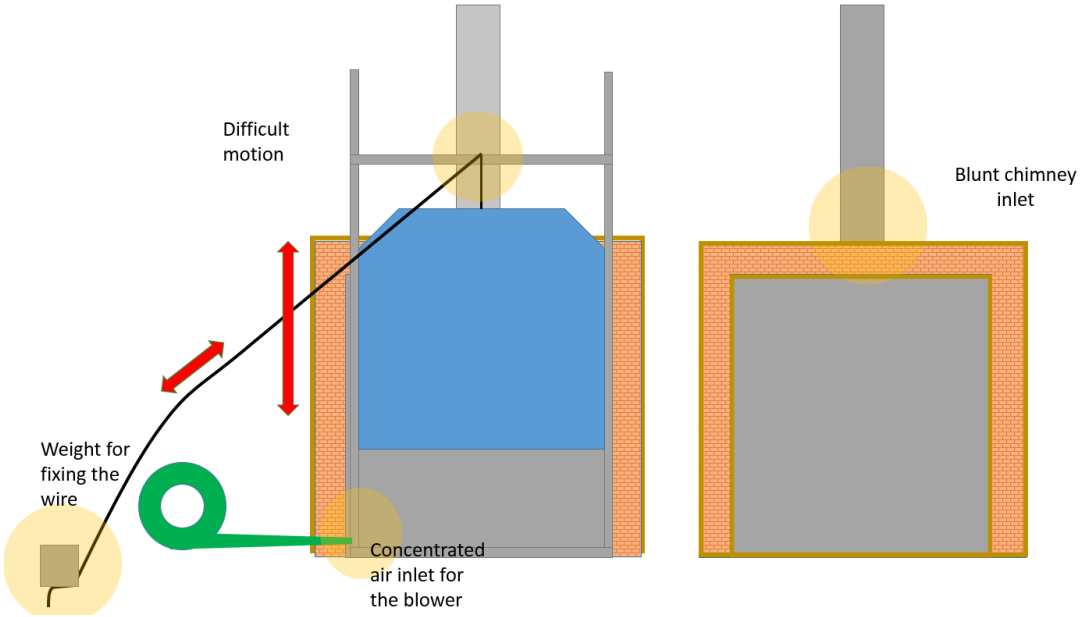



- Three walled furnace with dome shaped roof with chimney on the front of roof

## Dimensions of furnace covering arrangement

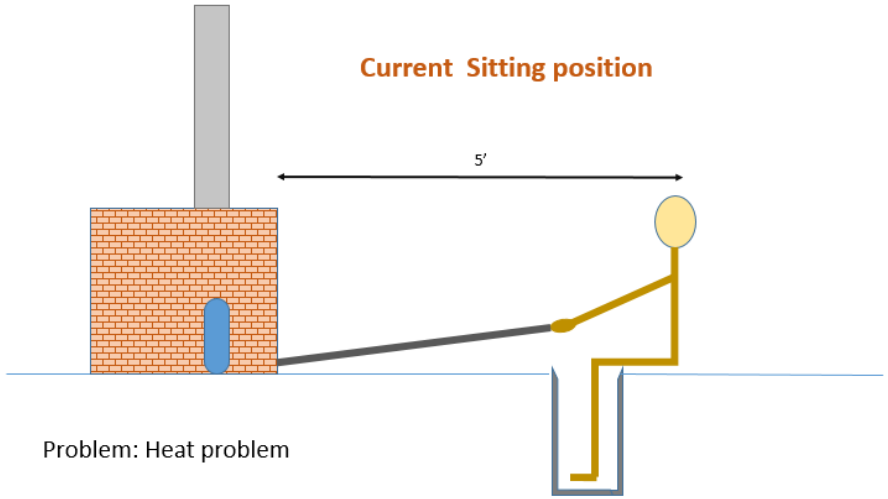


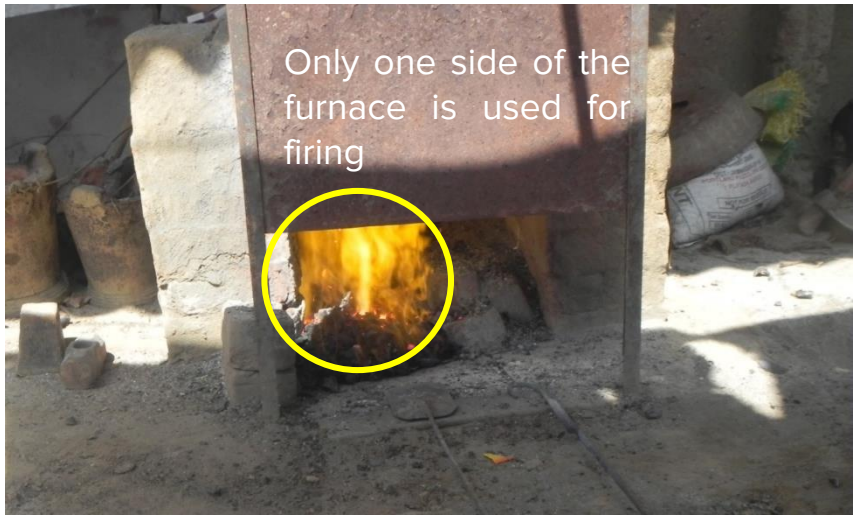
# Issues in current design

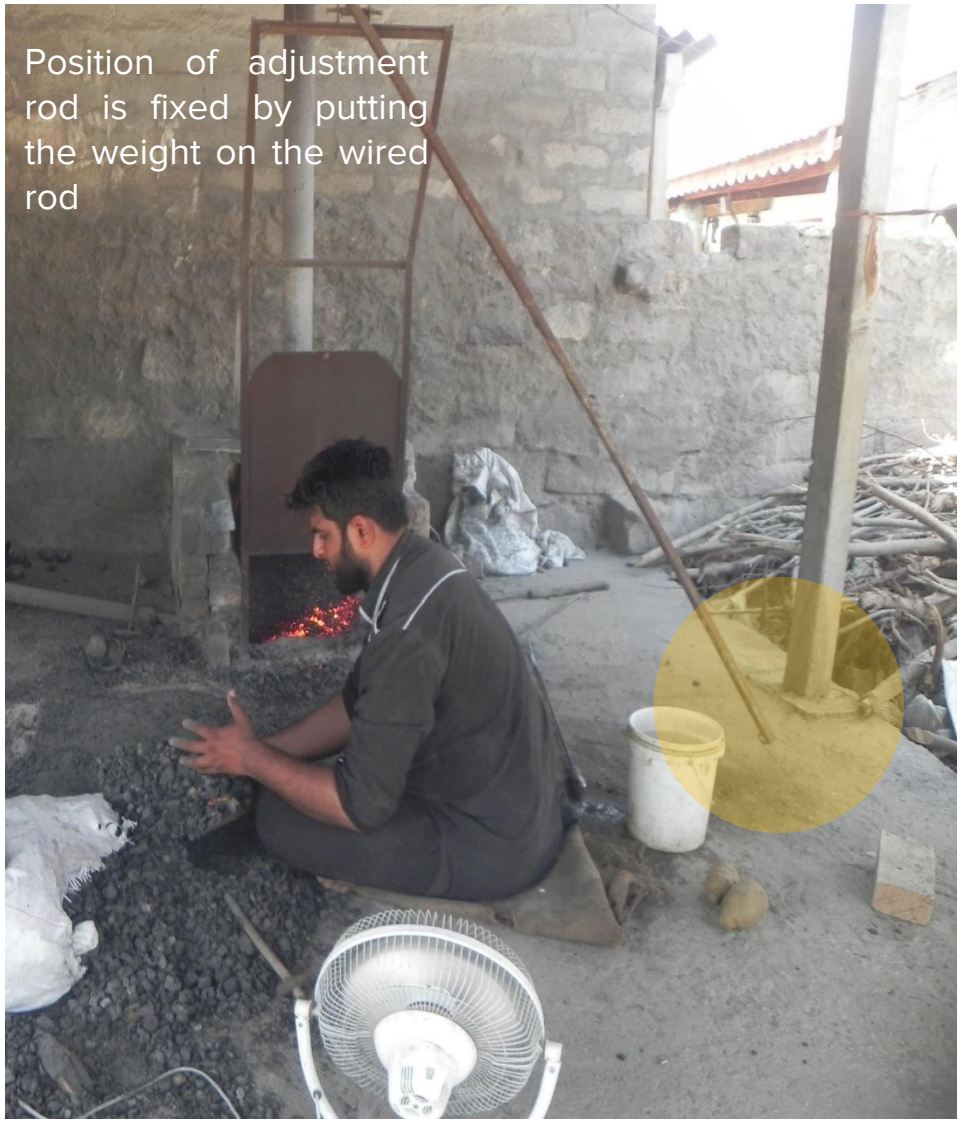


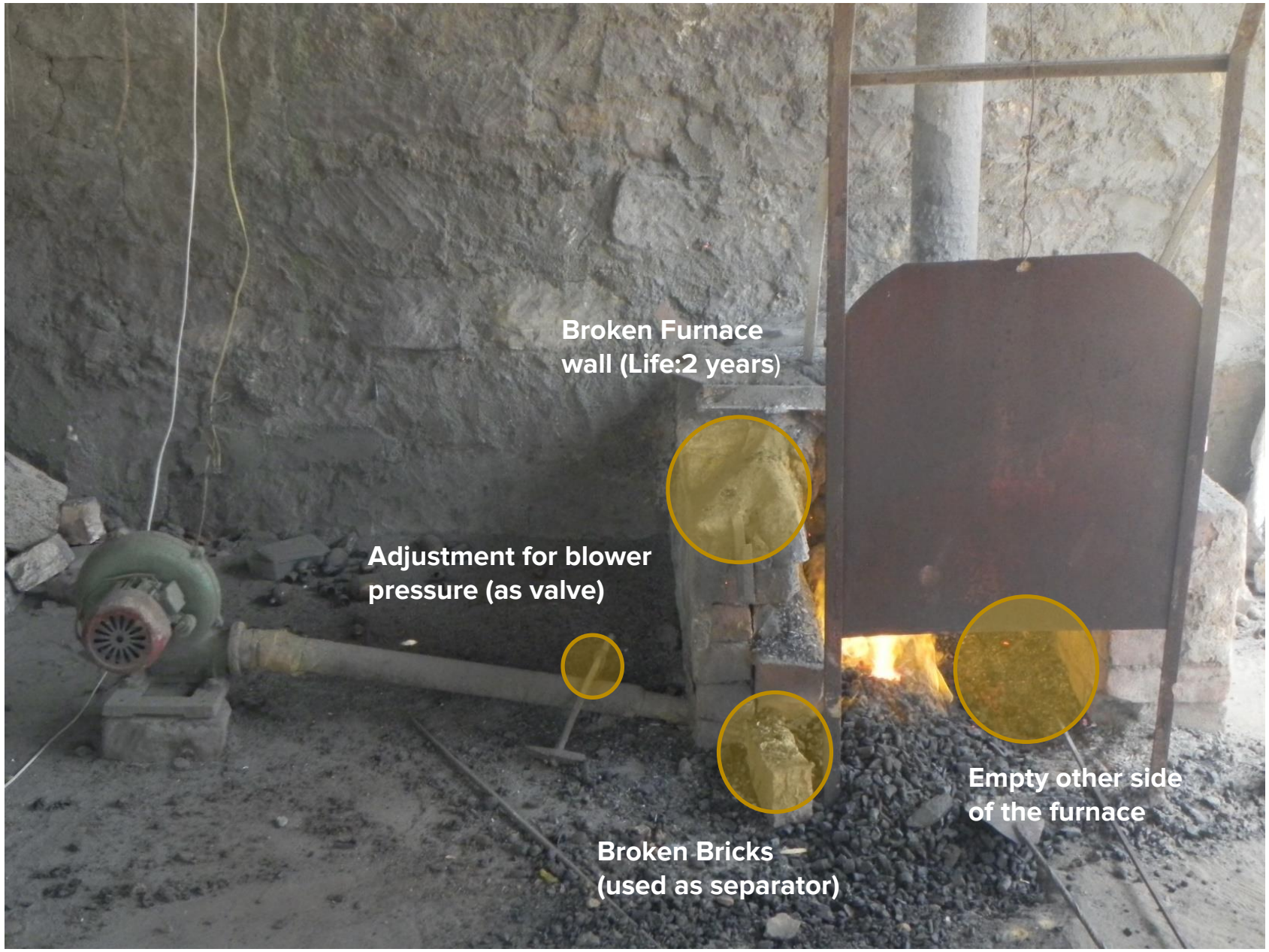

- The chimney opening at the furnace end is blunt which resists the fumes to exhaust from the system creating bad work condition.
- The air from blower is concentrated only on one side of the furnace resisting the other half to ignite properly.
- The furnace cover is stabilized in one position by wire 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

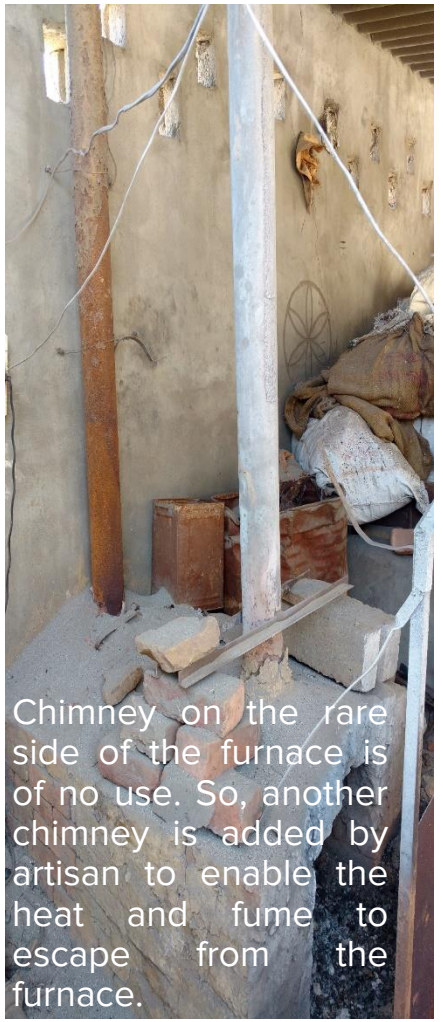

Position of adjustment rod is fixed by putting the weight on the wired rod


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


Open side and top


Extra fan is needed as the work environment temp goes high

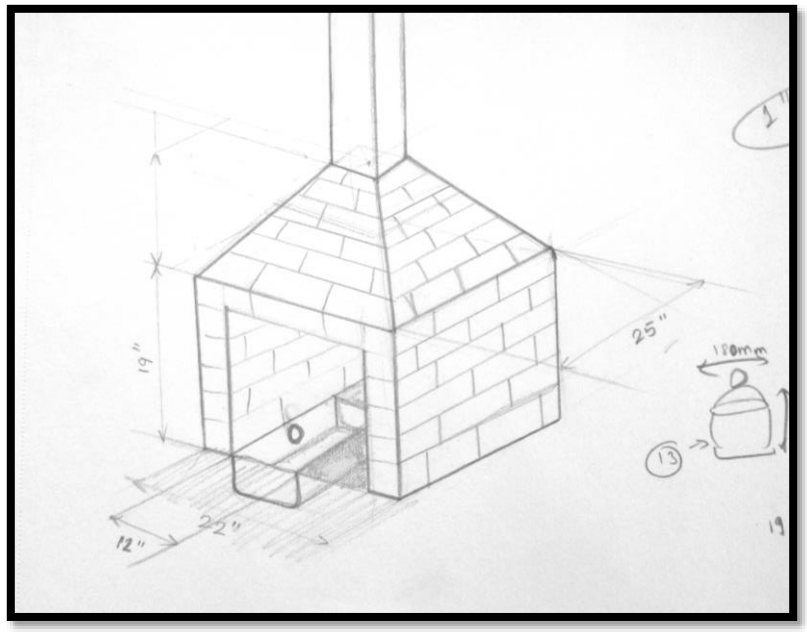

Added weight is needed to hold the adjustment rod in one place and the cover sheet in downward position

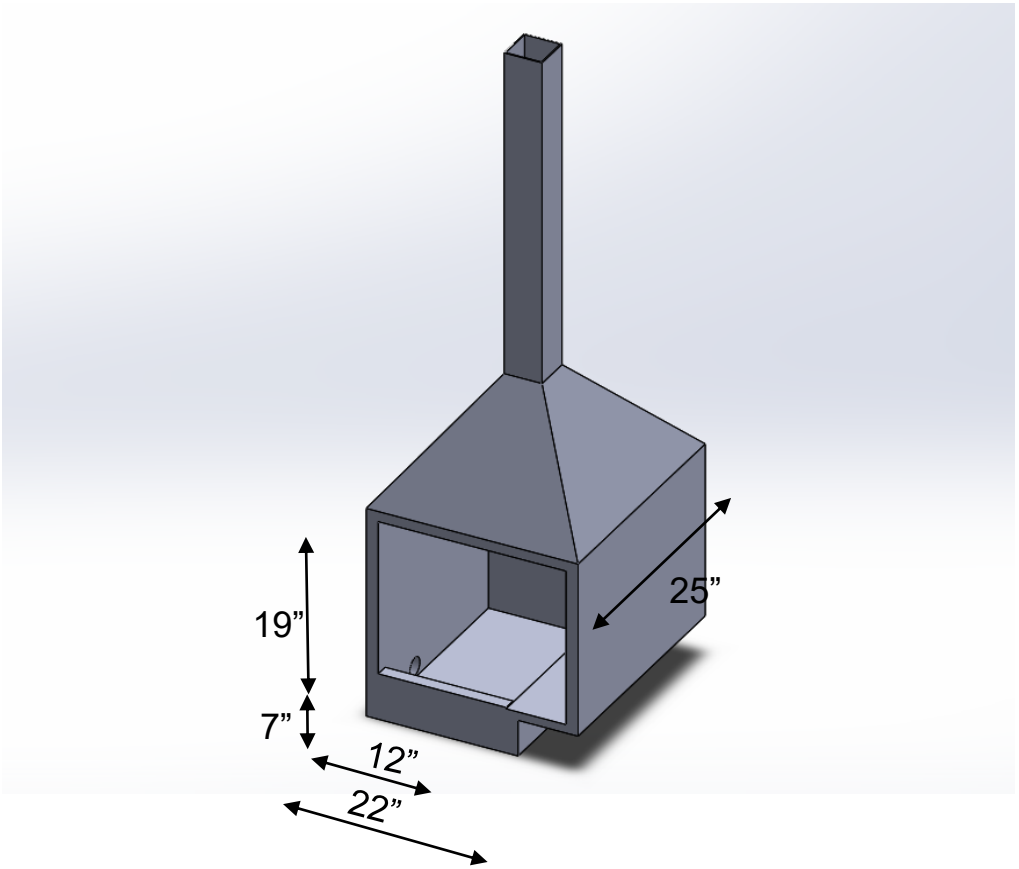

Chimney on the rare side of the furnace is of no use. So, another chimney is added by artisan to enable the heat and fume to escape from the furnace.

# 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.

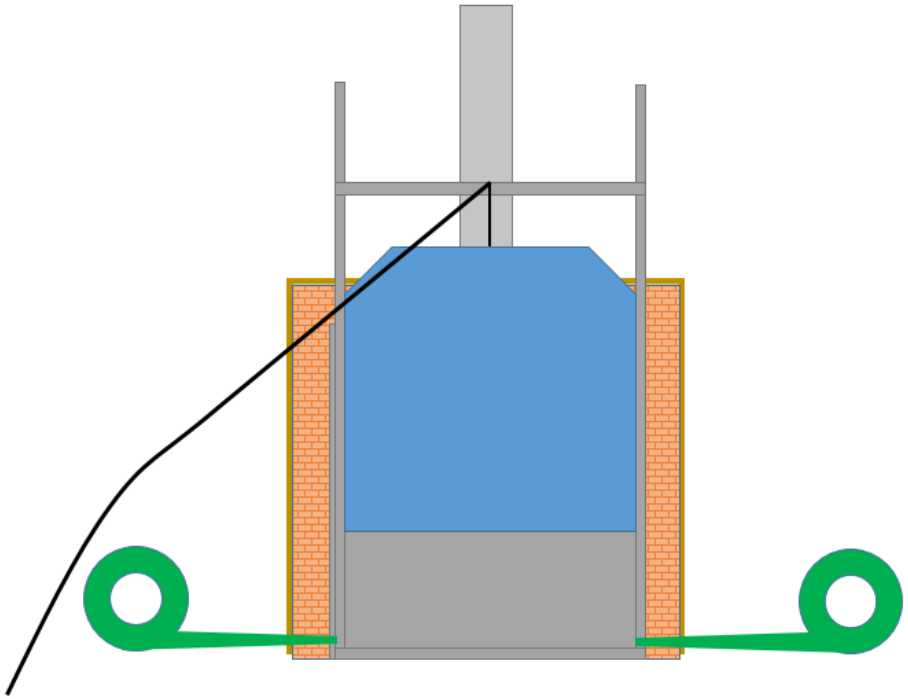


## Design suggestion 2

**Two Blower furnace**

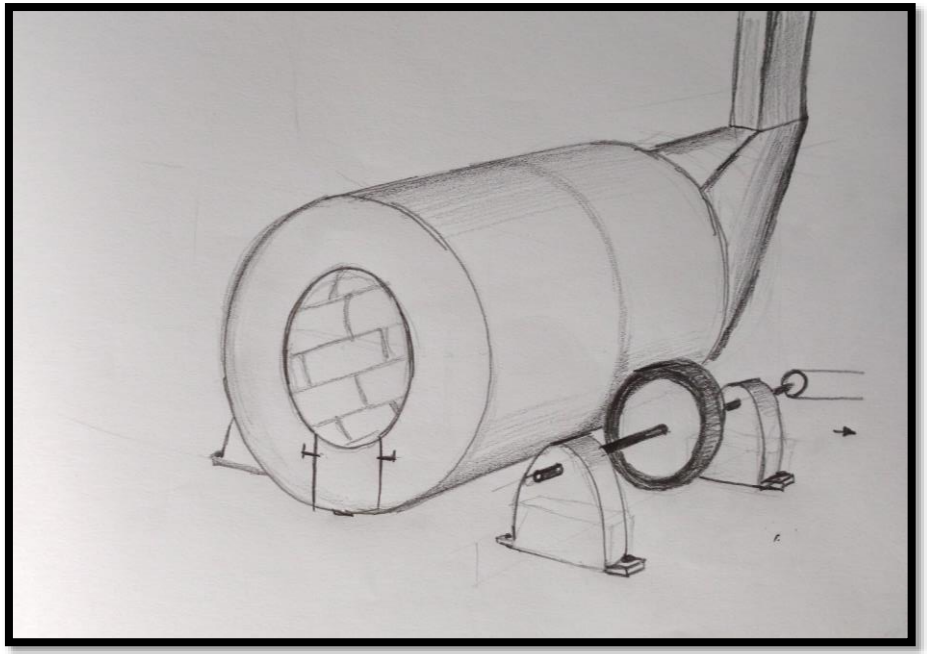
- Using two blowers from opposite sides will allow to heat the coal in less time while firing bigger bells or 1st bell provided the blower outlet reaches the firing area properly.
- One of the blower can be fixed while the other can be kept temporary and adjustable.



## Design suggestion 3

**Rotating drum furnace**

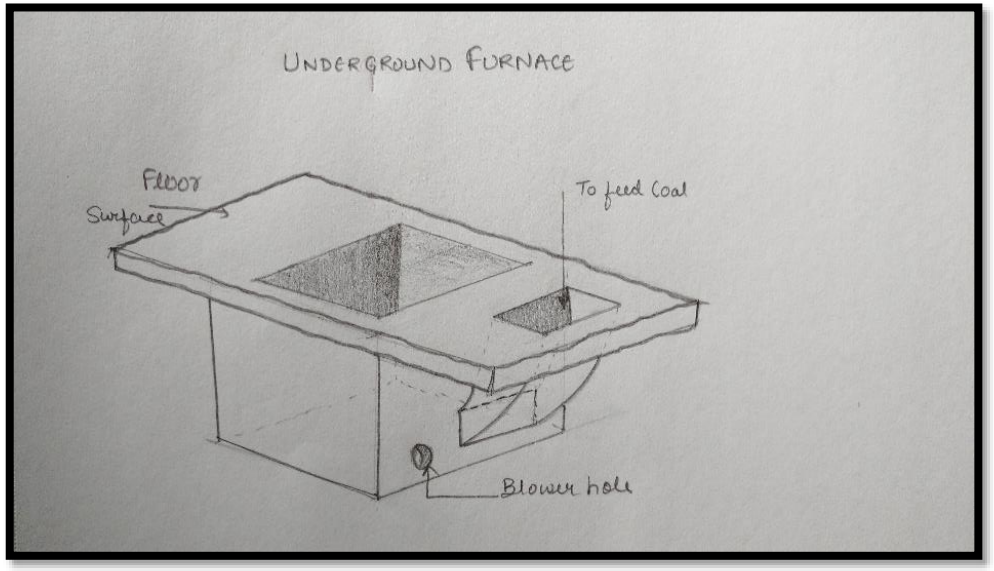
- This is a very basic idea where just like the rotating furnace drum used in industry, the same idea can be used here to fire the bells with uniform heating and without any need to rotate the bells manually.

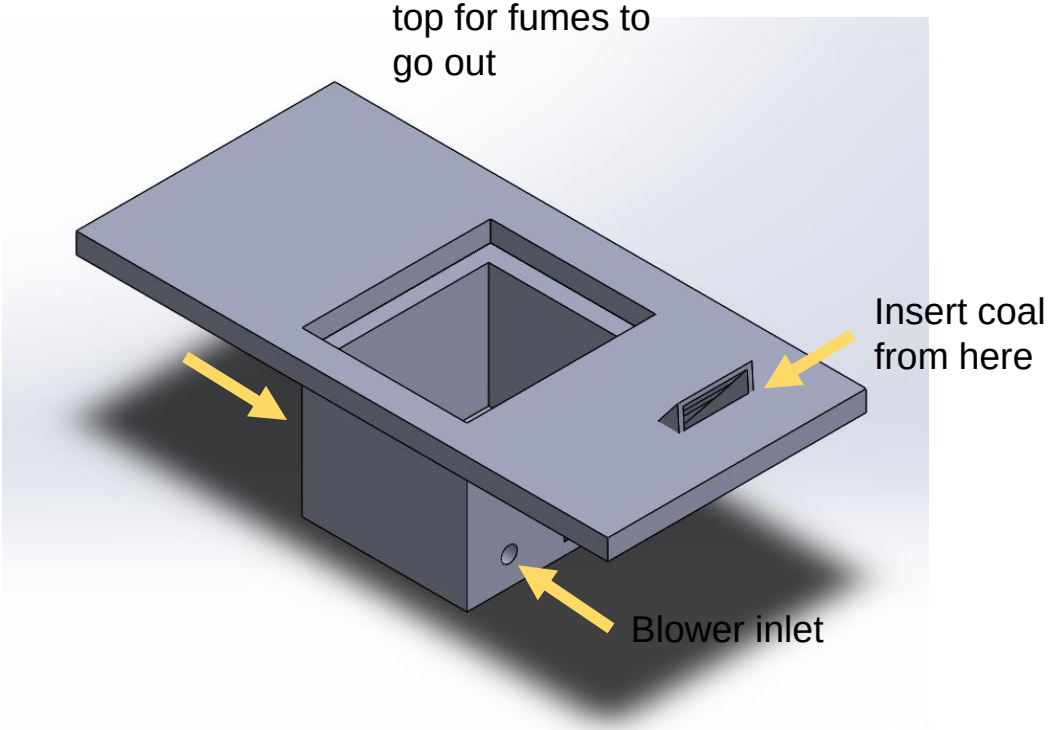


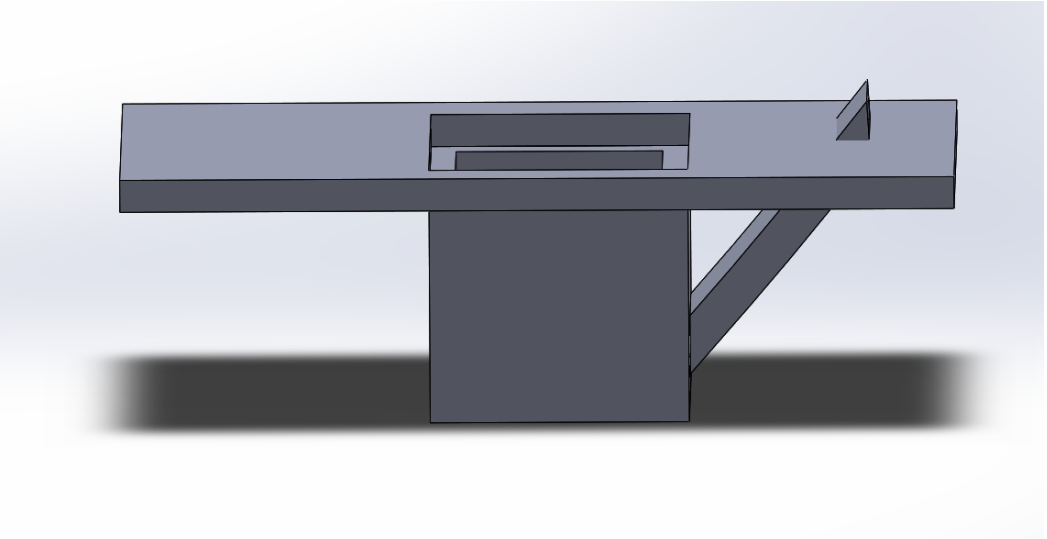
## Design suggestion 4

**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

Prof. BK Chakravarthy, head, IDC, IIT Bombay.
Prof. AG Rao, IDC, IIT Bombay
Ms. Juhi Pandey, Director, Khamir.
Mr. Ghatit Leharu, Khamir
Mr. Paresh Mangaliya, Khamir
Mr. Hemal Thacker, Khamir
Mr. Dipesh Buch, Khamir
Akthar Bhai, Amruth Bhai, Khamir.
Mr. Jogi Panghaal.

**ARTISAN TEAM**
Luhar Ibrahim mamad, Jura
Sadam Ibrahim  luhar, Jura
Ali Ibrahim luhar, Jura
Akbar Ibrahim luhar, Jura
Ayub Ibrahim luhar, jura
Amir hamja alibhai, jura
Abdul sumar, Bhuj
Iqbal remtulla luhar, Bhuj
Ramjan luhar, Bhuj
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# Thank You!