Design Resource

Brass Casting - Kerala

Making of Brass Artifacts, Padoli Kerala

by
Prof. Bibhudutta Baral, Divyadarshan C. S. and Amulya S.
NID Campus, Bengaluru

Source:
http://www.dsource.in/resource/brass-casting-kerala

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Introduction

We all come across metals in our daily lives. Metals play a vital role in our human's life. From a utensil to a show-piece we procure metals. Metals are found in solid form and are very strong except mercury; hence the metals are used in construction of the buildings, railways, bridges and many more. Metals have a lustrous appearance, thus it is used in ornaments and decorative artifacts. Metals can be shaped into anything like a sheet, wire and objects, due to its malleability, fusible and ductility characteristics. Metals are very good conductors, hence they are used in electrical appliances. Metals are sound makers, thus they are used in musical instruments. Metals are essentially recyclable; hence it is highly recommendable substance to use.

Metal have been extracted from the earth by mining ores, which are the sources for many metal industries. Metal works requires masculine efforts, extraordinary skills and strength. Metals are been taken into a consideration as a much desired matter of state to the human's life. Thus it is evident in every corner of human existence. Metal is been composed into many alloys by mixing often two metals or a metal with a chemical element, for the good enhancement of the material. Steel, solder, brass, phosphor bronze are few examples for alloys. As referred before metals have many characters that is favorable to human lives which lead to invention for innumerable objects.

Metal art is present from the ancient times to make objects for adornments, religious artifacts, and trade instruments of precious metals and weaponry instruments. The artisans, blacksmiths, atharvavedic practitioners, alchemist, and other categories of metalworkers around the globe are practiced the metal art. In India the origin of metal art arose at the time of Indus valley civilization, a beautiful figurine of a dancing girl. Ever since then India is been extraordinary metal art producer. Different places holds unique styles of metal art, like koftagari art of Rajasthan, rich engraved traditional silver samovars of Kashmir, cast sculptures of deities in Uttar Pradesh and Gujarat; Madhya Pradesh Ornate metal boxes of Bundelkhand, lamps of Sarguja, rice measuring bowls and animal figurines of raigarh; Andhra Pradesh bidri ware, sheet metal work of Pembarti, well-designed utensils of Srikakulam and the very famous Dokra metal art from various tribal belts of Andhra Pradesh, Orissa and Madhya Pradesh.

Kerala is one of the finest places to find exclusive arts and handicrafts. Metal craft is the pride of gods own country, Kerala. Bell metal that is Brass casting is one of the oldest traditional art forms practiced still now in Kerala. Brass metal is been acquired in various metal art forms because of its gold like appearances, lustrous features and its combination of high workability with hand tools and durability. Brass metal is also used in musical instruments like saxophone, harmonica, trumpet and many more because of its acoustic property. Idols, exquisite variety of traditional lamps, arches and pedestals for the idols and many decoratives for the temples are made out of brass. Multi-layered lamps, the Greek lamp (Changalavatta), the Archana lamp, the Arati Dipa , the Aranmula metal mirror are few fame products made out of brass metal in Kerala. Even now few artisans from Trivandrum practices the Koftagari style of work in figures of deities, landscapes, floral designs and fancy articles.

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Padoli Govindan Andhithiriyan from Padoli, Kerala is the one of the artisans who practices and has experience of fifty years in brass casting. Being the son of the father who served in temple by making traditional brass equipment inherits this tradition from the age of fifteen. The artisan owns a studio and equipment required for the brass casting in Padoli along with the help of family support and very skilled employees. The artisan implements lost wax method to make beautiful brass articles.

A wooden door with intricately sculpted brass mural as its handle and latch system.

A brass idol of Goddess Lakshmi, which is casted, and has to be buffered before its ready.

Brass water and flower vase, used for decorative purposes, being detailed with beautiful motifs.

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Artisan beating the sheet metal, to a smaller mass, so that it can be put into melting pot.

A close view of brass chain, which is used in decorative purposes.

Artisan covering the clay model with clay.

A clay negative mold, in which brass will be poured.

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Tools and Raw Materials

Following are the tools and raw materials used for the process of Brass Casting:

- **Chisels:** These are used in designing and shaping the sculpture.
- **Hammer:** It is used in hitting the chisel.
- **Refined Sand:** Anthill sand or riverbed soil strained for the moulding purpose.
- **Bee Wax:** Raw material used in making the model of sculpture.
- **Furnace:** A pit made for melting of the metal.
- **Crucible:** It is made out of clay graphite and it is used like a container to melt the metal in it.
- **Charcoal:** It helps is producing huge amount of heat.
- **Furnace Tongs:** Round Head, Rake, Stopping Hook, 'S' Hook Casting Brackets tools used in lifting, holding and balancing the Crucible
- **Brass Metal:** Metal used in sculpture.
- **Clay:** It is used as a binding component in moulding.
- **Water:** It is used in washing the sculpture.
- **Gas Propane and Torch:** It is used for ignition of fire.
- **Tamarind Pulp:** It is used like a soap which helps in cleaning the sculpture.
- **Furnace Exhaust Motor:** A machine for blowing air to obtain fire flames in the furnace.
- **Buffing Machine:** It is used in dusting and cleaning of the casted article.
- **Wooden Round Stick:** The stick used like a base for the model in hallow casting.

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- **Bamboo Tools:** Handmade tools made according to requirements of the artisan.
- **Tools:** Spatula, knife and scraper used while modeling the article.
- **Brush:** It is used for cleaning of the sculpture.
- **Iron Rod:** It is like a soldering material heated to join two ends of the wax.
- **Iron Wires:** It is used like the armature by winding it round the second layer of the mould, which holds the mould together.
- **Rings:** It is used like an open cap over the furnace and mould which dodges the dust particles from getting in.
- **Sack:** It is used in last layer of moulding process which enacts like the binding object.
- **Nitric Acid:** It is used in cleaning the metal article from the sand dust.
- **Emery Paper:** Paper with rough texture used in refining the metal article.

A raw chunk of Wax, which artisans purchases from market

A heavy wrought iron container, in which other metals are melted, keeping it in a fire furnace.

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A coloring agent, used in coloring of wax.

Pliers of different shapes and sizes, used in holding containers, in which metal is melted.

Cutters used in shaping and sculpting the wax model.

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A lid, which is used in closing the wood fire operated furnace.

Set of negative molds made from a wax model.

A pit, used in firing the negative molds and as a furnace.

Large containers, containing water, with wax floating on the surface.

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A Large sized hammer, used in reshaping iron, which are to be melted.

A shovel, used in digging and relocating sand.

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Coal pieces, which are used in furnace, for firing purposes.

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An LPG cylinder, used in burning up the wax and metal.

A weighing scale and copper / brass objects, being measured, which are to be melted.

A large divider, used in measuring the accurate measurement of the wax models which are made.

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A bundle of GI wire, used in constructing large sized molds.

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Sheets of wax, which are used in preparing an original wax model.

A handheld buffing machine, which is used in polishing the metal, after it is casted.

Clay and water, which are used in making of a mold.

A small sized hammer and an Iron weighing bar.

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Air blower, used in firing up the furnace.

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Making Process

Artisan keeps the requirements of the process like raw materials, tools near to him. This process requires an open plain space. The artisan should be very cautions while performing this process. The required article is thought and drawn for the reference of size and shape on the wooden board. The model is made out of the wax, and then sand moulding is done over it. Later wax is removed by melting which creates a cavity and metal is poured inside the mould to obtain the brass sculpture.

Firstly the wax is prepared, the resin from the tree Damara Orientails and groundnut oil in ratio of 4:1 is mixed on the active stove in a container. Once the mix attains little thickness in liquid form the pure bee wax is added in ratio of 4 and stirred until it is mixed well and liquefies. With the help of fine metal sieve or coarse-woven cloth the wax mix is strained onto a container of cold water, which allows the wax to solidify. Now the wax is ready for making the model.

Artisan decides on the article to be made and bifurcate the article into many parts to eradicate the difficulties. The required shape is made with the wax by warming it with the help of fire from the gas propane torch, which make the wax malleable, and with the help of spatula, knife and scraper the final shaping is given. The separated parts are joint and merged by heating the ends of the wax with the hot iron tool, which enacts like a soldering iron tool. The model is attested by the artisan and it is given the required strength by putting wax cross strappings which in a way helps the molten metal reach all the parts of the model without any gaps later when casting is done. A funnel shape which consists of a sprue (top of the funnel), runner (middle of the funnel) and gate (bottom of the funnel) is made with the wax and it is joined at an appropriate location, which links to the whole model. The model is ready with the gating system for the moulding process.

Moulding is done in varied stages of different mixtures of clay and sand. The first layer consists of a refined soil (sometimes they use old moulded mud finely powered), mixed with cow dung forming a thick mixture. This layer assures the protection of the wax model and reproduction of the minute details of the model. The model is completely covered with this layer except the wax sprue top surface, which is the channel to outlet the melted wax and inlet the molten metal for casting. The layer should be ensured of no air bubbles, which damages the mould, and in turn the cast of the model. The model is kept on the paper or cloth according to the size and form of it. The application of this layer is made in a process, like one half of the model is covered and kept for drying in shade or in a mild sunlight then the model is turned and the other half is covered. Since the model is made with wax, the drying process of the mould is made in shade to avoid the melting of the wax.

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The second layer consists the refined soil and clay mixed with water. The thickness of this layer is more than the first layer. It is made in the same process like the first layer and kept for dry. Before the third layer is made the mould is covered with metal wires thoroughly, which enacts like the armature which holds the mould tight, firm and reinforcement is obtained. The third layer consists the mixture of clay mud, powered tiles and sack threads grinded, which makes a very good binding component and avoids the clay to crack. If in case the model is larger the clay mixture is applied once more which makes a fourth layer. Once the last layer is dried in shade, the mould is ready to hold the heat pressure.

The mould is kept in sun on the container with the sprue top surface towards the ground and heated it with cow-dung cakes and dried grass leaves as fuel. The wax model melts and the liquid is flowed into the container. Thus, the mould is acquired the negative cavity of the required model. Now the mould is ready for the casting process.

The main process of brass casting is of melting the metal. The brass metal is collected from the localites villagers and the old brass objects, which are not in usage, are acquired. Copper and zinc or copper and tin alloys makes brass metal. The collected old brass utensils are heated in open-air fire, which softens and helps to mallet it easily. The mallet metal and metal pieces are put in the clay graphite crucible. The furnace is made underground and it is filled with charcoal, later the fire is ignited to a charcoal and dropped inside the furnace were rest of the charcoal is ignited. The furnace exhaust blower is used to blow air towards the heated charcoal to acquire flame and excessive heat, which also helps in igniting the furnace completely. The crucible filled with metal scrap is placed inside the underground furnace. A ring like object is placed over the crucible, which dodges the dust, mud, charcoal or any kind of particle, which disturbs the metal, to fall inside the crucible. The rake tool is used to check the molten metal and to remove impurities found on the surface. The measurement of the metal required to cast the mould is generally calculated the eight times more of the wax model weight. When the metal is obtained liquid form by heating it about 1120 degree Celsius, the mould is pre heated to red-hot which eliminates the air bubbles inside the mould cavity and it also avoiding sudden cooling of the flow of molten metal. It also avoids from exploding because of the high heat of the liquid metal. Once the temperatures of the metal and mould is reached up to a level for casting, the mould is held with the help of picking tongs and it is buried in the ground with the sprue top surface out. A ring like object is placed on the sprue of the mould, which helps in flowing the molten metal firmly into the mould. It also guards the mould from the dust falling inside. The moulds are left for cooling for some time and it is doused with water for immediate cooling.

Once the mould is sufficiently cooled, it is broken with the help of the hammer until the metal wires are seen. The wires are been separated and preserved for reuse. Then the mould is scrapped out from the casted model. The metal model obtained is chiseled to recapture the contours and details, and then it is buffed, washed with Nitric Acid to cleanse the article from the mud dust, brushed, smoothened with the help of emery paper and cleaned by scrubbing with wire brush with tamarind soup-nut water. Finally the model is brushed with polishing sand and water.

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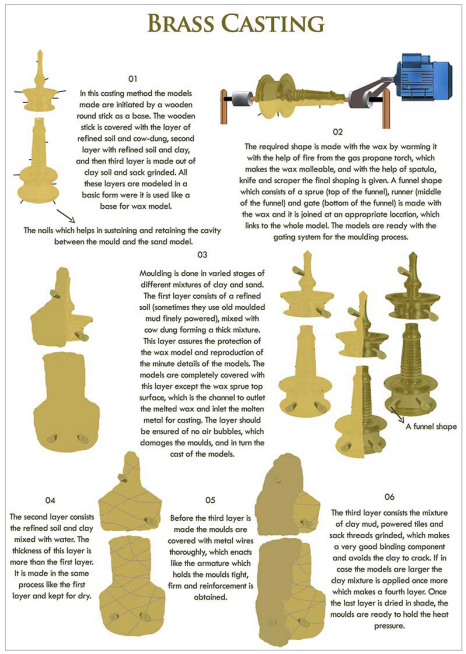
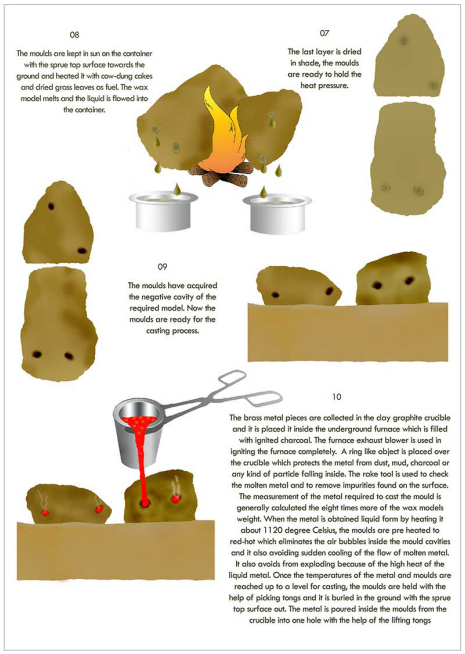
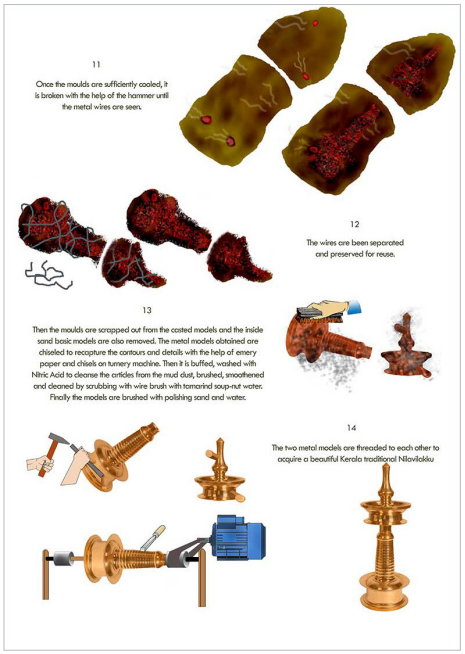
Hallow casting: In this casting method the model made is initiated by a wooden round stick as a base. The wooden stick is covered with the layer of refined soil and cow-dung, second layer with refined soil and clay, and then third layer is made out of clay soil and sack grinded. All these layers are modeled in a basic form were it is used like a base for wax model. Only the last layer is made in wax, which contains the details and required shape made with the help of bamboo tools. Later the moulding process is same like the other moulding method mentioned above.

Basically this form of casting is done in making of traditional lamps, utensils and many more. This method avoids the wastage of the metal. And the weight of the metal used will be less gradually so the cost of the metal.

Flow Chart:







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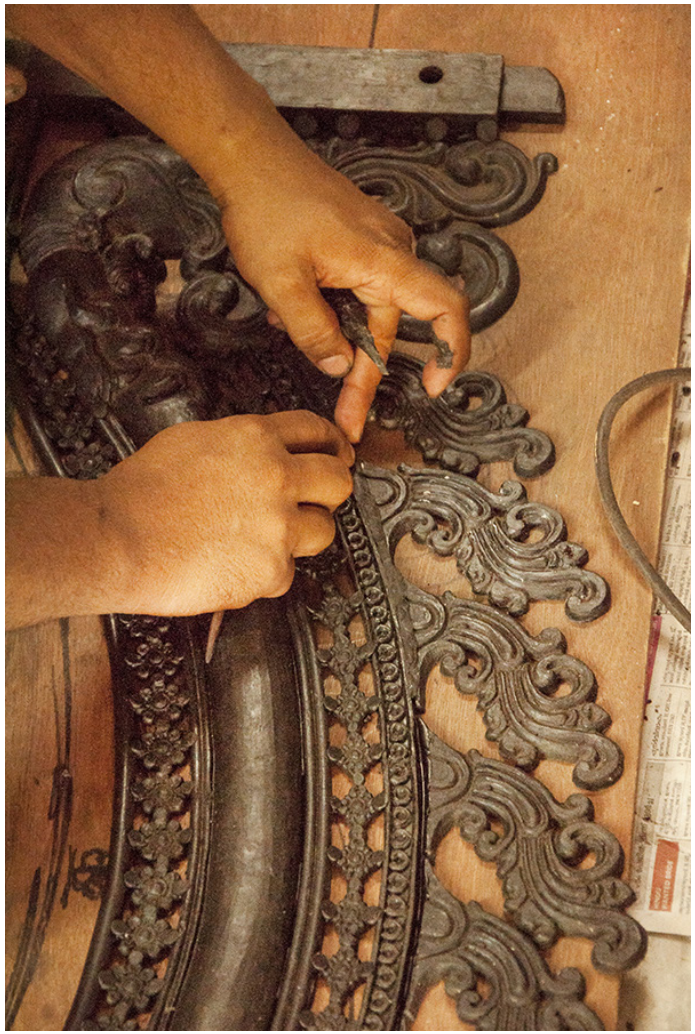
Wax being melted, so that it can be given a desired shape for sculpting.

Artisan then places all the carved pieces on a diagram, to check the accuracy of the model.



Artisan carving intricate details on the wax model, which has floral motifs.

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Artisan then corrects the wax model with reference to the diagram.

Image showing artisans applying wet mud over the wax model, to make a mold for pouring molten brass into it.

It is carefully packed in all the places, ensuring there are no leaks when the brass will be poured.

Image showing a wax model fully covered with mud, which is dried naturally.

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The wax models which are covered in clay, are kept in a wood fired furnace.

It is then fired so that the wax melts away, and creates a hollow negative space, into which molten brass can be poured.

A pit is made by digging the soil.

Artisan then places the hollow molds in the ground, where he has dug the hole previously.

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The wrought iron container is kept in an air blow furnace, in which brass is melted.

Once cooled, the molds are then extracted, and are broken to reveal the brass idol.

The molten brass is then poured into the molds, and is let to cool naturally.

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Image showing a freshly extracted brass ornament, from the mold.

It is then buffed from a buffing machine, to clean it from sand and wax.

It is then finally buffed with a lathe machine, to give it a sheen look.

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Products

Brass artifacts are admired for their beauty and strength. Highly skilled artisans, put in their greatest commitment to sculpt fine quality, to give perfect finish to gain persona for the sculptures. Mr. Govindan Andhithiriyan from Padoli, Kerala is one of the artisans known for brass sculptures and artifacts. Traditional lamps, Iconographies, Idols, Pedestals for Idols, Decorative narrative Arch for the Idol, Utensils for the temple and many more articles are made by this artisan and his fellow beings.

Cost of the article depends on the weight, size and the intricate work done on it.

Few price list below:

Small Idols like sizes one-inch height and weighs 50 grams costs around Rs 2000 to 3000

Big Idols like five to nine feet height and weighs about 1000 kilograms costs around Rs 14 lakhs.

A wooden door, with intricately detailed brass latch and lock system.

A brass pot used in decorative purposes, too keep fresh flowers and water.

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A large sized brass oil lamp, which are used in auspicious ceremonies.

A brass pillar, used in decorative purposes for interiors of old Indian styled architecture or in temples.

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A brass mask with decorative patterns, which are native to the region.

A brass hanging chain, which is used in holding a swing.

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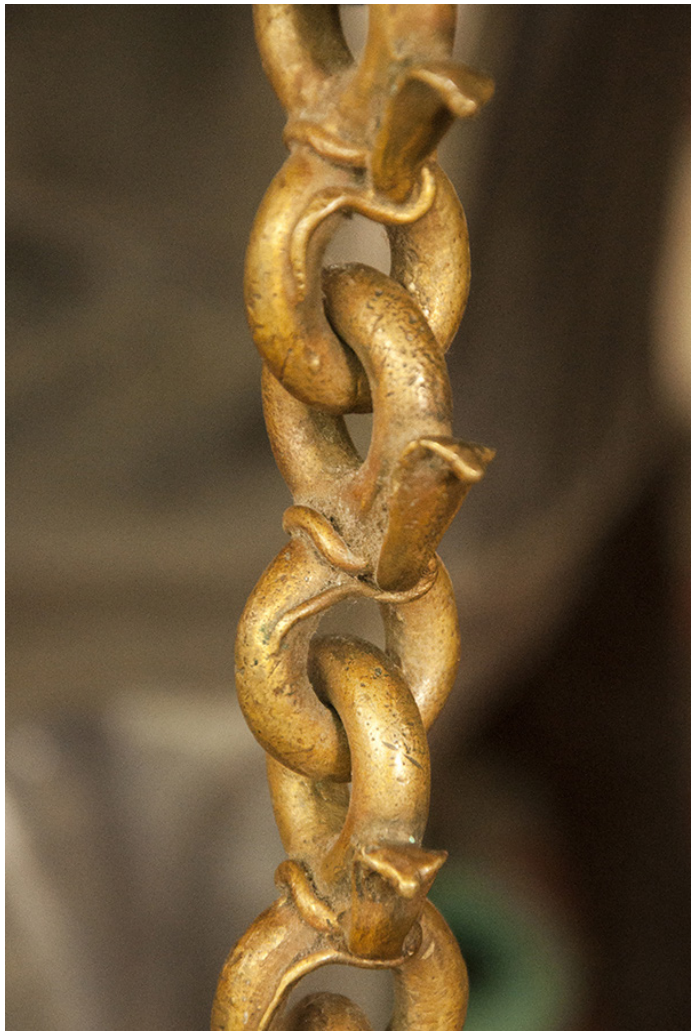

Close up details of a chain, which has a snake pattern on it.

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Video

Brass Metal Craft Part 1 - Payyannur, Kerala

Brass Metal Craft Part 2 - Payyannur, Kerala

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