

MATERIALS TO BE KEPT READY FOR SOLAR COOKER

1. 26 baked bricks or stone for the foundation.
2. 80 earth bricks, 30cm long by 15cm wide and 10cm thick.
About half should be of sifted earth without stones.
3. A piece of pure wool fabric. This can be a used shawl or an old blanket. It can be torn but it should be clean.
4. Three or more good straight long bamboo poles.
5. One gunny bag in perfect condition.
6. Two pieces of strong rope.
7. Ten loads of ordinary well mixed mud mortar.
8. One load of the best building mud sifted and kept aside.

Materials for making cookers:

Shuttering as per the design given. If really well seasoned straight grained wood is not available a further shuttering for casting the ~~wooden~~ separators in plaster of Paris.

Materials for each cooker:

'Drawer and drawer frame' as design given.

If really well seasoned straight grained wood IS available:

a set of separators, 2cm X 2cm X 88cm X two

2cm X 2cm X 65cm X two

two sheets of ordinary ^{2mm} glass 60cm X 90 cm. The top glass may be of the thicker quality, if desired.

Durable plastic sheeting: 1m 25cm X 1m 80cm

90cm X 98cm

Five used ghee or oil tins.

Matt black paint (black board paint or industrial matt black.)

Fevicol.

Nails 6" X eight, 4" X six, 1½" aprox. 100grms.

Rice sheller husk one gunny bag full.

Strong string for stretching weather cover.

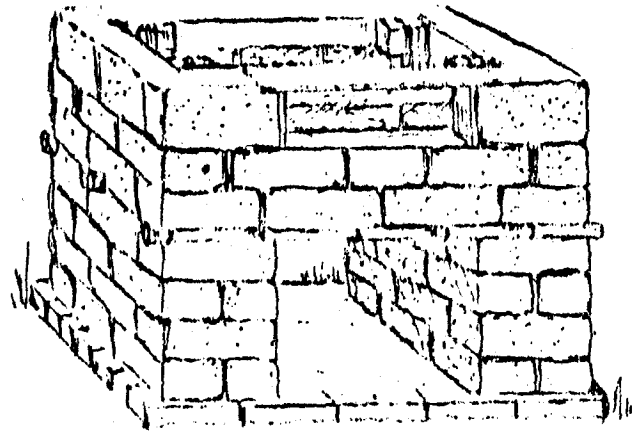
Linseed, 'alsai' khal (after oil has been extracted) and cow dung for mixing final layer of cooker mud mortar.

STRUCTURE

The site and orientation of the cooker must be correct. The site should receive full sun year around from at least eight in the morning until four in the evening. It should be of easy access from the kitchen and have enough space to move around it easily. If no such site is available it is not advisable to build the cooker.

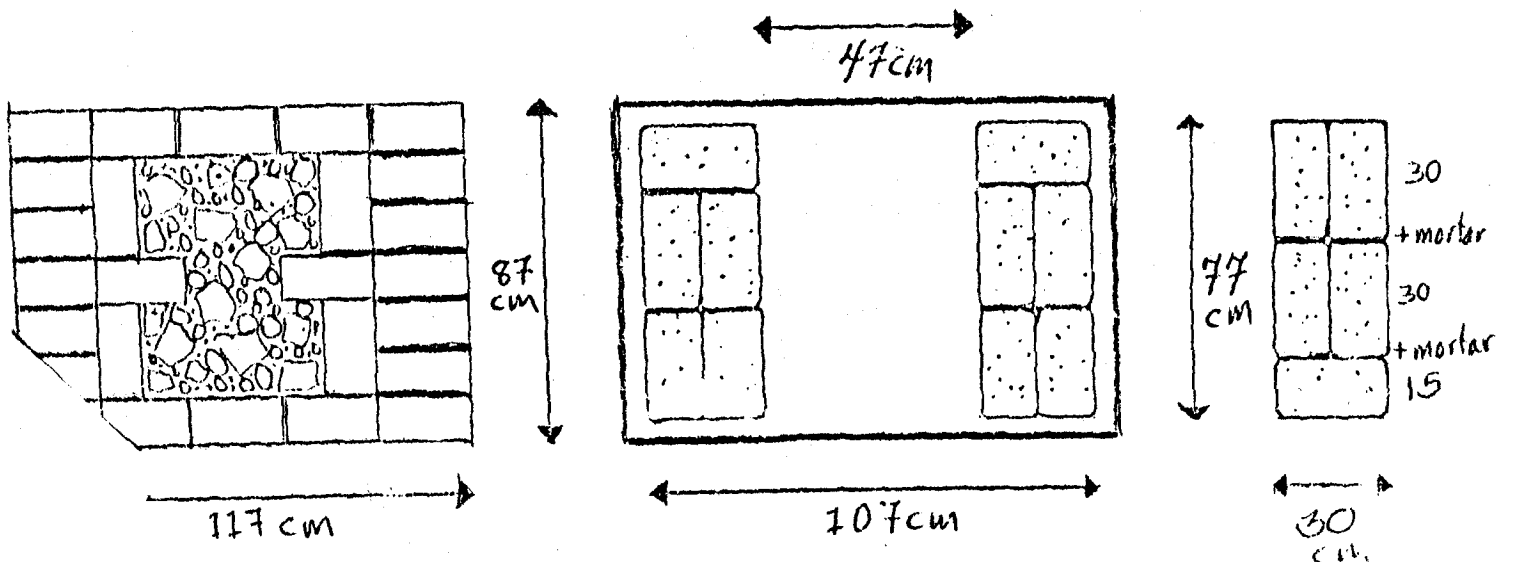
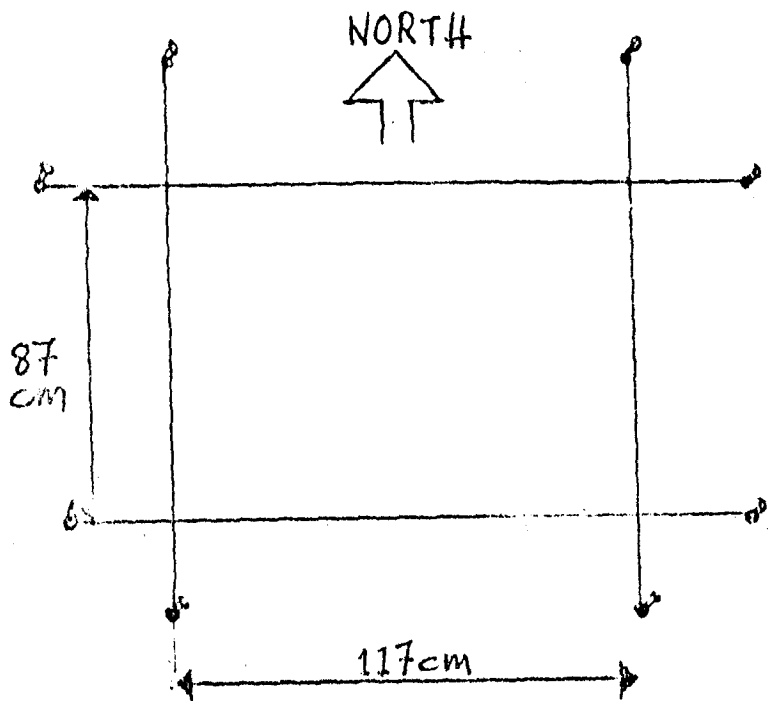
Materials:

- baked bricks X 20 (or more)
- mud bricks 30cm X 15cm X 10cm:
 - ordinary quality X 56 bricks
 - stone free bricks X 20 bricks
- ordinary mud mortar X 12 buckets
- sifted mud mortar X 2 buckets
- bamboo; straight poles 115cm long X three poles
- 78cm splints to cover 1m
- 1m splints X two
- 1 1/2" nails for bamboo work and
- 6" nails X six
- Shuttering, Drawer frame (A), and Weather Cover
- Stakes, string and compass for the lineout:

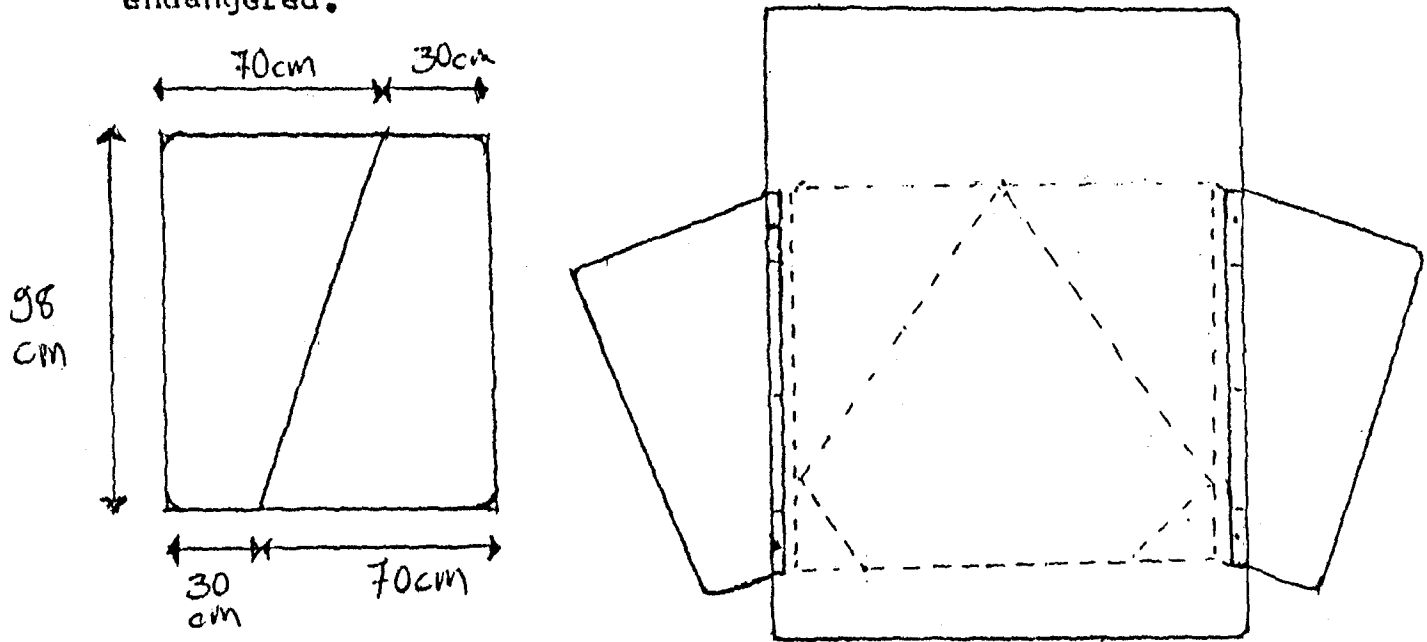


Structure seen from the South side.

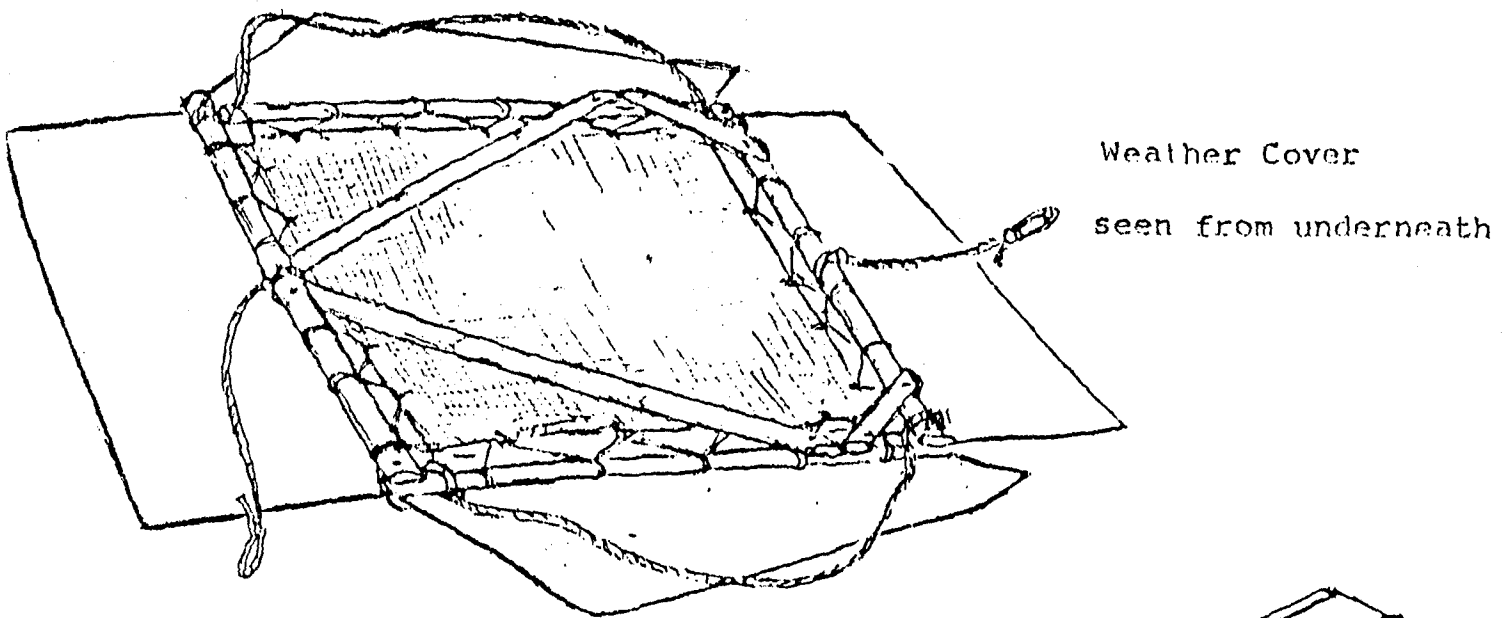
- (1.) Line out the site as shown and dig to level. Check the orientation carefully.
- (2.) Lay a foundation of brick as shown. Trimmed or rough stone can also be used. Fill with rubble, cover with mortar and work smooth.
- (3.) Mark the walls and build them as shown below. The walls can also be made of baked brick, in which case baked bricks will be required, the outer dimension and height should be the same: 107cm to approx. 46cm high.



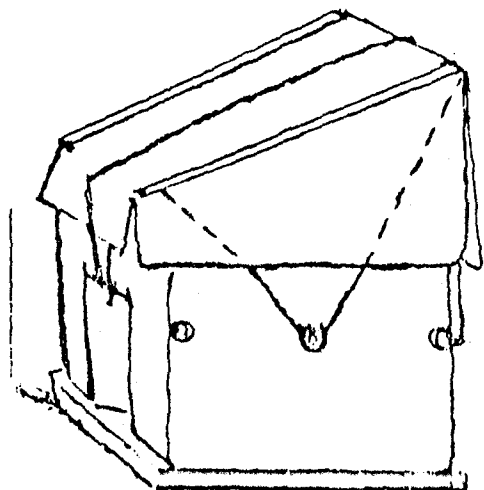
- (4.) Cut the .90m X .90m plastic on the diagonal as shown to make the side flaps. Place these on the sides of the frame lapping in 5cm and secure with tacks.
- (5.) Place the large plastic over the frame as shown and nail splints above the overlapping sides. Turn and hammer the protruding nail points flat along the grain of the bamboo. If these points are not safely embedded the upper glass is endangered.



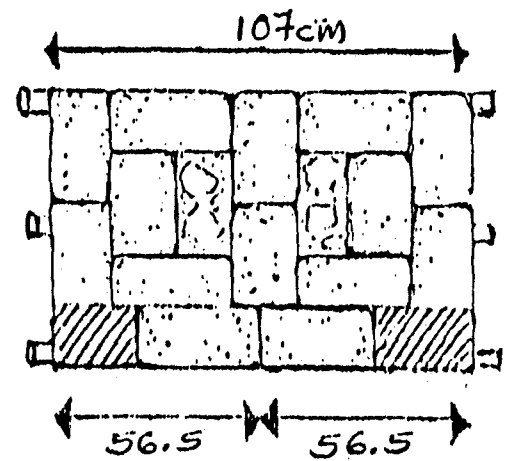
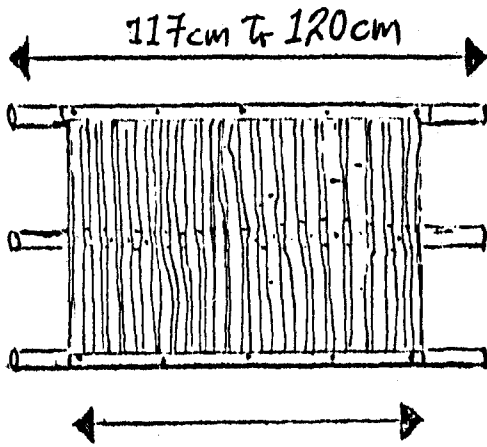
- (6.) Cut two lengths of strong string or thin rope 1.40m each and secure as shown below to the sides of the weather cover. Cut one length 75cm and secure to the center back of the weather cover. Cut 40cm and secure to the center front.



- (7.) When the structure and weather cover stand are ready, place the cover over the cooker. Loop the side ropes around the protruding bamboo ends at the side of the cooker. Make loops as shown at the front and back to fit the nails (stage 6. weather cover stand.) In stormy weather tie another rope over the top.




ALWAYS TIE ON THE WEATHER COVER WHEN THE COOKER IS NOT IN USE!



(7.) Join the bamboo support as shown above. If substituting wood use the same plan. Place on walls and smooth over with mortar.

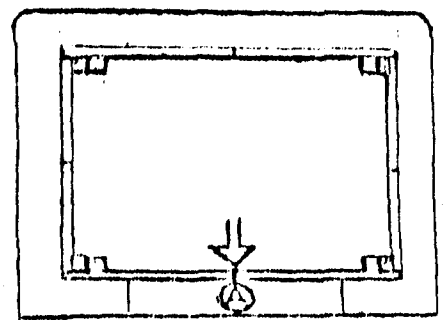
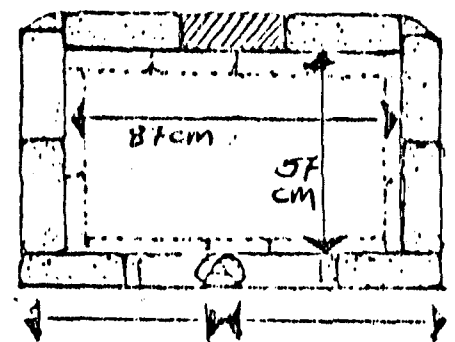
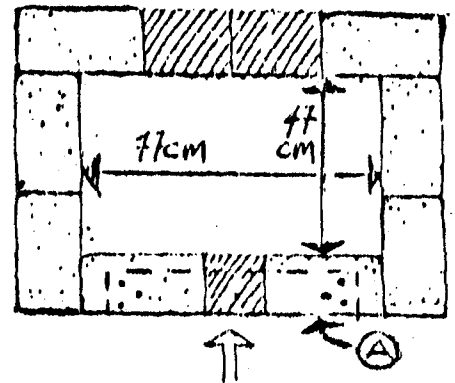
(8.) Lay the floor of the cooking chamber following the plan. Smooth over with mortar.

Note: All bricks marked  to be trimmed to measure.

(9.) Build this and the last course with stone free bricks. Allow this course to set, then center Drawer frame (A) slightly forward so it will be flush with the front after plastering. Check level and nail into place with 6" nails through the drilled holes.

(10.) Build the top course. Check the inner measurements and angles carefully. Plaster the inside and assemble the shuttering inside the cooking chamber. Center and align the shuttering level with top of (A). Check level all around and nail shuttering lightly to (A).

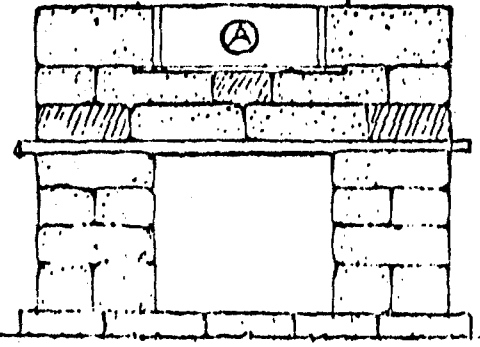
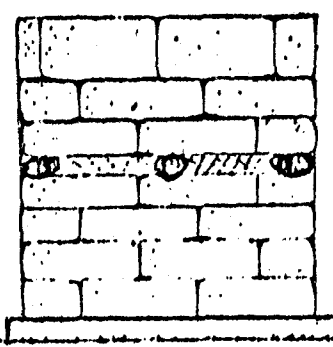
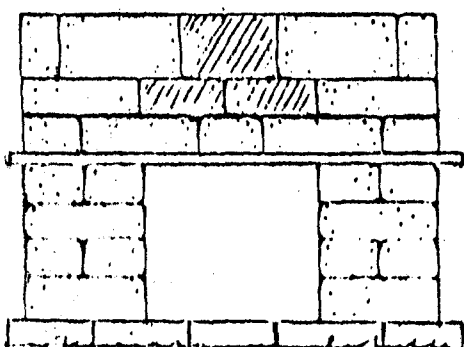
(11.) Spread the top layer using sifted mud mixed with cow dung and a hardening agent such as powdered linseed cake (the residue after oil has been extracted). Work smooth and level using the shuttering to perfect this important surface onto which the glass will be set. Do not remove the shuttering until this surface is set dry. Protect the cooker with the weather cover while it dries.



Back of the cooker:

Side:

Front:



WEATHER COVER STAND

This stand holds the weather cover at a slant to protect the cooker from rain. The stand must be firmly attached to the structure in order to ensure the safety of the cooker during storms. If reflectors are to be used in the winter, this stand acts as a support onto which the reflector can be attached.

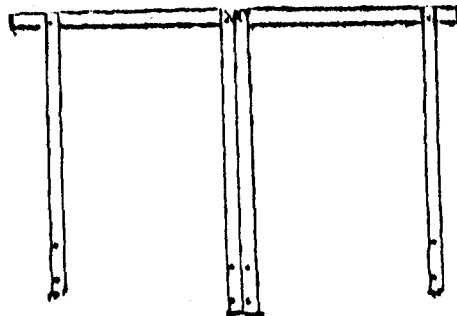
Materials required:

Bamboo poles with a total running length of 2 meters 95 cm.
Nails: 1½" X four, 4" nails X ten. 6" nails X eight.
(plus four 6" nails for the weather cover rest which will be nailed into place at the time of fitting the glass, but can be kept ready at this stage.)

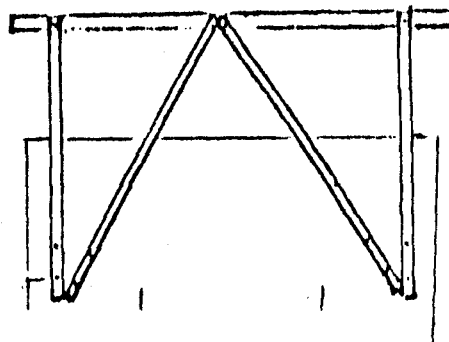
Instructions:

Cut the bamboo into lengths beginning at the thick end:
15cm, 1meter 15 cm, 75cm, 85cm and 90cm.
Split these lengths into half rounds and trim straight.
Drill or pierce the 75, 85 and 90cm pieces 2 cm and 10cm from the bottom.

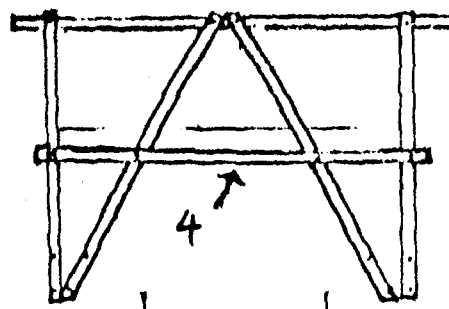
Assemble on the ground using 1½" nails:
Attach the 75cm braces 10cm in from either end of the 115cm top piece.
Attach the 85cm pieces on either side of the center of the top piece. Turn over and hammer nail ends flat.



Attach to the cooker structure. First nail the 75cm side braces into place nailing through the drilled holes 2cm from the bottom onto the bamboo pole (structural support stage 7. of the construction) using 4" nails. Swivel the 85cm pieces to slant as shown and nail into place through the bottom drill hole. Drive 6" nails through the holes drilled 10cm from the bottom and secure to course 8 of the mud structure.



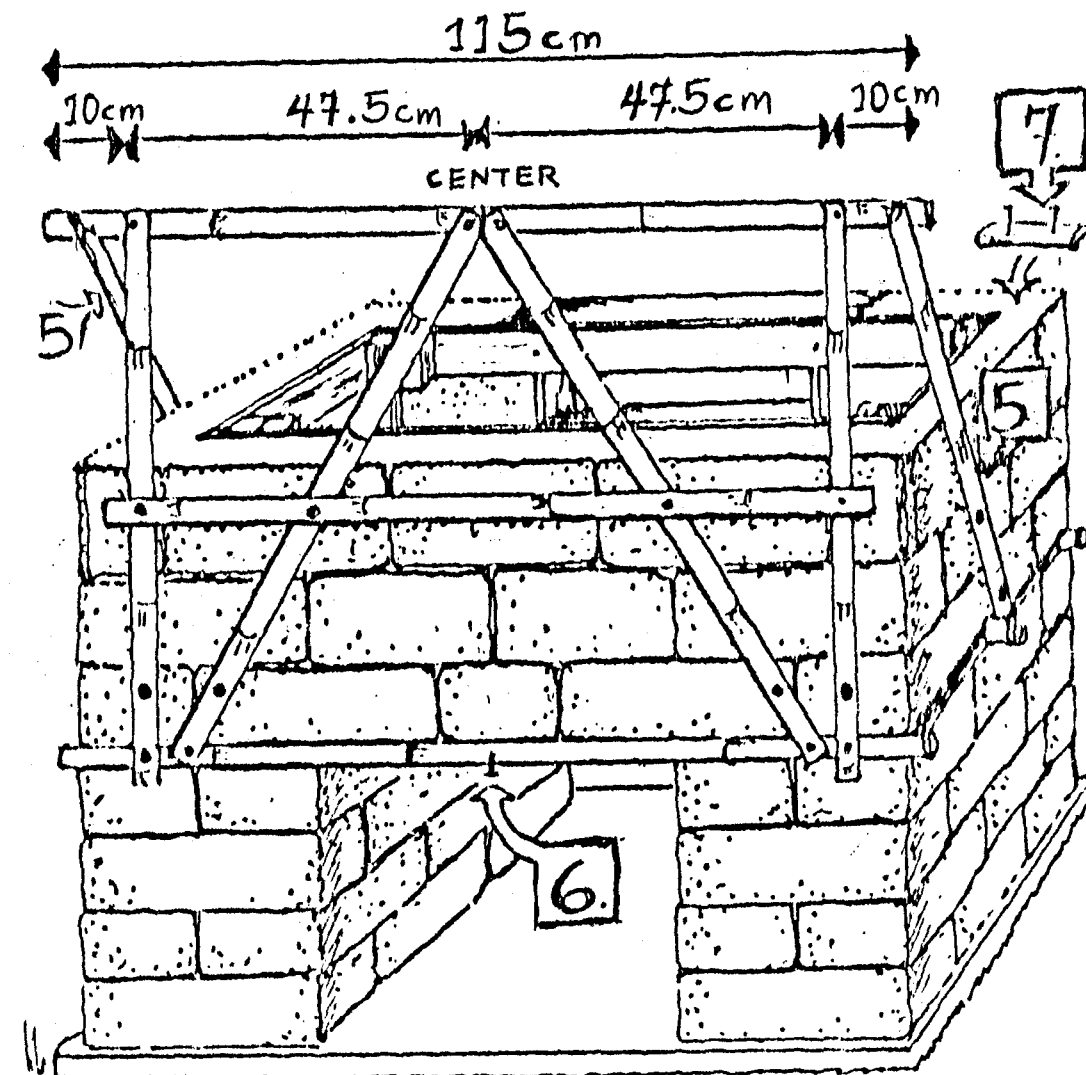
4. Cut the pair of the 115cm top piece down to 1 meter and hold it onto the stand about 5cm down from the top, of the cooker structure and mark for nails. Drill holes and attach to the back of the stand using 4" nails.



5. Attach the 90cm braces sloping from the center of the side to support the ends of the 115 cm top piece, using 6" nails driven into the mud structure.

6. Nail 4" nails into the front and back poles stage 7 of the construction from the bottom at the center.

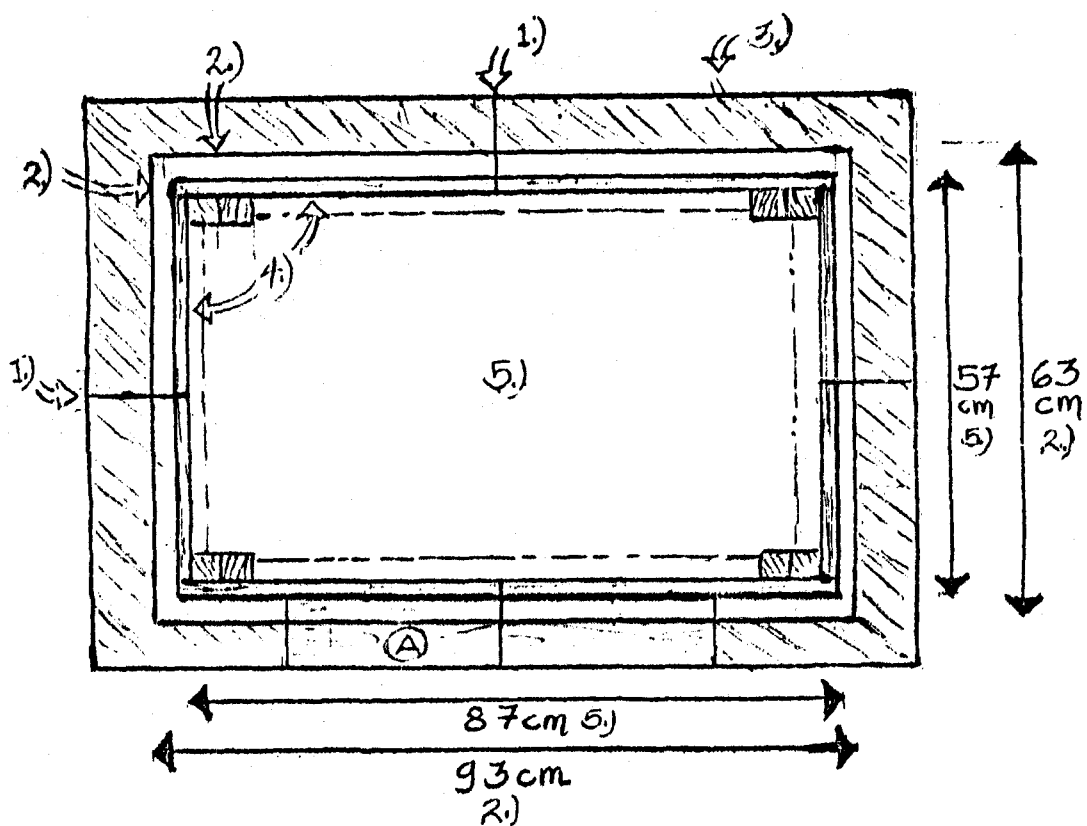
7. Drill or pierce the 15cm weather cover rests 2cm in from either end and keep ready, these will be required after the fitting of the glass



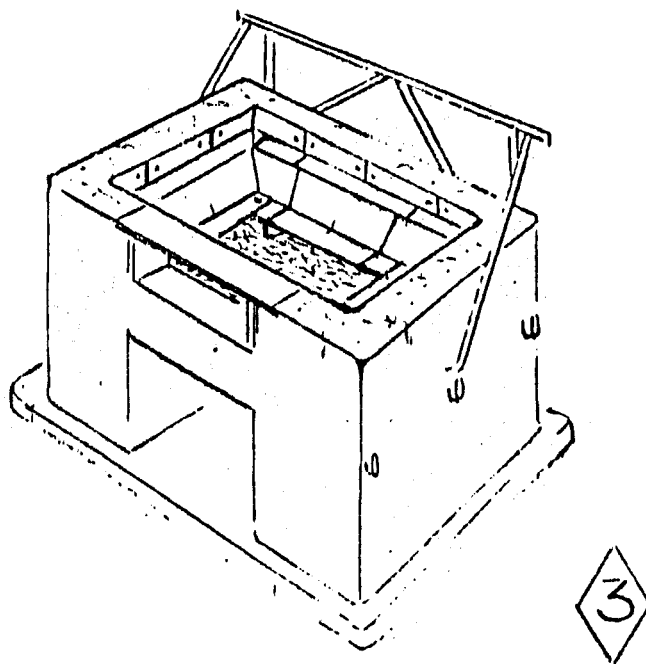
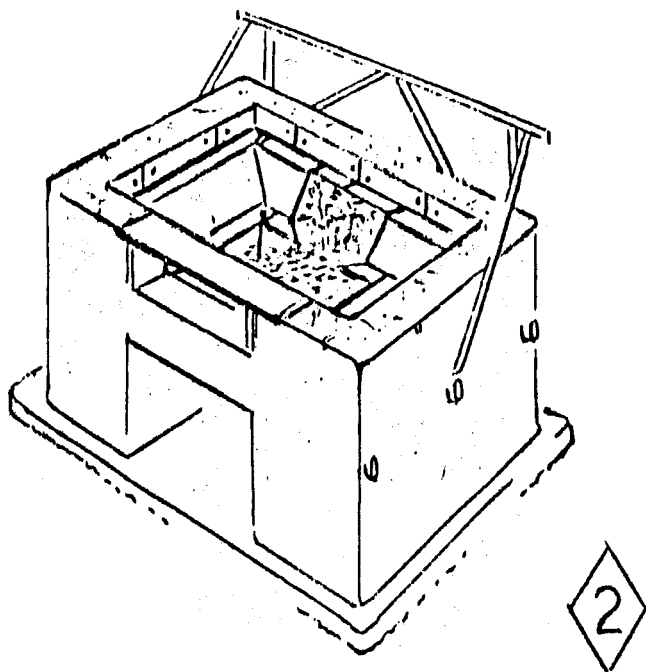
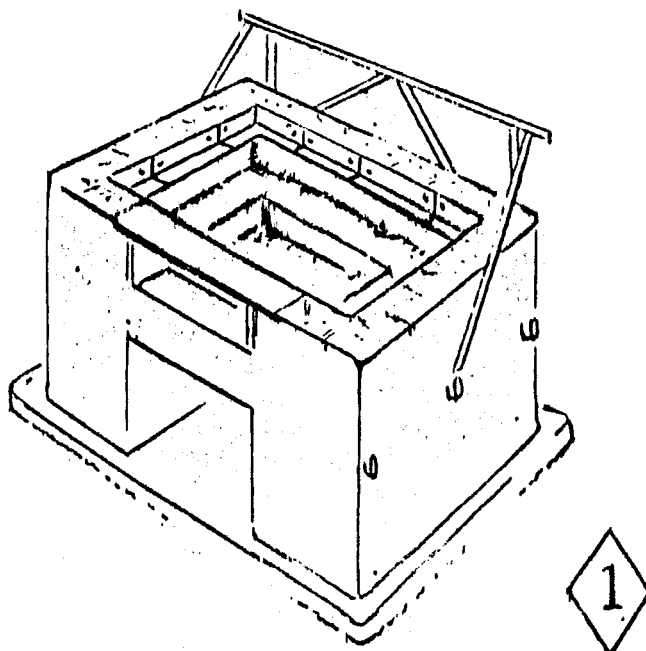
REMOVING THE SHUTTERING:

A few days after building the structure of the cooker the mud mortar will be firm and the structure will be partially dry. Before taking out the shuttering the top layer should be made ready for the final stage of fitting out the cooker:

- 1.) Mark out all the way across each side at the exact center (using the marks at the center of each side of the shuttering) of each side.
- 2.) Measure 3cm out from the inside edges and scratch a line enclosing an area that should be 93cm X 63cm. Within this area, fill any cracks that have developed during drying and work smooth and level using the top of the shuttering as a guide.
- 3.) The top of the structure outside this area will have a layer of mortar around the glass. Cracks will help this layer of mortar adhere firmly. To further insure that this next layer will adhere, score the surface, protecting the smooth inner area with the metal angle measure.
- 4.) Lift out the shuttering. *Detail sequence: Back, sides, front.*
- 5.) Using a trowel, scrape out the inside of the cooking chamber. Check the angles of all the corners and scrape or add to correct. Measure the inner rim of the cooking chamber. This should be 57cm X 87cm. Fill any cracks within the cooking chamber with mud mortar. Using a plaster of cow dung and a small amount of earth, plaster the inside of the cooking chamber as smoothly as possible.
- 6.) Tie the weather cover over the cooker so that drying will be slow. The day before the glass is to be fitted, allow the structure of dry in the sun. Before fitting the tin parts, husk, and glass the structure should be completely dry, as any remaining moisture will hamper the operation of the finished cooker.



Fitting the fin parts.



FITTING THE GLASS

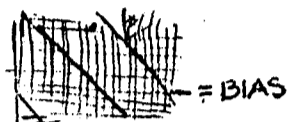
The efficiency of the cooker and the safety of the glass depend on care taken in carrying out this procedure correctly.

Materials and preparations:

GLASS: two sheets of glass 60cm X 90cm. Both may be 2mm thick. If desired, thicker glass can be used for the top. Inspect the glass before purchasing, and select glass without flaws or chips along the edges. Reject any glass with bubbles. Polish the glass with clean rags.

FABRIC: Thick woolen homespun is best. A used blanket or shawl can be used. The fabric should be clean. Cut into strips on the bias:

64cm long X 14cm wide X two strips
88cm long X 14cm wide X two strips



These strips of fabric cushion the edges of the glass and seal the heat into the cooker. Cutting on the bias prevents fraying and gives greater elasticity for folding.

SEPARATORS: The two sheets of glass are to be set 2cm apart. If well seasoned wood is available, wooden separators are easy to place.

66cm long X 2 to 3cm wide X exactly 2cm thick X two
88cm long X 2 to 3cm wide X exactly 2cm thick X two
These should be planed so that the thickness is level. If well seasoned rosin free wood is not available (and a number of cookers are to be made, the separators can be cast in situ in Plaster of Paris. For this a mold is required. (See design).

STRING: String stretched along the edges of the glass during fitting are withdrawn when the top is complete to leave a hollow along the edge of the bottom glass. The bottom glass expands when the cooker heats, this hollow will prevent breakage.

1.20m of string 2mm thick X two lengths
1.50m of string 2mm thick X two lengths

MORTAR: Mortar made from a mixture of sifted mud, cow dung and a hardening agent such as linseed cake powder, as was used for the top level of the structure should be well mixed and kept ready. One load.

WEATHER COVER RESTS:

Two half rounds of bamboo approx 15cm long nailed on either side of the front will prevent the weather cover from crashing into the glass and breaking it.

FEVICOL, NAILS (2" and 3")

FITTING THE GLASS

Procedure: (Read over each section carefully before attempting!)

CUSHIONING FOR THE GLASS:

- (1.) To adhere the fabric to the structure, dab Fevicol inside the line that marks off the smooth surface 3cm from the inside of the cooker all around, except at the corners.
- (2.) Fold the 88cm length of woolen fabric to find the center. Align with the markings at the center of the front and back. Place the edge of the fabric along the marked line with the remaining fabric hanging in toward the cooking chamber. When working with bias fabric be careful not to pull it out of measure and shape. Press down firmly.
- (3.) Center the 64cm strips of fabric and adhere to the sides as above.
- (4.) To double the cushioning of wool below the bottom glass, fold the fabric back towards the outside of the cooker. The edge of this fold should protrude slightly along the rim of the cooking chamber to protect the glass from any contact with the tin parts.

BOTTOM GLASS:

- (5.) Supporting the glass carefully by holding both ends with clean rags (the rags keep your hands from smudging the glass and protect your hands from being cut) place the long edge of the glass along the cushioning at the back of the cooker, and tilt the glass forward lowering it slowly onto the cooker. (You are standing in front of the cooker.) Adjust the bottom glass so that it is supported equally on the front, back and sides of the structure. Check that the glass is completely clean.
- (6.) Place string along all edges of the glass and stretch taut by tying down with nails driven into the outer structure of the cooker.
- (7.) Fold the fabric up over the glass and string. You will have to cut into the ends of the side strips along the string and pull the flap up. You are now ready for the separators.

SEPARATORS:

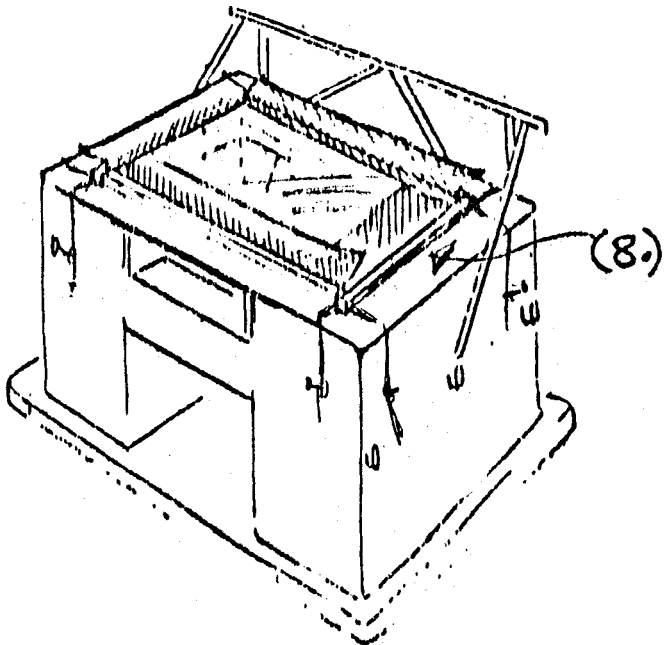
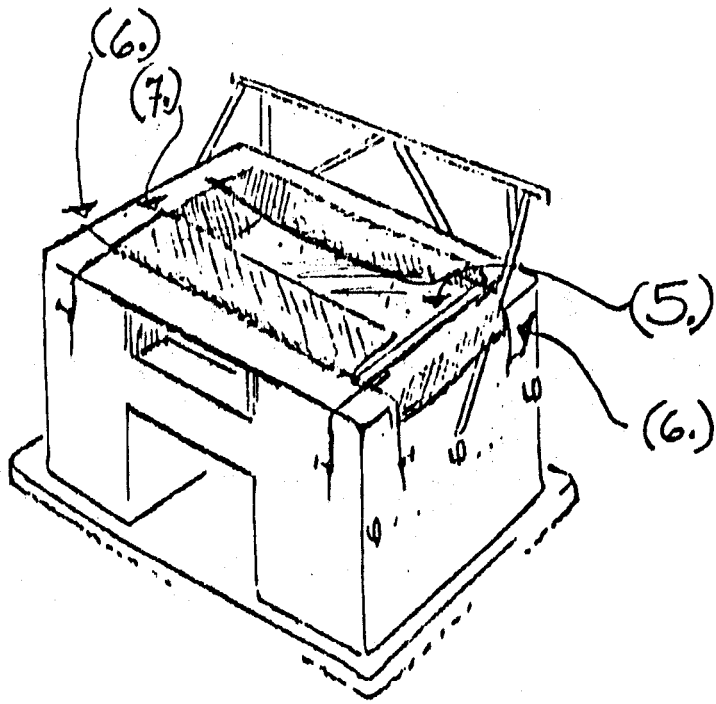
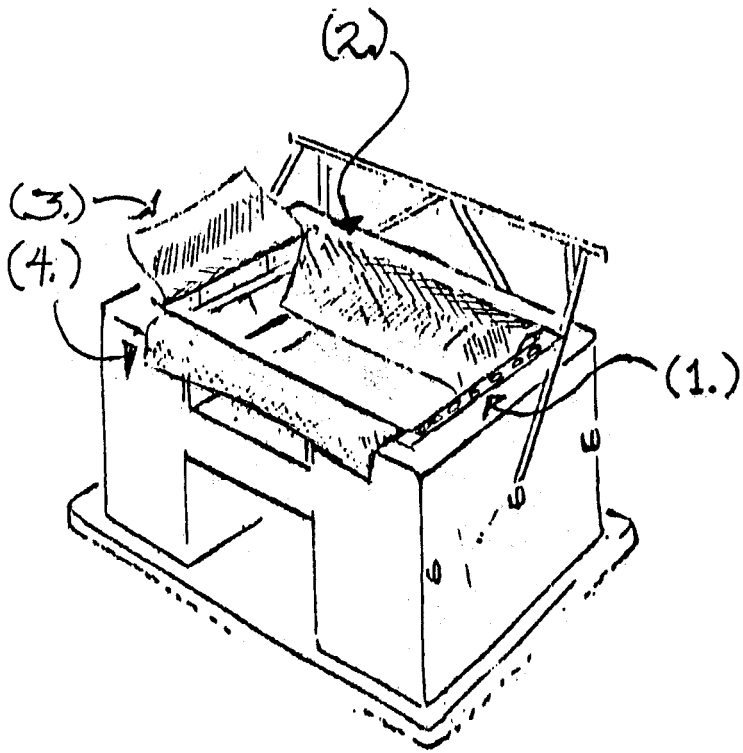
If wooden separators are being used:

- (8.) Place the side separators, bring the fabric up over the separators. Then place the front and back separators and bring the fabric up over them.

OR

If plaster of Paris separators are being cast:

- (8.) Protect the bottom glass with pieces of news print and a 60cm X 90cm sheet of plastic. Place the molds with a 4cm gap all around between them. Grease the string and the insides of the mold so that the plaster will not stick. Seal the outside of the outer mold with mud all around to prevent the plaster from running out. Bring the fabric up inside of the gap between



the inner and outer frame. Mix and pour the plaster using a small amount at a time. (Shake the dry plaster into water stirring constantly in one direction until there is enough plaster to form a consistency like thick cream or whipped curd) Pour into the mold poking the fabric so that it stays down onto the glass and string with the excess fabric to the side of the inner mold. Allow to set before pouring the next layer. Push back any plaster that leaks toward the inside to seal off the inner edge. Pour layers of plaster until it reaches the level of the top of the outer mold. Allow to set. Scrape level on the top, if need be. Gently move each string back and forth and pull them out one by one. Lift up the outer mold. Lift off the inner mold. Remove plastic.

CUSHIONING FOR THE TOP GLASS

- (9.) Dab Fevicol on the top of the separators. Turning the edge of the fabric back under to form an edge like a 'piping' in sewing, and a double layer of wool on the top of the separator. Press down.

TOP GLASS:

- (10.) Standing in front of the cooker, holding the top glass at each side with clean rags, place the back of the glass at a slant along the back separator and slowly lower the glass into place. Adjust so that the glass is supported equally at all sides. Protect the top glass with newspaper and/or a 60cm by 90cm plastic sheeting.

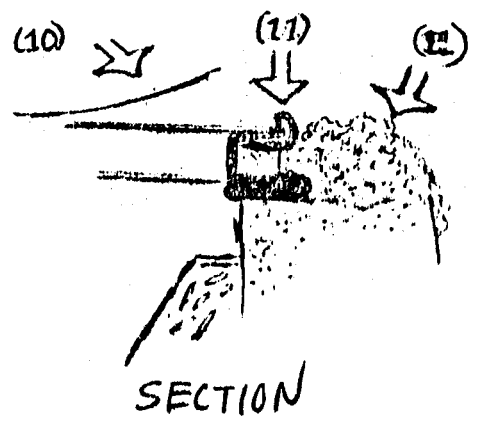
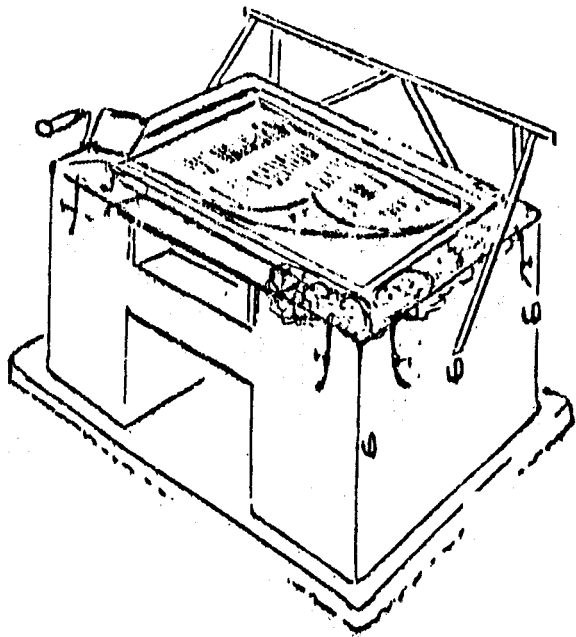
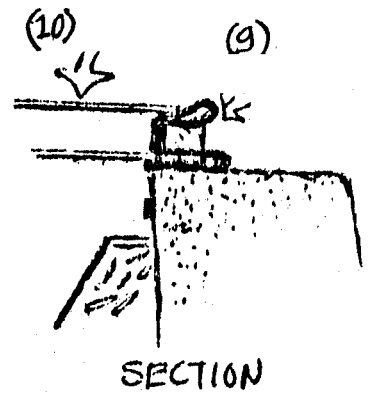
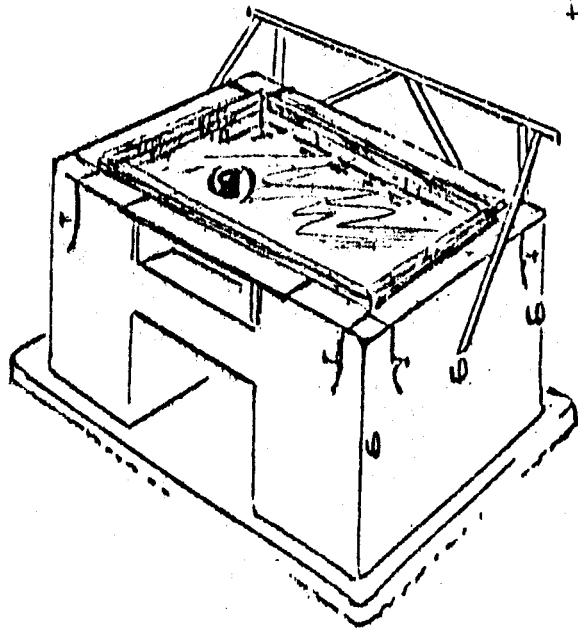
FINISHING THE COOKER:

- (11.) Slap the mud mortar all around the separators. Pinch up the 'piping' around the edges of the glass and hold any straight piece of wood along the glass. Work the mud from the outside to hold this rim of fabric up. Smooth the outside mud down over the edge of the structure, to help hold it in place. Work smooth. The 'lipai' plaster of the outer structure can be done now or later, but should not be done before.

(note) If wooden separators have been used the cooker should NEVER be allowed to heat until the strings around the bottom glass have been removed. Keep the top glass covered and do not put the drawer (A) into place until the mud plaster sets firm (depending on the weather this will take a day or two.) Keep the cooker under the weather cover. Withdraw the strings.
NAIL WEATHER COVER RESTS IN PLACE ON THE FRONT CORNERS OF THE COOKER

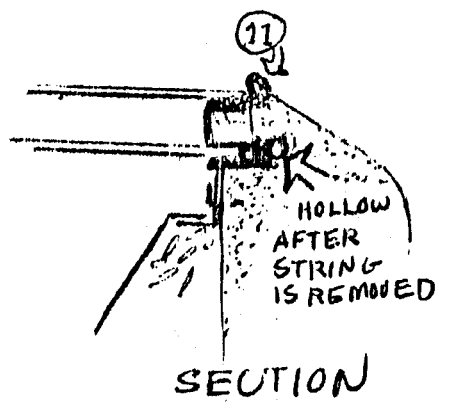
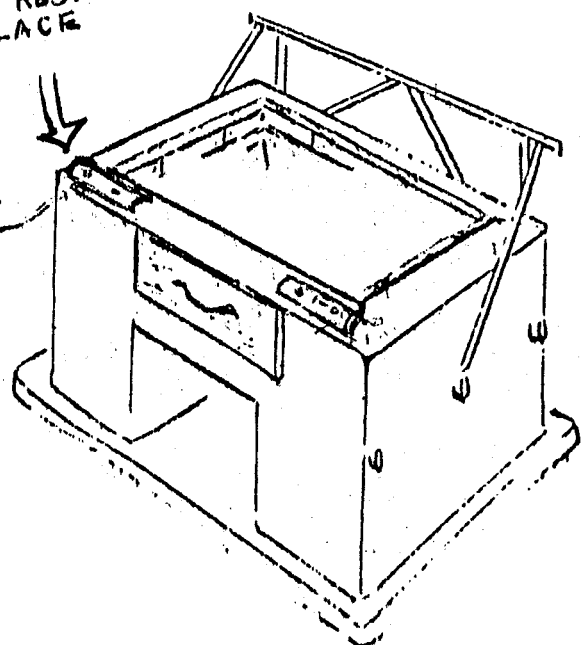
- (12.) Put drawer (A) into place and allow the cooker to heat up for one full day before attempting to cook. As the cooker heats moisture from the lipai may appear on the inside of the top glass. Gently tilt up the top glass and wipe dry. Such moisture only appears when the structure is lipai'd, after a spell of wet weather, or on very cold mornings.

ALWAYS PROTECT THE COOKER WITH THE WEATHER COVER WHEN NOT IN USE. A clean used bath towel may also be placed on the top glass to protect it from dust when the cooker is not in use.

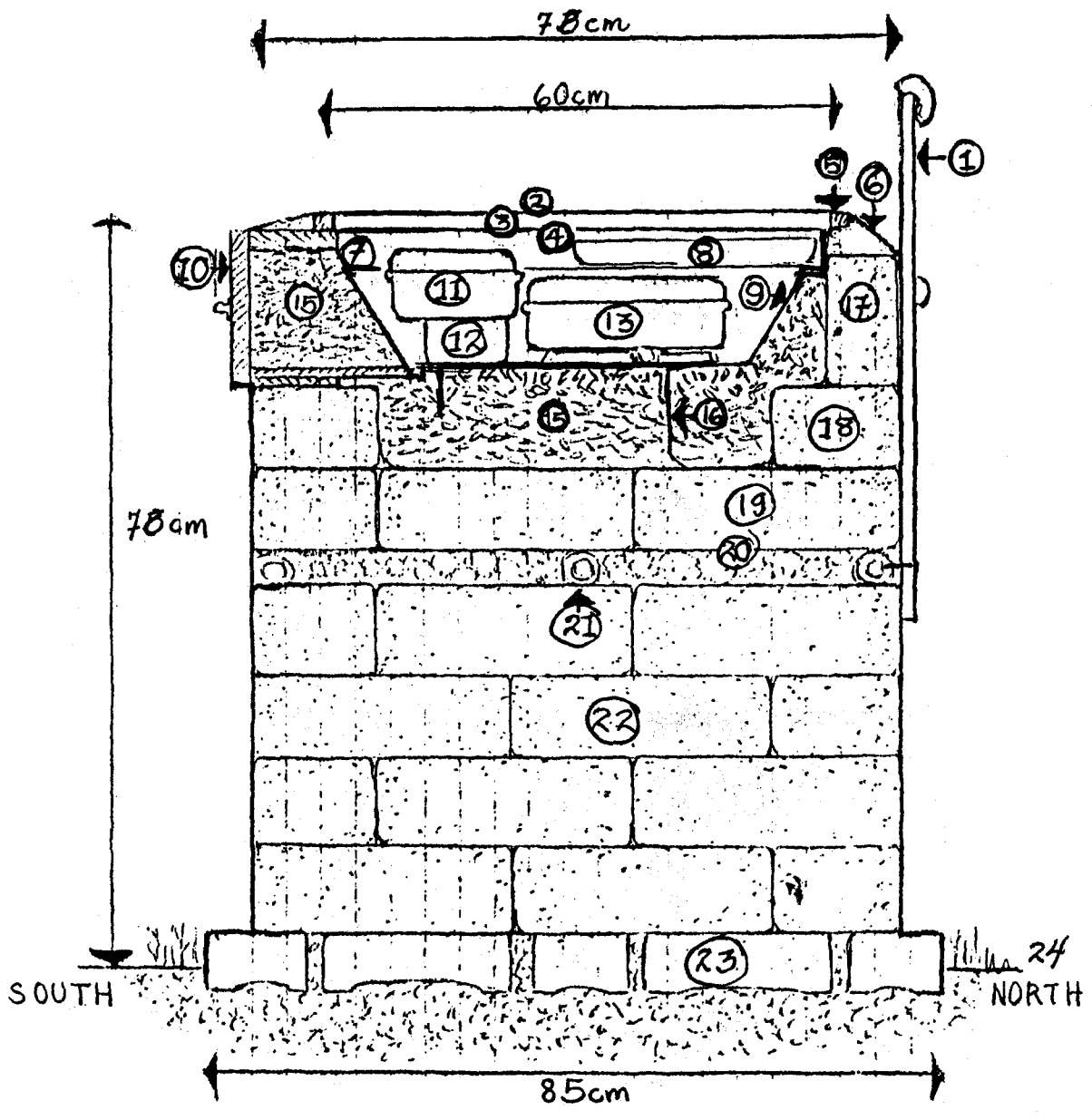


NAIL WEATHER COVER RESTS IN PLACE

WITHDRAW STRING



1. Weather cover stand
2. Top glass 60cm x 90cm
3. Gap between glass 2cm
4. Bottom glass 60cm x 90cm
5. Wood separators 2cm x 2cm x 69cm and x 98cm
6. Top layer of specially prepared sifted mud plus 'alsi' seedcake
7. Fixed tin rim on which oven tins are suspended
8. Inverted lid covered with glass set on rim for roasting or frying.
9. Tin collection oven fabricated from used ghee tins and painted matt black.
10. Drawer type opening, 41cm x 15cm high x 10cm deep at top 18cm bottom.
11. Black painted 'dubbah' type utensil set high for quick cooking on 12.
12. Ordinary 'katori' with a slow cooking food
13. Black painted 'dubbah' type utensil set on trivet,
14. Trivet to allow circulation of heat.
15. Husk from a rice sheller
16. Unpainted parts of the collection oven which carry heat into the husk and help support the tins.
17. Top layer of earthen bricks set on edge.
18. Side layer of earthen bricks
19. Bottom layer of earthen bricks; floor of the cooker.
20. 'Chachra' split bamboo support for the floor of the cooker.
21. Bamboo supports.
22. Base of cooker (these two walls can be made of baked brick or stone)
23. Baked brick or stone foundation, 85cm x 115cm
24. Ground level



HEAT COMES FROM THE TOP: broad shallow utensils give the best results. If a big utensil is used the food at the top will cook but not the food in the middle.

HEAT COMES IN THROUGH THE GLASS: the glass should always be clean. ALWAYS LET THE COOKER HEAT UP BEFORE LOADING: most foods require a 'quick start', the cooker gathers more heat empty, and transfers it to the food.

DO NOT OPEN THE COOKER OFTEN: Since nothing is going to burn or stick there is no need to open the cooker to check on the food. Each time the cooker is opened heat will escape and cooking will be slowed down.

DO NOT OVER LOAD THE COOKER: If there are too many items in the cooker it may never gather enough heat for cooking any. Load less in winter and more in summer.

DULL BLACK SURFACES GATHER HEAT: when the paint wears off the tins get them repainted (BLACK BOARD PAINT). Shiny surfaces repel heat. Glass will let the heat in.

AS THE SUN RISES IN THE SKY THE TEMPERATURE RISES IN THE COOKER: The heat in the cooker depends on the angle of the sun. When the sun rays hit the surfaces in the cooker straight on, as at noon in midsummer, the cooker will gather the most heat. Morning, evening and winter a reflector can increase the heat in the cooker.

HEAT RISES: If you prop items higher in the cooker they will cook faster.

FOOD WILL NOT OVER COOK: even when the food is ready it can be left in the cooker and will not spoil in any way. Most foods are not ready until the sun has reached the maximum angle. It is wrong to say rice cooks in an hour: rice does cook in an hour mid-summer mid-day BUT nothing cooks early in the morning. You can put rice into the cooker at nine, ten, eleven or even twelve: the rice that went in earliest will not be ready until twelve thirty and the rice that went in at twelve will be ready at one.

USE THE COOKER TO SAVE TIME: Use the cooker for items that would normally require stirring (like rice kheer) and the cooker will save time.

USE THE COOKER TO SAVE FUEL: Foods that cook quickly are best made on conventional fuel: use the cooker for items that require long slow cooking like whole dahls and baking.

USE THE COOKER AS A DRYER: Food stock that has become damp or infested with insects can be dried and purified by placing in the cooker. Two hours in the cooker (morning and evening are best as the high mid-day temperatures may affect the food) is worth a day in the open sun shine.

NOTHING WILL BOIL OVER: its the extra heat trying to escape from a food that causes 'boiling'. In the cooker at the same temperature in the food (water holds a maximum of 100° degrees centigrade and loses the rest by 'boiling') there may be lazy bubbles. Sugar and oil hold higher temperatures and foods cooked in sugar syrup or oil can sometimes 'burn', but not quickly.

Ratio of cooking time at low solar temperatures is not always proportionate to cooking times at high temperatures. That is some foods, like vegetables, cook quickly on high heat & take longer to cook on low heat. Other foods, like meats (if the ones being taken are not vegetarian), cook better & in the same time on slow heat. Whole dahl like rajma, chana, and soya (beans) (chickpeas)

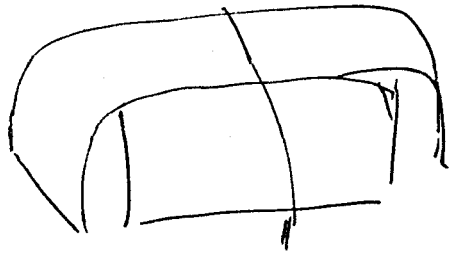
cook better on slow heat & take only a little longer than on the fire. Soak first. Drain. add hot water & put into cooker in winter. In summer cold water is OK.

The food should fill the utensil to catch the heat from the top. Dals & beans swell up while cooking. To find the capacity of the utensil fill with dry rice or dahl, measure. $\frac{1}{3}$ the amount is what will cook in that utensil. That is in a utensil that holds six glasses of dry rice, you can cook two glasses of rice, (+ four glasses of water ~~or~~ HOT in winter cold in summer). For poor quality rice: 2 glasses ~~so~~ washed well & soaked 2-3 hours wash well again & drain add 2 glasses hot water & place in cooker.

Dahl cooked with double the amount of water will be soft but dry - more water can be added over conventional fuel & the cooked dahl quickly spiced & diluted to soup consistency as desired.

cheap plastic

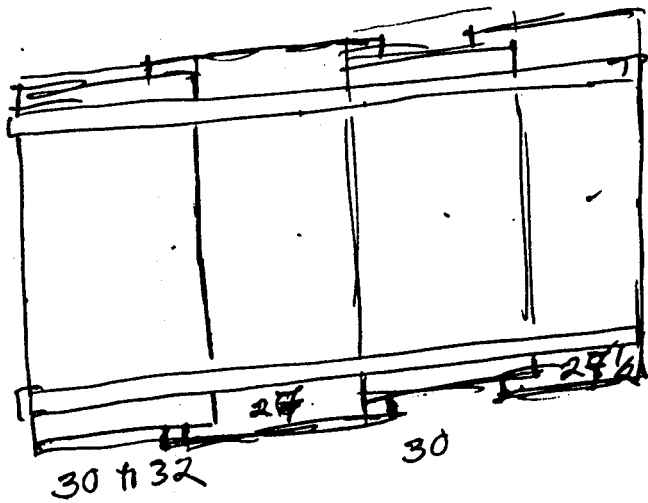
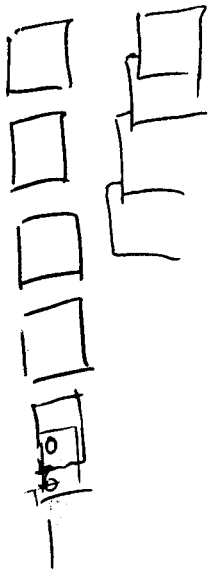
75 x 1.50
1.20 x 1.00



daily cover

TINS

seen from bottom



footrins

30
30
26
28

104
+ 3
107

