FOOD PROCESSING AND PRESERVATION

HAND-POWERED GRAIN MILL

ABSTRACT

This hand-powered grinder will grind corn, wheat or other grain coarse or fine. It is simple in design and easily built by a carpenter, being made almost entirely of plain one inch lumber.

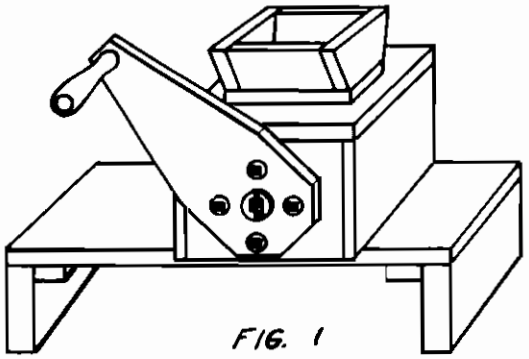


FIG. 1

TOOLS AND MATERIALS

Tools -
Hammer
Hand cross cut saw
Auger brace and 1/4, 1/2 and 7/8 inch auger bits.
Round file
Coping saw or key hole saw
Breast drill and 1/8" twist drill
One flat file
One three corner file
1/2" x 13" die and die handle
5/16" die
Wood chisel
Half round wood file
Tin shears
Screw driver

Materials -
12 feet of 1" x 6" seasoned sheathing lumber
2 feet 1" x 10" sheathing lumber
2 feet 2" x 8" framing lumber
3 feet 2" x 4" framing lumber
1 piece 1/2" x 14" cold rolled steel
12 - 1 1/2" x 8" flat head wood screws
3 - 1/2" steel washers
4 - 1" x 4" carriage bolts
1 - 1/2" wing nut
1 - 3/8" x 5" carriage bolt
2 cast iron burrs. (The cast iron burrs are available from Booher Equipment Company, 3627 Devon Drive S. E., Warren, Ohio, for about $.50 plus postage.

DETAILS

Through the following discussion 1" lumber refers to the standard board thickness for surfaced sheathing lumber in the United States. It actually measures only about three quarters of an inch in thickness. All dimensions are in inches. Lumber used should be flat and well seasoned. The numbers in the next section refer to part numbers shown in Figure 2 and subsequent detailed part sketches.

1. Grinder Body - make of 1" x 6" pine or hard wood lumber. Circular hole can be cut with coping saw or jig saw but for a better and quicker way to cut see Notes 1 and 2, Figures 3 and 4.

2. Rotor - See Note 2. Take care tc bore the 1/2" holes thru each part where required accurately and at right angles to the surface of the part. If

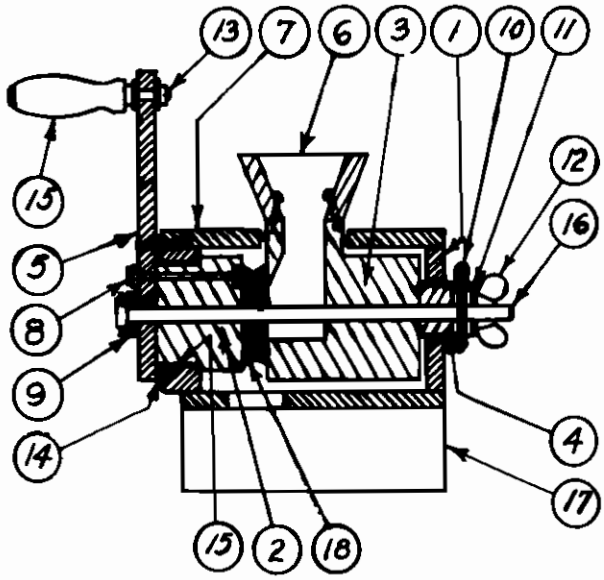
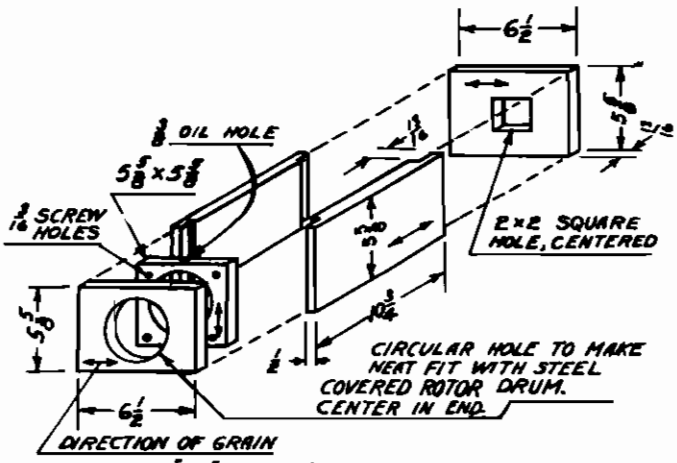


FIG. 2. ASSEMBLY DWG.

when placed on the assembly post, it does not lay flat to the assembly post surface marked "A" in Figure 3 or against an adjacent part because the hole is not bored straight, remove it from the assembly post and use a round file in the hole carefully until it will lay flat. Use a few spots of glue between parts. Be careful in nailing so nails will not interfere with boring the 1/4" holes later. Keep the nails within 1" of the center post. 1 1/2" finishing nails are about right.



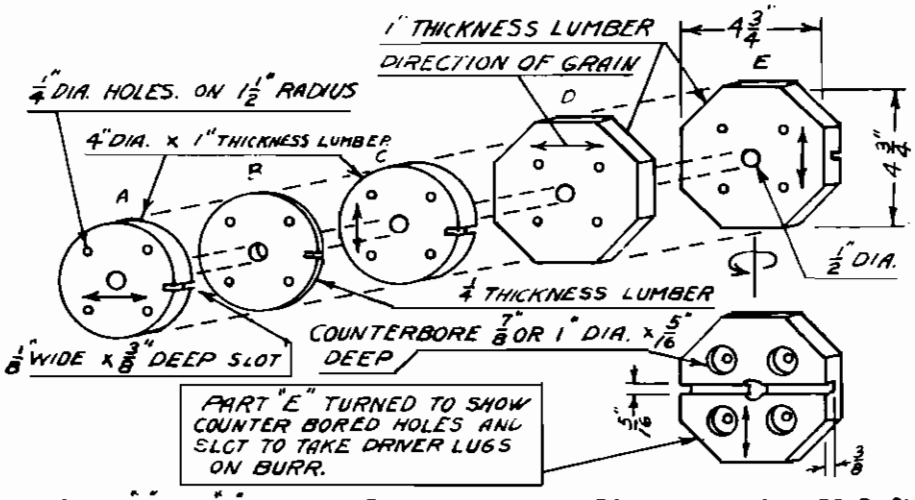
(1) GRINDER BODY. EXPLODED VIEW.

It is a help in getting the metal band snugly on the rotor drum to form the 3/8" lip on one end first, then bend the band around some round object that is about 3" in diameter. Next put it on the rotor drum with the one lip engaged in the slot. Use strong twine or flexible wire to pull band snugly around drum and mark position of the second lip. Remove from rotor, form the second lip and cut off excess. The band may need to be formed a little with the fingers. It should now fit snugly.

3. Stationary Burr Holder - In boring 1/2" holes and assembling follow the instructions given under (2). Assemble the parts using a few spots of glue and nails. 1 1/2" finishing nails are about right.

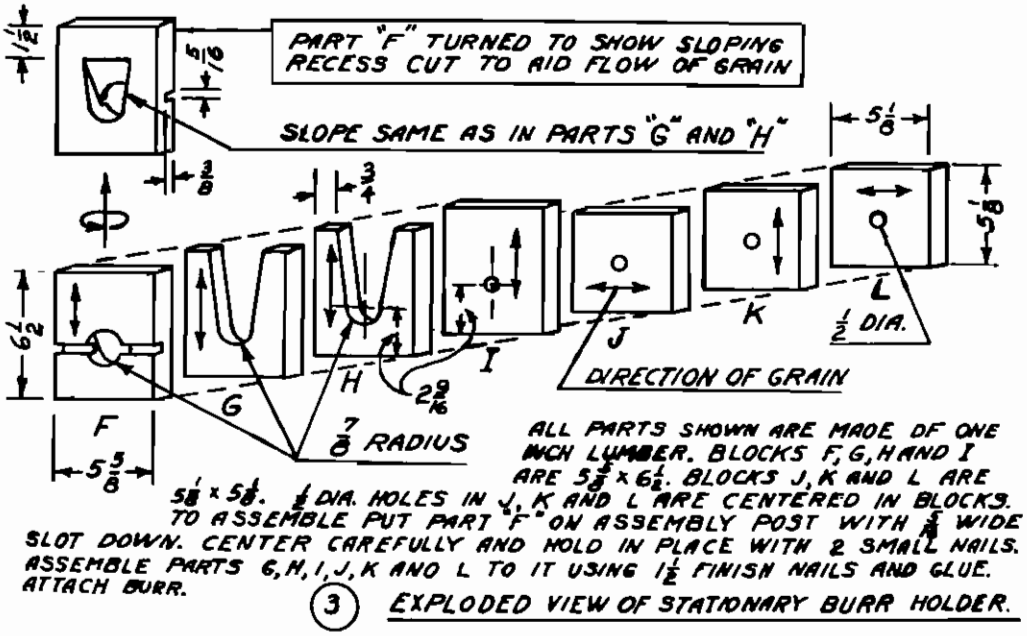
4. Follow instructions under (2) Rotor for assembling parts of the thrust block.

5. The 1/4" holes can best be located by placing the rotor and crank all on the assembly post. With bolts in place thru rotor, mark location for holes on crank by tapping with a hammer. Oil hole in the crank is bored to reach the 1/2" hole. This will supply oil to the steel shaft.



DISCS "A" AND "C" ARE CUT FROM FRONT END BOARDS OF GRINDER BODY USING CIRCLE CUTTER. SEE FIG. 4. CUT DISC. "B" FROM ¼" PLYWOOD OR PLAIN ¼" THICK LUMBER. BORE ½" DIA. HOLES IN CENTER OF EACH PIECE, THEN STARTING WITH PART "E," PLACE OVER ASSEMBLING POST WITH SLOT DOWN. ASSEMBLE OTHER PARTS AS SHOWN. USE 1½" NAILS AND GLUE. MAKE COUNTER-BORES AND ¼" HOLES AFTER ASSEMBLING. PUT THE FOUR ¼" BOLTS IN HOLES WITH HEADS IN COUNTER-BORES. ATTACH BURR WITH 1½"×8 WOODSCREWS.

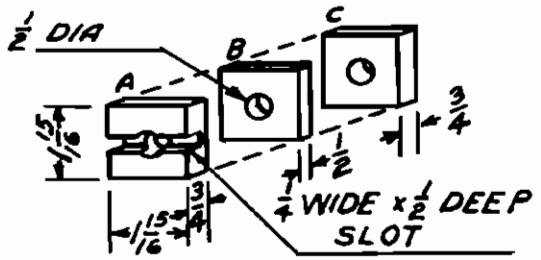
(2) EXPLODED VIEW OF ROTOR



(3) EXPLODED VIEW OF STATIONARY BURR HOLDER.

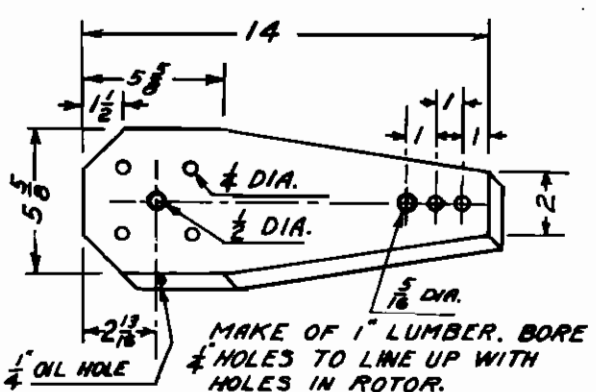
6. Attach hopper to top of stationary burr holder with screws. See Figure 2.

7. Cover



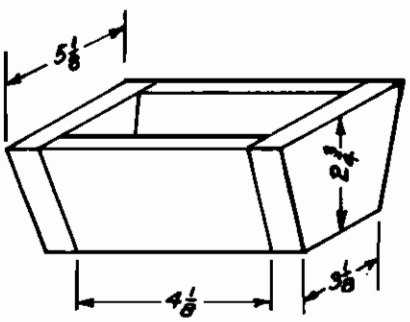
AFTER BORING HOLES AND CUTTING SLOT, ASSEMBLE PARTS A, B AND C USING SMALL NAILS AND GLUE. TOTAL THICKNESS OF A, B AND C IS 2"

(4) EXPLODED VIEW OF THRUST BLOCK.

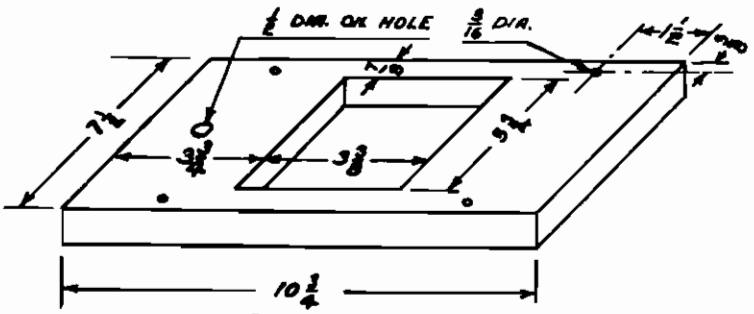


MAKE OF 1" LUMBER. BORE 1/4" HOLES TO LINE UP WITH HOLES IN ROTOR.

(5) CRANK


MAKE OF 1" LUMBER

(6) HOPPER



MAKE OF 1" LUMBER. LOCATE OIL HOLE TO LINE UP WITH OIL HOLE IN GRINDER BODY

(7) COVER

8. Four 1/4" x 4 1/2" carriage bolts with nuts and 8 washers.

9. Two steel washers for 1/2" diameter bolts.

10. Two 1/8" diameter x 2" cotter key. If a larger diameter cotter key is used, drill the hole to suit. The hole should not in any case be more than 5/32".

11. Three steel washers for 1/2" bolt.

12. One 1/2" winged nut.

13. One 5/16" diameter carriage bolt threaded 1 1/2". File square shank under head to roundness. Length 4 1/2".

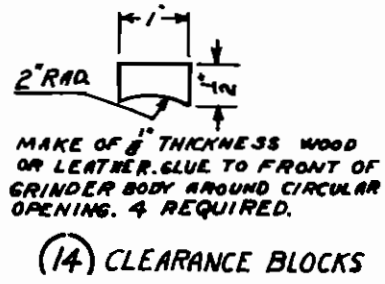
14. Clearance Block - The purpose of the clearance block is to keep the crank from rubbing the front of the grinder. Locate the clearance blocks at even quarters around circular opening in front of grinder body.

15. Rotor Drum Band - In making this part and attaching it to rotor read the discussion under Rotor (2).

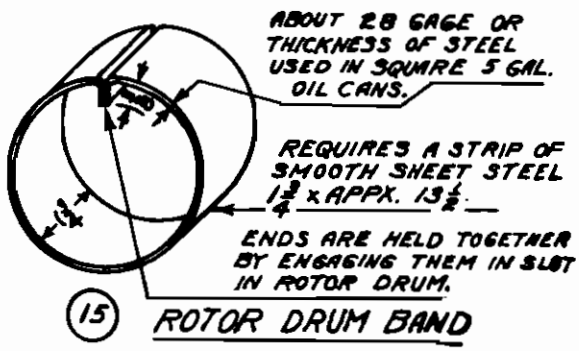
16. Steel Shaft - Threading is U.S. standard, 1/2" x 13 threads per inch.

17. Grinder Stand.

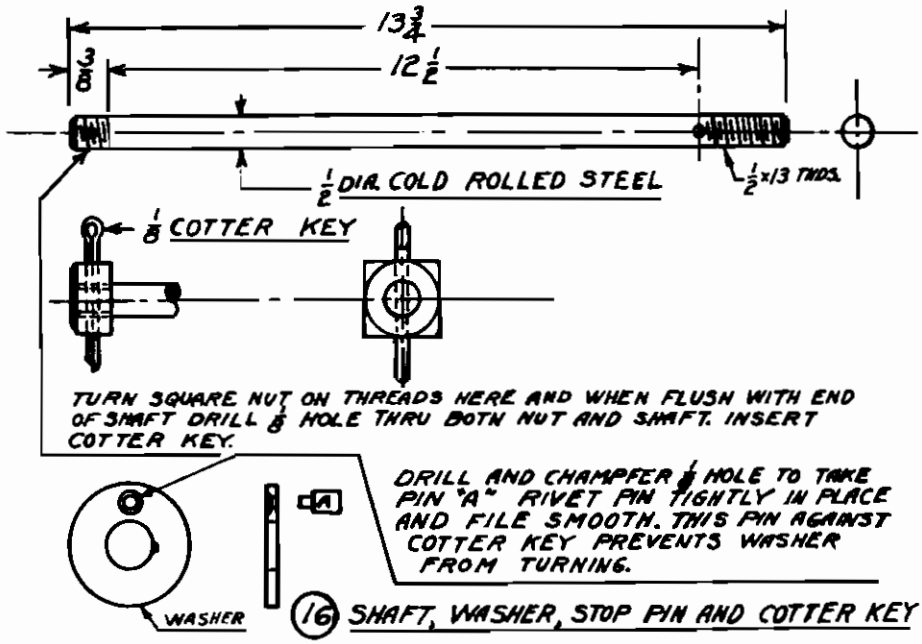
18. Two cast iron burrs. See materials.



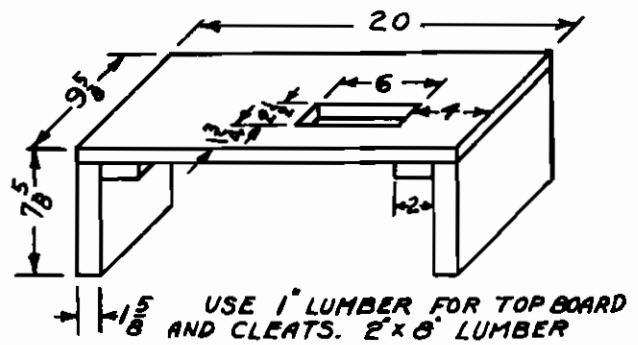
(14) CLEARANCE BLOCKS



(15) ROTOR DRUM BAND



(16) SHAFT, WASHER, STOP PIN AND COTTER KEY



(17) GRINDER STAND

FINAL ASSEMBLING

After all parts are completed the next step is to fully assemble the mill. The rotor with burr attached is placed in its position in the circular opening. Attach the crank. Next put the stationary burr holder in position and insert the steel shaft thru both parts. Put

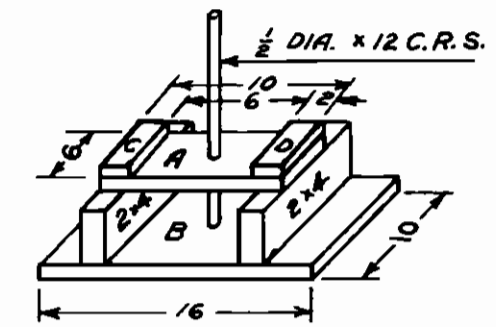
the thrust block in place, insert the cotter key, put on steel washer and run up the winged nut. In making the final adjustment it may be necessary to add one or more steel washers between thrust block and burr holder or to shorten the thrust block. When the winged nut is tight, there should be a little play between the cotter key and the bottom of the slot in thrust block.

Before putting on the cover turn the rotor and observe the burrs carefully. They should remain flat to each other when rotor is turned. If there is an opening which travels around as the rotor turns, a shim is needed under the burr on the rotor. Mark the place and note thickness of shim required. If the opening remains stationary a shim is needed under the burr on the burr holder. Remove the necessary part and add a shim. Of course, both burrs may need shims. A little glue under the shims makes a permanent job.

NOTES -

The purpose of the following is to facilitate and speed up the job of making the mills. It is assumed the mills will be made in a carpenter shop as a business. The notes along with Figures 3 and 4 describe two devices that will be found very useful in shops making these mills.

NOTE 1 - See Figure 3. The use of the assembly post is described under (2) and (3). In constructing the assembly post, care should be taken to make it very solid and strong and the steel post must be square with the surface marked "A" in Figure 3. A good way is to build the entire wood part of the device "C" and "D" before boring the holes for the steel post. When ready to bore these holes, bore thru "A" first, then push the bar thru to "B" and testing carefully with a square move top of bar until it tests square both ways then strike the bar on its top end to mark position of the auger hole in "B". Last, put on "C" and "D".



ALL WOOD PARTS ARE 1" LUMBER EXCEPTING THE 2 PARTS MARKED 2×4.

FIG. 3. ASSEMBLY POST

NOTE 2 - See Figure 4. The purpose of this device is to cut the circular discs out of the end boards of the grinder body. Test each on the assembly post to be sure the holes are square thru these members. Use a round file if the member does not lay flat on "A" of the assembly post. Place the pieces one at a time on the rod of the disc cutter. Remove the steel rod from the assembly post and pass the steel rod of the disc cutter thru both holes of the

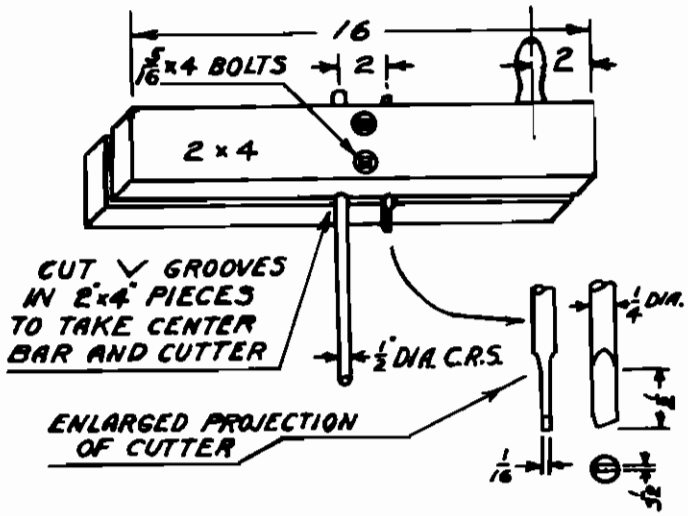


FIG. 4 DISC CUTTER

assembly device. The assembly device with disc cutter in place should now be held in a bench vise or fastened to a wall so the shaft is horizontal and at a convenient height for turning. Turn the crank and exert a gentle pressure to bring the cutter into play.

The steel cutter should be of tool steel. A six inch length of drill rod is excellent. If this is not available, a screw driver with approximately a 1/4" diameter shank can be shaped up with a file to do the job. In operating the disc cutter cut only half way thru the member then reverse and complete from other side.

For greater strength the cutter can be made more then 1/16" in thickness. This will make the discs that compose the rotor drum fit too loosely even after the steel band is on but the difficulty is easily corrected by giving the drum several turns of heavy wrapping paper before the steel band is applied. The paper should be glued to the drum.

EVALUATION

To date the grinder has not been field tested. Shop tests have been successful.

Material From - Designed by W. B. Booher
3627 Devon Drive, Warren, Ohio.

HOUSING AND CONSTRUCTION

TUBEWELL SAND AUGER

ABSTRACT

This slower cutting auger can be used where tubewell drilling is more difficult. A smaller version can drill sand from inside a casing pipe.

TOOLS AND MATERIALS

Tube, 6" outside diameter, 18" long steel
Steel plate, 6 1/2" x 6 1/2" x 3/16"
Acetylene welding and cutting equipment
Drill

DETAILS

This simple cutting head is quickly made and requires less torque to turn than the "Tubewell Earth Auger." It can also hold loose soil or wet sand, but is somewhat more difficult to empty. One made to fit inside your casing can be used to remove loose, wet sand.

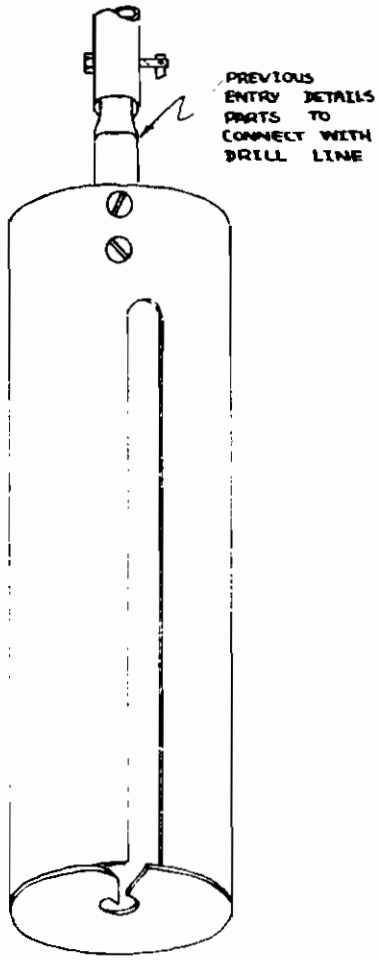


FIG 1

EVALUATION

This particular design needs field trial, although very similar devices have long been used with power drilling equipment.

Material From - Mainly based on information found in Armed Forces Technical Manual "Wells," Technical Manual 5-297 AFM 85-23 published by the U.S. Army and Air Force, 1957.

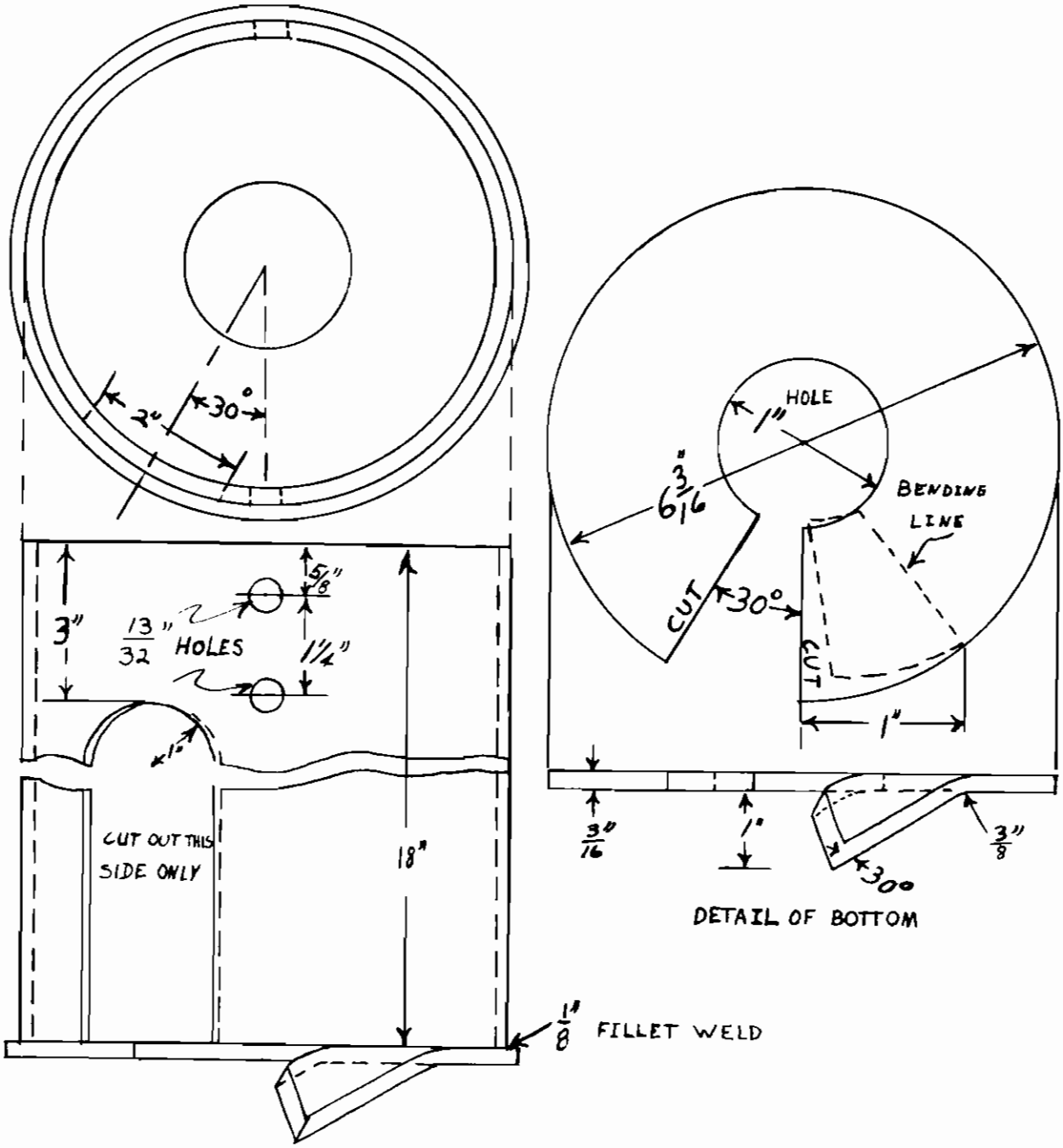
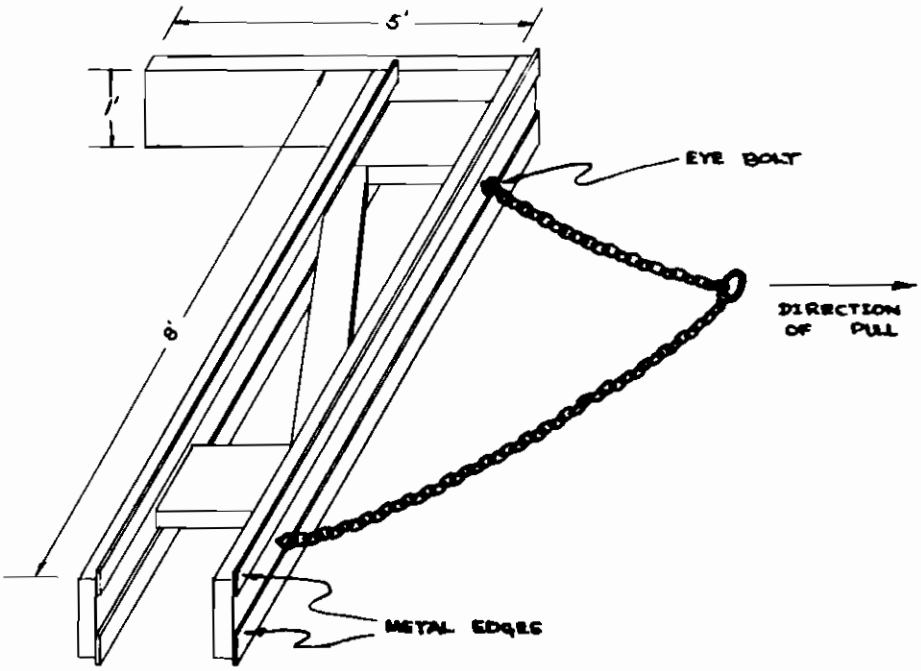

2"
30°
3"
13/32" HOLES
5/8"
1 1/4"
1"
CUT OUT THIS SIDE ONLY
18"
1/8" FILLET WELD
HOLE
1"
6 3/16"
BENDING LINE
CUT
30°
CUT
1"
3/16"
1"
3/8"
30°
DETAIL OF BOTTOM

FIG. 2

DRAG GRADER

ABSTRACT

This simple metal edged wooden grader is designed for two medium sized work horses or oxen.



TOOLS AND MATERIALS

3" x 12" lumber
  2 pieces 8' long
  1 piece 5' long
  2 pieces 1' long
3" x 6" lumber
  1 piece 4 1/2' long
4 metal edges 1/4" to 1/2" thick, 4" wide, 8' long.
17 lag screws 7" long, 5/8" diameter.
2 eye bolts, 3" diameter eye large washers
12 feet heavy chain
32 woodscrews, 3" flat-head steel.

DETAILS

The angle between the 5' and 8' beams should be made 30° if ditch cleaning is anticipated. The unit can be scaled down for use with one animal. The metal edge overhangs the surfaces of the 8' beam by one inch. Each is screwed on with eight large woodscrews or carriage bolts.

The position of the scraper is adjusted by changing the hitching point on the chain. The metal edges are attached to both top and bottom so the drag can be turned over to reverse the direction in which material is cast.

EVALUATION

This model was used for dirt and gravel roads in midwestern United States about 1925.

Material From - Peoria VITA chapter

INTRODUCTION TO CONCRETE CONSTRUCTION

ABSTRACT

Concrete is a strong, durable and inexpensive construction material when properly prepared. This brief summary in conjunction with later entries will give you a good introduction to concrete construction.

TOOLS AND MATERIALS

None - general information

DETAILS

After concrete has set, there is no simple non-destructive test to evaluate how strong it is. Therefore, the entire responsibility for making concrete a strong material in accordance with specifications rests with the supervisor on the job and the people who prepare, measure and mix the ingredients, place them in the forms, and watch over the concrete while it hardens.

The most important factor in making strong concrete is the amount of water. Beginners are likely to have too much. See the entry on a slump cone for further details.

The proper proportion of all the materials, designed for the application, is essential. The concrete calculator will help give the proper proportions and amounts for your job.

Properly graded, clean, sharp aggregate and sand is required to make good concrete. When we glue two pieces of paper together, we spread the glue evenly and in a thin layer, and press firmly to eliminate air holes. In concrete, the cement is the glue, and the sand and aggregate the material being joined.

By properly graded we mean that there are not too many of any one size grains or pebbles. Visualize this by thinking of a large pile of stone all 1 1/2" in diameter. There would be spaces between these stones where smaller pebbles would fit. We could add to the pile just enough smaller stones to fill the largest voids. Now the voids would be smaller yet, and even smaller pebbles could fill these holes; and so forth. Carried to an extreme, the pile would become nearly solid rock, and only a very small amount of cement would be needed to stick it together. The resulting concrete would be very dense and strong.

Sharp aggregate and sand is desirable. Smooth, rounded stones and sand can make fairly good concrete, but sharp, fragmented particles work better because the cement as a glue can get a better grip on a rough stone with sharp edges.

It is extremely important to have the aggregate and sand clean. Silt, clay, bits of organic matter will ruin concrete if there is very much present. A very simple test for cleanliness makes use of

a clear wide-mouth jar. Fill the jar about half full of the finer material available, the sand and small aggregate, and cover with water. Shake the mixture vigorously, and then allow it to stand for three hours. In almost every case there will be a distinct line dividing the fine sand suitable for concrete and that which is too fine. If the very fine material amounts to more than 10% of the suitable material, then the concrete made from it will be weak.

This means that other fine material should be sought, or the available material should be washed to remove the material that is too fine. This can be done by putting the sand (and fine aggregate if necessary) in some container such as a drum. Cover the aggregate with water, stir thoroughly, and let stand for a minute, and pour off the liquid. One or two such treatments will remove most of the very fine material and organic matter.

Another point to consider in the selection of aggregate is its strength. About the only simple test is to break some of the stones with a hammer. If the effort required to break the majority of aggregate stones is greater than the effort required to break a similar sized piece of concrete, then the aggregate will make strong concrete. If the stone breaks easily, then you can expect that the concrete made of these stones will only be as strong as the stones themselves.

In very dry climates several precautions must be taken. If the sand is perfectly dry, it packs into a smaller space. If you put 20 buckets of bone dry sand in a pile, stirred in two buckets of water you could carry away about 27 buckets of damp sand. The chart does not take this extremely dry sand into account. If your sand is completely dry, add some water to it or else do your measurements by weight instead of volume. The surface of the curing concrete should be kept damp. This is because water evaporating from the surface will remove some of the water needed to make a proper cure. Cover the concrete with building paper, burlap, straw, or anything that will hold moisture and keep the direct sun and wind from the concrete surface. Keep the concrete moist by sprinkling as often as necessary; this may be as often as three times per day. After the first week of curing, it is not so necessary to keep the surface damp continuously.

Mixing the materials and getting them in place quickly, tamping and spading to a dense mixture is important. This is covered on the entry on mixing.

Reinforcing concrete will allow much greater loads to be carried. Later entries describe the proper installation of reinforcing rods. Design of reinforced concrete structures can become too complicated for a person without special training, if they are large or must carry high loads.

Principal Reference - "A Building Guide for Self Help Project" Department of Social Welfare and Community Development, Accra, Ghana.

CONCRETE CALCULATOR

ABSTRACT

This easy to use chart will allow quick and accurate calculation of the amounts of material needed for concrete construction.

TOOLS AND MATERIALS

Straight Ruler and pencil
Information about the project: Area of concrete needed in square feet; thickness in inches; kind of work to be done (see definitions under DETAILS); wetness of sand (see definitions under DETAILS).

DETAILS

Use the alignment chart as follows. Make a light pencil mark on the left-most scale representing the area of concrete needed. Make a similar mark on the slanted thickness scale. Draw a straight line through these marks intersecting the third scale. This is the volume of your concrete. If your project has a complex shape, add up the volumes of all the parts before proceeding.

Now mark the total volume of concrete on the third (volume) scale, and the kind of work on the fourth. (See definitions.) A line through these two points will give the amount of fine aggregate needed. Continue on a zig-zag course as shown in the KEY to calculate the coarse aggregate, sacks of cement, and water.

It may be necessary to make slight adjustments to the mix, depending upon the type of aggregate used. The final mixture should be wet enough and workable enough to go into the forms fairly easily, requiring light spading or tamping to produce a dense mixture. Too much moisture produces a weak cement. The figures in the alignment chart do not allow for waste which may run as high as 10%.

All materials can be measured in "buckets" instead of cubic feet. The nomograph will still give the correct proportions. The total amount of concrete produced, however, will depend upon the size of the bucket used as the measure. Most buckets are rated by the number of gallons they can hold. To convert to cubic feet, then, you must know that one cubic foot equals 7.5 gallons. A four gallon bucket would hold 0.533 cubic feet. Incidentally, one cement sack holds exactly one cubic foot, so "buckets" can also be substituted for "sacks" on the chart.

Similarly, if your volume of concrete needed is less than 15 cubic feet, you can multiply this by some convenient factor (say 10) and then divide the amounts of materials the chart says to use by the same factor to get the actual amounts needed.

-- Definitions used in the chart are given on the fold-out page.--

Kind of work - "5" means "5 gallon paste" which is concrete subjected to severe wear, weather, or weak acid and alkali solutions. Examples would be the floor of a commercial dairy.
- "6" means "6 gallon paste" for concrete to be watertight or subjected to moderate wear and weather. Examples: watertight basements, driveways, septic tanks, storage tanks, structural beams and columns.
- "7" means "7 gallon paste" for concrete not subjected to wear, weather, or water. Examples: Foundation walls, footings, mass concrete, etc. where water tightness and abrasion resistance are not important.

Fine Aggregate - Sand or rock screenings up to one quarter inch in diameter. Should be free from fine dust, loam, clay and vegetable matter or the concrete will have low strength. Particles should vary in size, not all fine or coarse.

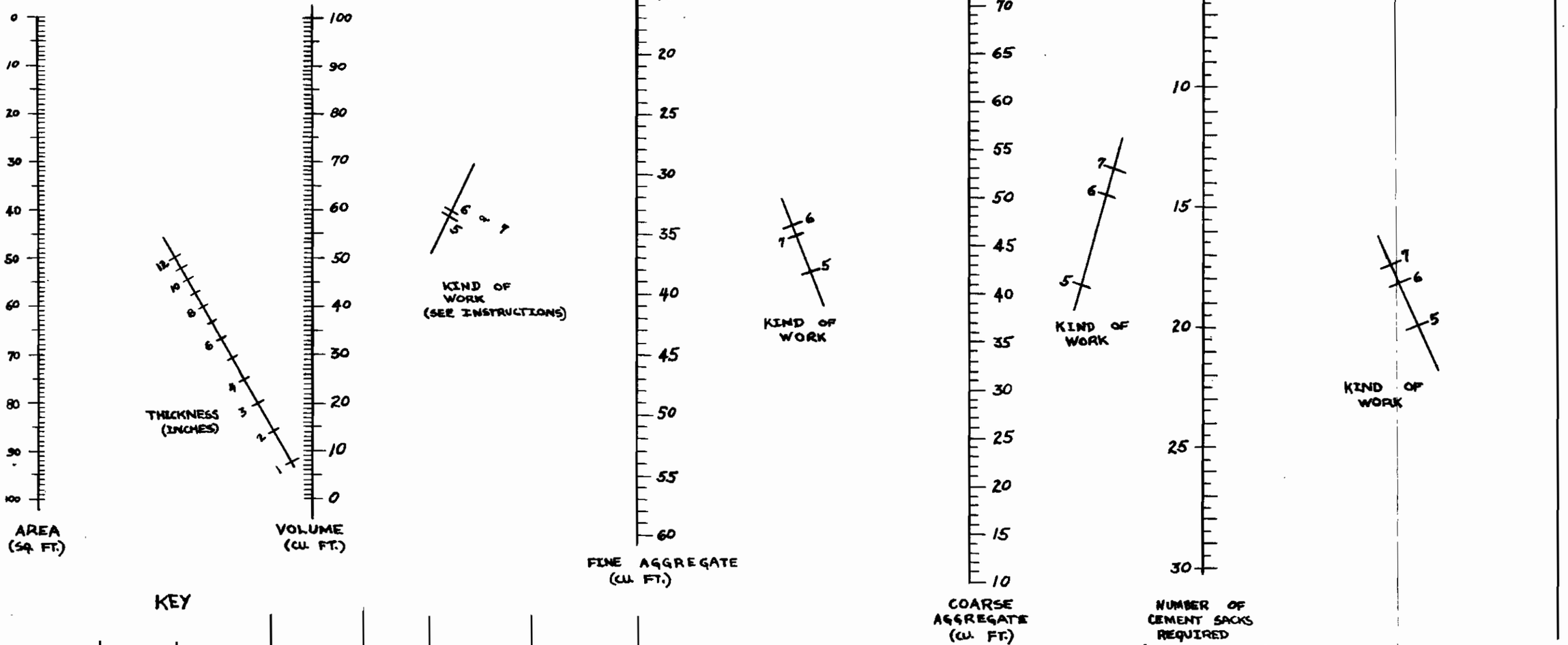
Coarse Aggregate - Pebbles or broken rock from 1/4" up to 1-1/2". Nothing coarser than 3/4" should be used for a 5 gallon paste.

Condition of Sand - Dry—feels slightly damp but leaves very little water on the hands.
Average—feels wet; leaves a little water on the hands.
Wet—dripping wet, leaves quite a bit of water on the hands.

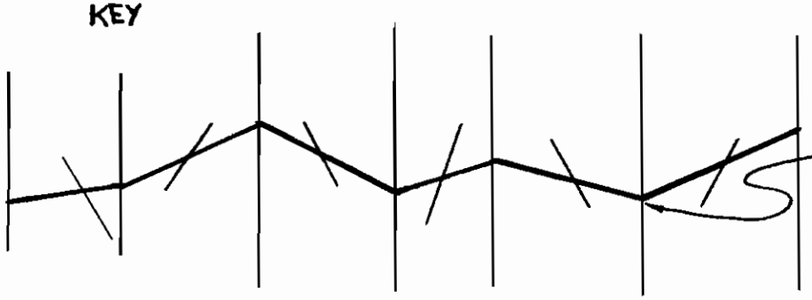
Gallons - The chart is based on the U.S. Gallon. (This is 0.835 of one Imperial Gallon.)

Material From - Designed by John Bickford from data furnished by the Portland Cement Association of Chicago, Illinois, U.S.A.

CONCRETE CALCULATOR

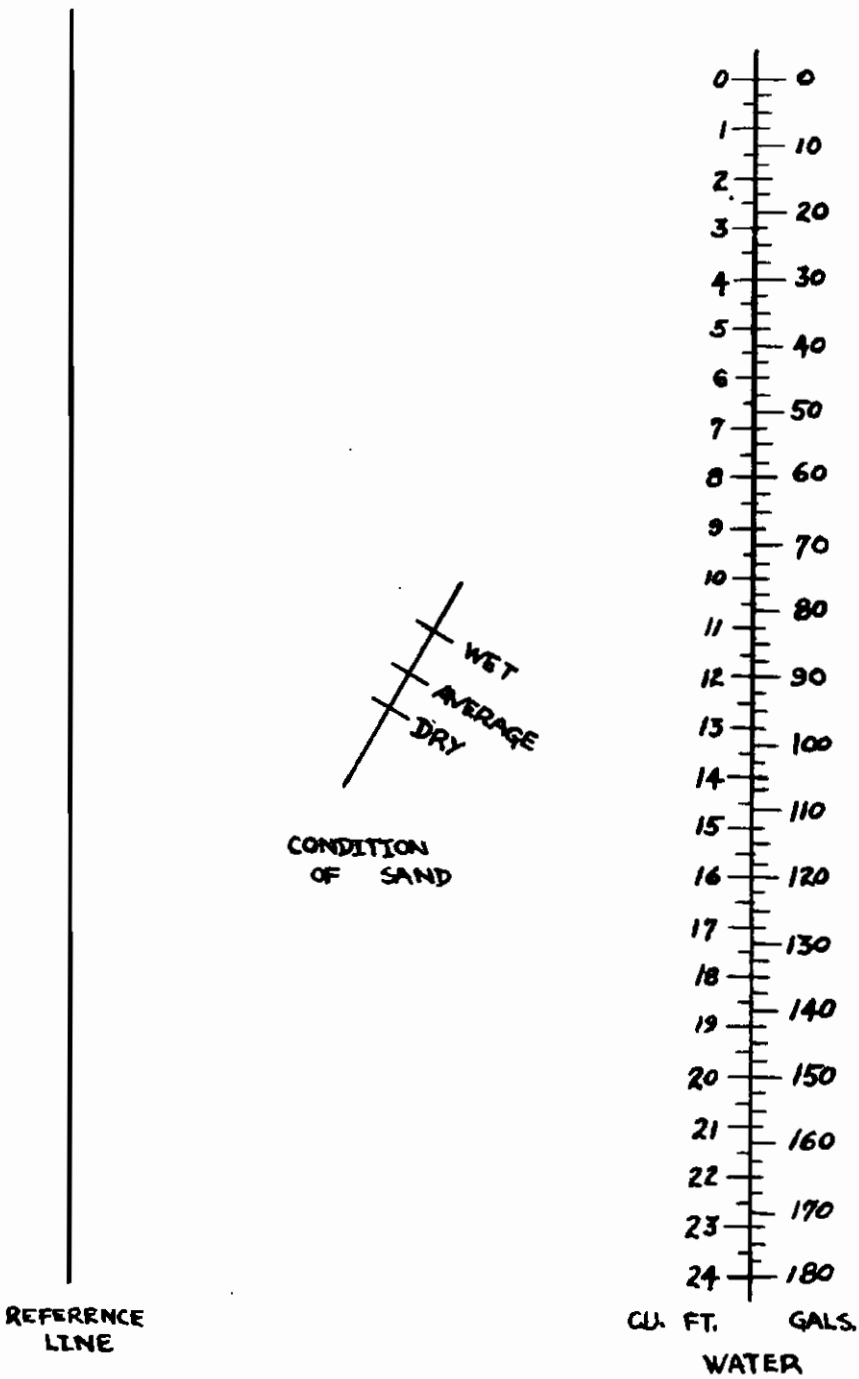


KEY



Note- use the number of sacks of cement required, and the kind of work to locate this point on the reference line. A line through this point and the condition of sand will give the amount of water needed.

DESIGNED BY JOHN BICKFORD FOR VOLUNTEERS FOR INTERNATIONAL TECHNICAL ASSISTANCE INC. 5/28/62


REFERENCE LINE
WET
AVERAGE
DRY
CONDITION OF SAND
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
CU. FT.
GALS.
WATER

HAND MIXING CONCRETE

ABSTRACT

Proper mixing of ingredients is necessary to get the highest strength concrete. Hand mixed concrete made with these tools and directions can be as strong as machine mixed concrete.

TOOLS AND MATERIALS

Lumber - 2 pieces
6' x 3' x 2"
Galvanized sheet metal - 6' x 3'
Nails
Saw, Hammer - -
Or concrete for making a mixing floor.
(About 10 cubic feet of concrete are needed for an 8' diameter mixing floor made 2" thick with 4" high rim.)

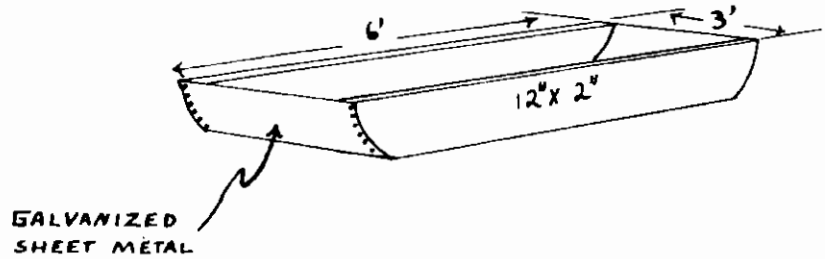


FIG. 1

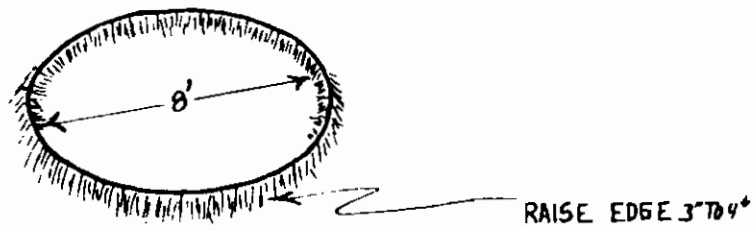


FIG. 2

DETAILS

On many self-help projects the amount of concrete needed may be small or it may be difficult to obtain a mechanical mixer. Under these circumstances hand mixing of the concrete will be necessary and, if a few precautions are taken, the quality of concrete can be made equivalent to that from a mechanical mixer.

The first requirement is a watertight and clean base upon which the mixing can be done. This can be a wood and metal mixing boat (Figure 1) or a simple round floor made of concrete (Figure 2).

The ends of the wood and metal mixing boat are curved to make emptying easier. The raised edge of the concrete mixing floor serves to prevent loss of water from the concrete.

The procedure for mixing is similar to that for mechanical mixers in that the dry materials should be mixed first. As a minimum it is recommended that the pile of stone, sand, and cement be turned completely once. It should be completely turned a second time while the water is being added. Then it should be turned a third time. Anything less than this will not adequately mix all materials. When this last step is completed the mix can be placed as usual.

Correctly placing the fresh concrete in the forms or shuttering is important in making strong structures. The wet concrete mix should not be handled roughly either in carrying to the shuttering or putting into the shuttering. In either case it is very easy, through joggling or throwing, to separate the fine from the coarse material. We have said before that the strongest concrete comes when the various sizes of aggregate and cement are well mixed together . The concrete mix should be firmly tamped into place with a thin (3/4") iron rod.

Be sure to rinse concrete from the mixing boat and tools when finished each day with the work. This will prevent rusting and caking of cement on them for smooth shiney tool and boat surfaces make mixing surprisingly easier, and the tools will last much longer. Also try to keep wet concrete off your skin, for the material is somewhat caustic.

When the shuttering is full the hard work is done, but the process is not finished. The shuttering must be removed and the concrete protected until adequate strength is attained. The hardening action of cement begins almost immediately after the water is added, but the action may not be fully completed for several years.

Concrete reaches the strength used in the designing after 28 days and is strong enough for light loading after 7 days. In most cases the shuttering can be removed from standing structures such as bridges or walls after 4 to 5 days. In small ground supported structures such as street drains it is possible to remove the shuttering within 6 hours of completion provided this is done carefully. Special conditions, usually specified on the plans, may require leaving the shuttering in place for a much longer time.

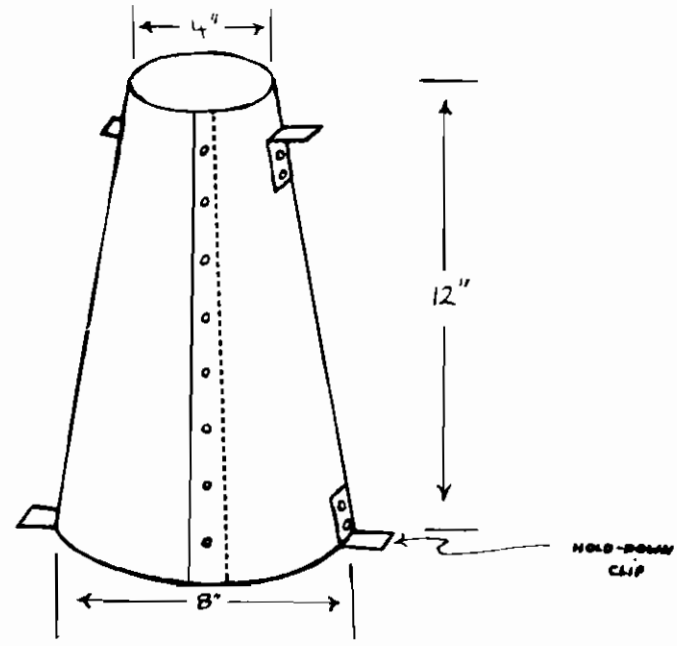
During the early stages of hardening or curing the cement in the concrete continues to need moisture. If there is insufficient water available the cement is unable to complete its job of gluing the aggregate together. Because of this, it is recommended that new concrete be protected from drying winds and the sun, and that the surface of the new concrete be kept damp. For cement floors or open construction a covering of banana or palm leaves will be adequate, but these should be given a sprinkling of water at least once and perhaps twice each day for a period of not less than one week.

Material From - "A Building Guide for Self-Help Projects," Department of Social Welfare and Community Development, Accra, Ghana.

CONCRETE SLUMP CONE

ABSTRACT

The use of this simple device will enable you to determine if the proper amount of water has been added to the mix, which will insure maximum strength in the finished concrete.



TOOLS AND MATERIALS

Heavy galvanized iron
Strap iron - 4 pieces 1/8" x 3" x 1"
16 iron rivets 1/8" diameter x 1/4" long
Wooden dowel 24" long, 5/8" diameter

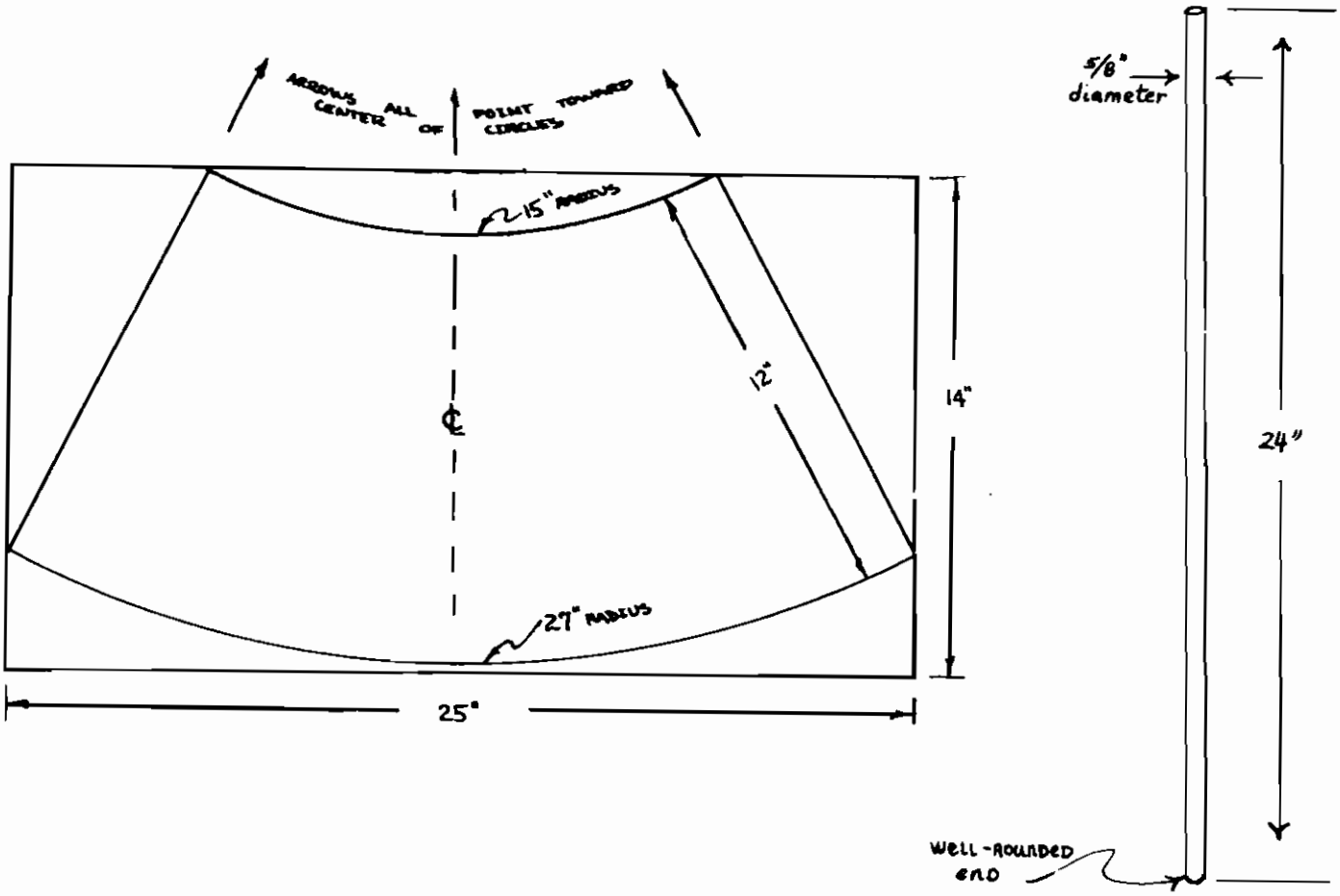
DETAILS

In making reinforced concrete, it is important to have just enough water to make the concrete settle firmly into the shuttering (forms) and around the reinforcing when it is thoroughly tamped.

The easiest way is to look at the mix and at the way the workmen place the wet concrete. If the mix appears soupy and the aggregate shows up clearly in the mix, then it is too wet. At the same time it will be noticed that the workmen dump the mix into the shuttering and do very little tamping because, if they do any amount of tamping, large amount of water will immediately appear on the surface. The workmen will soon complain if the mix is too dry.

A more accurate method of making a decision on the proper amount of water is to use the slump test. This test requires a small cone made of fairly strong metal and open at both ends. Dimensions of the cone and tamping rod are shown in the sketch. Once this simple equipment is available the slump test becomes very easy. The steps to follow are listed below.

1. Set the slump cone on a smooth clean surface and stand on the hold-down clips at the bottom of the cone.
2. Have someone fill the cone to 1/4 of its height and tamp this layer 25 times.
3. Fill the cone to 1/2 its height and tamp this layer 25 times. Avoid tamping the first layer again.
4. Fill the cone to 3/4 its height and tamp 25 times. Avoid tamping the previous layers.
5. Complete filling of the cone and tamp this layer 25 times.
6. Step off the hold-down clips and lift the cone vertically and very carefully off the concrete.



Since this process will have taken only a few minutes the concrete will still be very soft when the cone is removed and the top will fall to some extent while the sides bulge out. This is called the slump. Obviously, if the mix is too wet the concrete will lose its shape completely and become just a soft pile. A good mix, as far as the water-cement ratio is concerned, will slump about 3" to 4" when the cone form is removed. It is well to keep in mind that dirty or muddy water can cause as much trouble as aggregate with excessive fine materials. Use clean or settled water.

EVALUATION

The slump test is a standard test for evaluating wet concrete. This particular cone and rod has been recommended for village construction projects in Ghana.

Material From - "A Building Guide for Self Help Projects" Department of Social Welfare and Community Development Accra, Ghana; received through the Near East Foundation.

QUICK SETTING CEMENT

ABSTRACT

Using calcium chloride as an additive in making concrete results in a faster setting product with high initial strength.

TOOLS AND MATERIALS

Ingredients for regular concrete (any Portland cement), and measured amount of calcium chloride.

DETAILS

In some applications a quick setting concrete is very useful. Situations arise when many repeated castings are desired from the same form or mold. Using an accelerator allows parts to be cast about twice as fast as without it.

However, the mixed batch must be put into the forms faster since the concrete setsup sooner. In general, the batches are small for these applications so that fast setting up is no particular trouble. Moreover, the accelerator does not impair the ultimate strength of the concrete.

The accelerator is best added by mixing one pound clean calcium chloride in each quart of water (1/2 kilogram for each litre) and then using this solution as part of the water used in the concrete mix. Use the solution at a ratio of 2 quarts (2 litres) for each bag of cement (94 lbs. or 43 kg.). Mix the concrete in the usual way.

EVALUATION

This is the method recommended by the Portland Cement Association to accelerate the curing of concrete.

Material From - DESIGN AND CONTROL OF CONCRETE MIXTURES, Portland Cement Association, 33 West Grand Avenue, Chicago 10, Illinois.

HOME IMPROVEMENT

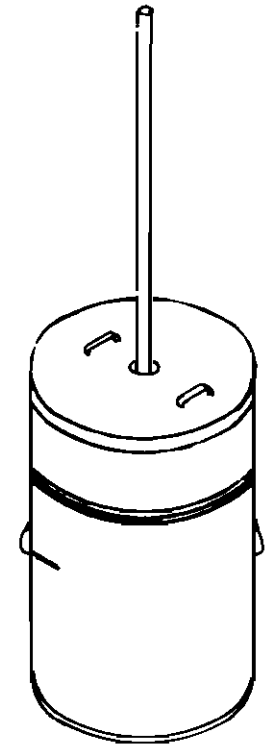
HAND WASHING MACHINE

ABSTRACT

This hand washer is simple to construct and simplifies washing considerably.

TOOLS AND MATERIALS

Tinsnips
Pliers
Hammer
Soldering equipment
Galvanized iron sheeting: 140 cm x 70 cm for tub
100 cm x 50 cm for lid and bottom
36 cm x 18 cm for agitator
Wooden handle - 4 cm diameter, 140 long



DETAILS

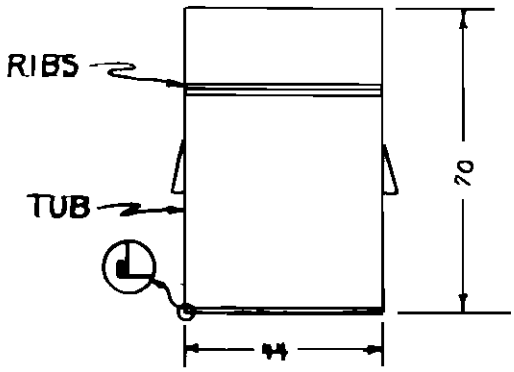
The tub, lid and agitator are made of the heaviest galvanized tin available which can be worked by a tinsmith.

To operate the washing machine the agitator is worked up and down with a quick motion but with a slight pause between strokes. The movement of the water caused by the agitator will continue for a few seconds before additional agitation is needed. On the upward stroke the agitator should come completely out of the water. The agitator should not hit the bottom of the tub on the downward stroke as this would damage both the tub and the clothes.

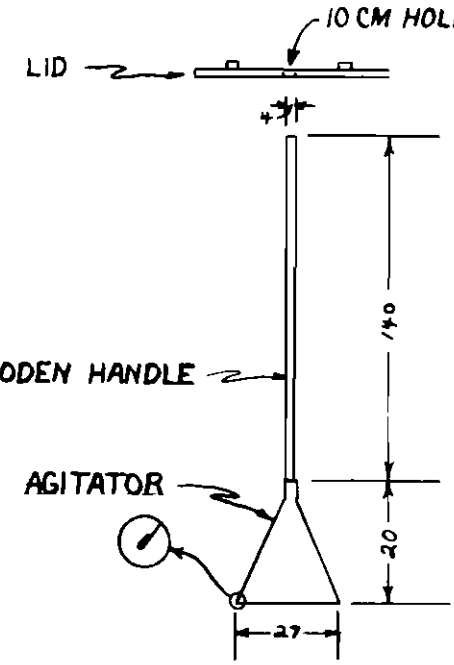
EVALUATION

Has been used successfully in Afghanistan.

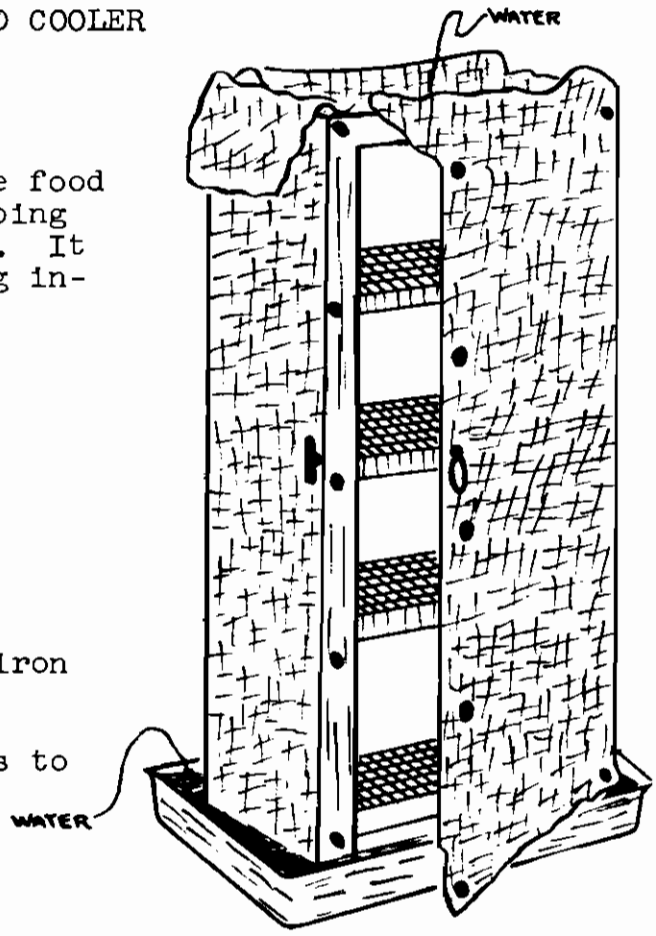
Material From - Dale Fritz, The Asia Foundation



DIMENSIONS IN CM



EVAPORATIVE FOOD COOLER



ABSTRACT

In warm, dry climates an evaporative food cooler will extend the period for keeping food fresh and allow saving leftovers. It also helps to keep crawling and flying insects away from food.

TOOLS AND MATERIALS

Saw
Hammer
Nails, tacks
Burlap or other cloth 2 m. x 2 m.
Wood for frame 3 cm x 3 cm x 13 m.
Pan 10 cm deep, 24 x 30 cm for top.
Screen, hardware cloth or galvanized iron 2 m. x 2 m. (non-rusting)
2 pair hinges
Pan larger than 30 cm x 36 cm for legs to stand in
Paint for wooden parts

DETAILS

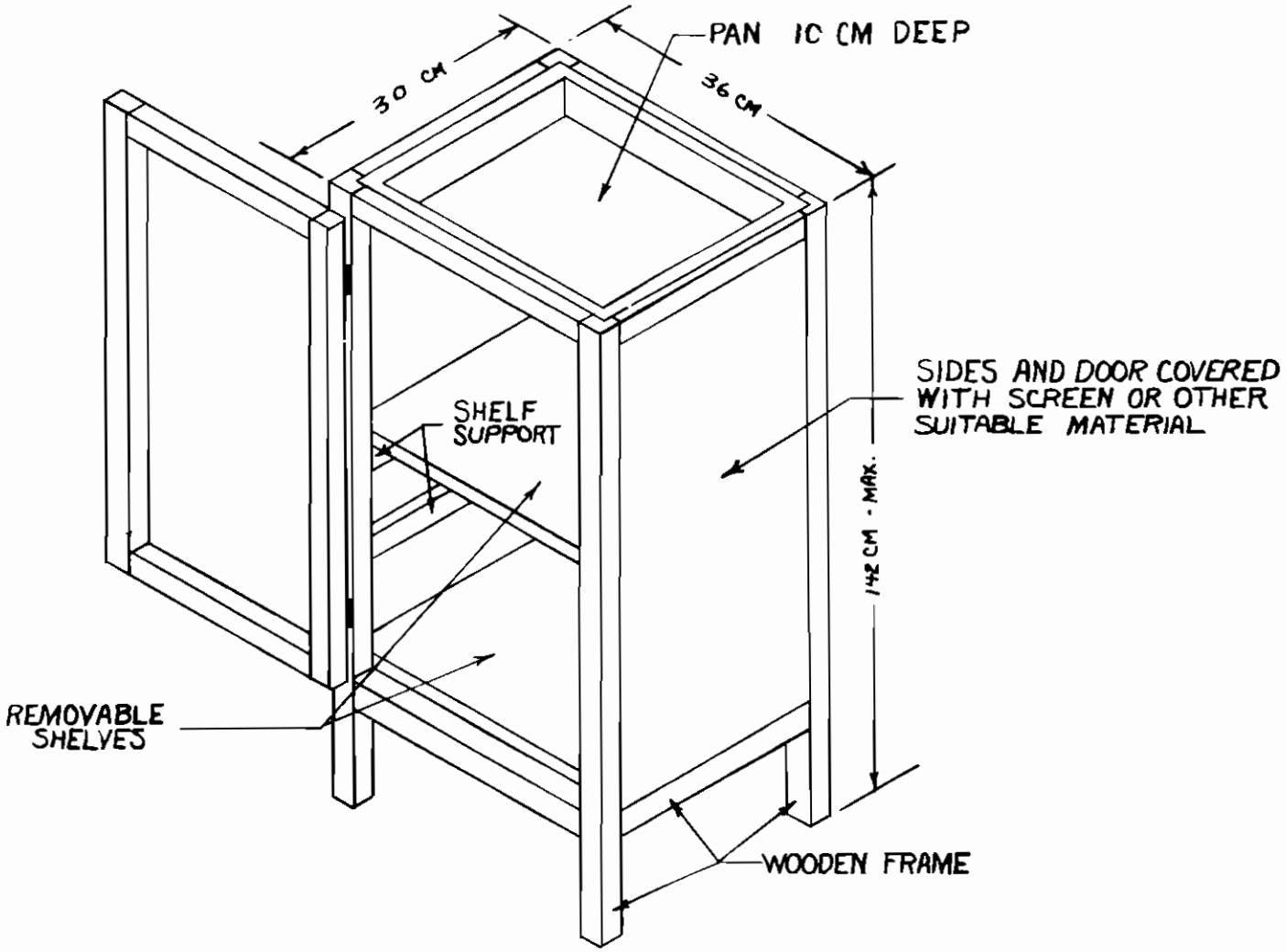
Make the wooden frame to fit the upper pan. This might be the bottom of a discarded 5 gallon oil can. Screen and bracing sticks on the inside top of the frame prevent the pan from falling into the refrigerator. Hinge the door carefully so it swings easily, and make a simple wooden or thong latch. Paint or oil all the wooden parts. Shelves and frame are covered with screening or hardware cloth and tacked in place. Cutting this screen diagonally uses a bit more material, but will strengthen the frame considerably. Make the shelves adjustable by providing several shelf supports.

Two covers of canton flannel, jute burlap (not sisal or henequin burlap) or heavy grade absorbent coarse cloth are made to fit the frame. Wash and sun one cover while using the other. Button or lace the cover to the frame, with the smooth side out. On the front, fasten the cover to the door instead of the frame. Allow a wide hem to overlap the door closing. The bottom of the cover should extend down into the lower pan. Strips 20 cm wide should be sewed to the top of the cover. These form wicks that dip over into the upper pan. Keep both the upper and lower pans filled with water.

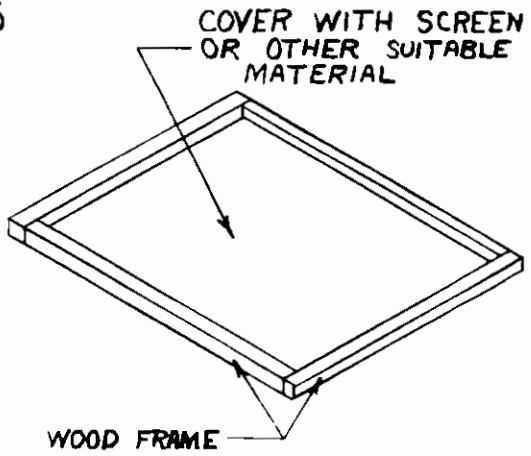
EVALUATION

If the cooler is kept in a breezy spot in the shade, and the climate is dry, it will cool food considerably. The cover keeps flying

insects out, while the lower pan discourages roaches and other crawling types. To be safe, the cooler must be kept clean.



FRAME OF ICELESS REFRIGERATOR



SHELF

Material From - A.I.D. publications

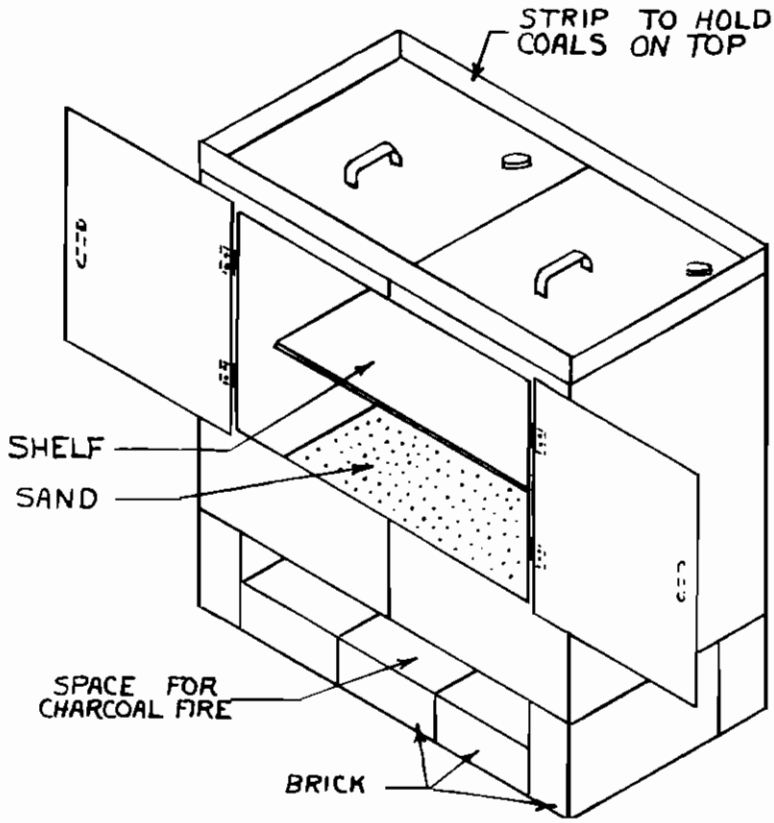
CHARCOAL OVEN

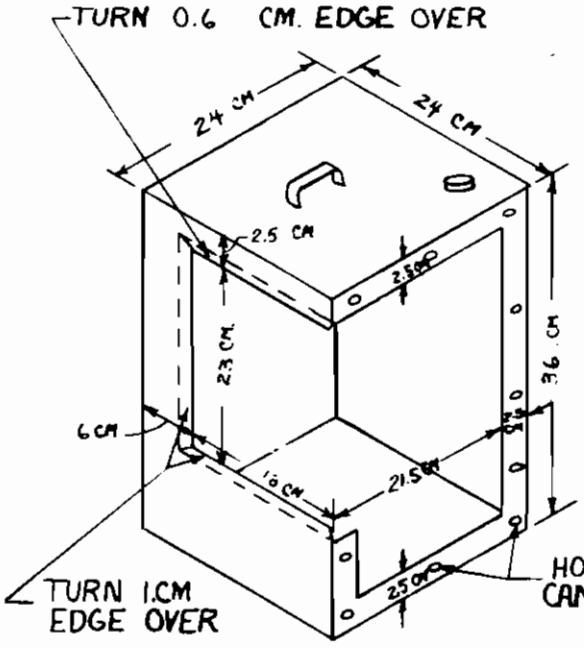
ABSTRACT

This simple charcoal-fired oven is made from two discarded 5 gallon oil tin cans. With practice, all types of baking can be expertly done.

TOOLS AND MATERIALS

Nail for scriber and punch
Tinsnips
Heavy knife to start cuts
Hammer
Screwdriver
Pliers
Metal bar 20 cm long with square corner for bending
Two 5 gallon oil cans
Tin cans to provide shelf material
Light rod 50 cm long, 5 to 7 mm diameter
Two pairs of light hinges
12 machine bolts, nuts, lockwashers, size 8-32 or soft rivets
Bricks for base
Sand





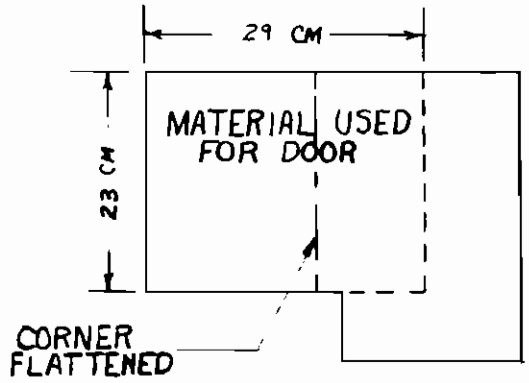
NOTE: OTHER CAN IS CUT REVERSE OF THE ABOVE CAN.

DETAILS

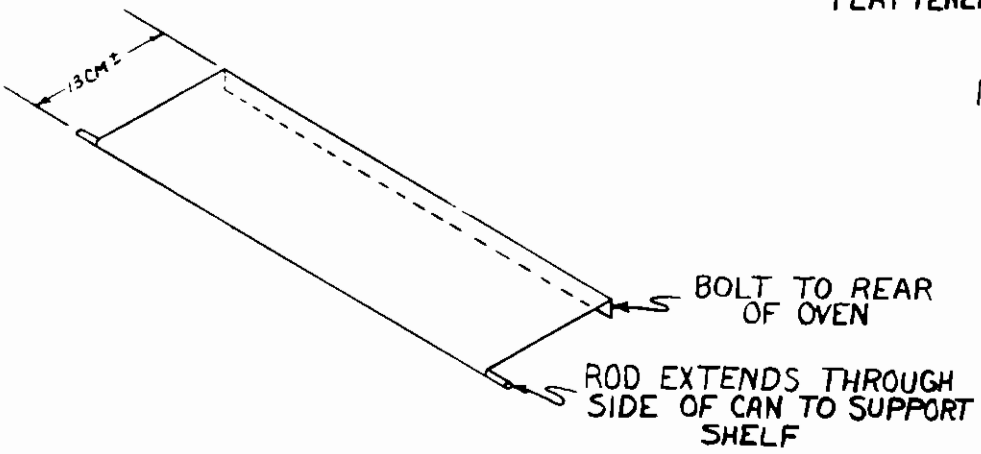
Cut the material from the side of the oven with care so as to preserve the material removed for making the door. Don't cut out the corner with a vertical seam; it is to hard to do, weakens the oven, and the revoved material is hard to make into the doors. Fold the edges of the door and door opening back (1 cm wide) and hammer flat to remove sharp edges. The latch can be made of three thicknesses of metal scraps left over. Clean the oven thoroughly and heat at least once before baking to burn out any residual oil. The strip around the top forms a rim to contain burning coals, to make the oven hotter, or to brown the surface of baked goods.

EVALUATION

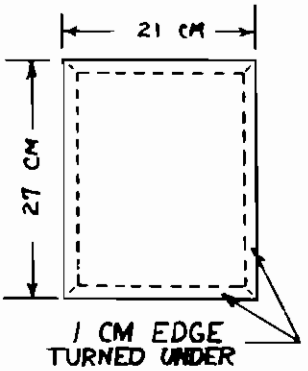
This oven is being used successfully in a number of countries. Baking and roasting are quite effectively done with this simple and inexpensive appliance. Any recipes which involve these processes may be used.



MATERIAL CUT FROM CAN



SHELF



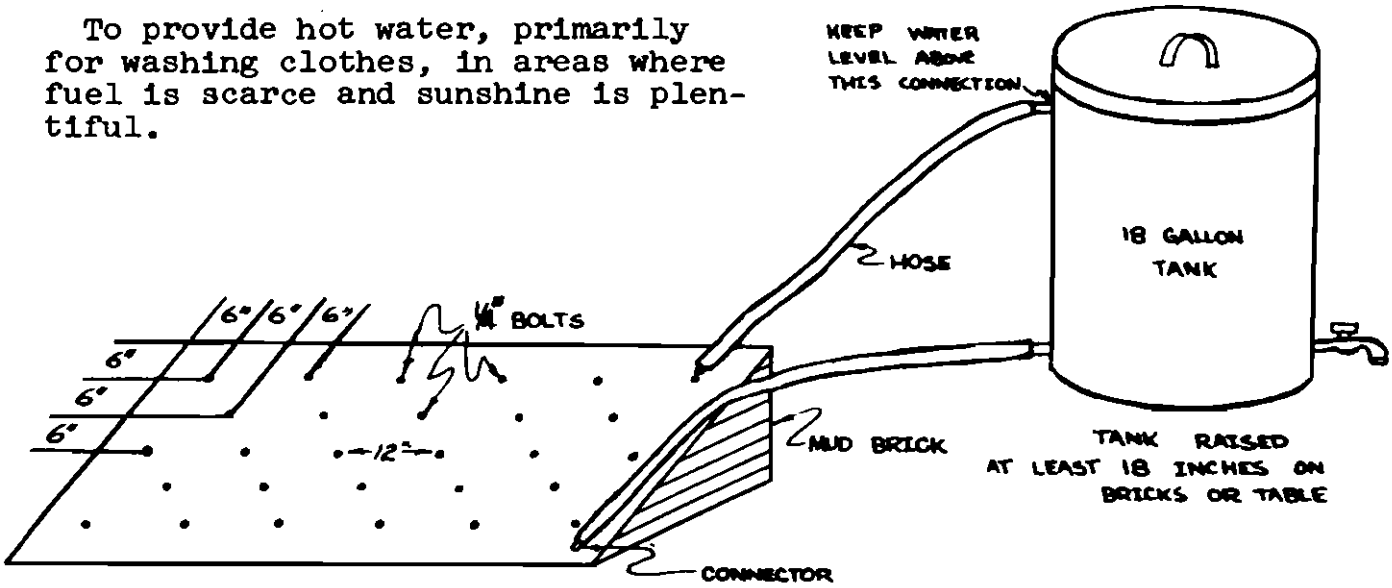
DOOR

Material From - V. C. Pettit, I.C.A.-AID

SOLAR WATER HEATER

ABSTRACT

To provide hot water, primarily for washing clothes, in areas where fuel is scarce and sunshine is plentiful.

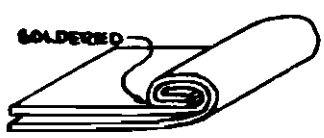


TOOLS AND MATERIALS

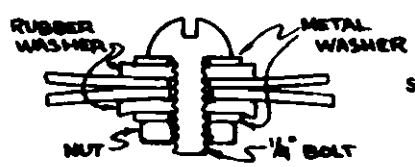
2 pieces galvanized sheet metal, 3' by 6' for heater.
2 pieces galvanized sheet metal pipe, 6" long by 1" in diameter for connectors.
2 pieces rubber hose, 4' long by 1" in diameter.
56 metal washers for 1/4" bolts.
56 rubber washers cut from heavy truck inner tube. Inside hole diameter should be 1/8", outside diameter same as metal washers.
28 stove bolts, galvanized, 1/4" long.
1 galvanized sheet metal tank, 18 gallon capacity with faucet, removable lid, 1" hose connectors near the top and bottom.
Tinsmith's tools: hammers, anvils, soldering equipment, etc.
Drill and 1/4" bit.
Screw driver and wrench to fit 1/4" bolts or a pair of pliers.
Quantity of mud bricks.

DETAILS

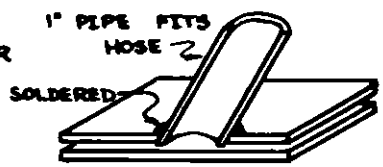
The heater is made by placing the two sheets of galvanized sheet metal together in the form of an envelope. The edges of the sheets are double folded and soldered to make an air tight seal. (See detail below.) To prevent the sheets from being forced apart when the heater is filled with water, it is necessary to reinforce it



EDGE FOLD



BOLT AND WASHERS



CONNECTOR

with 1/4" bolts placed at regular intervals, like buttons in a mattress. To make the bolts water-tight they must have rubber and metal washers on both sides. (See detail on page 153.)

Inlet and outlet connections are provided in the upper and lower right hand corners of the heater for connection to the tank. The front of the heater is painted black to absorb the sunlight rather than reflect it. A flat black paint is better than an enamel.

The tank does not have to be of any definite shape but should hold approximately 18 gallons of water. The hot water will rise to the top and, with the removable lid, it is possible to dip out the hottest water when only a small quantity is needed. When all of the water is to be used it may be drained out of the faucet. The water level must be maintained above the upper hose connection.

When the solar water heater is set up, the heater should be facing southeast to take advantage of the morning sun. The back of the heater should be raised about 18" so the sunlight will strike it as directly as possible. A simple way to raise the heater is to build up the back and sloping sides with mud bricks. Use three small boards (2" by 4") to prop up the back while putting the mud bricks in place. Then, remove the boards and seal any holes with mud to form a dead air space under the heater which will serve as insulation and increase the efficiency.

The heater is connected to the tank in such a way as to allow the water to circulate as it is heated. The upper connectors of the tank and heater are connected with one hose and the lower connectors with the other. The tank is raised approximately 18", using a small table or a brick platform, so the coolest water will be in the heater. As the water in the heater is warmed, it rises and flows out the upper hose into the top of the tank. Cool water from the bottom of the tank enters the heater at the bottom. Insulating the tank will increase the efficiency of the solar water heater by cutting down the heat losses. Any suitable local material may be used, such as straw or sawdust.

EVALUATION

The solar water heater described here was made and tested in Kabul, Afghanistan, for the purpose of providing hot water for use in the hand operated washing machine. Three sizes were made and tested: 2 1/2' x 4 1/2', 3' x 6', and 3' x 8' which are the sizes of sheet metal available in Kabul. The 3' x 6' heater with an 18 gallon tank was most suitable from the standpoint of cost and water requirement. In Kabul, where there is lots of sunshine, the 18 gallons of water were heated to 140° F. between sunup and noon on a clear summer day.

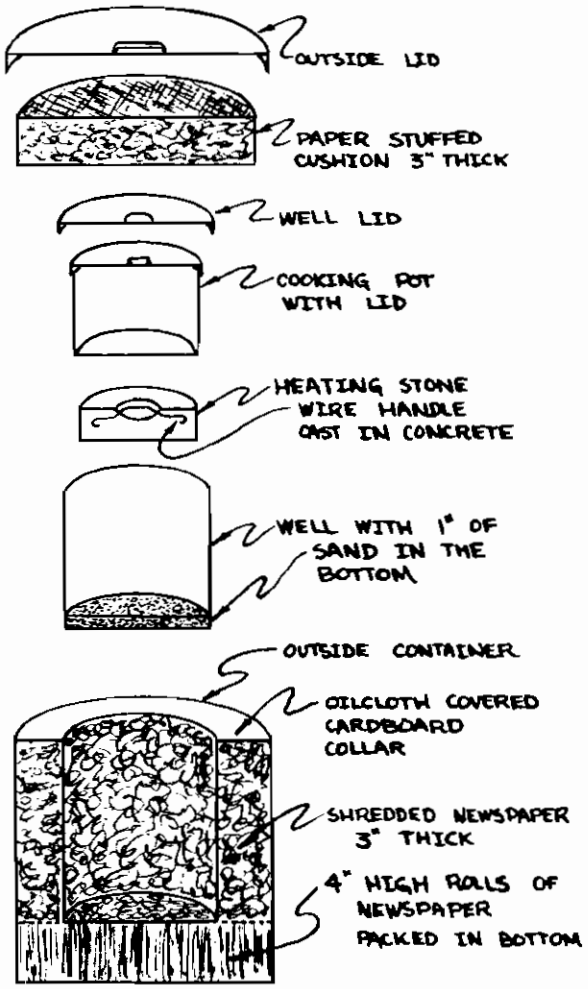
The cost of the solar water heater was $15.00 at prices paid for material and labor in Kabul during the summer of 1961.

Material From - Dale B. Fritz, The Asia Foundation

FIRELESS COOKER

ABSTRACT

In some places where fuel is scarce, this easy-to-build fireless cooker can be a real contribution to better cooking. It works by heat retention through insulation.



TOOLS AND MATERIALS

Outside container with lid -
(15" to 24" in diameter)
Inside container or well -
at least 6" smaller in diameter and 6" shorter than outside container
Cooking pot with lid
1 1/2 yards cloth for cushion
50 sheets newspaper or other insulation.
Cardboard
6 cups sand
4 cups cement
1/2 yard oilcloth for collar (optional)

DETAILS

The principle of the fireless cooker is to keep food cooking with the small amount of heat stored in hot stones by preventing heat loss with a thick layer of insulating material around the pot.

The outside container can be a wooden bucket, kerosene can, garbage can, packing crate or even a hole in dry ground. The inside container or well can be a pail or can with a lid. It must allow for the three inches of insulation between it and the outside container and should hold the stone and cooking pot without much vacant space.

Insulation can be made of shredded newspapers, wool, cotton, sawdust, straw, rockwool, fiberglass or other material. The insulation should be at least three inches thick on all sides, top and bottom. Be sure that it is very dry. The bottom layer of insulation must be strong enough to support the weight of the well, stone, and cooking pot. A natural stone carved to shape or a piece of concrete may be used for the heating stone. The cushion is a three-inch-thick cloth sack filled with shredded newspapers or other insulation and should fit snugly in the outside container. The cooking pot must have a tight lid, and fit nicely into the well with the stone in place. Be sure it can be easily removed when full of hot food.

Direction for building -

Wash and dry the containers and lids.

Cut 4" wide strips of newspaper several layers thick. Roll each into a cylinder with a center hole no greater in diameter than a pencil. Pack these on end into the bottom of the outside container. They will support the well, stone, and cooking pot.

Put the well in place and pack the insulation around it to within 1/2" of the top.

Make a cardboard collar covered with oilcloth. Though this is not necessary, it improves appearance and cleanliness.

Place about an inch of clean sand in the bottom of the well. This will prevent the hot stone from scorching the paper rolls and possibly causing a fire. The stone should never be heated not enough to scorch paper.

To make a concrete heating stone, place a 2" wide cardboard band or collar on heavy paper or board to form a circle the size of the stone desired. Mix 4 cups each of cement and sand washed free of silt, then add 1 1/2 cups of water or until a stiff mush is formed. Fill the collar, casting in a wire handle for lifting the hot stone. Let the stone stand for 48 hours, then remove the collar, place it in cold water and boil for 30 minutes. Cool it slowly.

Use of the Cooker -

It is important to keep the cooking pot and well carefully washed and open, in sunshine if possible, when not in use. The cooker's lid should be left partly open and the stone kept clean and dry.

It is not necessary to use much water when cooking in a fireless cooker for there is little loss by evaporation. Most foods should be brought to a boil and cooked for 4 to 5 minutes on a stove. Then, the covered cooking pot is set on the hot stone in the cooker and the lid is placed on the well. Cereal may be left in the cooker all night. Rice and cracked or whole wheat are especially good. Beans should be soaked over night, boiled for 5 minutes and then placed in the cooker for 4 to 5 hours. Dried fruit should be washed, soaked for an hour in 2 parts water to 1 part fruit, boiled for 5 minutes, then placed in the cooker for 4 hours.

EVALUATION

Fireless cookers have been used and found very successful in many countries.

Material From - "Home Making Around the World"
A.I.D. publication.

HAND-OPERATED WASHING MACHINE

ABSTRACT

This easily operated washing machine can be built by a semi-skilled carpenter of materials readily found in most countries. It can wash six pounds of clothes, can be shared by several families, and is easy on clothes while being effective and sanitary.

TOOLS AND MATERIALS

Tub Construction - Moderately firm softwood (such as Cedro of South America) free from large heartwood growth.

2 pieces - 2.5 x 45.7 x 96.5 cm. - sides
1" x 18" x 38"
2 pieces - 2.5 x 30.5 x 40.6 cm. - ends
1" x 12" x 16"
2 pieces - 2.5 x 15.2 x 40.6 cm. - bottom
1" x 6" x 16"
1 piece - 2.5 x 40.6 x 66.0 cm. - bottom
1" x 16" x 26"
4 pieces - 2.5 x 10.2 x 76.2 cm. - legs
1" x 4" x 30"
2 pieces - 2.5 x 25.4 cm. diameter - round plungers
1" x 10" diameter
2 pieces - 3.8 x 12.7 cm. diameter - round plungers
1.5"x 5" diameter
2 pieces - 2.5 x 20.3 x 91.4 cm. - cover (may be omitted)
1" x 8" x 36"
6 pieces - 2.5 x 7.6 x 20.3 cm. - cover (may be omitted)
1" x 3"x 8"

Operating parts - Moderately firm hardwood such as Caoba of South America.

1 piece - 2.5 x 7.6 x 121.9 cm. long - lever
1" x 3" x 48"
2 pieces - 2.9 cm. square 38.1 cm. long-plungers
1 1/8" square 15" long
2 pieces - 2.9 x 7.6 x 61.0 cm. long - uprights
1 1/8" x 3" x 24" long
2 pieces - 3.2 cm. round 45.7 cm. long - pivot and handle
1 1/4" round 18" long

Metal Parts

4 pieces iron or brass plate - .64 x 3.8 x 15.2 cm. long (1/4" x 1 1/2" x 6" long) - plunger connection
10 rods - 3.6 or .79 cm. diameter (1.4" or 5/16" diameter) 45.7 cm. (18") long with threads and nuts on each end - iron or brass.
20 washers about 2.5 cm. (1") diameter with hole to fit rods
1 rod - .64 x 15.2 cm. (1/4" x 6") with loop end for retaining pivot
6 bolts - .64 x 5.1 cm. long (1/4" x 2" long)

24 screws - 4.4 cm. x #10 - flat head (1 3/4" x #10)
50 - 6.35 cm. (2 1/2") nails
Strip Sheet Metal with turned edge - 6.4 cm. wide, 152.4 cm. long (2 1/2" wide, 72" long)
Small quantity of loose cotton or soft vegetable fiber for caulking seams

Minimum Tools Needed

Tape measure or ruler
Hatchet, Saw
Wood chisel 1.3 or 1.9 cm. wide (1/2" or 3/4")
Screw Driver
Adjustable Wrench
0.64 cm. (1/4") drill, gimlet or similar tool
Draw knife or plane and coping saw (would be useful but not essential)

DETAILS

This model of washing machine should be a decided improvement to conserve clothing over methods now in use in many countries. This is especially true where clothes are beaten or scrubbed on rocks. It will also save a considerable amount of labor. If the cost of this machine is too great for one family, it could be used by several. However, too many users will probably mean severe wear or breakage and competition for times of use.

The machine reverses the principle employed in the usual commercial washer, in which the clothes are swished through the water for various degrees of a circle until the water is moving and then reversed. To keep this machine simple, the clothes stay more or less stationary while the water is forced back and forth through the clothes by the piston action of the plungers. One plunger creates a suction as it rises and the other plunger creates a pressure as it moves downward. Since the principle involves the churning action of the water, the slope at the corners of the machine bottom is important for best action.

The machine needs a rectangular tub for this method of operation. The rectangular box also is easy to build and does not require skilled cooperage methods. In general, any moderately strong wood that will not warp excessively (such as cedro in Central America) will be satisfactory. The sides should be grooved for the ends and bottom of the tub as indicated and bolted with threaded rods extending through both sides with washers to permit it to be drawn tight. The through bolting is important, otherwise, leaks are inevitable.

The size indicated on drawings is considered sufficient for an average family in the U.S. The same principle may be used for a larger or smaller machine provided basic proportions are maintained. The tub should be slightly less than half as wide as it is long to get a proper surge of water. The pistons should be wide enough to move within a couple of inches of each side of the tub. The lever pivot should be high enough to permit the plungers to move up and

down several inches without the edge of a lever hitting the edge of the tub. Likewise, rods on the plungers must be long enough to permit plungers to go well into the water so that clothes come completely out of the water at the highest position.

For efficient use of the above washer, several suggestions are made. Fill the washer with fifteen gallons of warm or hot water depending on what is available. Stains should be removed, soap rubbed into areas of garments which come in close contact with the body, and especially dirty clothes should be soaked before placing them in the washer. Shaved soap may be dissolved by heating it in a small quantity of water before adding it to the wash water. A six-pound load of clothes is recommended for best cleaning. Wash at a moderate speed (about fifty strokes per minute) for at least ten minutes or longer if it seems necessary. After washing and rinsing clothes, rinse the washer until clean and then replace the stopper. To prevent the wood from drying out and the washer leaking, add one to two inches of water to the washer when not in use.

Instructions for making washer

Mark and groove sides for end and bottom members.
Drill holes for cross bolts.
Cut off corners and trim ends of side members to length.
Level ends and bottom pieces to fit into groove in side members.
Miter bottom and end members together.
Assemble and bolt.
Cut and install legs.
Caulk seams between ends and bottom members with loose cotton or other vegetable fiber to make seams watertight. If joints to side members are carefully made, they probably will not need caulking.
Bore hole and make plug for draining tub. NOTE: This is shown on side in drawing but it is better in bottom of tub.
Make and install pivot members (upright).
Make and install plunger lever. NOTE: the cross pivot member (round) should be shouldered or notched at each pivot to prevent side movement.
Make plungers and install.

EVALUATION

A pilot model of the machine was made by the U. S. Department of Agriculture in their shops and tested in the Home Economics Laboratory at Beltsville, Maryland. Under test conditions a comparison with standard electric commercial washers was very favorable.

Material From - HOW TO MAKE A WASHING MACHINE
V. C. Pettit and Dr. K. Holtzclaw, A.I.D.

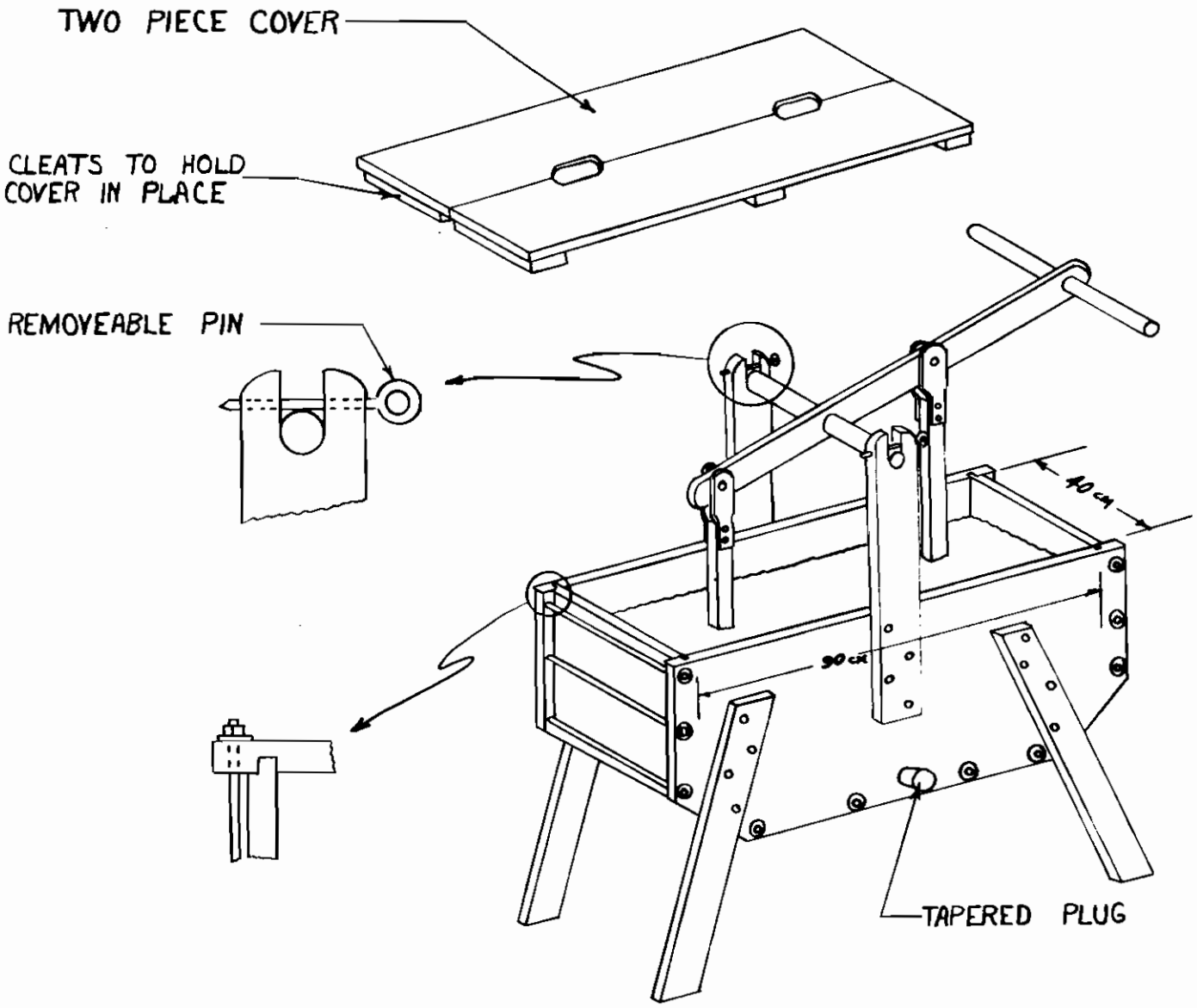
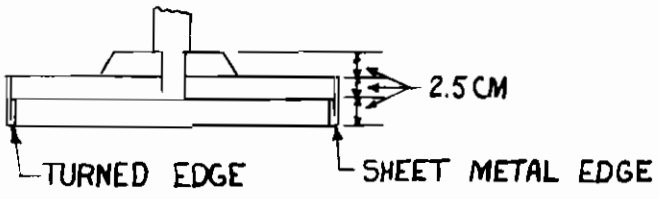
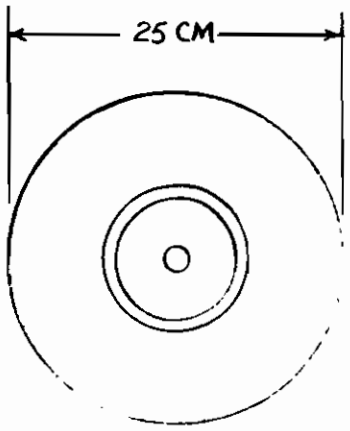


FIG. 1



PLUNGER SECTION



TOP VIEW OF PLUNGER

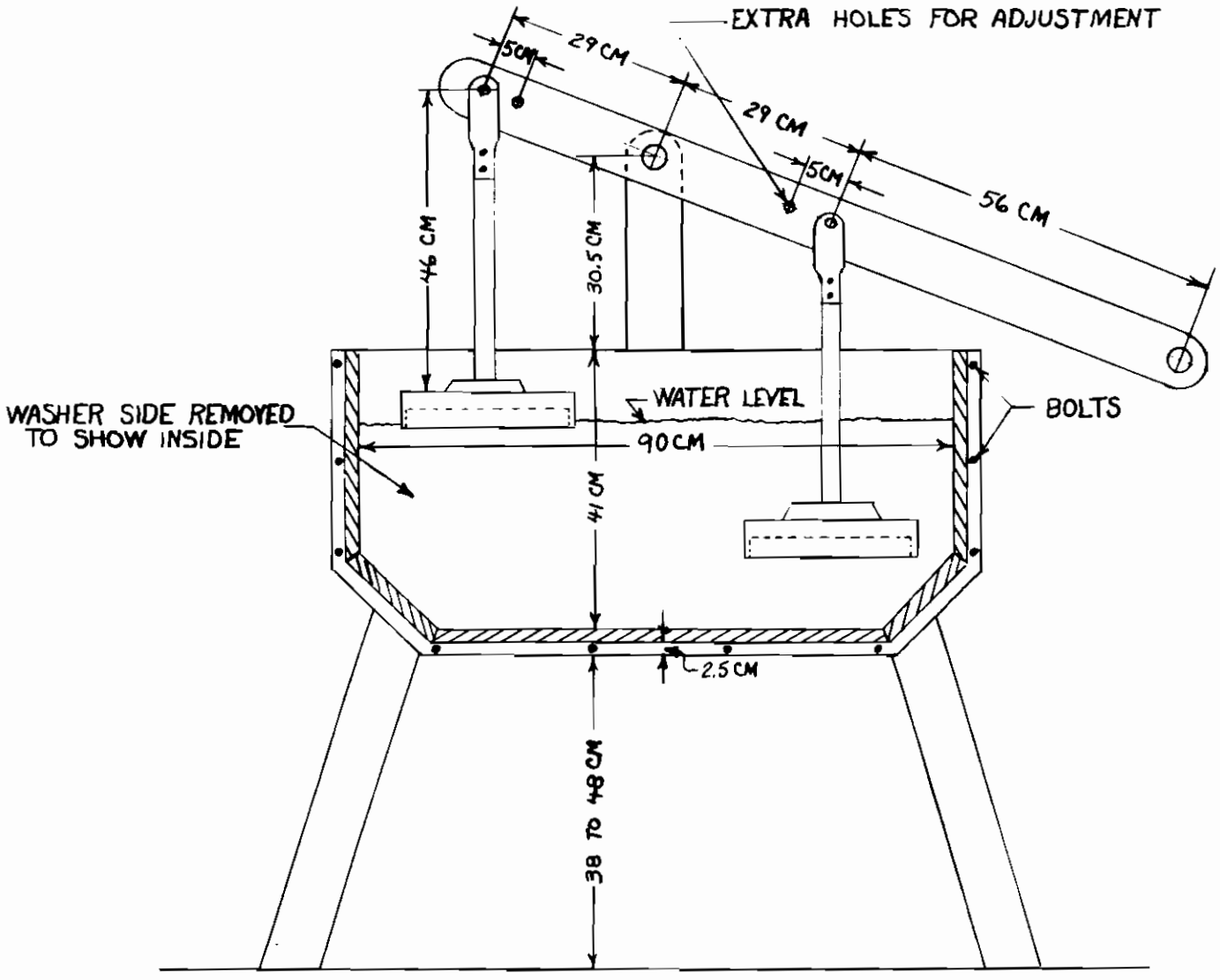

EXTRA HOLES FOR ADJUSTMENT
5CM
29 CM
29 CM
5CM
56 CM
46 CM
30.5 CM
WASHER SIDE REMOVED TO SHOW INSIDE
WATER LEVEL
BOLTS
90CM
41 CM
2.5 CM
38 TO 48 CM

FIG. 2

EDUCATION AND COMMUNICATION

BAMBOO OR REED WRITING PENS

ABSTRACT

This inexpensive and easily constructed pen has been in use since 3000 B.C. in Jordan. Large block letters to fine writing can be produced by making pens of different sizes.

FIG 1

TOOLS AND MATERIALS

Dry bamboo 15 x 1 x 1/2 cm.
Small rubber band or fine wire
Sharp knife
Fine sandpaper

DETAILS

Whittle one end of the bamboo to the desired width, and shave it down to the proper flexibility. (See figure 2) Be sure that the writing tip is made out of the harder and more durable material near the surface of the bamboo.

Cut the end straight across with the sharp knife and smooth with the sandpaper. By gently "writing" with the dry pen on the sandpaper, the point of your pen will be shaped to the proper writing angle for your hand.

Place the tip end of the knife at least 3 mm. from the point of your pen and rotate to drill a hole about 2 mm. in diameter for retaining the ink.

After practicing with a few models, it will be apparent that frequent re-inking is necessary. A two-piece reservoir pen can be constructed as shown in Figure 3. Attach the thin

FIG 2

cover plate to the pen by wrapping a small rubber band or fine wire around the notches provided for this purpose.

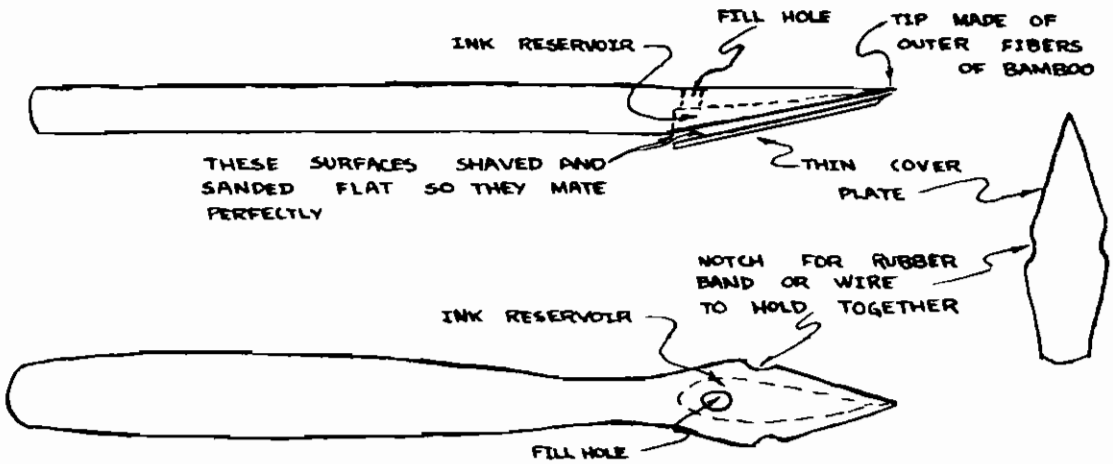


FIG. 3

EVALUATION

These have found use in Thailand and Jordan.

Original Material From - THE MULTIPLIER, Vol. 3 Issue #10, published by the Department of State Agency for International Development.

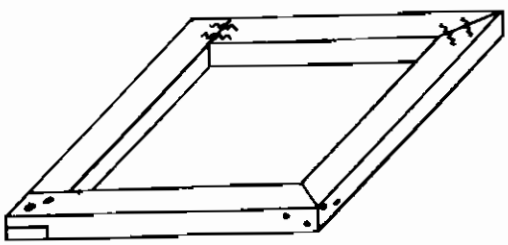
SILK SCREEN PRINTING

ABSTRACT

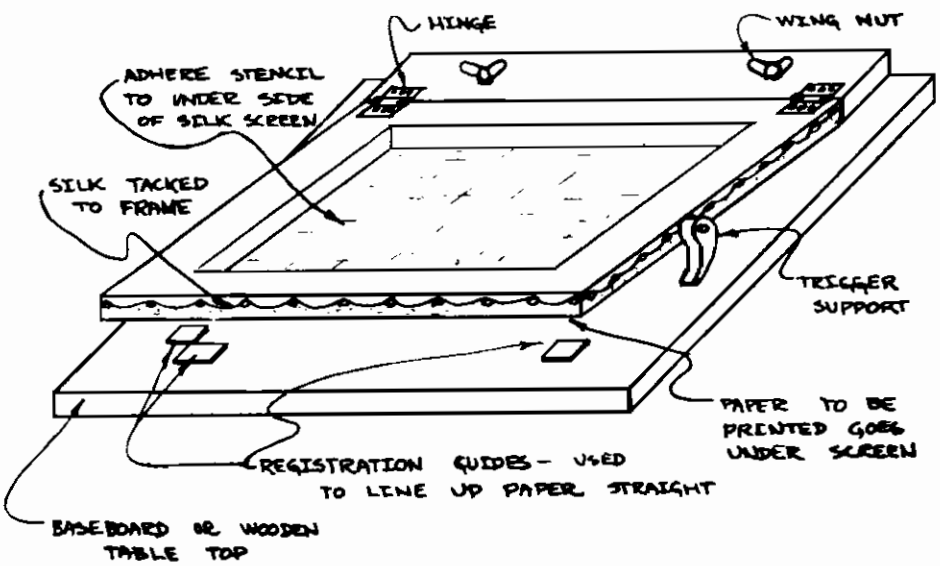
Silk screen printing is a simple and inexpensive method for producing multiple copies of visual aids, posters, etc. A squeegee is used to force very thick paint through the parts of the silk screen exposed by the stencil to the paper placed underneath.

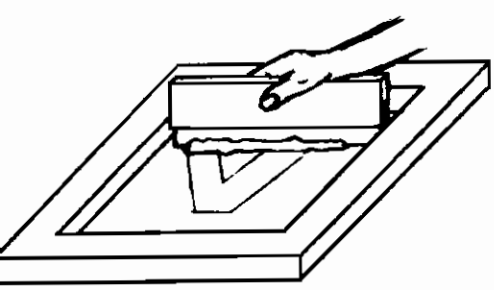
TOOLS AND MATERIALS

Hinges (about 1" x 3")
Wing or regular nuts
Squeegee
Trigger support
Frame
Baseboard or smooth table top
Silk or other sheer cloth
Thumbtacks
Silk screen paint
Paper for copies

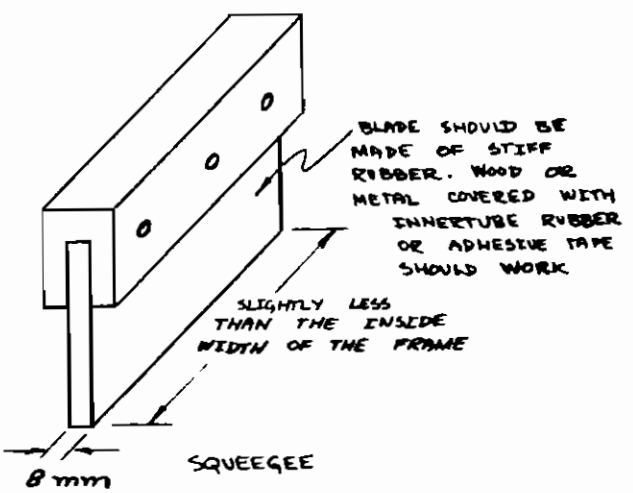


FRAME
SHOWING VARIOUS JOINT CONSTRUCTIONS





SQUEEGEEING PAINT ACROSS SILK



DETAILS

1. Study the drawings, then construct a frame as illustrated using approximately (1.9 x 5 cms.)(3/4" x 2") plywood or other wood. The exact size of the frame is determined by the size of the largest prints to be made. Average inside frame dimensions might be (38.1 cm. x 50.8 cm.)(18" x 24"). Make sure the corners are square and that the frame lies flat against a flat baseboard or table top, which can also be made of 1.9 cm (3/4") plywood.

2. Stretch the silk very tightly over the underside of the frame using tacks or thumb tacks every 1" or 2 cm. Tack either in the center of the underside of the frame or pull the silk over the outside bottom edges and tack around the outside. Make sure that the threads of the fabric are lined up with the frame edges. A few coats of shellac over wooden frame will make it more durable and less apt to warp.

3. Cut stencil and adhere to screen according to instructions.

4. Place the paper cardboard, etc, to be printed under the screen and stencil; draw a couple of spoonfulls of finger paint or other water-soluble paint in a line across the edge of the silk just inside one end of the frame.
(Oil soluble paints work well, but require a solvent cleanup; also, the viscosity of the paint should be like auto transmission grease, not thin enough to fall through the screen of its own accord.)

5. Pull the paint across the silk surface using an edge of the squeegee blade. This squeezes the paint through all the open areas of the paper stencil. Lift screen. Remove print and replace with next piece to be printed. Pull paint back the other way for the next print. The desired technique is to place an amount of paint on the screen which, together with the right blade pressure, will produce an acceptable print with one stroke of the squeegee.
Make certain that dried paint particles do not get in the paint as they could damage the screen.

6. If more than one color is to be printed, registration becomes an important feature and can be achieved by the following method:

(a) Print the first color using registration guides. Registration guides can be made of thin cardboard or several layers of tape. (Thicker guides can cause silk to break when squeegee blade presses the silk against the guides.)

(b) A piece of wax or thin translucent paper is taped on one edge to the baseboard beneath the second screen to be printed.

(c) Print a trial image of the second screen onto this paper.

(d) Raise the screen.

(e) Slide the sample of the first printing into position beneath the taped wax paper until the desired registration with the first printing is achieved.

(f) Once registered carefully hold the first printing sample in position, and remove the wax paper.

(g) Tape new registration guides on three sides of the first printing sample.

(h) Now proceed to print the second color. Subsequent colors are printed by returning to Step (b).

7. Several colors can be printed over one another if transparent paints are used. The size of the printed area can be restricted by using paper masks.

8. Pull off stencil. Clean wet paint out of silk and frame by unscrewing wing bolts, taking the frame to a convenient wash area and holding under running water.

9. Optional: A drying rack pictured here is helpful when many prints are to be dried.

DRYING RACK MADE WITH 2" x 2" UPRIGHTS WITH 1" x 1" CROSS BARS ABOUT AN INCH APART

Material From - John Tomlinson, VITA Participant


UNITED STATES OF AMERICA