

coffee percolator
diploma project
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Design of coffee percolator

diploma project

submitted in partial fulfilment
of the requirements for the
postgraduate diploma in
Industrial Design

by

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Guide

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Co-guide

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Contents	Page No.
1. Problem statement	
2. History of coffee	5
3. Brewing	11
4. Analysis	19
4.1 Structural Analysis	19
4.2 Functional Analysis	24
4.3 Visual	27
5. Hypothesis	28
6. Synthesis	32
7. Design decision	40
8. Communication	51
9. Acknowledgement	52
10. Bibliography	53

1. Problem statement

Problem statement:

To design a coffee percolator considering

1. ease of handling and
2. good formal appearance

The problem constraints are such that

1. The percolator designed should be of filter type.
2. Its design should facilitate making small number of cups also.
3. It can be used directly on flame as well as on electric current.
4. There should be markings for water level and corresponding level indicator for coffee in the basket.
5. The heater should be easily replaceable.
6. An efficient outlet system is to be provided.
7. The operations required to make coffee should be minimum and should not consume time.
8. The working of percolator should be understandable even to people without any educational background.
9. The maintenance should be easy.
10. The handling must be very safe.
11. It must be made strong and durable.
12. Possibility of mass production.
13. Good finish.
14. It should not disturb its environments.

15. It should have many secondary functions like milk boiling etc.

16. The cost should be as low as possible.

2. History of Coffee

HISTORY OF COFFEE:

The discovery of coffee is quite generally accredited to Africa although earliest cultivation is traced to Southern Arabia. Coffee grew in Africa only in a wild state until fairly modern times, when it began to be developed there on a production basis.

Coffee probably derives its name from the original Arabic Qahwah, indirectly through its Turkish form Kahveh, although some etymologists connect it with the name Kaffa, a town in southwest Ethiopia reputed to be the birthplace of coffee.

The origin of coffee is vague and obscure, but its history is rich in legend. One of the most accepted tales surrounding the discovery of coffee about 850 AD is that of Kaldi an Arabian goat herd. Bewildered by the queer antics of his flocks, Kaldi is supposed to have eaten Berries of the evergreen bush on which the goats were feeding and, overjoyed at the feeling of exhilaration which he experienced, has been pictured in



Flowers of coffee tree



Coffee cherries. Each cherry contains two beans



legend as dashing off in excitement to proclaim his great find to the world. The physiological action of coffee in dissipating drowsiness was soon discovered and taken advantage of in connection with religious services of the Mohammedans, but the strictly orthodox or conservative section of the priesthood claimed that it was an intoxicating beverage and therefore prohibited by the Koran. Severe penalties were threatened upon the disposed to its use. Nevertheless coffee drinking spread rapidly among Arabian Mohammedans, and its growth and use became general in Arabia.

The early record of coffee in Europe, where it was introduced into the country after another during the 16th and 17th centuries, is filled with accounts of its use as a religious, political, and medical potion, its ups-and-dows in favour, its persecution, prohibition or approval. It is interesting to note that most of the attention given to coffee in the music and literature of that day was in support or defence of

coffee and its "soul stirring attributes", rather than critical. One of the most unique contributions to the good of coffee in music was Johann Sebastian Bach's "coffee cantata" (published in 1732) which portrayed the "protest of the fair sex" against the then existing propaganda in Germany for abstinence from coffee by women because "many doctors claimed its use provoked sterility".

Later coffee became very popular in Europe and coffee houses flourished in 17th century. Later these coffee houses played a significant part in the history. For example the Merchant's coffee house in, established in New York in 1737, is claimed by some authorities to have been the "birthplace of the American Union".

Until toward the close of the 17th century, the world's rather limited supply of coffee was obtained from Yemen in South Arabia but later gradually spread to Ceylon, India, Jawa and South American countries like Brazil, Jamaica, Cuba, Costarica, etc. The largest producer of coffee in the

world is Brazil.

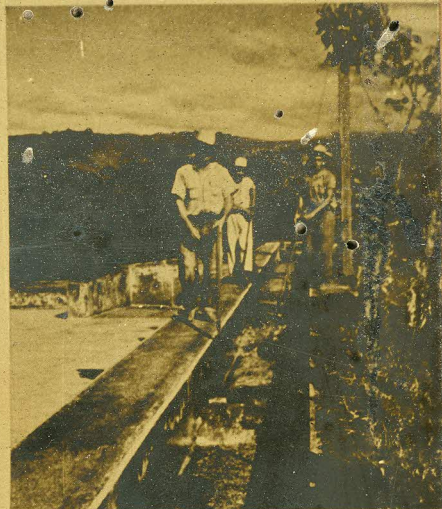
Coffee was introduced in India by Europeans who settled for trade. Gradually the beverage became popular. In India 55% of its production is from Mysore (Nilgiries), 22% from Madras and rest from Andhra and Kerala. Though the production is a very small percentage of world production, the coffee produced is of very high quality.



Washing and pulping coffee cherries at a small coffee co-operative on the Kenya-Tanzania border



Shoveling husked beans into fermentation vats at a plantation in Costa Rica



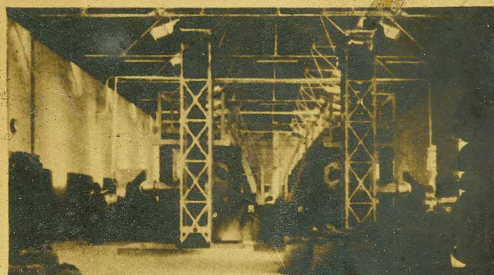
Moving the beans from storage vats along canals to concrete beds where the beans are placed in the sun to dry (Costa Rica)



Flaking the beans on a drying platform. The beans must be turned regularly to insure even drying (Brazil)



Drying by placing the beans in mesh-bottom flats so that air can circulate over top and bottom of beans (Kenya)



Drying by mechanical means. Warm air is circulated through rotating, perforated drums (Jamaica)



Hand sorting of dried beans before they are packed in bags for shipment

PREPARATION OF COFFEE FOR SHIPMENT

BY COURTESY OF (BOTTOM LEFT) BRAZILIAN MINISTRY OF FOREIGN AFFAIRS, (CENTRE RIGHT, TOP) MINISTRY OF INFORMATION, NAIROBI, (CENTRE RIGHT, MIDDLE) THE COMMISSION IN THE UNITED KINGDOM FOR THE WEST INDIES, BRITISH GUIANA AND BRITISH HONDURAS, (CENTRE RIGHT, BOTTOM) HILLS BROS. COFFEE, INC.; PHOTOGRAPHS, (TOP LEFT) HASSNER FROM "BLACK STAR", (CENTRE, TOP RIGHT) MAX HUNN

3. Brewing

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BREWING:

The coffee beans are graded according to their size and are dried. The dried beans are carefully roasted and powdered. This is known as coffee powder which is chief ingredient in coffee making. Water is boiled in a vessel and coffee powder is added (the measure depends upon the strength of coffee required and quantity of water taken) and allowed to boil with water. After some time the black liquid is filtered and this solution is known as coffee decoction. Depending upon the taste of the people consuming it various ingredients like sugar and milk are added. In western countries, people consume black coffee with a little sugar that is without any milk. But in India people add sugar and milk.

With the increased popularity of coffee as a beverage many new methods of making better coffee, in short time are invented. The latest trend is instant coffees which does not require any boiling before hand. But this contain chikori powder which

many people does not like. For pure coffee powder usage the decoction is obtained only by boiling. For this there are two types of equipment widely used by name

1. coffee filters
2. coffee percolators.

Principles and Method of Brewing:

1. coffee filters:

As shown in the figure a coffee filter consists of two compartments.

The upper vessel can be imbedded into the lower vessel (or fitted) and can be removed whenever necessary.

The bottom of the upper vessel is grilled to allow coffee decoction down into the bottom vessel which collects it.

Coffee powder is evenly spread at the bottom and on it a metallic inverted hopper is placed. The bottom of this hopper is also grilled. The use of this is to keep the coffee powder even at the bottom while hot water is poured. In other way it will not allow the water to scatter the coffee powder.

the top vessel and the lid is placed in proper position. The hot water through the funnel is mixed with coffee powder and due to gravity slowly filters through the coffee powder and grilled bottom and settles in the bottom vessel.

The decoction thus collected is very pure and free from any coffee particles. The strength of the coffee can be varied by varying the amount of boiled water or quantity of coffee powder.

The coffee tastes very good but the main draw back is that it consumes a lot of time. For example a filter with 6 cups capacity takes nearly 2 hours.

A lot of work is done to reduce the time and the result is a coffee percolator which gives very high quality coffee at a very less (considerably) time.

2 Coffee Percolator:

There are again two principle types namely

1. Filter (or direct) type percolator
2. Cona (or indirect) type percolator.

2.1 Filter type coffee percolator:

This percolator works on the principle of water percolation. It consists of a cylindrical vessel with a top lid and an outlet at the bottom. The vessel is filled with required amount of water. A filtering element consisting a grilled tray is placed into the water. The tray is for coffee powder and coffee powder is evenly spread in it. The vessel is heated on a heater or plugged in if it is an electric coffee percolator. When the water starts boiling convection currents occur and water will come in contact to the coffee due to percolation and comes down.

There is a glass top in the lid through which the colour of the



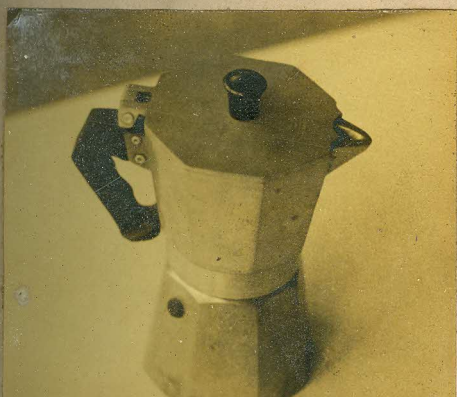
coffee can be observed. If the desired colour is obtained, the coffee is tapped out. Due to the presence of convection currents coffee is prepared in shorter time.

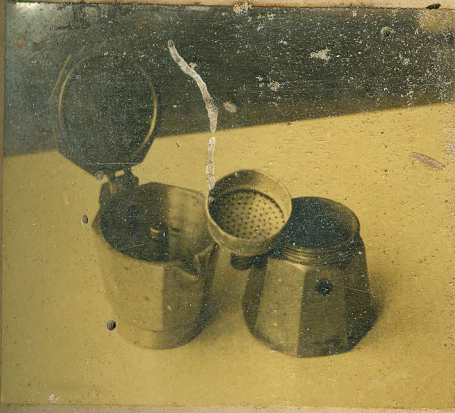
2.2 Cona type percolator:

This percolator consists of a bottom vessel in which a detachable funnel is placed. Before putting the funnel the bottom vessel is filled with water. Into the funnel a tray (perforated) is placed on which coffee powder is deposited.

The top vessel is screwed while in use to the bottom one and consists of a tube casted in the form shown in figure. This tube has a hole at the top through which coffee trickles down. To the bottom a removable tray with rubber washer is attached which acts as a filter and helps in stopping leakages.

When water boils steam is formed and this high pressure steam forces the water down. The water is sucked into the funnel through capillary action and due to the steam pressure





and enters the coffee tray. There it is boiled with the coffee powder and is filtered by the tray. The filtered decoction is forced up due to the steam pressure and is collected in top vessel.

This coffee is of very good quality and takes approximately 20 minutes to prepare 6 cups of coffee.

4. Analysis



ANALYSIS:

The analysis of the filter type coffee percolator is done in 3 different stages namely

1. Structural (detailed analysis of material, manufacturing process)
2. Functional (function of each part)
3. Visual (shape, form, etc.)

1. Structural Analysis:

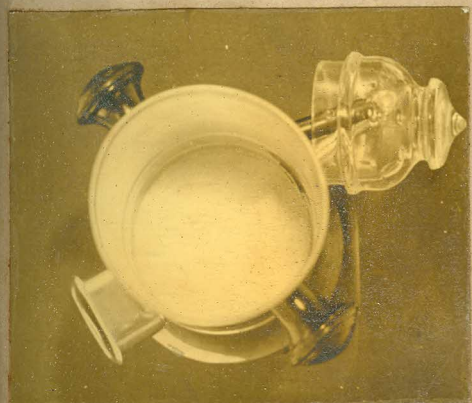
There are several parts in the percolator but the main parts are break up of the following units:

- 1.1 Container unit
- 1.2 Brewing unit
- 1.3 Sealing unit
- 1.4 Heating unit

1.1 The container unit consists of:

1.1.1 Cylindrical Vessel:

The container is made up of duralium (an aluminium alloy) which is stronger than aluminium with stainless steel finish. It is very much cheaper than steel but looks like steel. The entire container is spun in a single operation. The inside is hollow. It was chromium plated to give smooth shiny finish.





1.1.2 Handles:

These handles are a single mould pieces made up of bakelite. The moulding is by compression with threads inside the knobs. These handle knobs are round in shape with internal threads. Two screws are welded to the cylinder diametrically opposite to each other and the knob are simply screwed to them.



1.1.3 Tap:

The tap is made up of aluminium. It consists of a tube to the end of which a cylindrical valve is welded to control the flow as well as to shut. This control is done by an aluminium lever dip coated with bakelite. The tap is welded to the cylinder after drilling a hole of equal diameter.

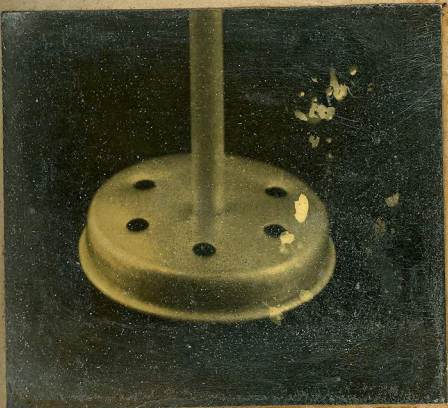


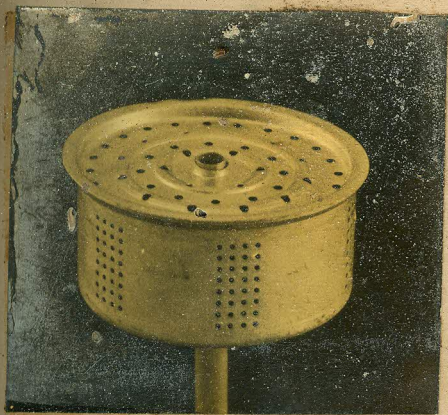
1.2 The brewing unit consists of:

1.2.1 Coffee Tray:

In this unit there are 3 parts.

1.2.1.1 Coffee container is a small cylindrical box made up of aluminium. It consists of small holes at the bottom as well as circumferentially. The aluminium sheet is first stamped





and then spun carefully.

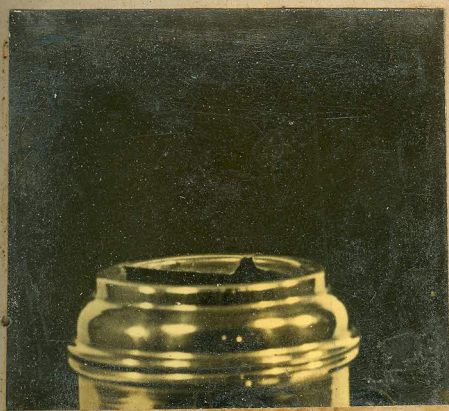
1.2.1.2 The grilled base plate joins the coffee container by means of a hollow aluminium rod. It is rivetted to the aluminium pipe. This is also stamped and spun.



1.2.1.3 The hollow connecting rod is press-fit to the coffee container at the top and rivetted to the base plate at the bottom. It is made up of aluminium. The entire unit is anodised.

1.3 Sealing Unit:

The coffee percolator is sealed by a lid while it is in use. It has



1.3.1 The metallic lid is made up of derulium. It is press-fitted into the cylindrical container. It is spun. Has a circular clearance at the top with groves into which the glass top is fitted.



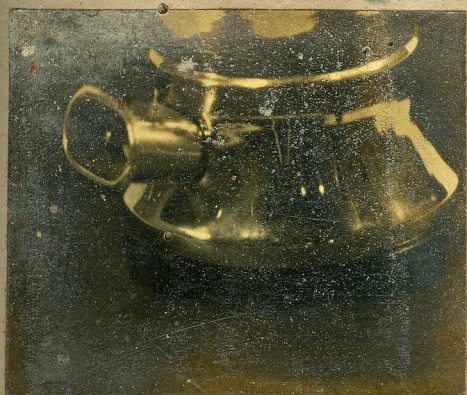
1.3.2 The glass top is moulded as a single unit. It is made up of very thick, pressure with standing silicon glass.

may cause injuries in the kitchen.
It cannot effectively seal.

2.8 The percolator is electrically heated and the heating unit is fitted to the main vessel by means of rigid screws. This gives difficulty in cleaning. If water enters the heating element it will be short circuited. Very high precautions are to be taken for cleaning.

2.9 The projections of handles and tap make packaging difficult.





1.4 Heating Unit:

The main parts in this unit are:

1. Heating element
2. Container

1.4.1 The heating element is made with nichrome wire and rated at 220 V, 100 W.

1.4.2 The heating element is kept in a container. This container is of duralium and is spun. It is joined to the percolator by

1. press-fit and
2. screwed from the bottom.

2. Functional Analysis:

2.1 The main vessel is one of the main parts of the percolator. Measured quantity of water is poured into this and coffee decoction is obtained after brewing. This supports the brewing unit and is fixed to the heating unit which when plugged in heats the water.

2.2 The handles are attached to the vessel. These are too small to hold and there is every possibility of getting the fingers burnt. To lift the coffee percolator both hands are to be used which is quite unnecessary. Due to their round shape they will not give good grip and there is every possibility of oscillating in the hands while lifting spilling the coffee.

2.3 The tap is provided to take out the coffee. It is too small and takes a long time for discharge. The valves are not good and there is every possibility of leakage.

2.4 The coffee tray is filled with the coffee powder. It is just above the water level and is supported by





the base plate. The base plate holds the tray in position in the main vessel and is connected by a hollow aluminium rod. The plate as well as the tray are grilled to allow the convention water currents pass through them for brewing the coffee.



2.5 Filtering lid serves two functions.

2.5.1 It filters the coffee powder and they preventing it from mixing with the dicoction which spoils the colour of the mixed coffee.

2.5.2 To allow convention currents to pass through it for brewing.



2.6 The metalic lid completely seals the main vessel and prevents the coffee spilling over as well as the expending of auroma.

2.7 The glass top is to see the colour of the coffee while brewing. The colour in turn depends on the konzentracion and thus allows to prepare the coffee of required strengh. But it is too fragile and is not properly fit. It is too loose and falls of very easily and





3. Formal Analysis:

3.1 There is no smooth formal transition. The whole percolator is of cylindrical form from bottom to top. At the top it suddenly changes to a conical form. Even the conical form is not uniform. The sudden depression makes it ugly.

3.2 The formal integration is not at all satisfaction. The two handle knobs suddenly protrudes out and does not match with the rest of the percolator. They seems out of place and appears as 2 foreign elements rather integral part of the percolator.



The tap to discharge the coffee is projected outward. This spoiled the balance of percolator. These sudden protrusions make it look like a heavy equipment rather than a delicate kitchen appliance.

5. Hypothesis

Hypothesis:

From the brief survey conducted, the following conclusions were made.

Consumers:

1. Structural:

1.1 The whole unit should be made without rigid joints unnecessary screwing to be avoided.

1.2 Unnecessary elements to be removed.

1.3 Sufficient grip is to be provided for the ease of handling.

1.4 The whole unit can be workable with only one hand.

1.5 The heater unit can easily be detached.

1.6 Percolator should have many secondary functions like milk boiling etc.

1.7 As far as possible sharp corners are to be avoided.

1.8 The sudden protrusion of the elements are to be controlled.

2. Functional:

2.1 The lid should be removable without touching the metal top.

2.2 The main handle should be designed considering human factor engineering to give good non slippery design.

2.3 The handle should be such that the hand should not touch the metal portion while handling it.

2.4 The percolator cleaning should be easy.

2.5 The coffee can be poured without any tap.

3. Visual:

3.1 The appearance should be very simple and pleasant.

3.2 The formal integration should be achieved properly.

3.3 The sudden appearance of some elements to be removed.

Manufacturer:

1. The material chosen should be cheap, strong and must be available in market all times.

2. The processing should be easy, so that the cost of the percolator will be less.

3. Unit should have good finish which will be retained for a fairly long period.

4. Reduction in cost of manufacture should be considered. If more the increase in price should be marginal.

Seller:

1. The handling of the units from factory to market should be free from trouble.

2. There should not be any damage or disfigurement while brought from factory.

3. Should have a very good packaging.

4. It should appeal to the customers.

5. Should occupy less space for storage.

6. Synthesis

Synthesis:

1. The coffee is made in a percolator or filter type coffee maker. As already explained it will have a coffee basket to which a hollow rod is attached through which the hot water enters into the basket due to convection currents. The hot water is mixed with the coffee and coffee is ready.
2. The hollow rod connecting the coffee basket is sufficiently long to reach bottom. Because the water raised is by convection due to steam pressure the lengthening of the tube will solve the problem.
3. The unit has a detachable electric heater. When required to clean or electric supply fails, the heater unit can be removed easily. The rest of the unit can be heated on flame and it works in the same way as it is with the electric unit except that it has no automatic cut-off. The time of coffee making will depend on temperature of the flame.

4. The heater unit is attached to the main body by tight press fit. This eliminates screwing. Also the percolator can be cleaned often without trouble. If the unit is not cleaned often there is the possibility of the formation of a coffee oil coating in the inner surface of the percolator. This results in

1. increase in the heat energy required to raise the temperature of the water.

2. The unit will retain the coffee flavour and can not be used for other purposes like using it simply as a kettle etc.

5. The outlet system can be improved by removing the tap with a spout. The tap has the disadvantage of

1. leakage
2. slowness in filling.

The spout avoids both these disadvantages. Moreover the fixing of spout is cheaper than the tap. The spout can be easily manufactured in the same factory where as the tap has to be purchased from outside. Thus it is more economical.

6. The main operations in making coffee are:

1. Opening the lid
2. Filling with required quantity of water in the well
3. Filling the coffee powder in the basket
4. Placing the percolator unit in proper position
5. Replacement of lid
6. Heating.

All these operations are achieved without any inconvenience in less than a minute.

7. The making of coffee can be explained very easily as no complicated operations are involved.

8. The dimensions are chosen in such a way that it permits easy hand movements inside if a bresh is not used. The shape is without any sharp corners.

9. The handle are the parts which are often handled and these should be made of a good heat insukting material. The placements of handles and knobs should be convenient to operate. These should not allow the hands to

touch the metal, which is at a high temperature and may burn the fingers. The main handle should be at a safe height from the base. If it is too long, it may be spoiled by the flame when it is not electrically heated.

The electric heater unit is carefully insulated to avoid shocks and short circuits. It is properly concealed while in use. Double insulation is provided to avoid shock hazards.

10. The strength and durability depends on the choice of material.

For example stainless steel is much stronger and more durable than aluminium. The choice of material depends on the cost and heat conductivity. If a weaker metal like aluminium is chosen its strength is increased by selecting proper thickness.

11. For house hold appliances the process of manufacturing is selected carefully keeping in view the following points:

1. The process should be cheap
2. It must enable batch production as well as mass production.

The most widely used methods of production are:

1. Deep drawing
2. Spinning.

1. Deep drawing is not applicable to all types of shapes. The depth of the appliance is another limitation. Unless the production is more than 5000 units it is very costly. For some shapes after drawing operations are necessary. But the method is very quick.

2. Spinning is a widely used process as almost all shapes are possible. Cost of mould is very cheap. No after machining is required. The only disadvantage is the rate of production is very low. Batch production is possible.

12. House ware finishes are of two kind:

1. Chemical (anodizing and oxidizing)
2. Mechanical (porcelain enamel, tin, zinc, flouorocarbon resin (teflon) and other applied materials.

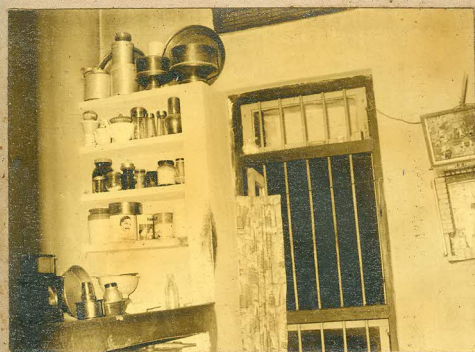
In the case of chemical finish, it does not require any more operations. On

the other hand in the case of mechanical finish, when the base material is finished and no other material is applied it may be polished, satinized, etched.

The above said finishes are to be chosen depending on selected. For stainless steel only polishing is sufficient. Where as aluminium is to be anodized.



13. The percolator should not disturb the environments wherever it is placed. As it is place is generally in kitchen, it should have a kitchen look. That is it must be easily identifiable as a domestic kitchen appliance. The above factors are achieved by giving it a neat clean form with simple appearance.



14. The percolator can be used for other purposes like milk boiling, for pudding making small cake baking, by providing an extra unit. The other secondary functions are as

1. electric kettle
2. water jug.

15. The cost of the unit depends on the factors like,

1. choice of material
2. process of manufacture
3. type of finish
4. no units made
5. size of factory

By a careful selection of the above factors the cost will be minimum.

7. Design decision

Design Decision:

1. Choice of material:

Many factors besides its function enter into the design of a utensil.

A design must be home decor, be easy to assemble, and, to remain in service for many years, have built in quality. The designer is usually furnished with samples of similar materials in market and he has to decide depending on strength required, processability, cost and finish. Some times suggestions are obtained from the survey from customers.

Generally for domestic equipment aluminium, copper, iron, steel stainless steel, steel alloys, porcelain covered sheet iron, tin covered sheet iron, glass, ceramic, brass and plastics are used. For appliances with heating, purpose plastics are not at all suitable as their operational temperature is very low. Ceramics are quite expensive and like glass are fragile. For an appliance of every day usage durability is a must. Hence ceramics and glass are eliminated.

40

Metals are preferred. Since conduction is the major method of heat transfer this factor influences the selection of material. The following table illustrates the conductivity of the various metals used. Under the "absorber" column, the usefulness of the material for an oven utensil was the rating factor. The ratings were simple. A good conductor is marked "plus", a poor conductor is given "minus" and those are intermediate are designated by a "zero". Some results are the opinions of experts but not established experimentally.

From the following table the most suitable metals are aluminium and stainless steel. Out of these two aluminium is chosen due to its advantages.

Stainless steel is not only costly by three times, but also its density is high by three times. For the same cost the gain in aluminium is three times by weight and nine times in volume of the material. Aluminium is inferior in temperature withstandability to stainless steel as its

Table: 1

Materials of utensils

Material		Conductor* (surface cooking)	Absorber (oven)
Aluminium (Al)	9	+	+
Copper (cu)		+	0
Iron (Fe)		+	+
Steel (alone)		-	-
Steel with copper		+	0 -
Steel with aluminium		+	0 -
Stainless steel		+	+
Porcelain - covered sheet iron		+	-
Tin covered sheet iron		-	-
Glass		-	+
Ceramics		-	+

* + = positive effect, 0 = no effect. - = negative effect.

Table: 2

Comparison between aluminium and
stainless steel

	density	cost/kg in Rs	Processability	Melting Point
Aluminium	2.7	12	Very easy	660°C
Stainless steel	7.8	50	a bit difficult	1500°C

melting point is 660°C . But the best temperature for coffee brewing is 90 to 95°C and only 50 to 60°C is necessary to keep it warm. So the choice of aluminium is justified.

For the same thickness aluminium processability is easy as it is soft. Stainless steel is very brittle and generally it is welded after shaping it which is very costly. The finishing of stainless steel is easy compared to aluminium but the cost is very economical.

2. Form:

The form of the percolator is cylindrical. This is arrived by considering the following calculations:

Average volume of a coffee cup =

180 to 200 cc

Assuming $\frac{2}{3}$ of the cup is coffee and rest is milk

Volume of coffee per cup = 120 cc

Total volume of coffee for 8 cups =

960 cc

(1000 cc)

Allowing some clearance for the air which is necessary for percolation

the optimum volume of coffee percolator should be 1500 cc.

The above calculations shows that the volume required is 1500 cc and a suitable shape is to be chosen with that volume. One more requirement is that it should be accommodate hand for cleaning in case a brush is not used. This condition eliminates all the possibilities of using triangular, rectangular or polygonal shapes due to their sharp corners unless they are given a very generous radii. Rhombus and Trapezoidal shapes were avoided due to the complicity in accommodating the in a kitchen and they do not go well with the generally rectangular and round shapes of kitchen utensils.

For the same dimensions oc circle encloses more area. Arriving at circular shape the dimensions of diameter and height are fixed. If the diameter is narrowed the height will be more which makes the unit visually unstable. If the diameter is great, the height reduces. This makes the unit look a bit bulky. Also the hand while holding comes nearer the bottom which is heated which be uncomfor-



table for hand. Various heights and diameters are tried and the ratio is calculated and they are fixed on the basis of golden proportions i.e. 1:1.618. The heater unit and the lid portions are slightly tapered to give the unit better appearance.

The handles are made up of bakelite and are designed ergonomically to give a comfortable grip without touching the walls of the vessel. The spout and handle are given same radius to make them more integrated with the main form. The spout eliminated the tap. It avoids all the disadvantages of operation of a tap like slow discharge, leakages, etc. and mainly the ugly projecting elements.

The lid and the heater are press fitted to the main vessel. The advantages is removal of them is very easy and at the same time the joint is strong and considerably air tight.

The lid is stepped inside as illustrated in the drawings. The step accommodates the milk boiling unit

and percolator unit. By doing so an extra element is eliminated from the percolating unit. The percolating unit is press fitted into this step after it is filled with coffee. This eliminates the removal of the unit from the percolator for pouring coffee in the cup. It would not obstruct the spout while pouring. In the existing unit it has to be removed which makes the kitchen table dirty. There is considerable difficulty at present to remove it in hot condition.

The milk boiling unit is a cylindrical vessel with a small pressure valve screwed to the body. While milk is boiled steam passes out through this valve which produces a hissing sound which indicates that the milk is ready. The boiling will be quicker due to the steam pressure heating. It rests on an aluminium base plate which is shallow drawn. The capacity is 1 liter. The same unit can also be used for baking small cakes. The main vessel is filled with a little quantity of water. When water boils, steam is produced and heats the milk.

The boiling point of milk is between 100 to 115°C depending on the purity and the thermostat is set for 95°C.

3. Manufacturing process:

The chosen shape can be produced by:

1. die casting
2. deep drawing
3. spinning

All these produces seamless shapes.

The die casting is eliminated as it requires the missing of zinc with aluminium which is hazardous to health, if any eatable is prepared in it.

Deep drawing is more expensive compared to spinning unless 5000 units are produced. If more than 5000 units are produced then deep drawing is more economical. As the rate of production. Varies on market conditions. Hence it is advisable to spin.

Finish:

The unit is chromium plated outside and inside it is anodized. The finish become a part of the metal itself.

The longer the time given for plating the thicker will be the plating and

the finish will remain for a longer time. It has a look like stainless steel.

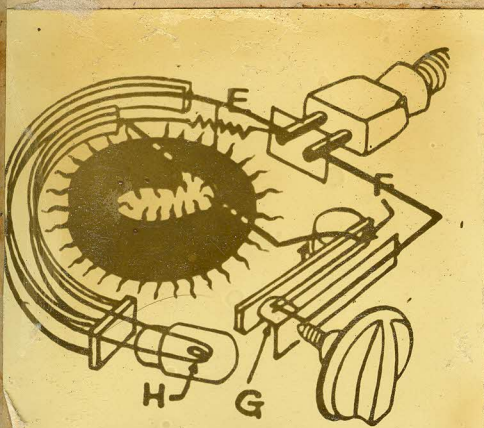
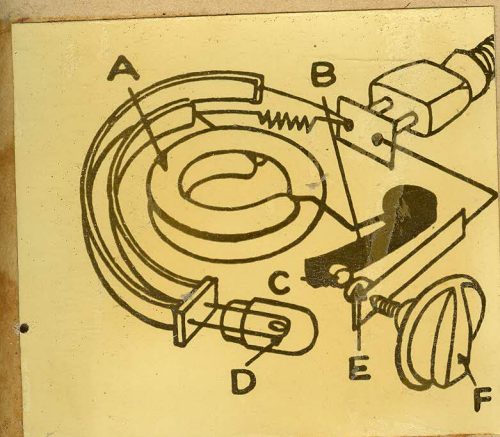
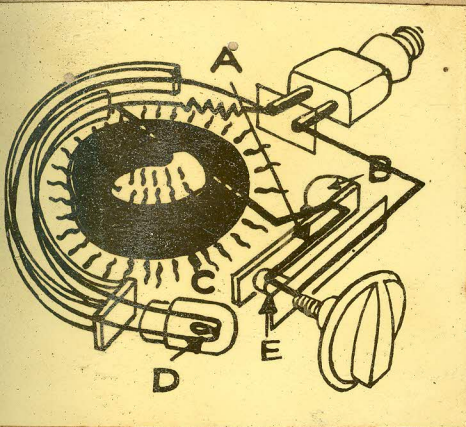
Heater unit:

Heater unit is made of aluminium.

It is deep drawing. It is designed for 400 w for boiling the water and 50 w for keeping it warm. It is connected to a built in thermostat rated at 95°C . It works in the following way:

1. When the supply is given the main heating coil will be red hot and heats the unit.
2. When the temperature is 95°C the thermostat becomes very hot and it bends the thermostat which disconnects the circuit. The heater is off and the temperature is 95°C .
3. In off condition the thermostat is hot and when it cools it becomes straight and comes in contact with the main circuit which will heat the main vessel again.

The addition of this thermostat makes the utilization of the percolator more economical.



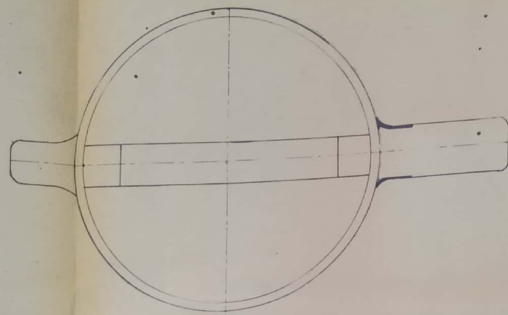
Precautions to use:

1. Fill the coffee basket upto the level indicated for the number of cups required.
2. Fill the water in the well upto the mark for the corresponding level.
3. The water should be at the room temperature.

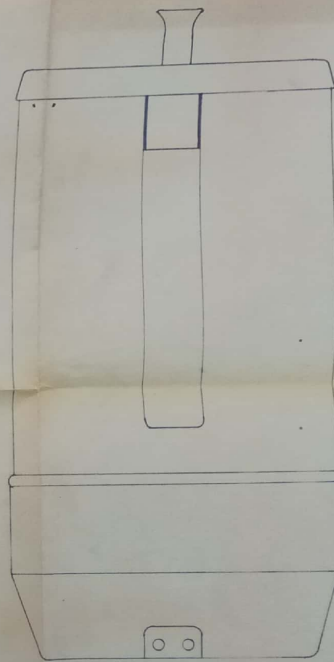
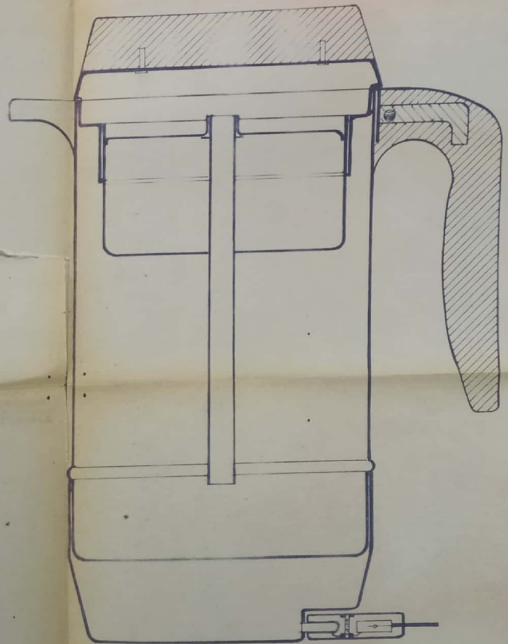
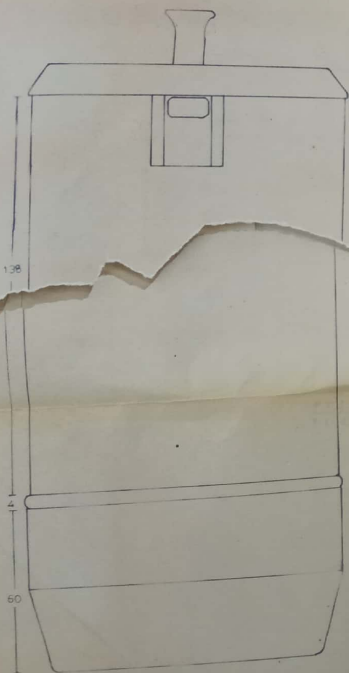
I. D. C. Library
L. I. T. Bombay.

8. Communication

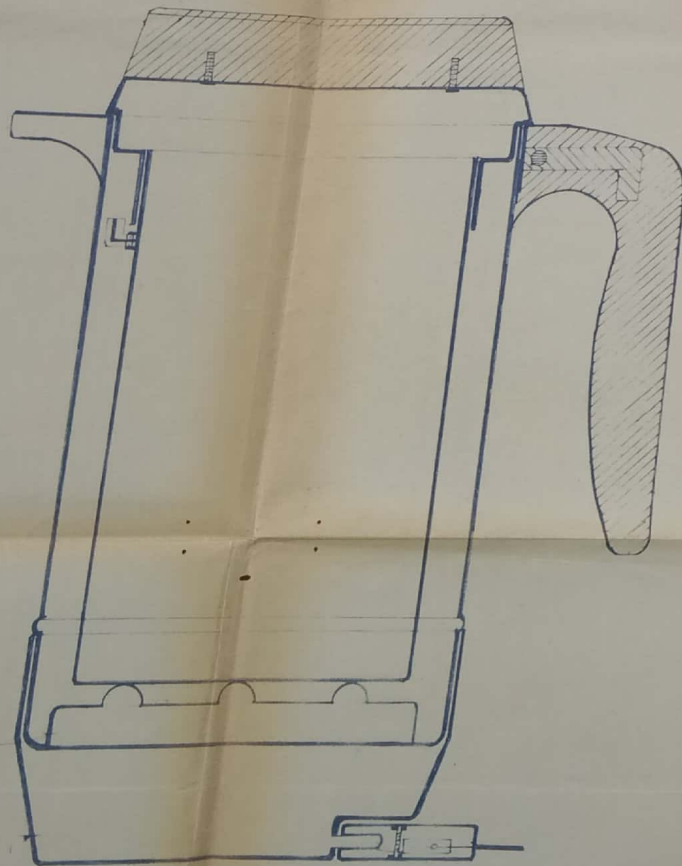
PERCOLATOR ASSEMBLY
SCALE FULL SIZE
DIMENSIONS IN MM



97
112



18



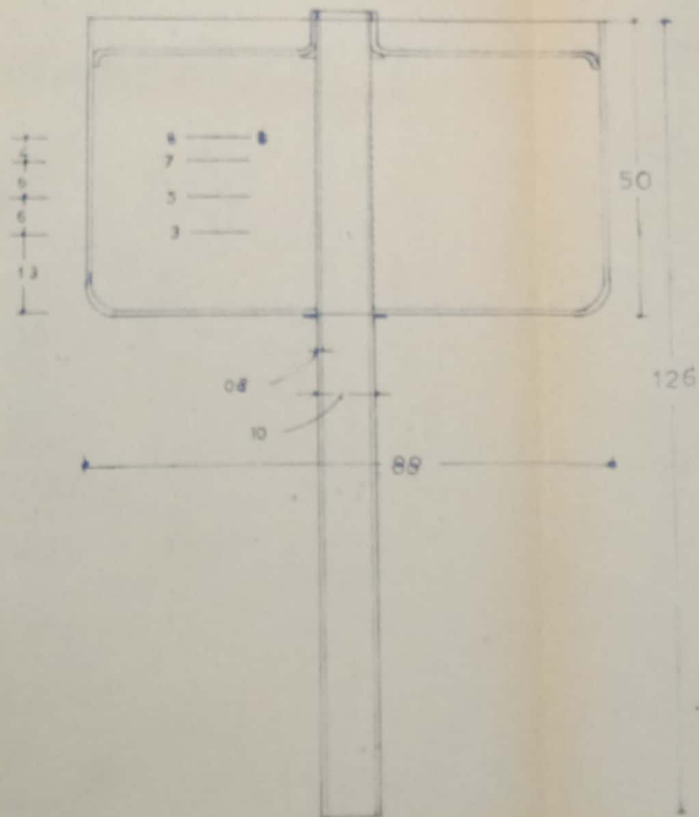
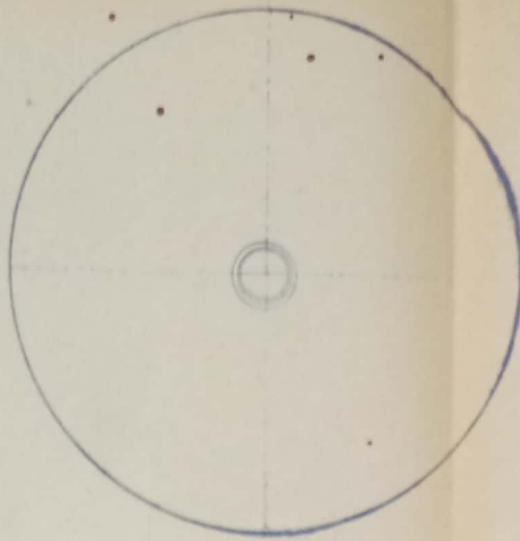
ITEM	DESCRIPTION	MATERIAL	QTY	UNIT
13	DIRECTING WIRE	PVC	1	3 MTS
12	ROSTER PLUG	PVC	1	
11	SCREWS	BRASS	2	
10	BASE PLATE	AL	1	
9	SPOUT	AL	1	
8	HEATER UNIT	AL	1	
7	WID HANDLE	BAKALITE	1	
6	MAIN HANDLE	BAKALITE	1	
5	PRESSURE VALVE	SS	1	
4	MIX BOILER UNIT	AL	1	
3	PERCOLATOR UNIT	AL	1	
2	WID	AL	1	
1	MAIN RESSE	AL	1	
ITEM DESCRIPTION MATERIAL			NO OFF	

DIPLOMA PROJECT COFFEE PERCOLATOR
V. RAO
S 978 2nd BATCH

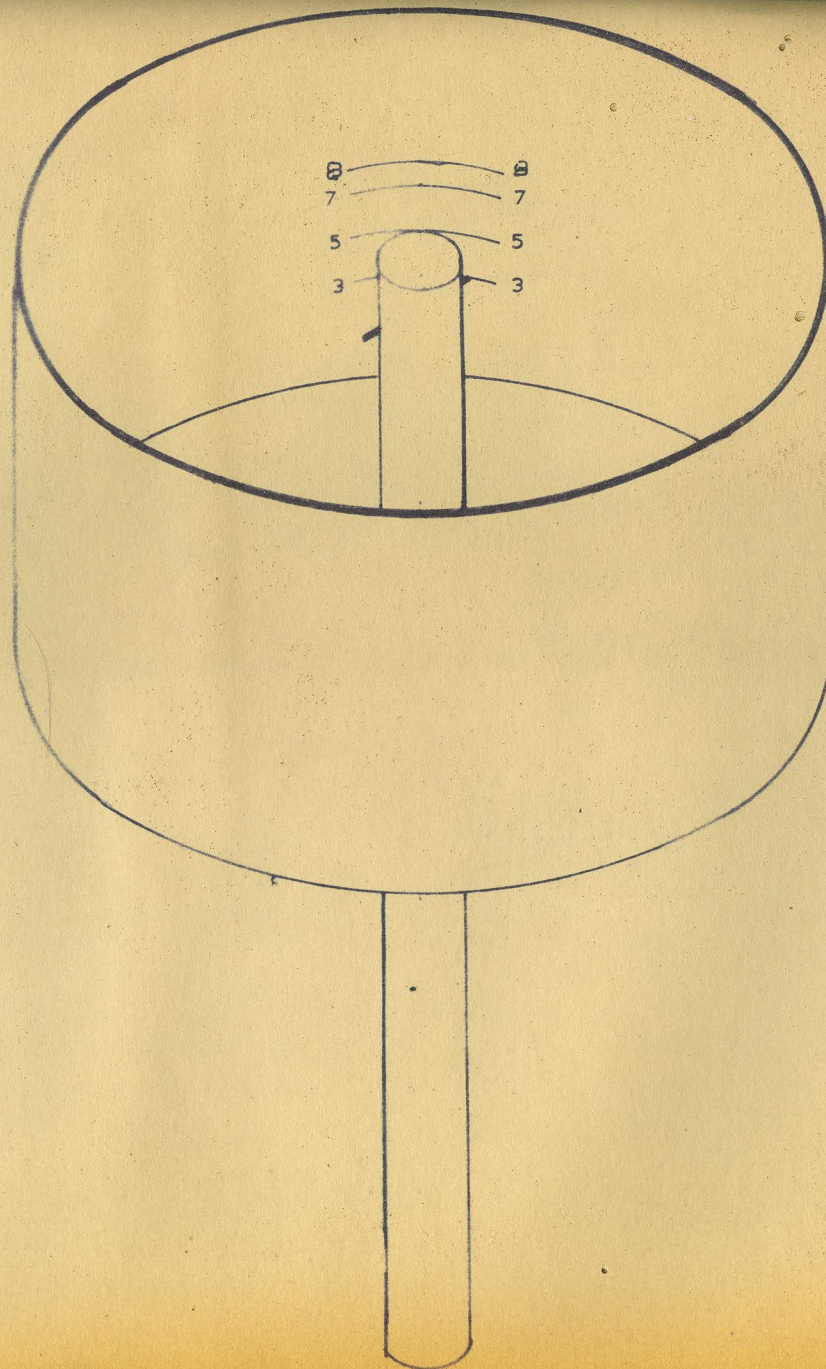
SCALE : 1 : 1
ALL DIMENSIONS IN MM

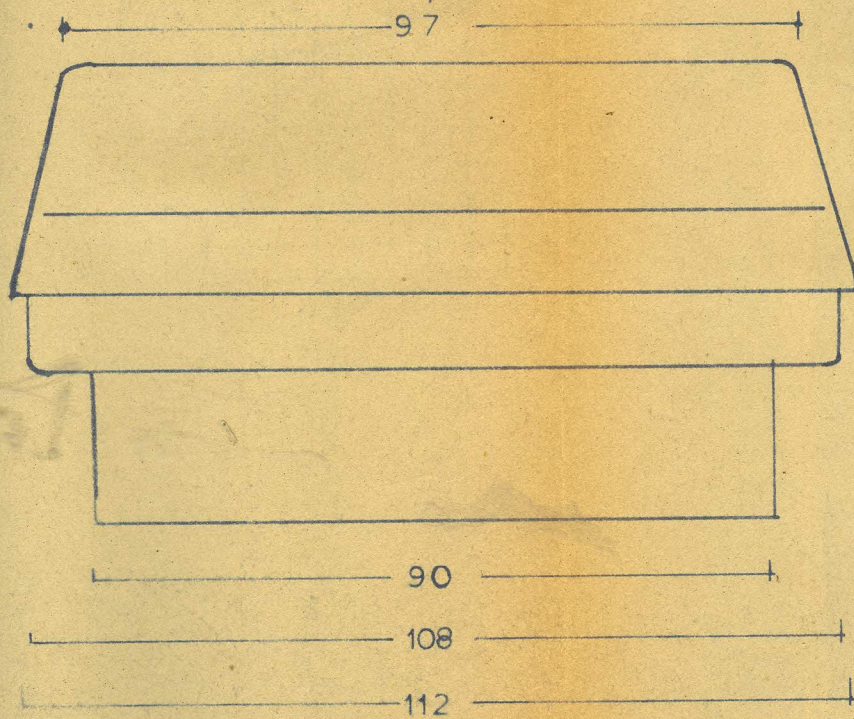
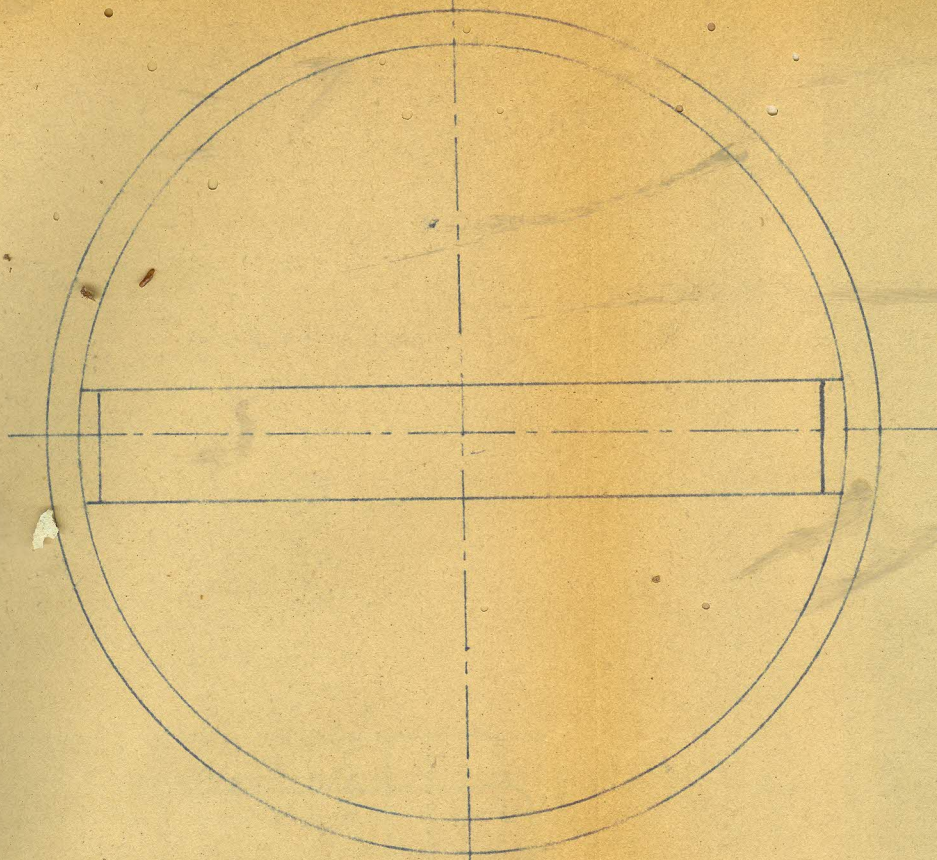
INDUSTRIAL DESIGN CENTRE

DETAILS OF PERCOLATOR UNIT SCALE FULL SIZE DIMENSIONS IN MM



PERCOLATOR UNIT

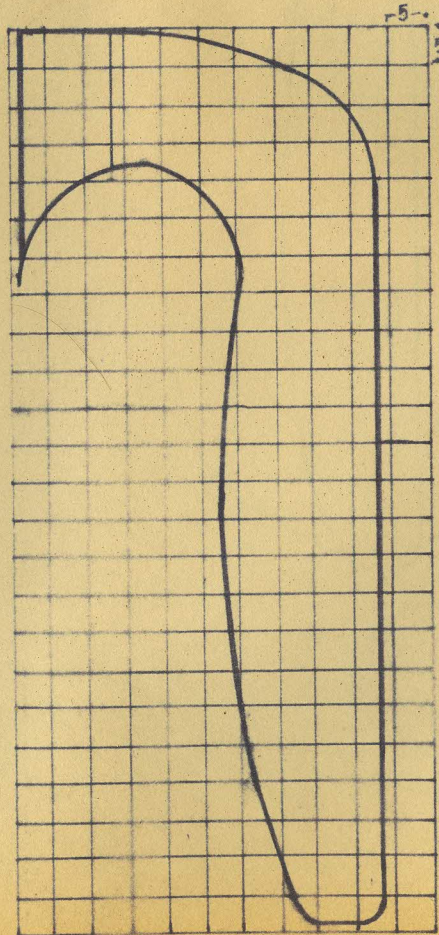
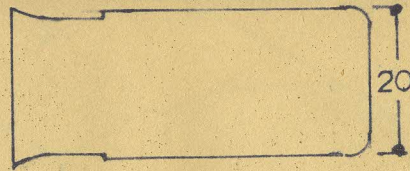




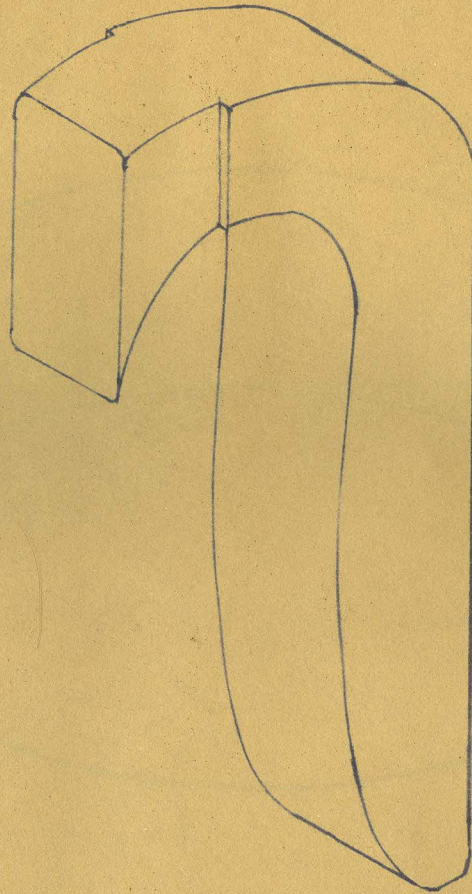
DETAILS OF HANDLE

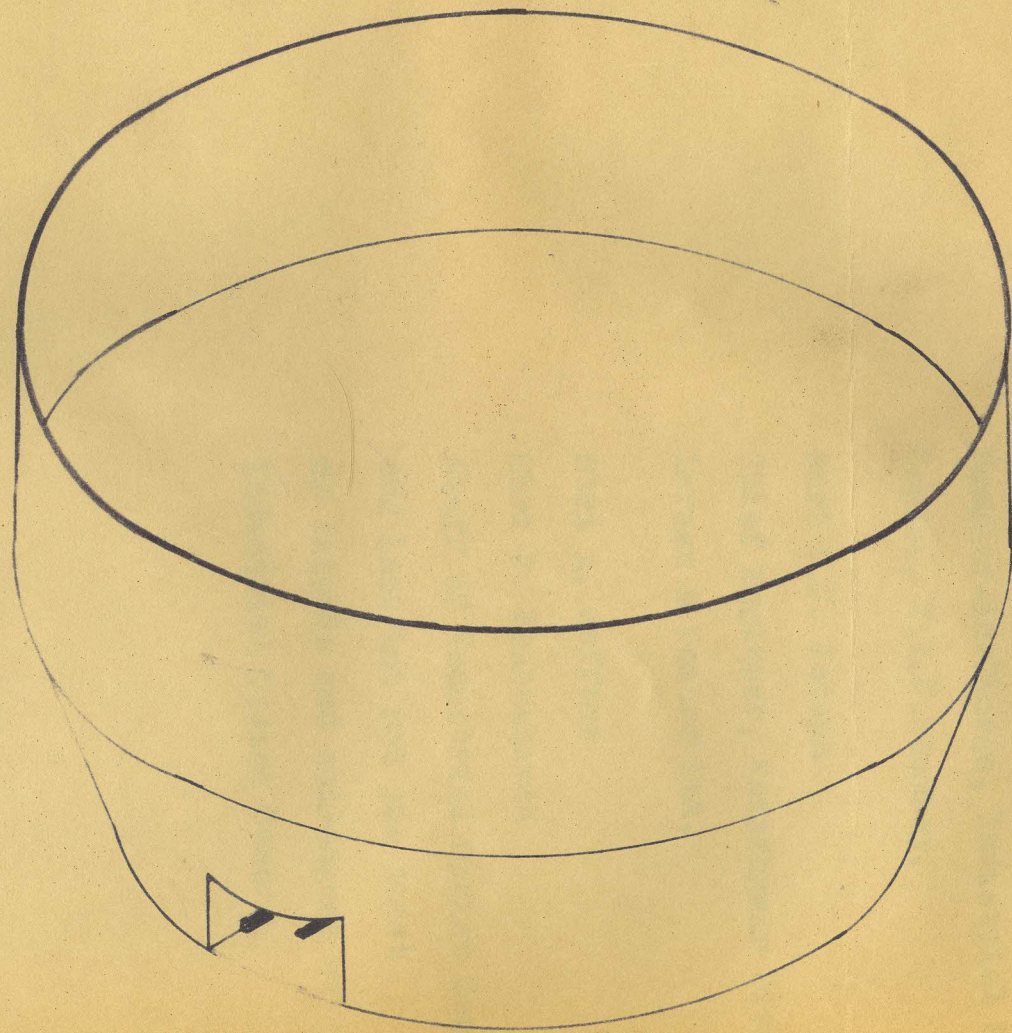
SCALE FULL SIZE

DIMENSIONS IN MM



ISOMETRIC VIEW OF
HANDLE





My acknowledgements to

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Lecturer, Industrial Design Centre
I.I.T. Bombay.

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Chief Engineer, Switchgear Division,
Larsen & Toubro Ltd.

Shri A. Gaffoor

Shri P. Prabhakaran

Staff of Industrial Design Centre
and last but not the least
my friends and colleagues of
Industrial Design Centre

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1. **Encyclopedia Britannica**

2. **House hold equipment principles**

by

Helen J. Van Zante.