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Chain Link Fence Making Machine  
VITA Technical Bulletin 25

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# TECHNICAL BULLETIN 25

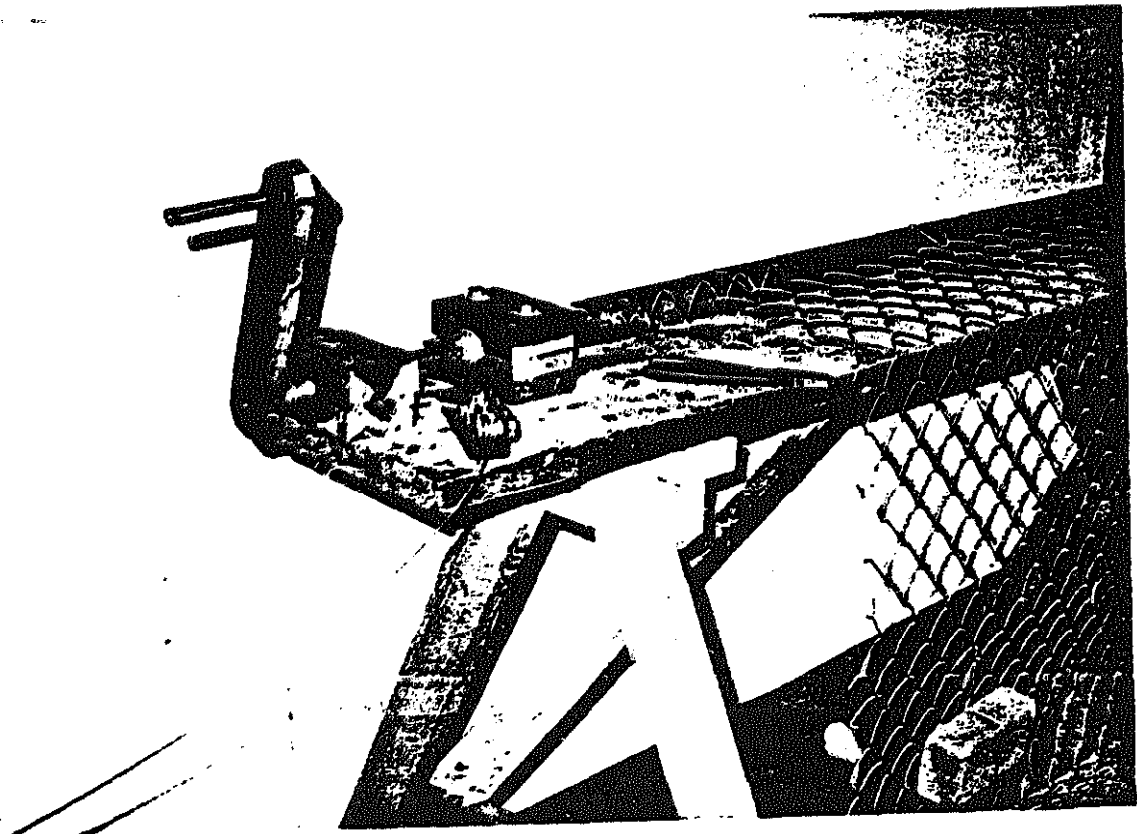
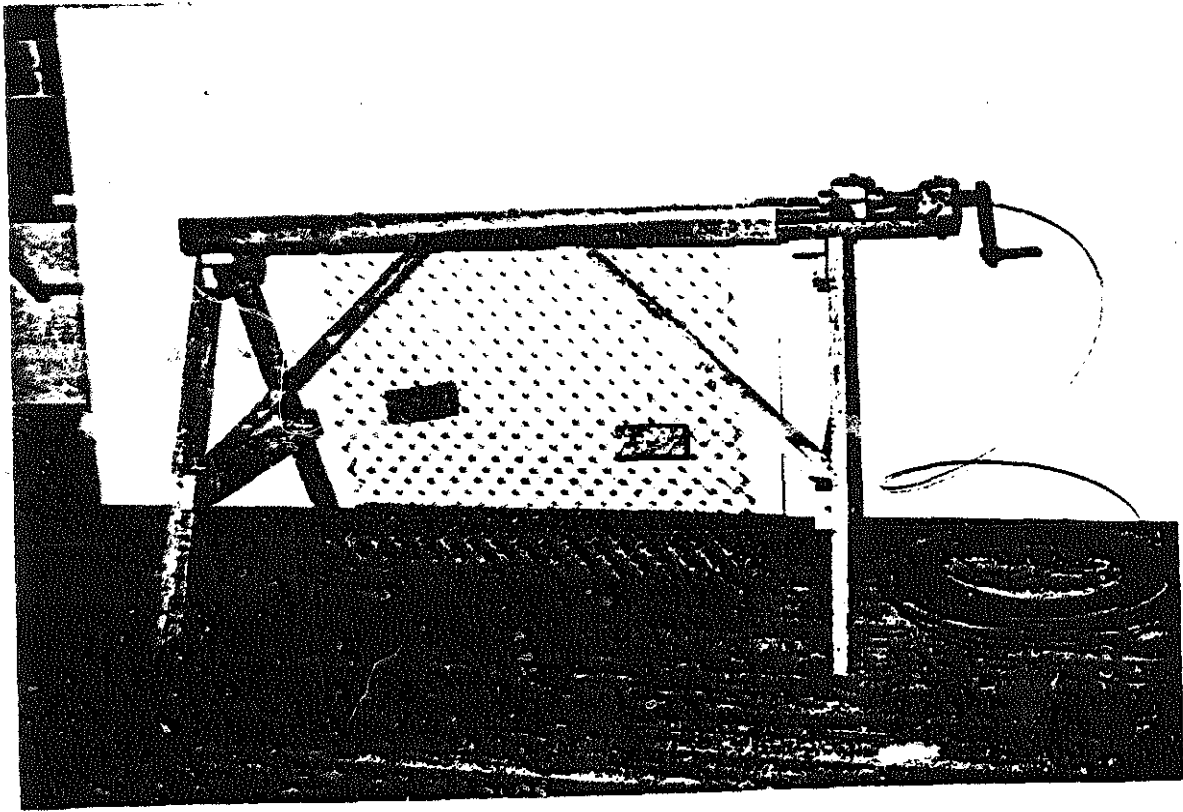
## Chain Link Fence Making Machine

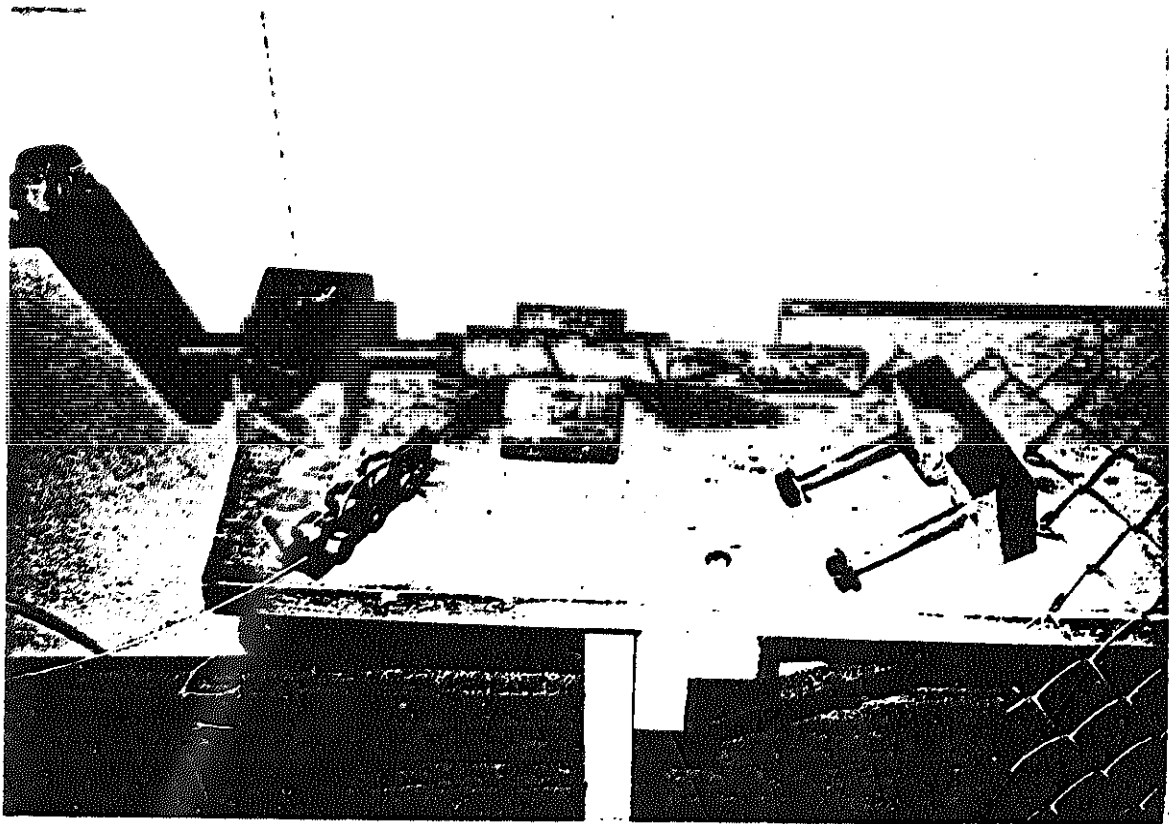
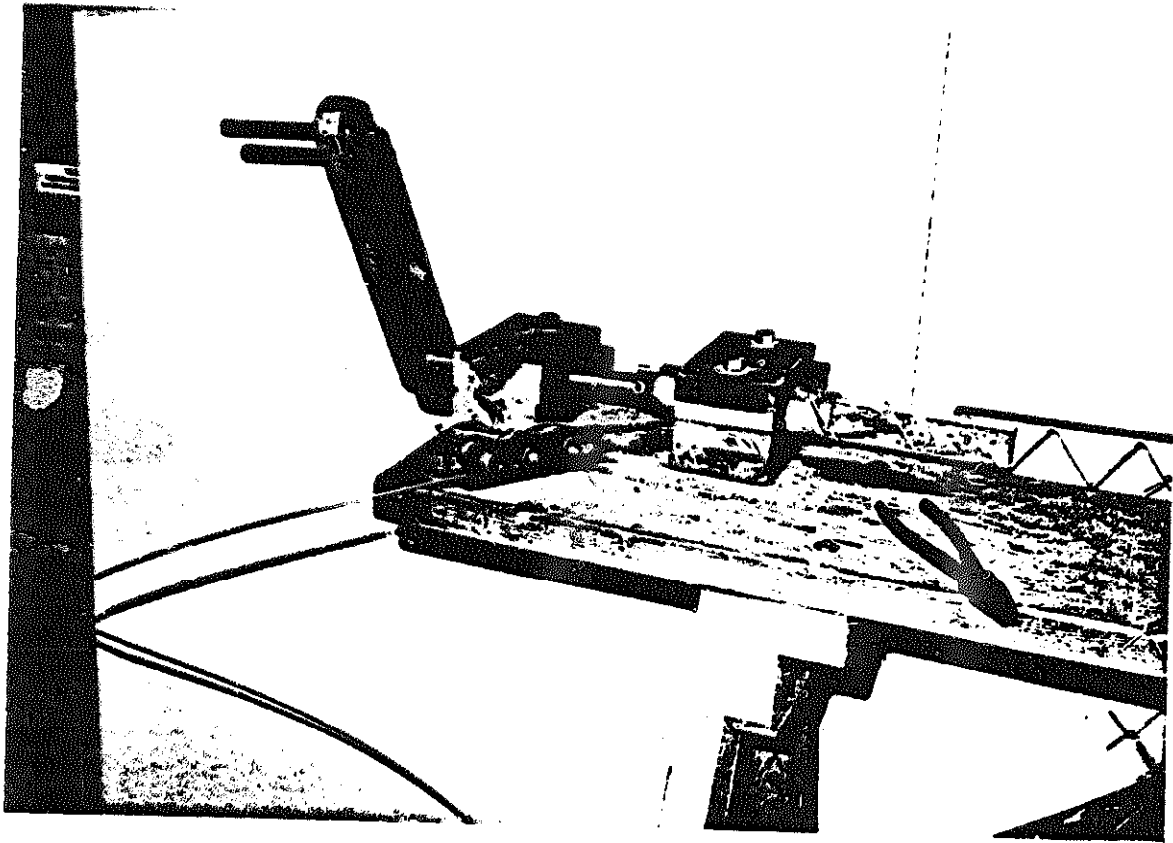
This bulletin contains step-by-step procedures for parts manufacture and assembly of a hand-operated machine for making chain link fencing. The machine here is designed to produce fencing up to 244 cm (96") but can be used to produce fencing of any height. The size of the openings in the fencing is controlled by the size of the "bending-head." The machine described here requires #12 or #14 wire, but the machine could be modified to take larger wire.

The chain link fence making machine was designed by VITA in response to requests from South America and Africa. In Botswana, the machine has become the basis for a small fence manufacturing business which serves as a source of employment and produces fencing which is far more affordable locally than is the imported fencing which was the only material previously available.

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CHAIN-LINK FENCE MAKING MACHINE

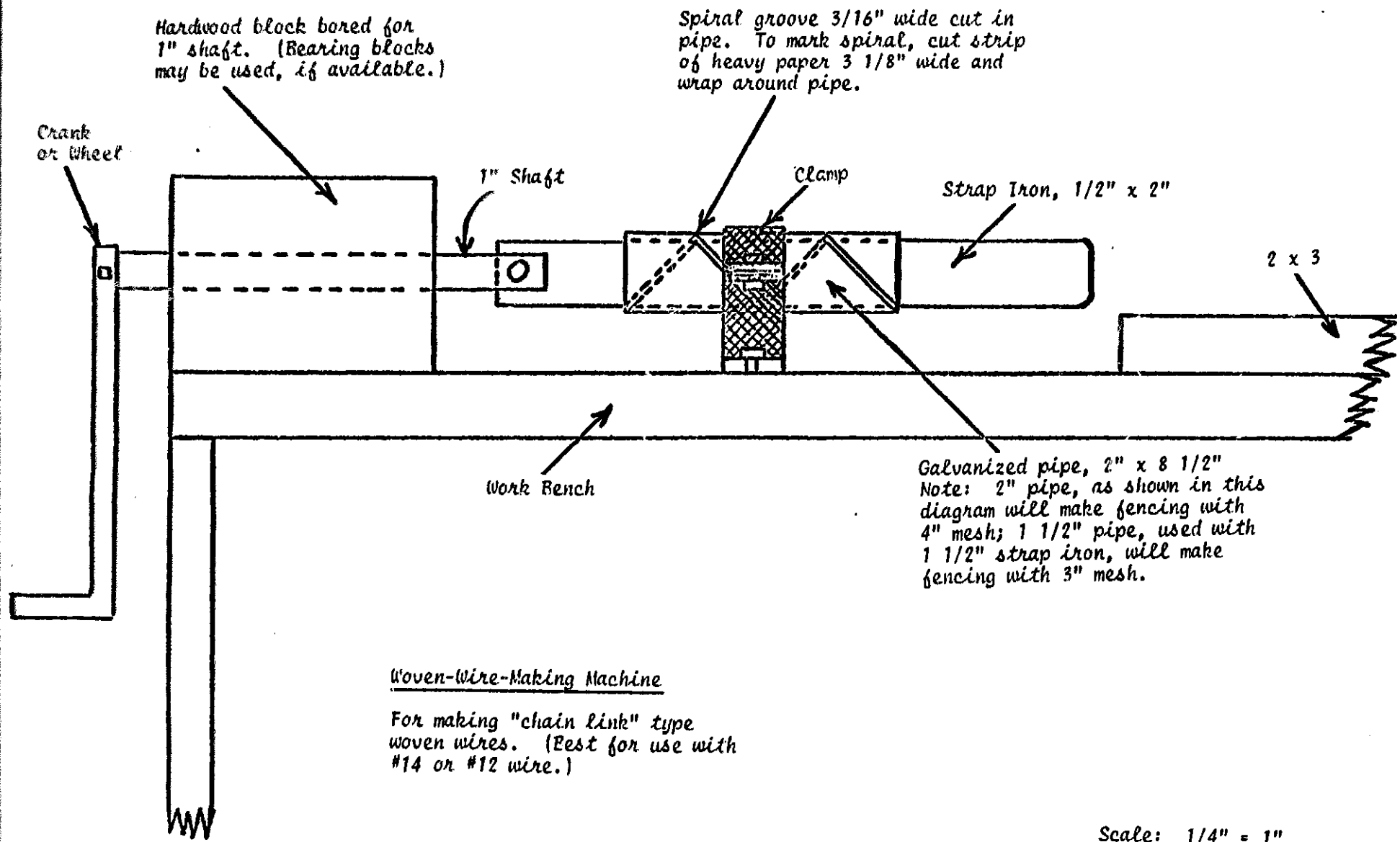
TOOLS

Ruler  
Saw (for wood and metal)  
Drill (for wood and metal)  
Screwdriver  
Hammer

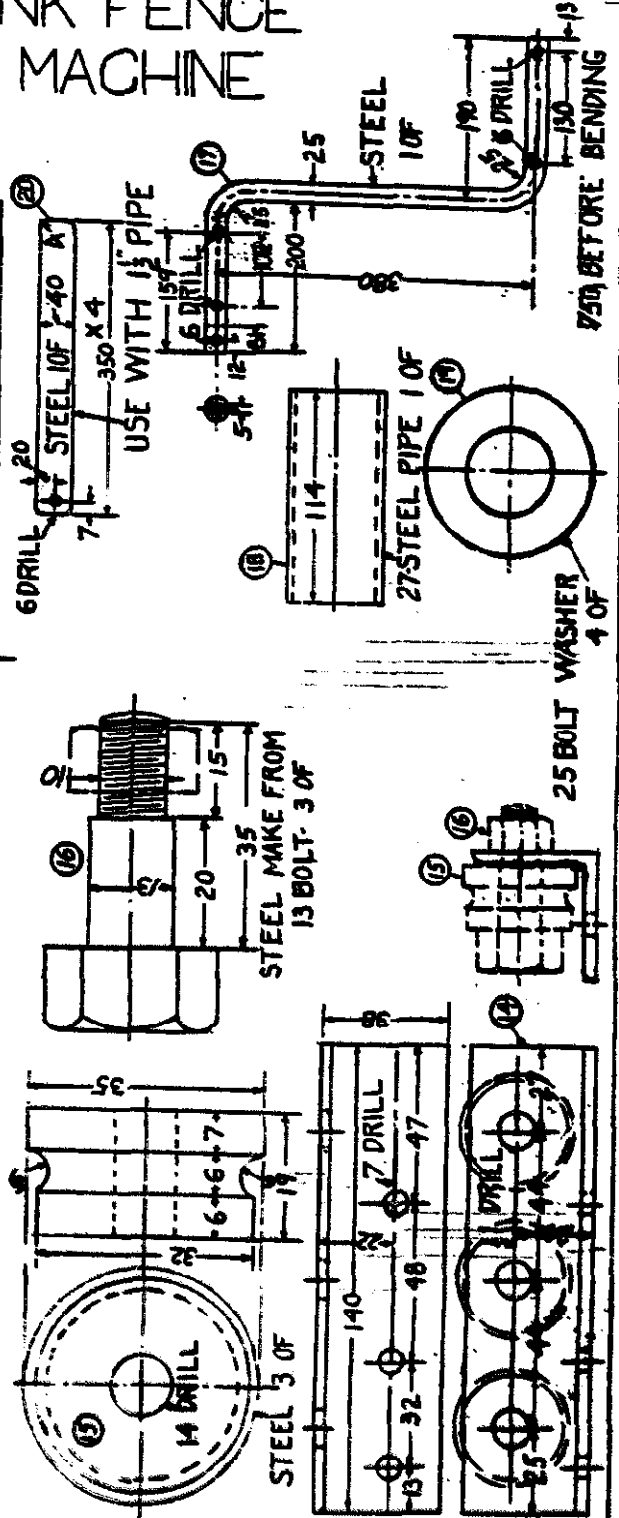
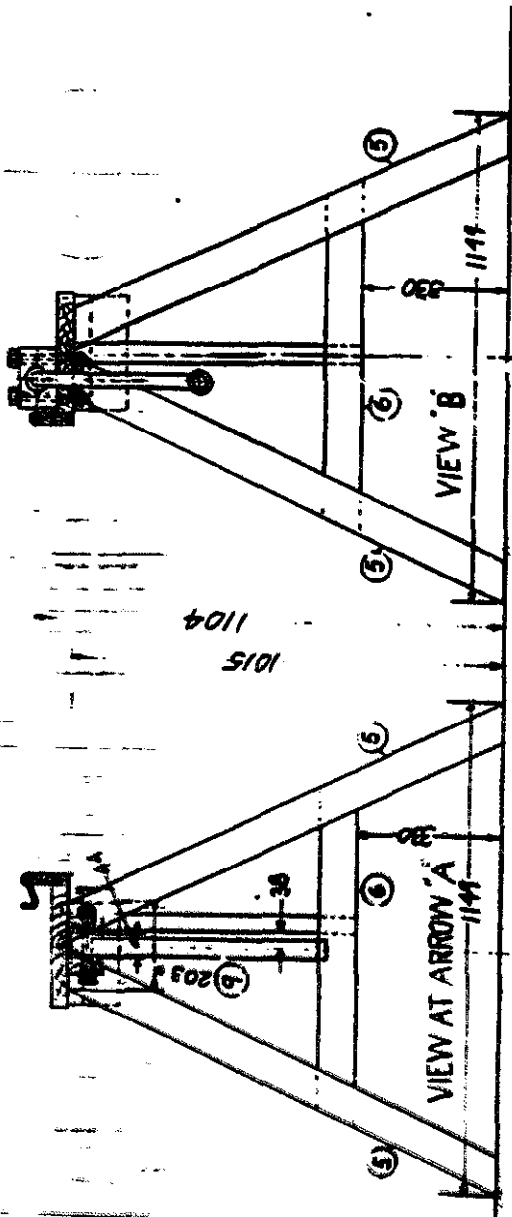
Adjustable wrench  
Pliers  
Vise  
File

MATERIAL

ITEM	PIECES	DESCRIPTION	CENTIMETERS	INCHES
<u>Wooden Parts</u>				
1	4	Wood	5 x 10 x 15	2 x 4 x 6
2	1	Wood	4 x 30 x 305	1 1/2 x 12 x 120
3	1	Wood	2.5 x 10 x 262	1 x 4 x 103
<u>Metal Parts</u>				
4	1	Steel plate	0.3 x 5 x 35	1/8 x 2 x 14
5	1	Iron rod	2.5 dia x 78 lng	1 dia x 31 lng
6	1	Angle iron	4 x 4 x 14 lng x 0.3 thk	1 1/2 x 1 1/2 x 5 1/2 lng x 1/8 thk
7	1	Steel pipe	5 ID x 6 OD x 17 lng	2 ID x 2 3/8 OD x 6 5/8 lng
8	1	Strap iron	0.3 x 2.5 x 15	1/8 x 1 x 6
*9A	6	Steel washers	2.2 ID x 3.5 OD x 0.6 thk	7/8 ID x 1 3/8 OD x 1/4 thk
*9B	3	Steel washers	2.2 ID x 2.9 OD x 0.6 thk	7/8 ID x 1 1/8 OD x 1/4 thk
*9C	3	Steel pipes	1.3 ID x 2.2 OD x 2.1 lng	1/2 ID x 7/8 OD x 13/16 lng
*10	3	Steel rod	3.5 dia x 1.8 lng	1 3/8 dia x 3/4 lng
11	1	Steel pipe	2.5 ID x 3.5 OD x 12 lng	1 ID x 1 3/8 OD x 5 lng
<u>Metal Fasteners</u>				
12	5	#12 wire	0.2 dia x 15 lng	.08 dia x 6 lng
13	4	Round/hex-head bolts with 4 nuts, 4 flat washers and 4 lockwashers	0.6 dia x 16 lng	1/4 dia x 6 lng
14	5	Round/hex-head bolts with 6 nuts, 3 flat washers and 3 lockwashers	0.6 dia x 5 lng	1/4 dia x 2 lng
15	4	Flat washers	2.5 ID x 3.5 OD x 0.2 thk	1 ID x 1 3/8 OD x 1/16 thk
16	4	#12 wire	0.2 dia x 5 lng	.08 dia x 2 lng
17	24	Common nails	5 lng	2 lng
*18A	3	Round/hex-head bolts with 3 nuts and 3 lockwashers	1.3 dia x 3.8 lng	1/2 dia x 1 1/2 lng
*18B	3	Round/hex-head bolts with 3 nuts and 3 lockwashers	1.6 dia x 1.9 lng shank & 1.3 dia x 1.6 lng thread	5/8 dia x 13/16 lng shank & 1/2 dia x 5/8 lng thread
19	3	Washers	3.2 OD x 1.3 ID x 0.2 thk	1 1/4 OD x 1/2 ID x 1/16 thk

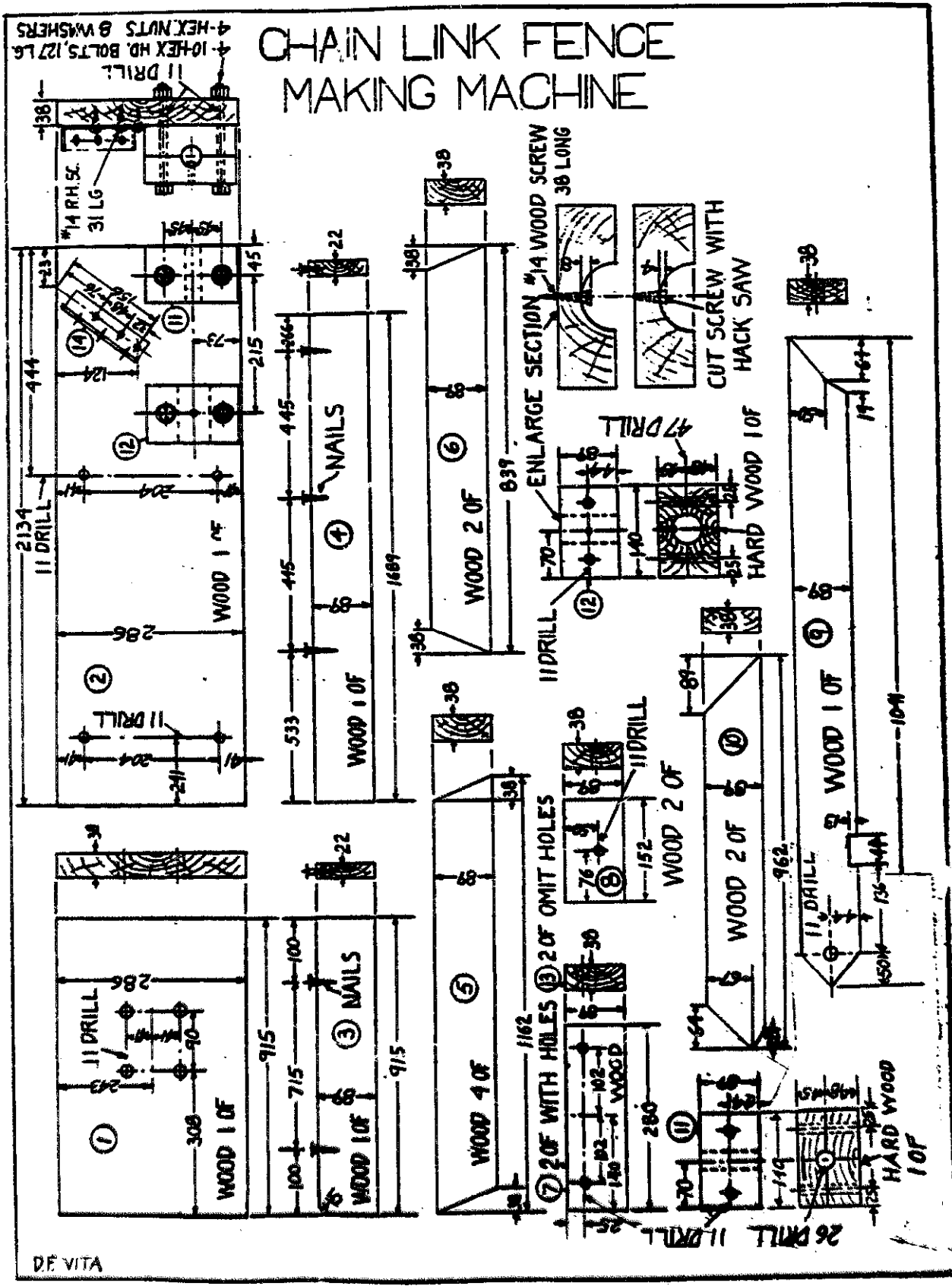


# CHAIN LINK FENCE MAKING MACHINE



DF VITA

# CHAIN LINK FENCE MAKING MACHINE



DE VITA

26 DRILL 1 1/2" DRILL



DE VITA

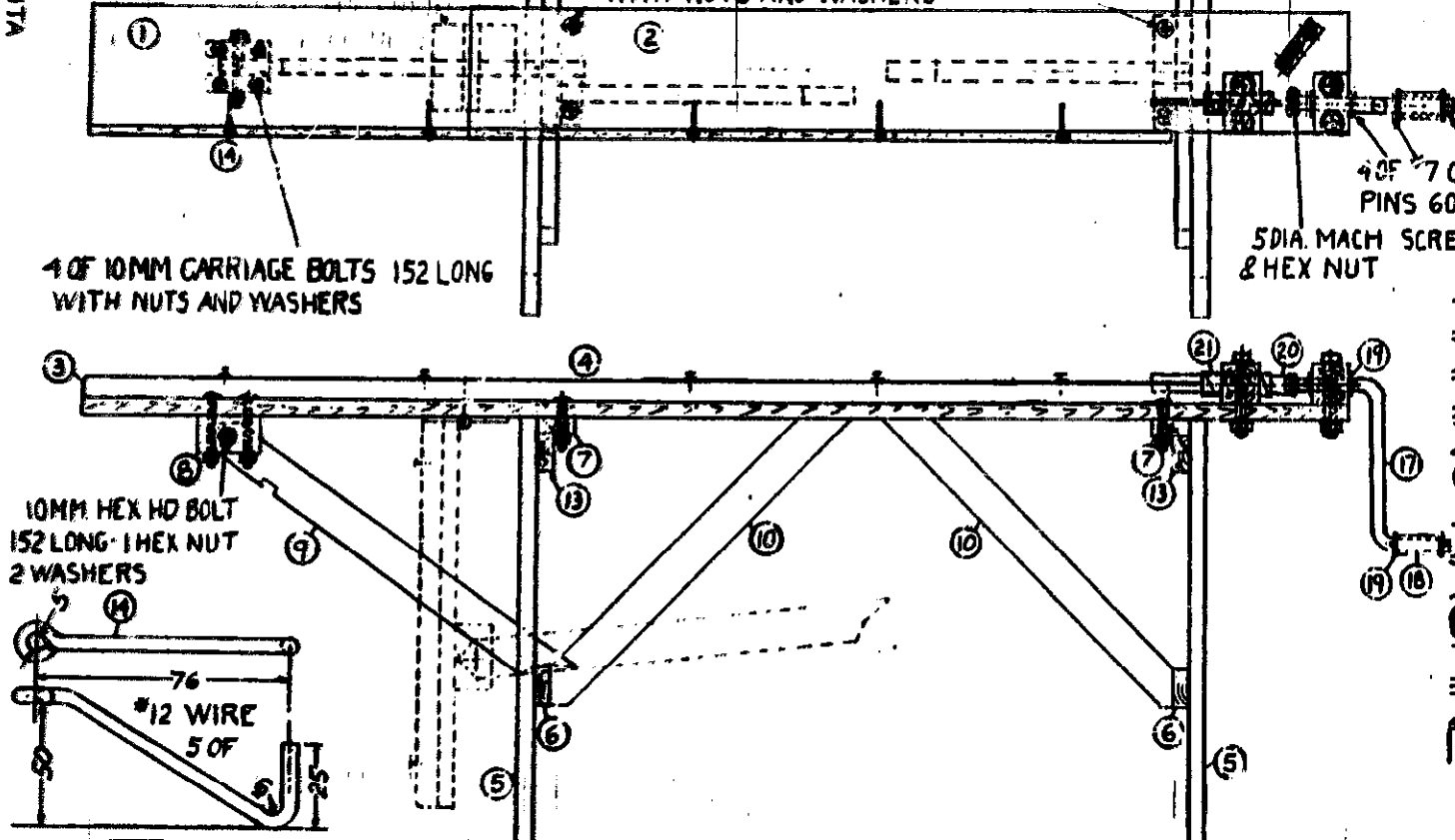
BUTT HINGE

4 OF 10MM CARRIAGE BOLTS 100 LONG WITH NUTS AND WASHERS

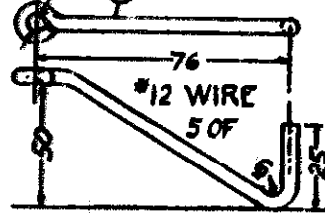
4 OF 10MM CARRIAGE BOLTS 152 LONG WITH NUTS AND WASHERS

4 OF #7 COTTER PINS 60 LG  
5 DIA. MACH SCREW 35 LG & HEX NUT

CHAIN LINK FENCE MAKING MACHINE

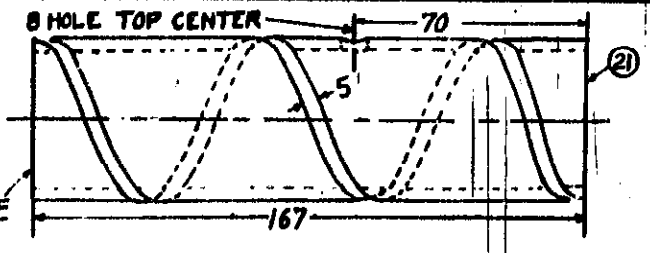


10MM HEX HD BOLT 152 LONG - 1 HEX NUT 2 WASHERS

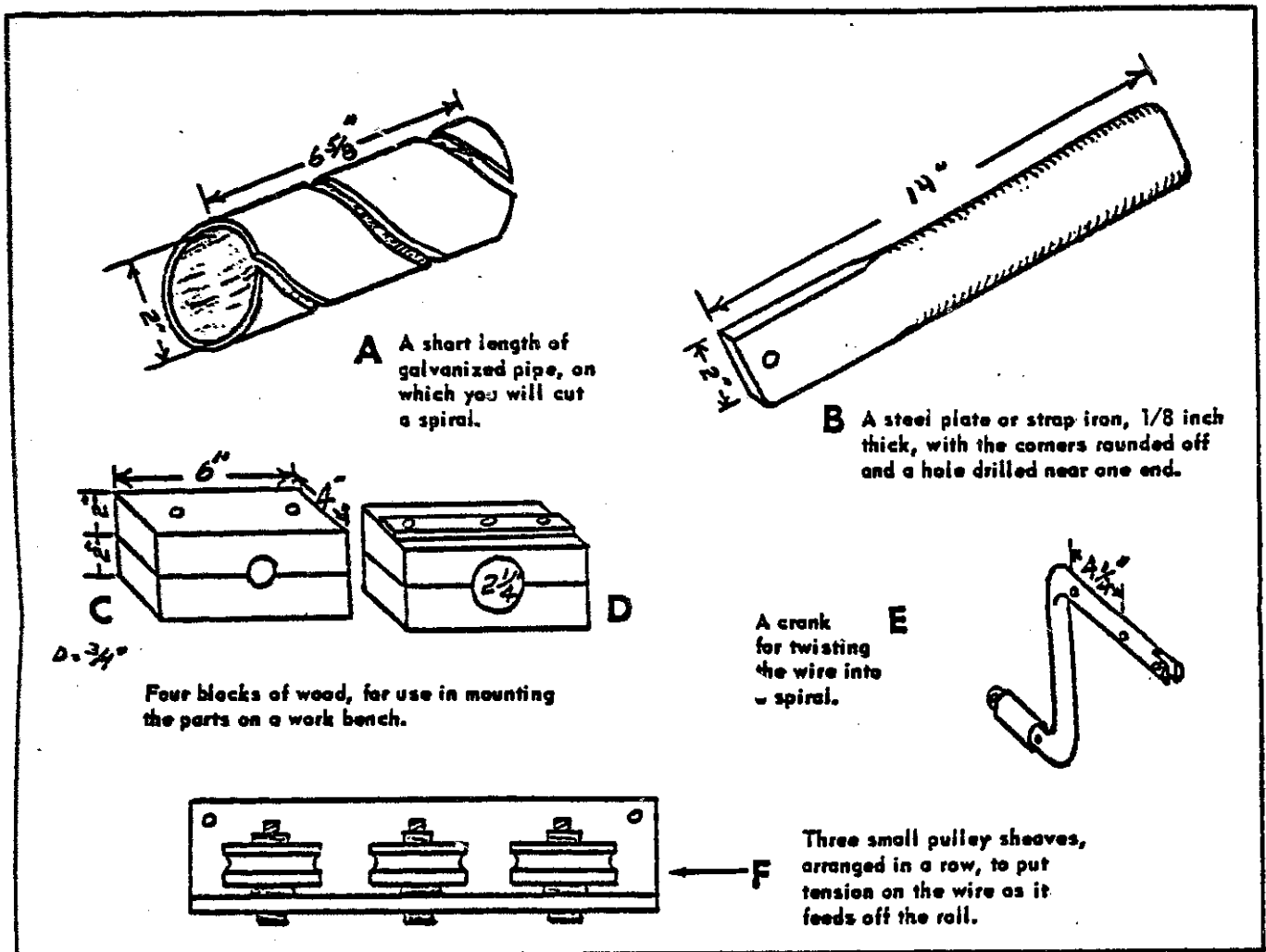


USE #12 OR #14 WIRE.  
 38-PIPE WILL MAKE FENCING WITH 76 MESH  
 SPIRAL GROOVE 5 WIDE CUT IN PIPE, TO MARK  
 SPIRAL, CUT STRIP OF HEAVY PAPER 67 WIDE  
 AND WRAP AROUND PIPE

38 GALVANIZED PIPE 10F



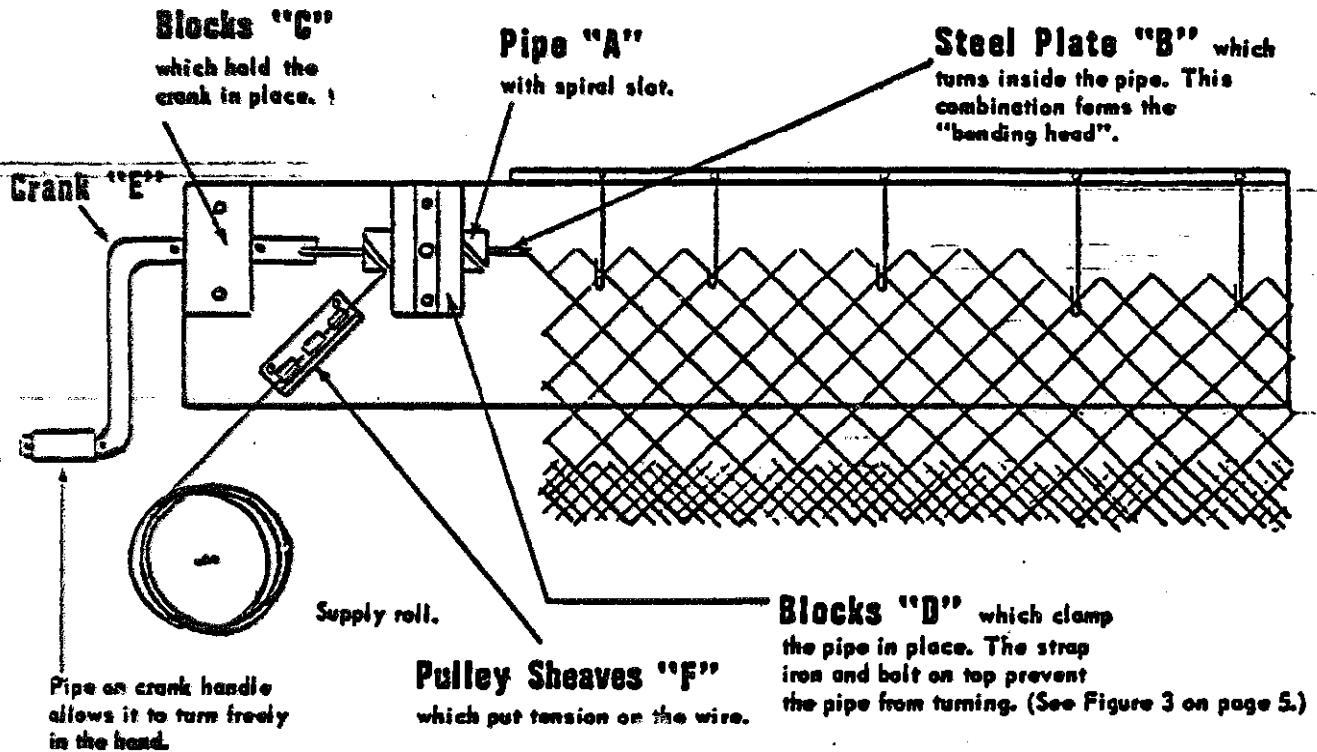
An abstract of the fence-making machine as it appeared in "World Neighbors in Action."



- A.** The size of this pipe determines the size of the openings in the mesh. A 2-inch pipe will make fencing with 4-inch openings. To mark the spiral, cut a strip of heavy paper 3-1/8 inches wide and wrap it around the pipe. To cut the spiral slot, a hacksaw is used. The slot should be 3/16 inches wide. A 1/4-inch hole is drilled in the top of the pipe, for holding it in place.
- B.** This "blade" may be made from steel or strap iron. It must be tough enough so that it will not tend to twist out of shape with use. The edges should be filed off so that it fits snugly but turns freely inside the pipe.
- C.** Two blocks are clamped together and a 1-inch hole bored between them horizontally, as shown. Two 1/4-inch holes are also drilled vertically, for fastening the blocks to the work bench.
- D.** In the same way, the two blocks are clamped together. A hole 2-1/4 inches in diameter is bored horizontally, and three 1/4-inch holes are drilled vertically, as shown. The top center hole also requires a 1/2-inch counterbore, (1/4-inch deep) in the top block, to admit a locknut. A 6-inch strap iron is also drilled with three 1/4-inch holes to match the holes in the blocks. (See Figure 3 on page 5).
- E.** The crank may be made from a 1-inch rod, 31 inches in length. A 3/16-inch slot is cut in the end, so that it will fit over the "blade", or bending arm. Holes are drilled as indicated, to hold the crank in place. A 5-inch length of pipe is fitted over the handle, so the crank will turn easily in the hand.
- F.** The size of the pulley sheaves is not especially important. A 1-1/2 or 2-inch diameter is a good size to use.

## FIGURE 2: This Is How You Assemble The Parts. (Top View)

Note the Corresponding Positions of the Parts Pictures in Figure 1.



The parts are assembled by bolting the blocks "C" and "D" to a sturdy, narrow table or work bench, as shown above. If such a work bench is not available, it may be constructed for this purpose. The top of the bench should be made of a plank 1 foot wide, 10 feet long, and 1-1/2 inches in thickness.

As the wire feeds off the supply roll, it goes first through the pulley assembly. It goes over the first pulley, under the second, and over the third. The end of the wire is then inserted in the slot in the pipe "A". When the crank is turned (clockwise) the wire winds around the steel plate or "bending arm", follows the spiral slot, and is forced out the other end in the form of a flat spiral. When the spiral strand reaches the desired length, it is cut off with wire-cutting pliers. The first strand is held in place while the next strand winds itself around the first.

A narrow board (1 inch x 4 inches x 103 inches) is fastened to one side of the work bench, as shown above.

Wire hooks are arranged along the edge of this board, and are used to hold the finished section of wire in place, while each succeeding strand is being made. This arrangement holds the fencing up off the table, so that the spiral has room to turn.

As each strand is cut off, the two ends are twisted together with the ends of the preceding strand.

Finished fencing accumulates on a roll on the floor beside the work bench. For continuous production, a rack may be prepared, with an axle-and-crank arrangement, on which the finished wire may be rolled up as it accumulates.

Also, for continuous production, it is best always to leave a short section of fencing in line on the machine, since the first few strands are always somewhat difficult to hold in line. To separate two sections of fencing, it is not necessary to cut the wire; simply loosen the two ends of one of the strands and turn the spiral backwards out of the fencing.

## FABRICATION

Clamp two halves of crankshaft-bearing block (1A) in vise, drill two 0.6cm (1/4") diameter holes vertically through both halves and drill 2.5cm (1") diameter hole horizontally.

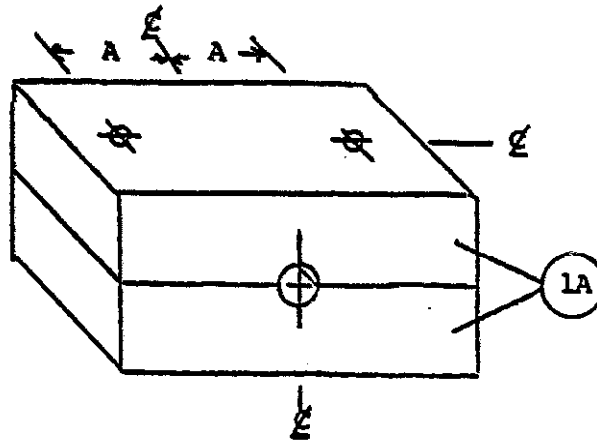


FIGURE 1

Similarly, clamp and drill two 0.6cm (1/4") diameter and one 5.7cm (2 1/4") diameter holes in bending-head block (1B); also drill 0.6cm (1/4") diameter vertical hole with 1.3cm (1/2") diameter x 0.6cm (1/4") deep counterbore in top half.

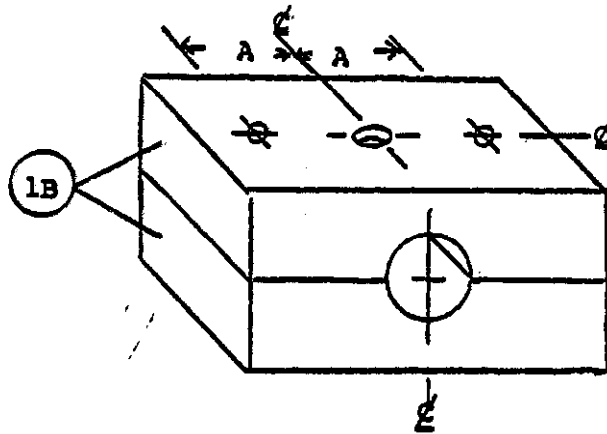


FIGURE 2

Drill 0.6cm (1/4") diameter hole in bending-head arm (4) and round off corners.

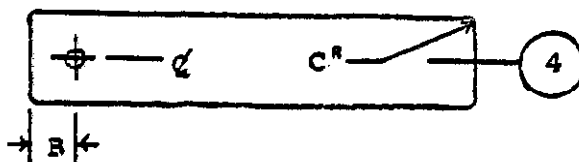


FIGURE 3

### DIMENSION CENTIMETERS INCHES

	CENTIMETERS	INCHES
A	5	2
B	1	3/8
C	0.5	3/16
D	21	8 3/8
E	3.2	1 1/4
F	0.5	3/16
G	16	6 1/4
H	3.7	1 1/2
I	11	4 1/4
J	5	1 7/8
K	14	5 5/8
L	13	5 1/4
M	38	15

- 4 Bend crankshaft (5), cut slot in end indicated, drill 0.6cm (1/4") diameter hole through slotted end and drill four 0.3cm (1/8") diameter holes.

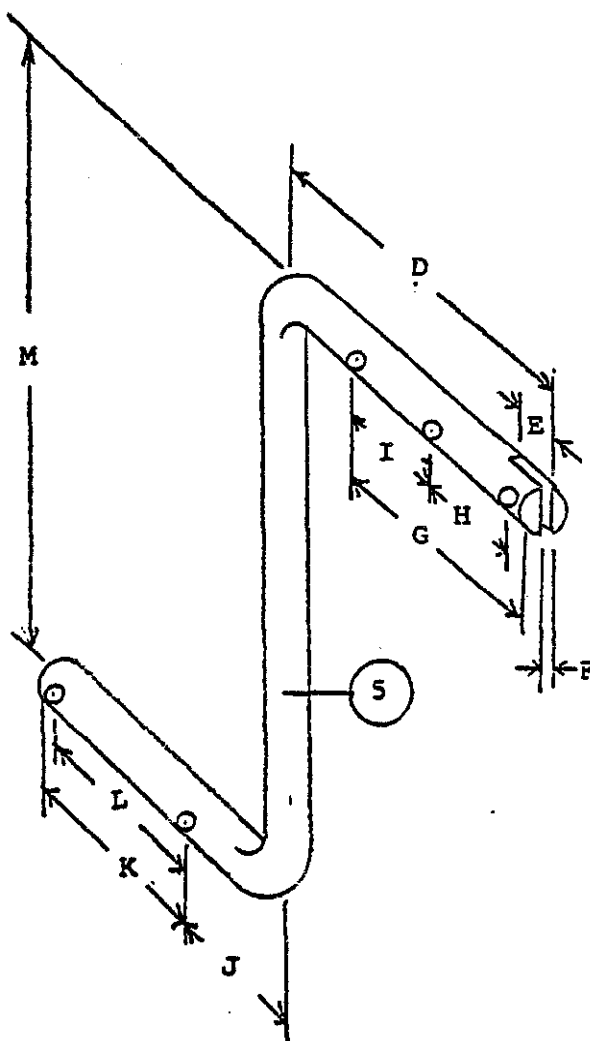


FIGURE 4

- 5 Cut 0.5cm (3/16") wide spiral slot in bending-head pipe (7); to mark spiral, cut strip of heavy paper 8cm (3 1/8") wide and wrap around pipe. Drill 0.6cm (1/4") diameter hole in top of pipe.

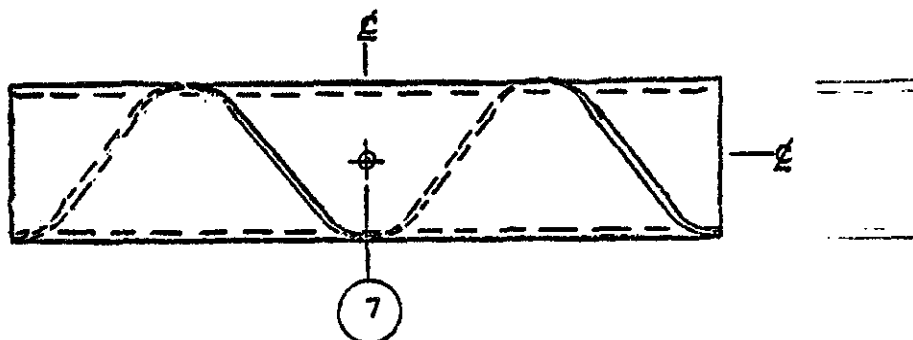


FIGURE 5

6 Drill three 0.6cm (1/4") diameter holes in bending-head brace (8).

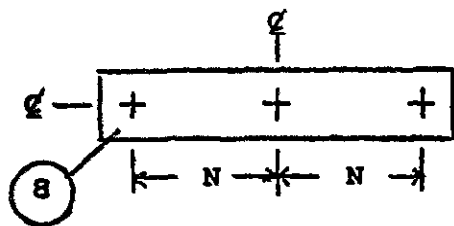


FIGURE 6

7 Form hooks (11).

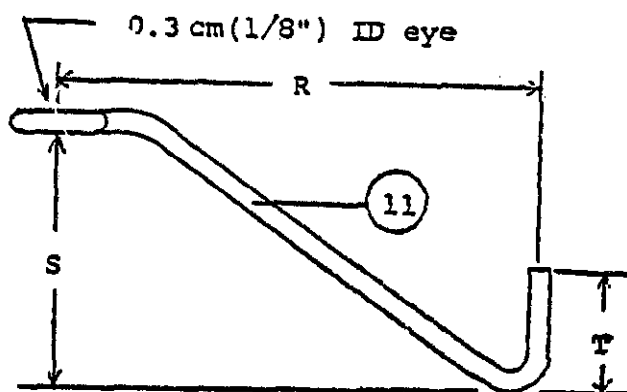


FIGURE 7

8 Drill three 1.3cm (1/2") diameter and three 0.6cm (1/4") diameter holes in tension-assembly base (6).

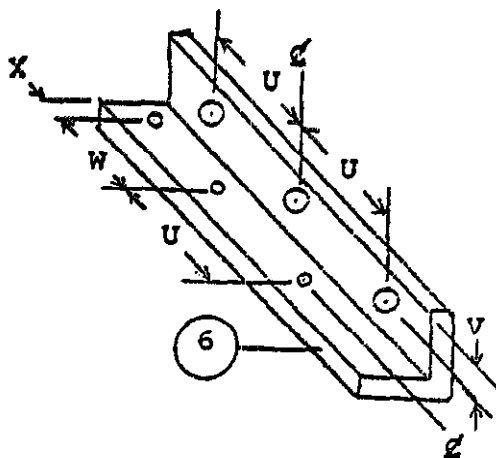


FIGURE 8

### Smoothing the spiral groove.

It is necessary to smooth the spiral groove with a small file so that the wire will move freely through the bending-head.

### Strengthening the bending-head.

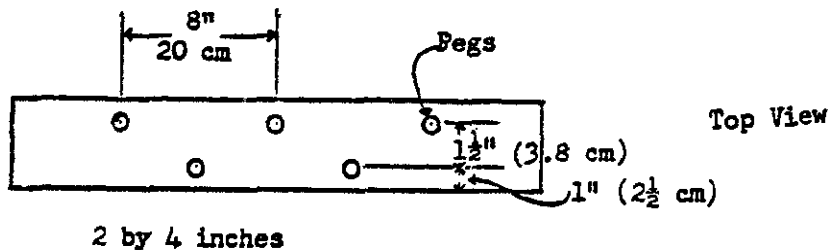
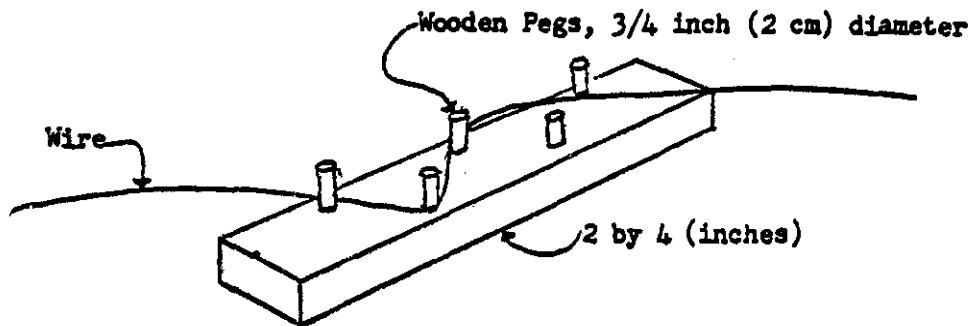
To make the bending-head stronger, start with a piece of pipe 2" (5cm) longer than required. Cut the spiral groove as described in the instructions leaving the 2" uncut portion at the end near the crank. Made in this way the pipe will hold its original shape much better and the uncut part will not interfere with the operation of the machine.

### Alternate method of crank construction.

The crank can be made from 1/2" diameter pipe and fittings, if available.

### Alternate method of constructing tension-assembly.

A very simple and suitable tension-assembly can be made with wooden pegs mounted in a board as shown below. The wire is passed around as many of the pegs as necessary to provide the proper tension. As wear begins to show on the pegs they can be driven into the board until the area of wear disappears. After some time it will be necessary to replace the pegs.



The positioning of the wooden peg tension-assembly will depend on the general construction of the machine. If it is built with wooden legs, the pegs can be placed in the leg nearest the bending-head to form the tensioning device. Otherwise, the tension-assembly must be constructed as a separate piece and attached to the machine bed in the appropriate position.

9 There are two methods of fabricating the tension-assembly sheaves (9A & 9B, or 10) and their axles (26A or 26B):

- a. Preferred method, if use of lathe is possible, Figure 9 cross-section view: fabricate sheaves (10) as shown.
- b. Alternate method, if use of lathe is not possible, Figure 10 cross-section view: assemble sheaves (2-9A & 1-9B) each) with bearings (9C) as shown; file bearing (9C) lengths so that assembled sheaves will revolve singly; 9A and 9B may each be built up of series of thin washers, if necessary.

DIMENSION CENTIMETERS INCHES

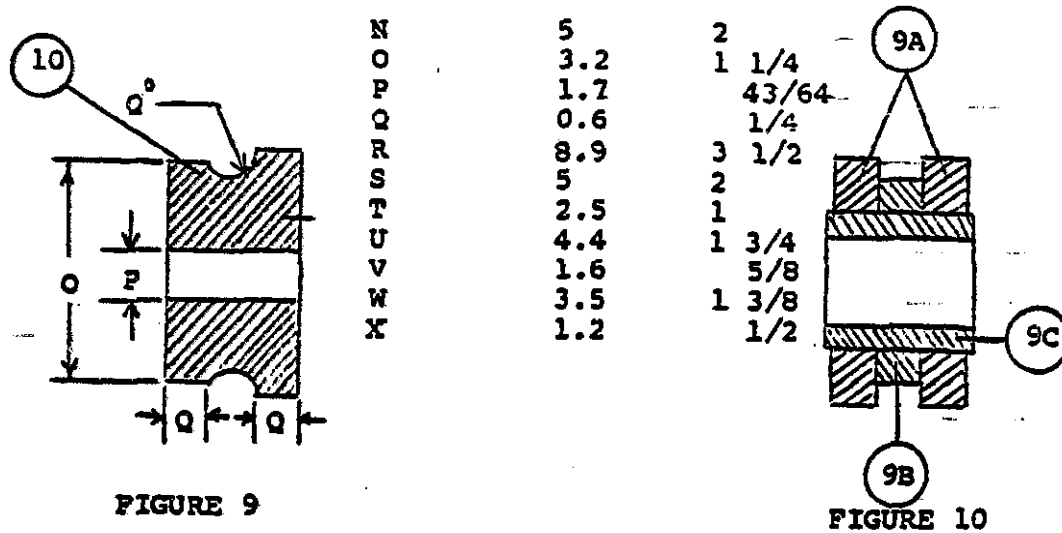


FIGURE 9

FIGURE 10

SOME ADDITIONAL NOTES ON THE CHAIN-LINK FENCE-MAKING MACHINE

Making the spiral groove in the pipe.

The width of the paper used for marking the spiral groove is:

- 2 5/8" (6.7cm) wide for 1 1/2" (3.8cm) pipe
- 3 1/8" (8cm) wide for 2" (5cm) pipe

The paper is wrapped spirally around the pipe with just enough space between the edges of the paper to mark with a pencil.

Using a hacksaw, cut along this line, rotating the pipe so that the blade just goes through the metal. Too deep a cut will cause the hacksaw blade to bind.

A second cut is made near the first so that the resulting groove is 3/16" (0.5cm) wide.



ASSEMBLY

1. Assemble tension-assembly as shown.

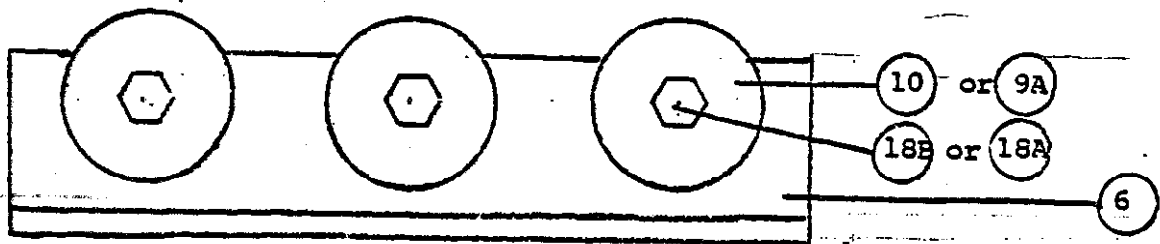


FIGURE 14

Assemble tension-assembly sheaves in one way.

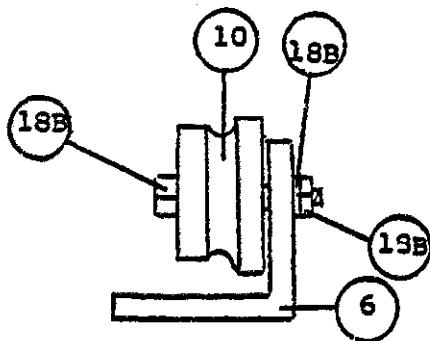


FIGURE 11

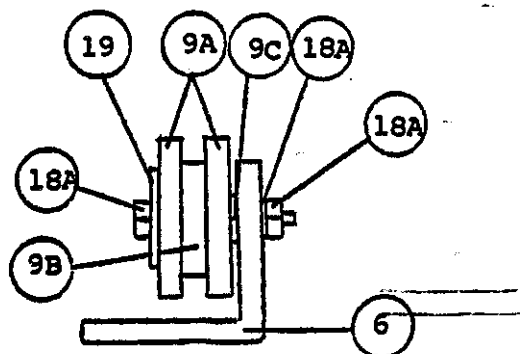
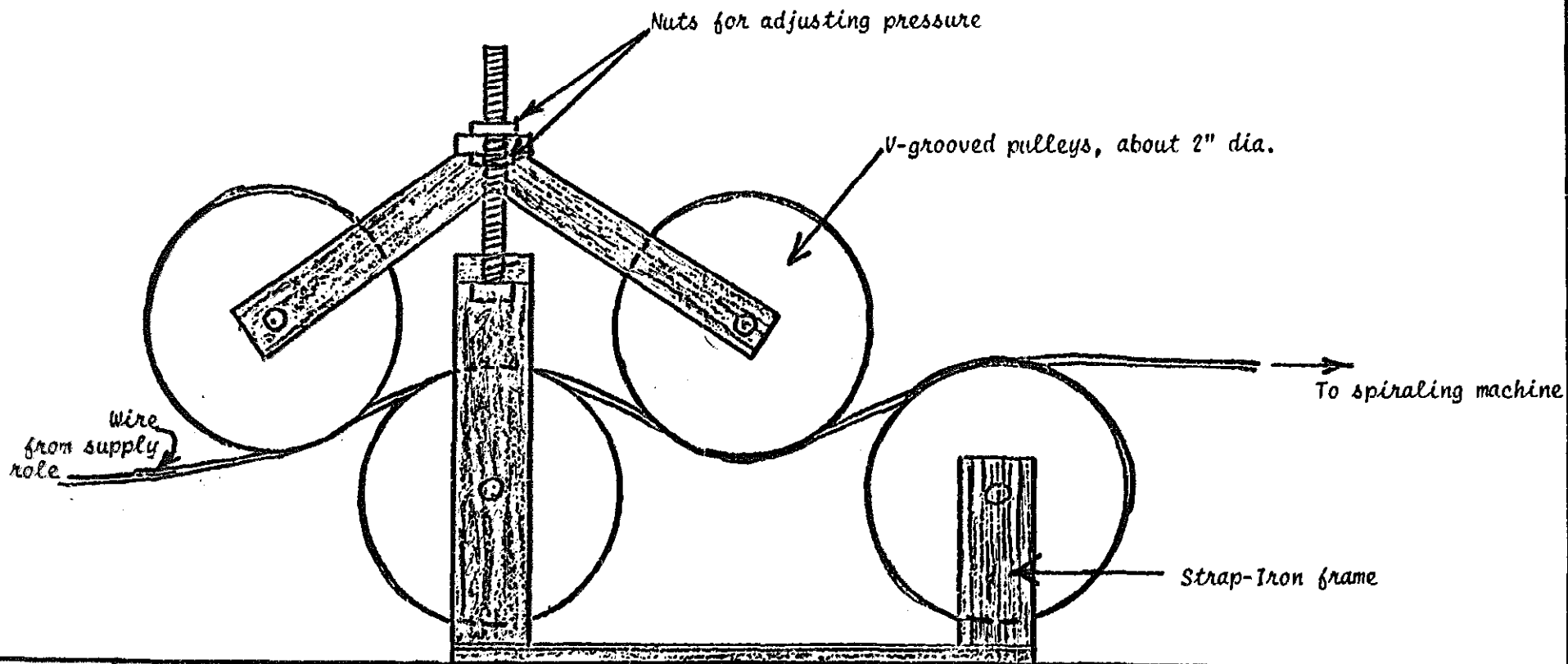


FIGURE 12

Bearing pipe ODs in Figure 12 may have to be filed slightly so that sheaves are snugly free-turning.



Tension-Adjustment Assembly for use with Wire-Making Machine

(Any system which puts tension on the wire as it feeds from the supply roll into the machine would be satisfactory. It has occurred to me that it might be simpler to pass the wire between two boards faced with rubber and pressed together.)

2. Assemble bending-head assembly.

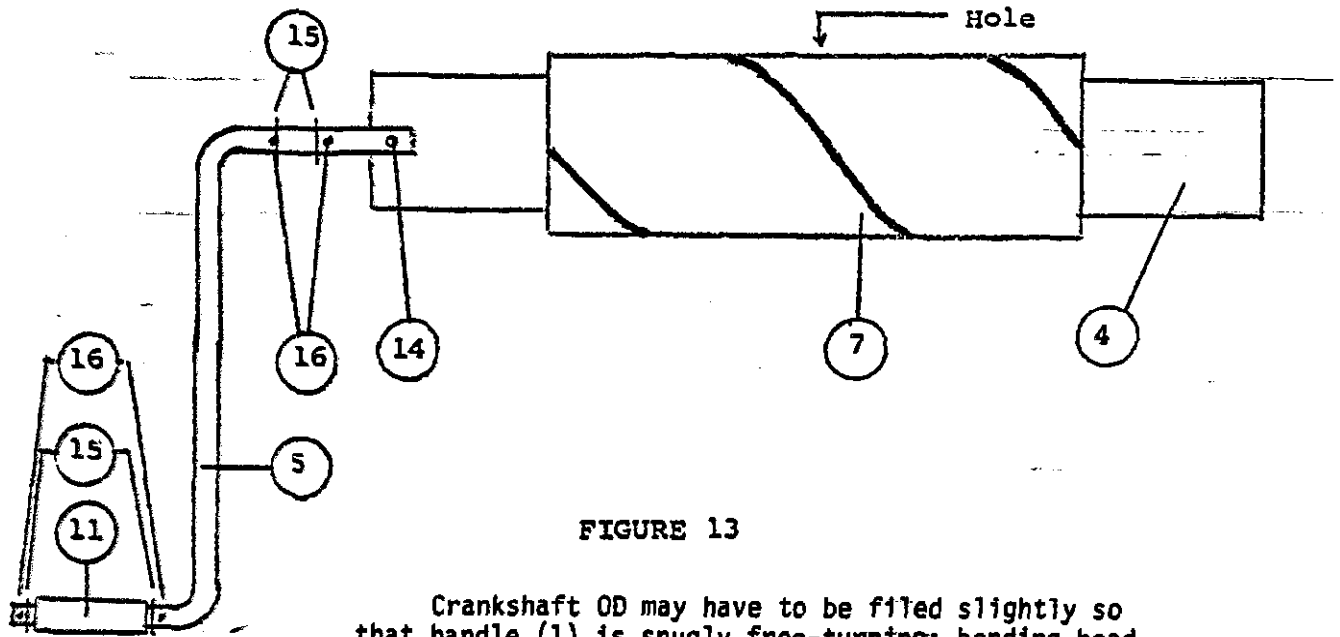


FIGURE 13

Crankshaft OD may have to be filed slightly so that handle (1) is snugly free-turning; bending-head arm (4) width may have to be filed slightly so that it is snugly free-turning inside pipe.

3. Fasten machine bed (2) to suitable sturdy legs approximately 90cm (36") above floor.

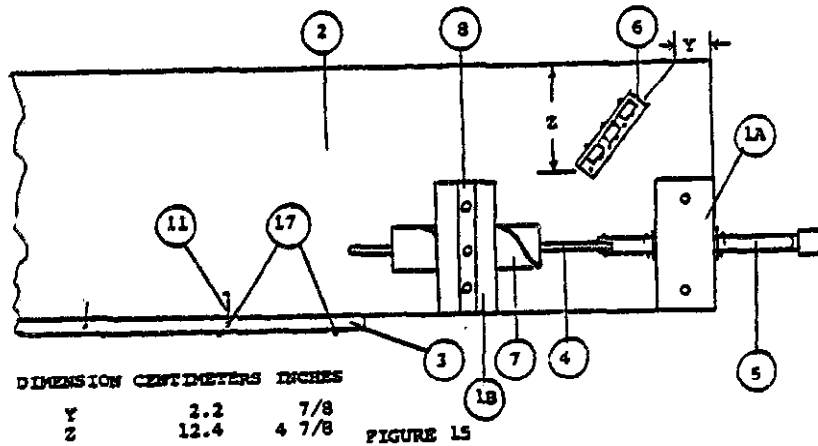


FIGURE 15

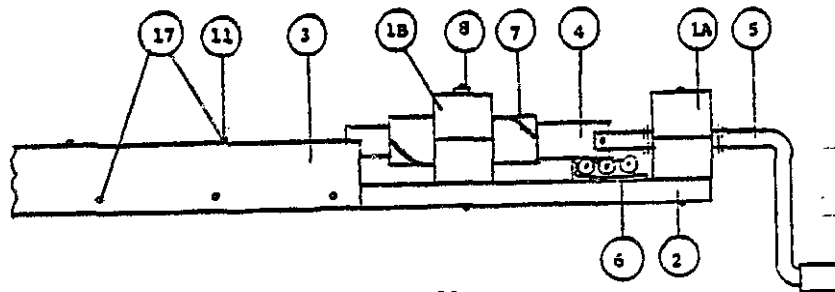
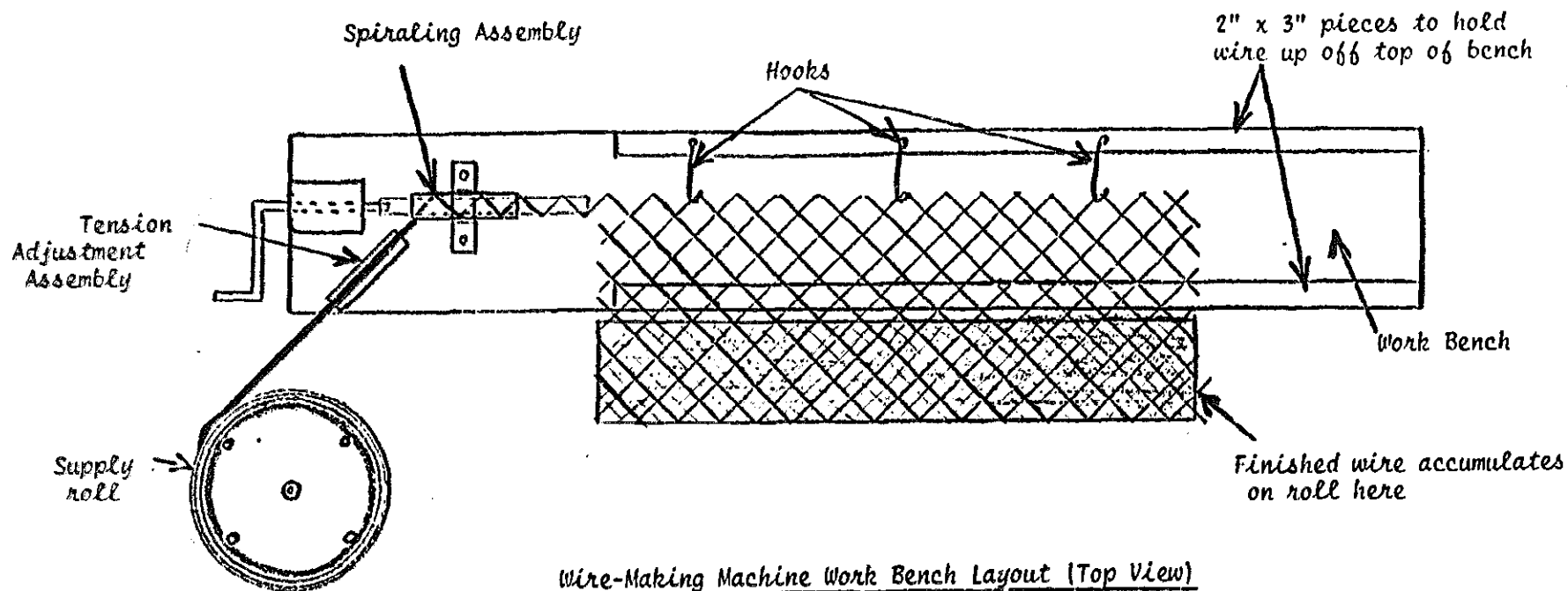


FIGURE 16



Wire-Making Machine Work Bench Layout (Top View)

*Additional Note: It is advisable to lubricate both the spiraling assembly and the tension-adjustment assembly occasionally with a strong solution of soap and water.*

## OPERATION

1. Feed #12 or #14 wire from wire feed roll over nearest tension-sheave; under middle tension-sheave and over last tension-sheave into spiral slot in bending-head pipe.

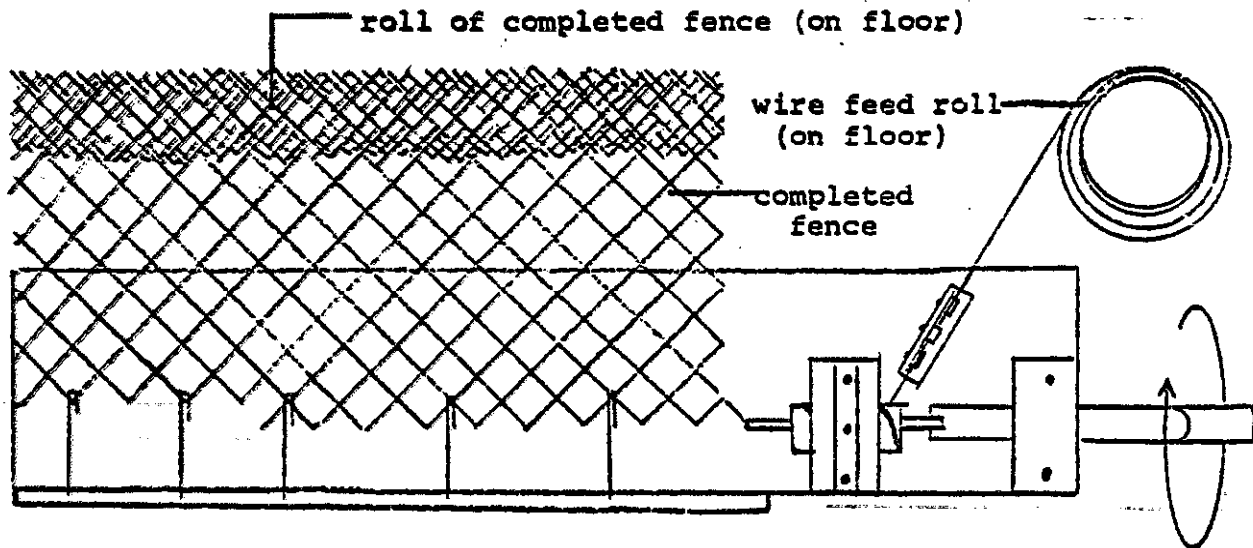


FIGURE 17

2. Figure 17: Clockwise rotation of crankshaft handle will produce properly formed wire at output end of bending head; continue rotating crankshaft handle until formed wire is of sufficient length for desired fence height.
3. Figure 17: Cut wire and rotate handle so that a second strand is formed which will interlock with first strand.
4. Figure 17: Continue the above procedure until fence length reaches end of machine-bed; hook hooks (11) to last formed strand to support fence and continue as above. As each strand is completed, move hooks to that strand.
5. 5cm (2") ID bending-head pipe used with 5cm (2") wide bending-head arm will make fencing with 10cm (4") mesh, while 3.8cm (1 1/2") ID pipe and 3.8cm (1 1/2") wide arm will make 7.6cm (3") mesh.
6. Lubricate both bending-head assembly and tension-assembly occasionally. Soap makes the best lubricant for the bending-head because it does not leave the fence dirty as does oil or grease. The soap can be applied as a thick soap and water solution to the bending-head itself or by allowing the wire to pass over a dry bar of soap just before it enters the bending-head--after passing through the tension assembly.

39

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# TECHNICAL BULLETIN 39

## Winnowing Fan

The enclosed plan for a winnowing machine is from the Philippines. The machine can be transported by two men and is a real time saver in the process of cleaning chaff and other impurities from grain. A series of successfully reduced sieves placed at the outlet will sort the grain according to size in the course of winnowing.

A host of power sources can be used to operate the device, the only alteration being that an appropriate pulley or sprocket must be fastened to the fan shaft.

Please send testing results, comments, suggestions and requests for further information to:

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### Tools Required

- . hammer
- . wood saw
- . wood chisel
- . sheet metal cutting shears
- . screwdriver
- . 1-1/2" drill for wood

### Materials

- . soft wood
- . sheet metal (galvanized iron sheet)

Exact quantities can vary with local resources. Possible variations are considerable.

### Construction

Details given in diagrams.

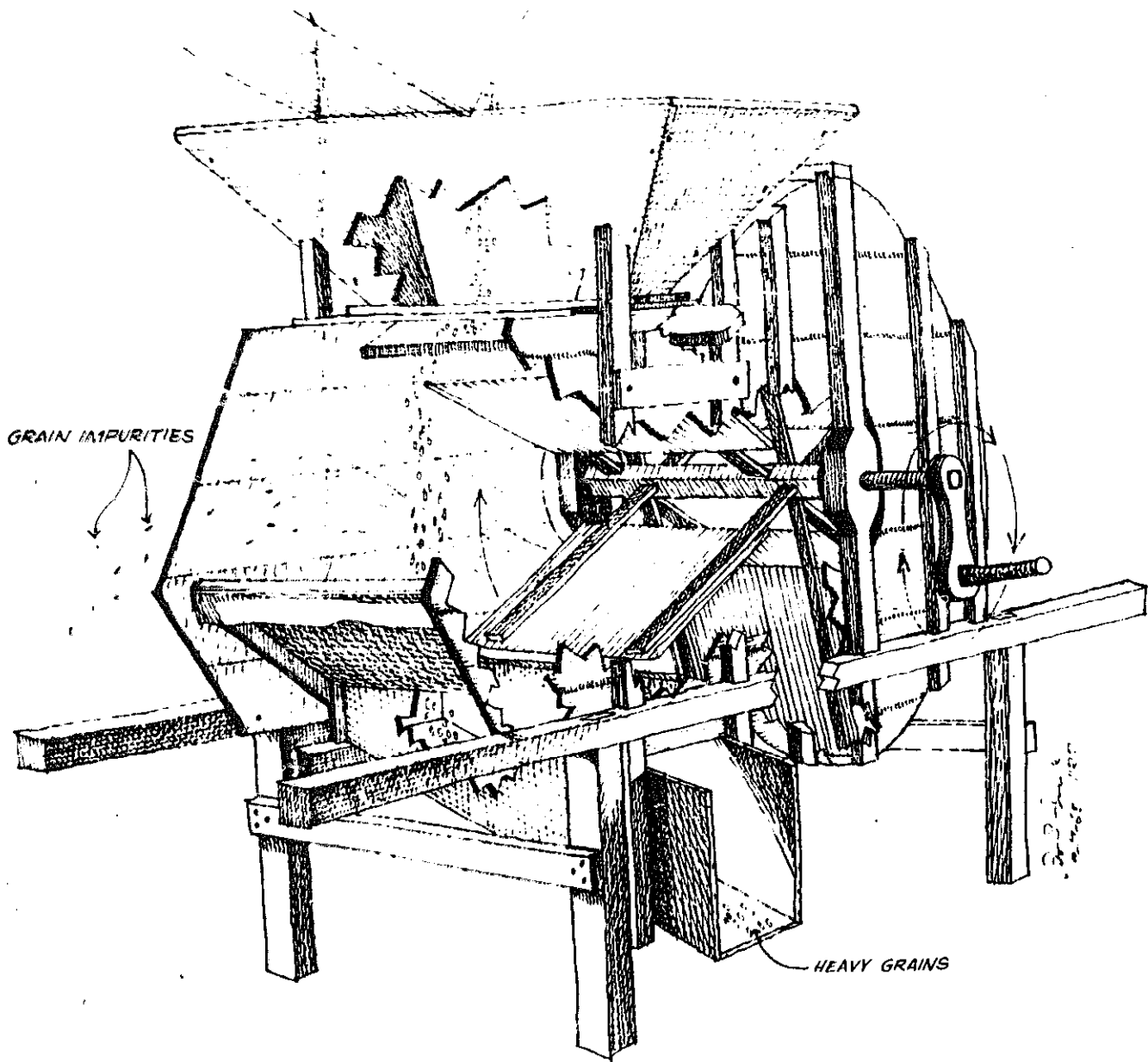
### Operation

There are only two variables in operating this device: the speed of the fan and the setting on the quantity control slide. Presuming that the fan is operated at a comfortable rpm for the operator, the only control to be concerned with is the quantity control slide. Moving this slide from the horizontal to the vertical will decrease the percentage of cleanliness of grain and increase the amount of grain processed per unit time.

Adjustment to the desired quantity and corresponding quality of grain processed is best determined by field tests, due to a variety of grain types and impurities as well as a variety of methods by which the grain is harvested and the conditions of humidity and temperature. Adjustment is managed by shifting the "stepped" board into a position at which one of the steps supports the quantity control slide handle at the desired angle.

### Maintenance

Since the only moving part is the fan shaft, this is the only part which will tend to wear. Periodic lubrication with heavy oil or grease will prolong the life of the fan shaft at points of wear.



GRAIN IMPURITIES

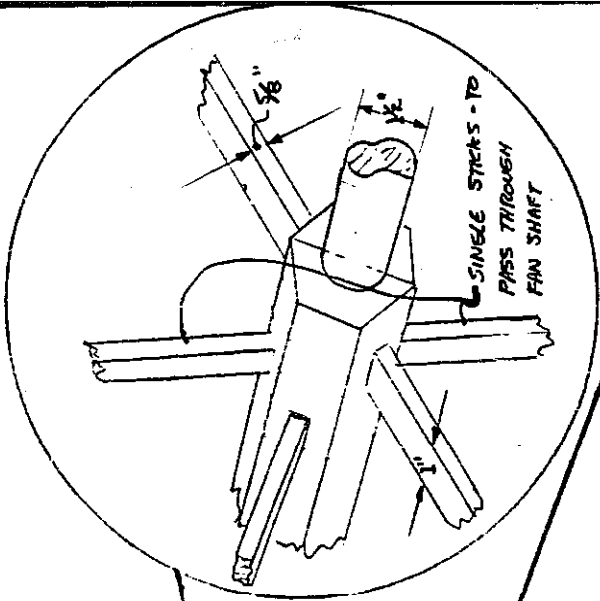
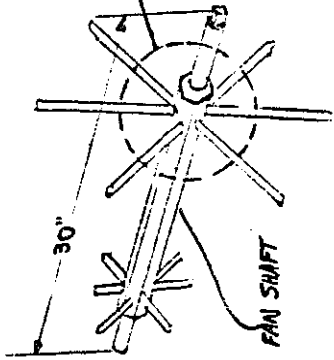
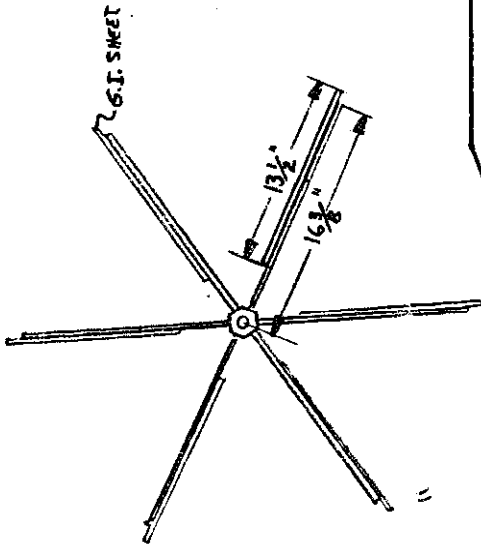
HEAVY GRAINS

WINNOWING MACHINE



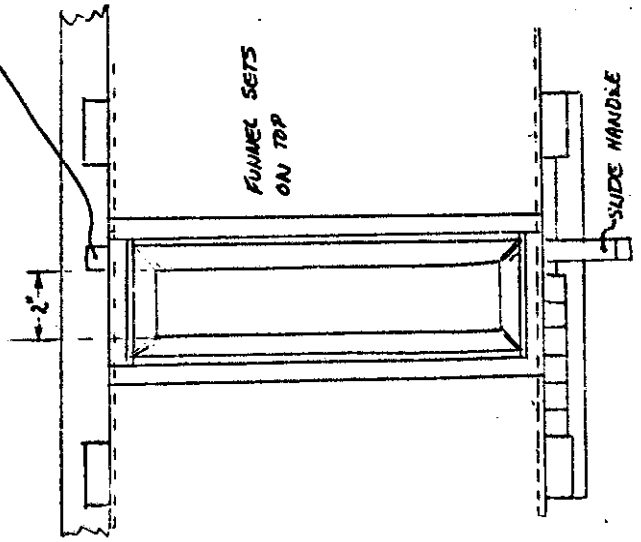
WINNOWING FAN DETAIL

FAN-END VIEW



SLIDE & HOPPER

GRAIN/SEED INLET - TOP VIEW

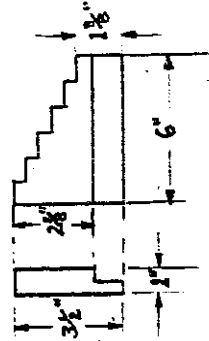


QUANTITY CONTROL  
SLIDE - COVER WITH G.I. SHEET TO PERMIT SEED/GRAIN TO FALL OFF FASTER

3"

MAKE THIS EDGE ROUND

RIDGE BOARD - MADE ADJUSTABLE - SLIDE BACK+FORTH



GRAIN W/ IMPURITIES ENTERS HERE

ENTRANCE IS CLOSED WHEN HANDLE TO SLIDE IS PUT IN HORIZONTAL POSITION, AND OPEN WHEN SLIDE HANDLE IS IN VERTICAL

22

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A project of Volunteers in Asia

Rice Thresher VITA Technical Bulletin No. 22

by: Bertrand Saubolle, S.J.

Published by:  
Volunteers in Technical Assistance  
1815 North Lynn St. Suite 200  
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# VITA

# TECHNICAL BULLETIN 22

## Rice Thresher

BERTRAND SAUBOLLE, S. J.

This rice thresher is a combination of observations of and experiences with a variety of other plans and machines. Bertrand Saubolle, S. J., designed and built the first one out of scrap wood and junk for use at the Godavari School in Kathmandu, Nepal.

Father Saubolle has been involved for years with designing low-cost machinery and equipment for agriculture and food processing. He is also interested in energy production through wind, water, sunshine and methane. Several other bulletins in this series are based on his designs.

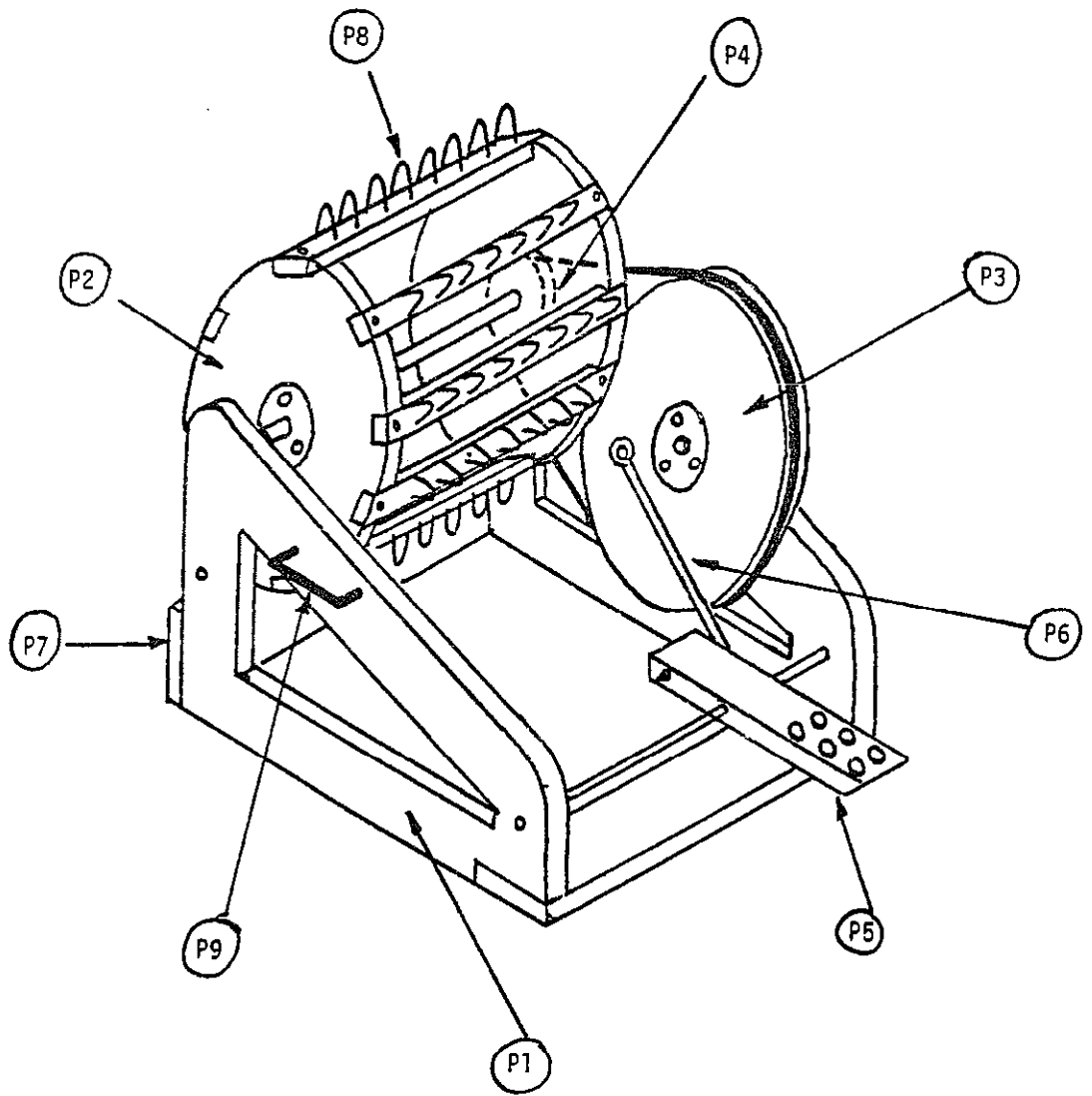
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The design of this Thresher is based partly on a small Japanese thresher seen in India, partly on ideas arising out of diverse thresher plans provided by VITA, and partly on the constructor's originality. Designs for more sophisticated threshers abound. This one aims at simplicity of construction, ease of operation and lowness of cost, combined with rapid and thorough threshing. It was built from scrap wood, junk rods, bits of pipe, an old bicycle pedal, discarded motor bearings, and so forth.

Material Requirements:

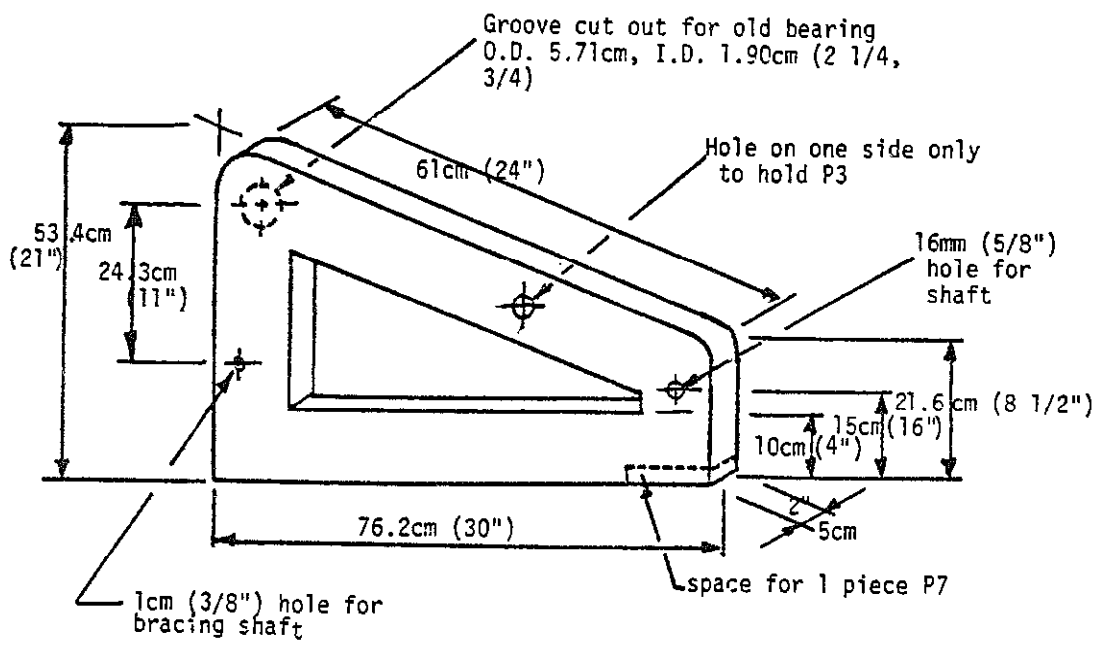
P1	2 pcs
P2	1 pc
P3	1 pc
P4	1 pc
P5	1 pc (2)
P6	1 pc
P7	2 pcs
P8	96 pcs
P9	2 pcs
Screws to hold P7, 4cm (1 1/2")	8 pcs
Screws to hold 12 slats to P2, 4cm (1 1/2")	24 pcs
Rubber studs for P5	6 pcs
Bolts for holding pipe-flanges on P2, 1 x 4.5cm (3/8" x 1 3/4")	3 pcs
Bolts for holding P4 and flange on P2 right side, 1 x 7.5 cm (3/8" x 3")	3 pcs
Pipe flanges on driving side of P3 which are fastened to right side of of P1 with 1/2" pipe to act as bearing	2 pcs
Handles P9 made of rods to carry machine here and there	2 pcs
Bolt to fit into 1/2" pipe to hold P3 on right side solid but free turning	1 pc
Rod for P2, 19mm x 59.7 cm (3/4" x 23 1/2")	1 pc
Rod for holding P5 and will act as strengthening for P1, 1.6 x 65cm (5/8" x 25 1/2"). After placing P5 into position be sure you place 2 flanges on each side of P5 to hold same in position, bolting flanges into 1.6cm (5/8") rod	1 pc
V-belt, 1.3 x 154cm (1/2" by 62") long, measuring on top. Since no pro- vision is made for adjusting belt, be sure before you drill hole to P1 for holding P3, that you fit belt tight, otherwise it will slip	1 pc

Important: When placing P8 into slats, first drill 2.4mm (3/32") holes, then hammer the P8 into holes. Be sure they do not line up on next slat but are positioned alternately so that all are at work when machine is running.

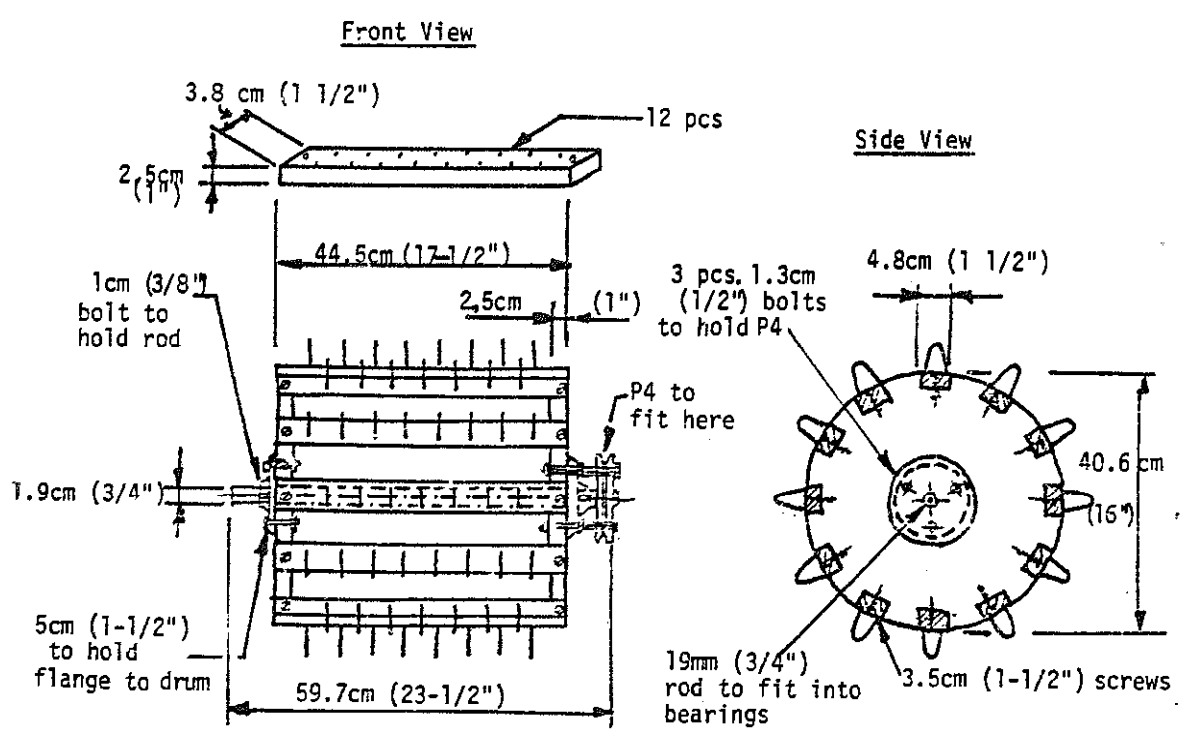
After assembling parts, drum will run smooth and free. When placing all parts together, a slight push by hand to start drum rotating will then permit foot movement which will also be very easy. One can then hold a sheaf of rice to be cleaned, while pumping without any difficulty.

The rice thresher was tried out in the villages around Godavari (Kathmandu Valley, Nepal). The farmers vied with one another to use it. Comments were: It is faster and less tiring than the traditional hand threshing; it is definitely more efficient since it detaches every single grain. It is awkward to carry (they don't use the handles, but sling the thresher upside-down by the frame on a bamboo pole which they place on their shoulders). The pedal is too narrow (I recommend a second pedal on the left with a wooden bar joining the two).

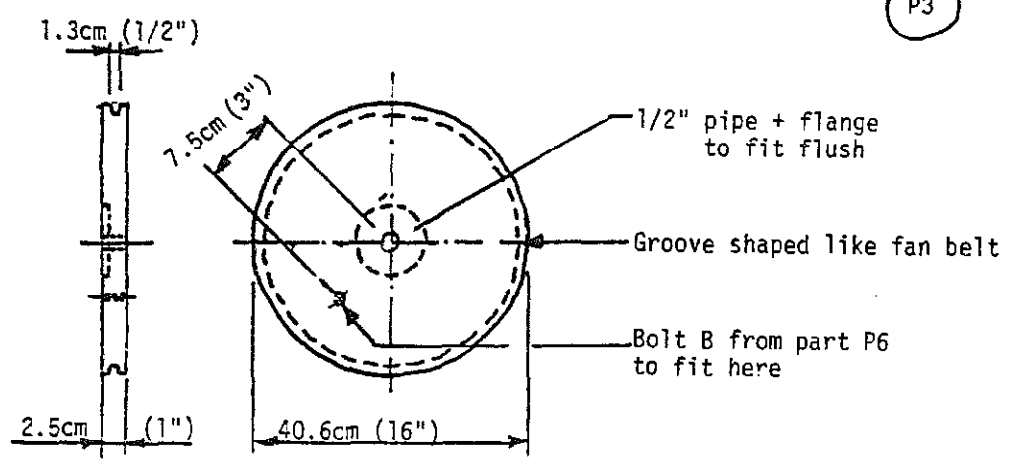
P1



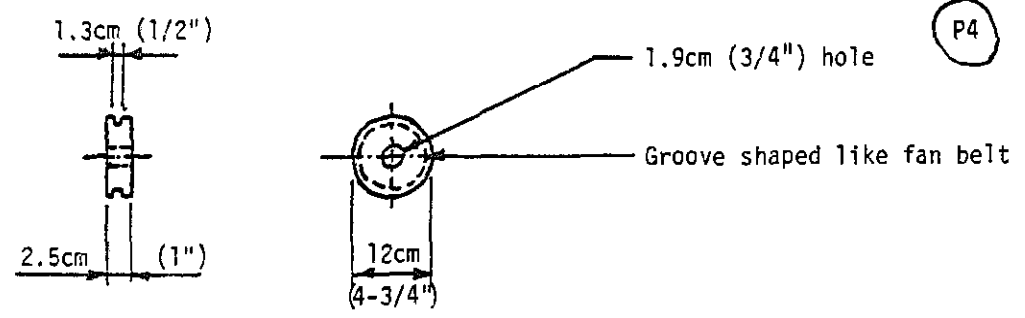
P2



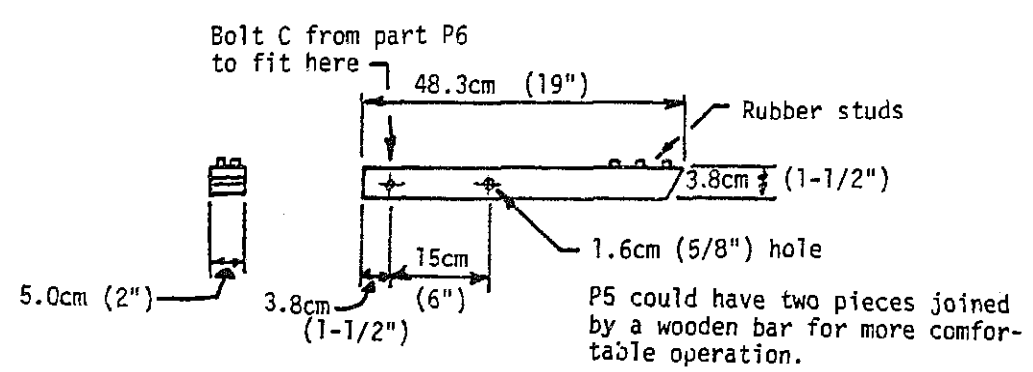
P3



P4

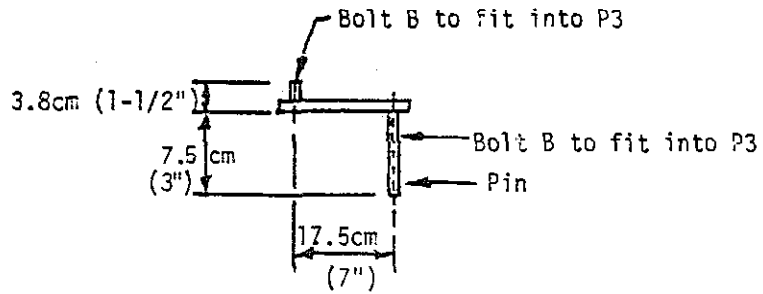


P5



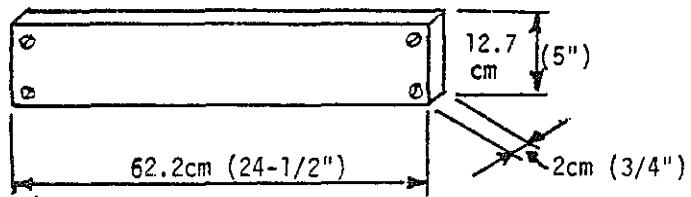
P6

Old Bicycle Foot Pedal

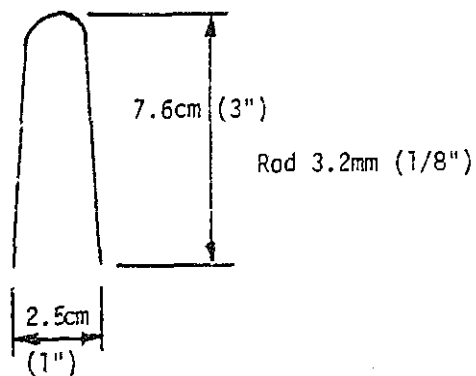


P7

Wooden supports for frame  
with 4cm (1-1/2") screws.



P8



21

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A project of Volunteers in Asia

Small Corn Sheller  
VITA Technical Bulletin No. 21

by: Bertrand Saubolle, S.J.

Published by:  
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Arlington, VA 22209 USA

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# VITA

# TECHNICAL BULLETIN 21

## Small Corn Sheller

**BERTRAND SAUBOLLE S. J.**

This small corn sheller is about the size of a kitchen meat grinder, and is very easy to build and to operate. Hob-nail studs on a solid wood drum scrape the kernels from the ears of corn.

The sheller design was provided by Father Bertrand Saubolle, S. J., of the Godavari School in Kathmandu, Nepal. Father Saubolle has done extensive work with small implements, methane digesters, ovens, etc., and is the author of several other Technical Bulletins.

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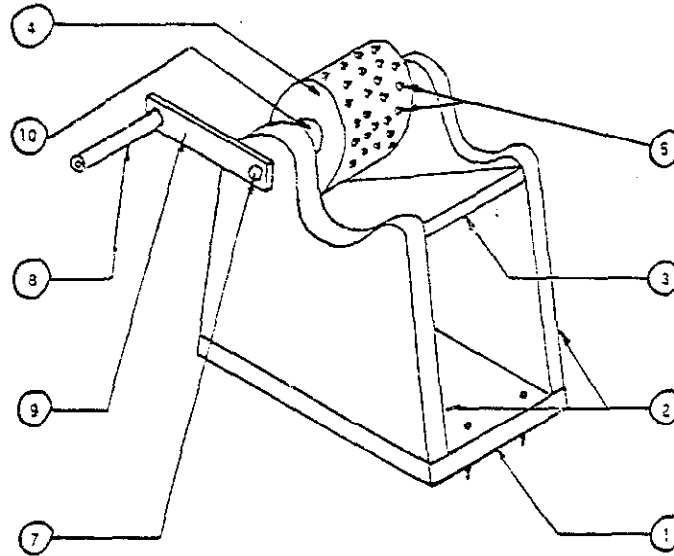
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This corn sheller is small, comparable in size to a kitchen meat mincer. It is light, extremely simple to construct and to operate. It can very easily be made in any village where there is a blacksmith and a carpenter. It will handle corn up to 10 inches in length.



#### Requirements

- ① 1 bottom board, 190 x 190 x 20mm
  - ② 2 side boards, 170 x 190 x 20mm
  - ③ 1 sloping board, 175 x 110 x 20mm.
  - ④ 1 solid wooden drum 80mm long, 70mm  $\varnothing$
  - ⑤ 50 hob nails
  - ⑥ 12 screws, 30mm
  - ⑦ 1 spindle, rod 175 x 10mm  $\varnothing$
  - ⑧ 1 handle, rod 100 x 10mm  $\varnothing$
  - ⑨ 1 metal strip connecting handle to spindle, 110 x 20 x 6mm
  - ⑩ 2 wooden spacers, one on either side of drum, 14 x 25mm  $\varnothing$
- Note:  $\varnothing$  = diameter.
- . 1 washer & split pin for fixing spindle
  - . 2 metal bushers for spindle
  - . 1 (plastic) pipe over handle rod

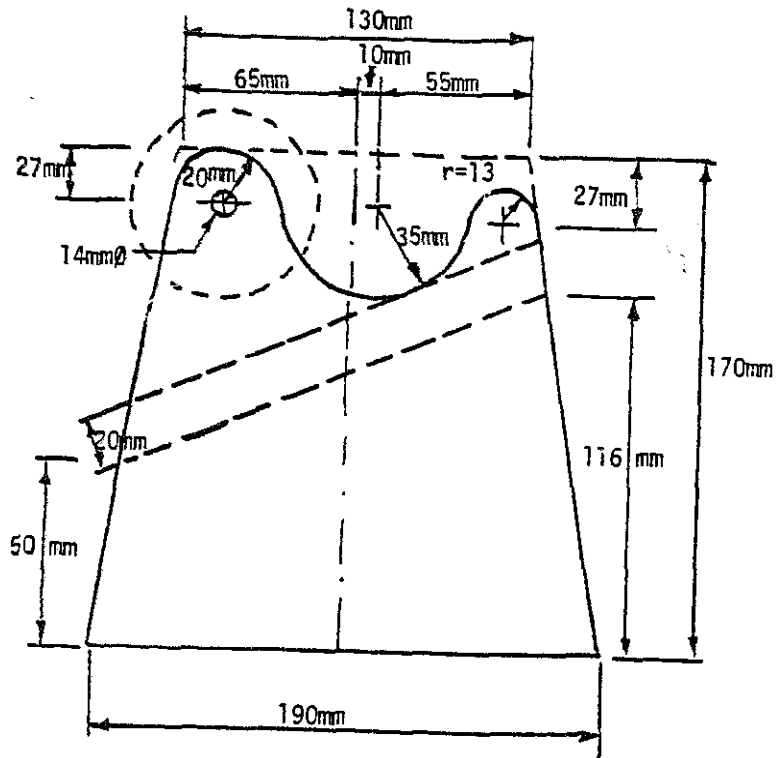
The construction is so simple that it needs no explanation, however one or two remarks are in order. The hob nails are driven into the drum at random, spaced 20-25mm apart centre to centre. They should not be in straight even rows.

The sloping board is used to rest the corn on. Its top surface should be flush with the curve in the side boards. When screwing the sloping board in position, leave enough room between it and the hob nails to prevent a child's fingers from being crushed.

Owing to the small size and lightness of this machine it is a little unsteady when operating. To overcome this put four screws through the base board and let them protrude 10mm. They will catch in the straw or palm mat on which the shelling is invariably done and will hold the machine firm.

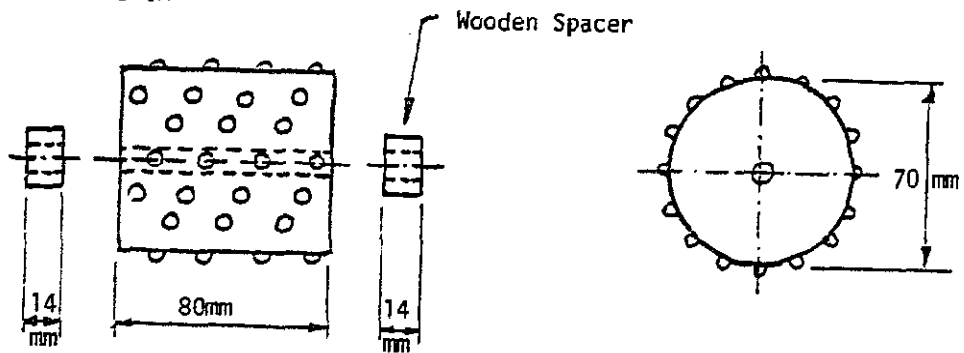


SIDE BOARDS

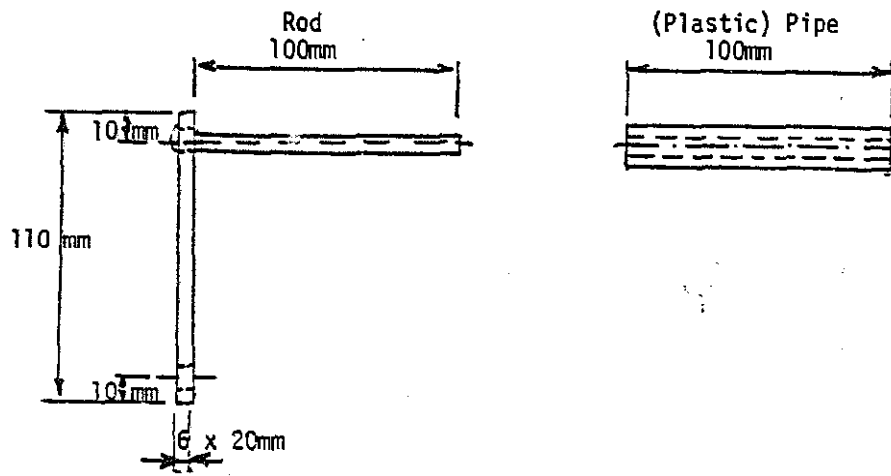


∅ = diameter

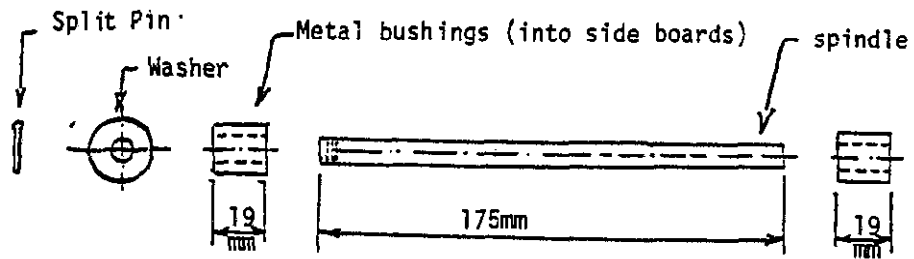
SOLID WOODEN DRUM



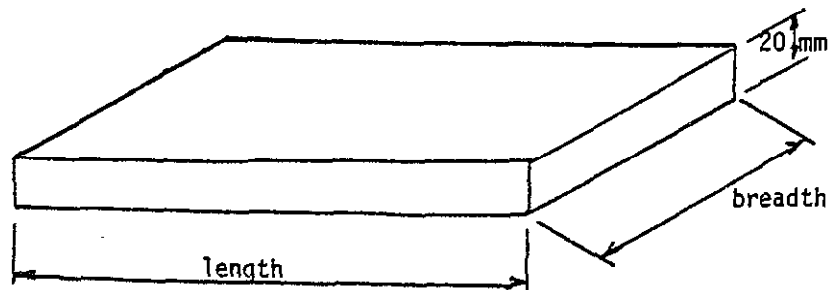
HANDLE



SPINDLE



	<u>length</u>	x	<u>breadth</u>
BOTTOM BOARD	190	x	190mm
SLOPING BOARD	175	x	150mm



41

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Cotton Gin

VITA Technical Bulletin 41

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# VITA

# TECHNICAL BULLETIN 41

## Cotton Gin

(ROLLER TYPE, FAMILY SIZE)

The origin of the plans for this item are found in both India and China, where it was known as the chuka. The gin is designed for family usage and is capable of producing about two kilograms of lint cotton per day. The device can easily be built from local resources, and is both low cost and easily transported.

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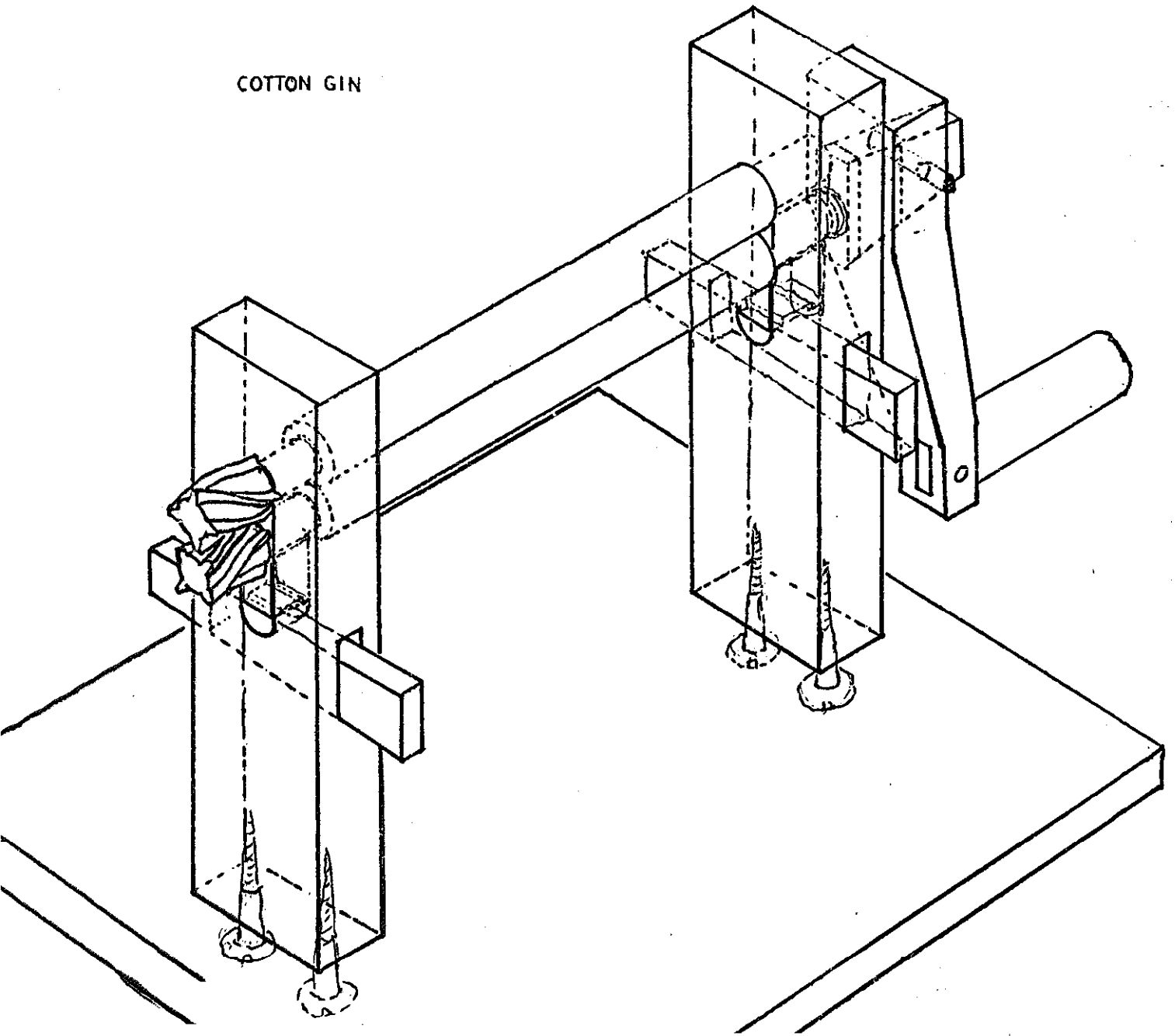
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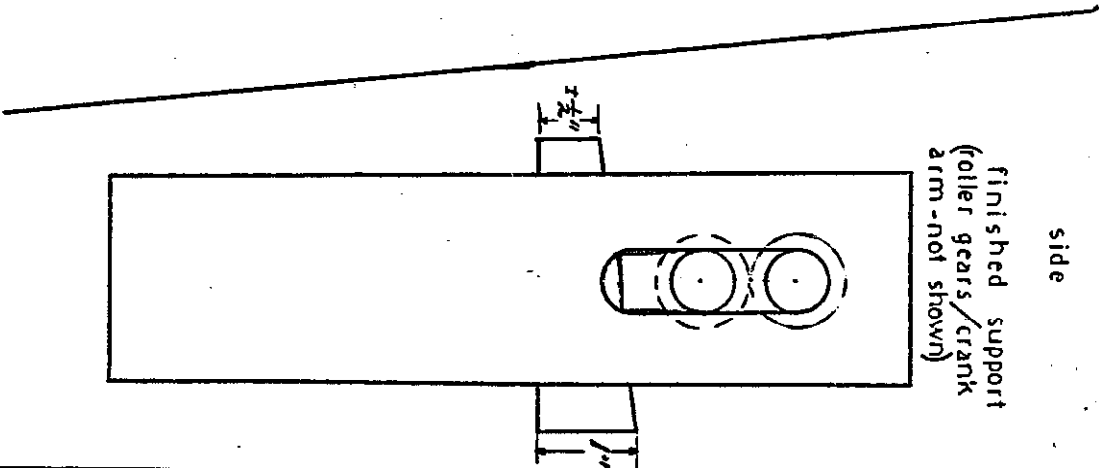
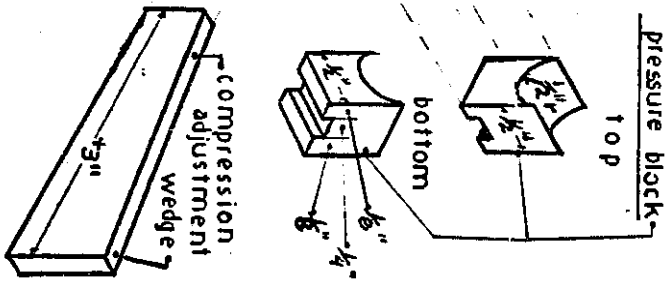
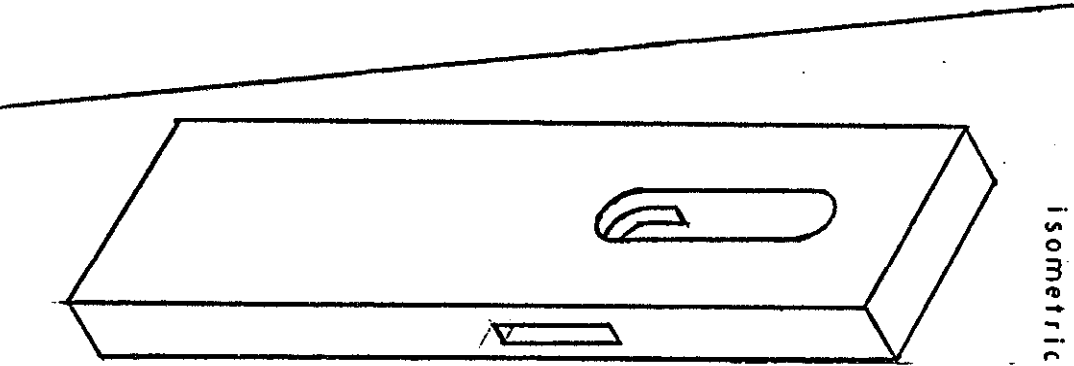
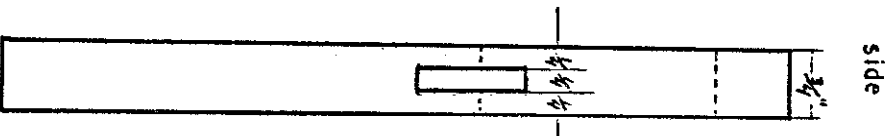
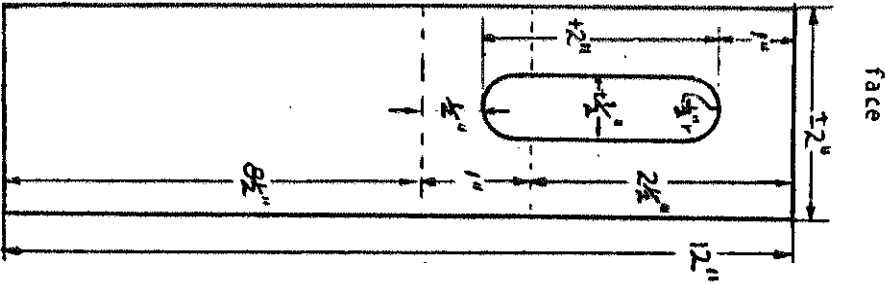
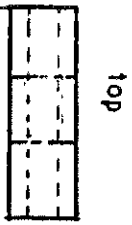
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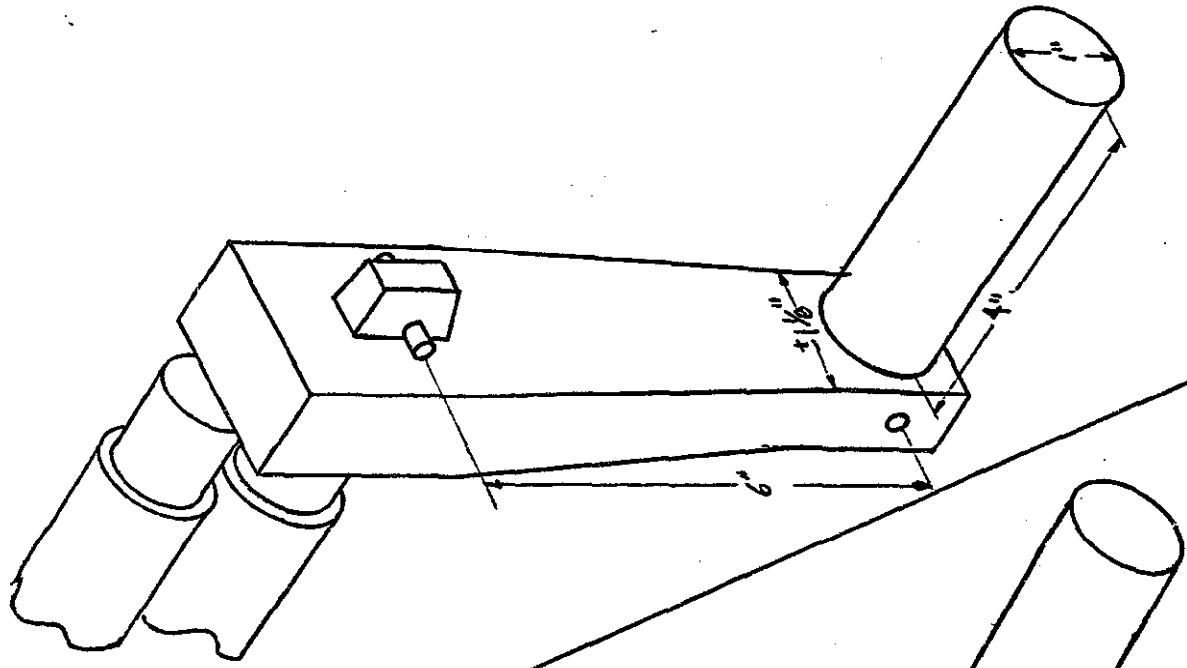
COTTON GIN



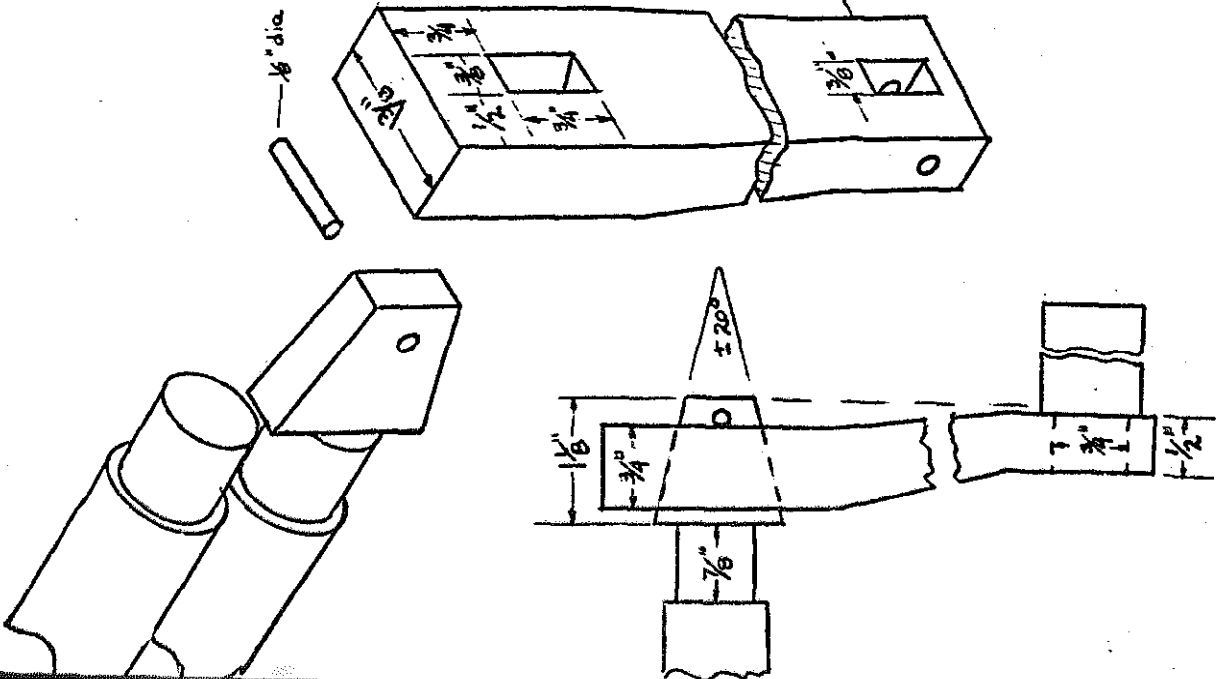
SUPPORT DETAILS (2-REQUIRED)



CRANK COMPLETED

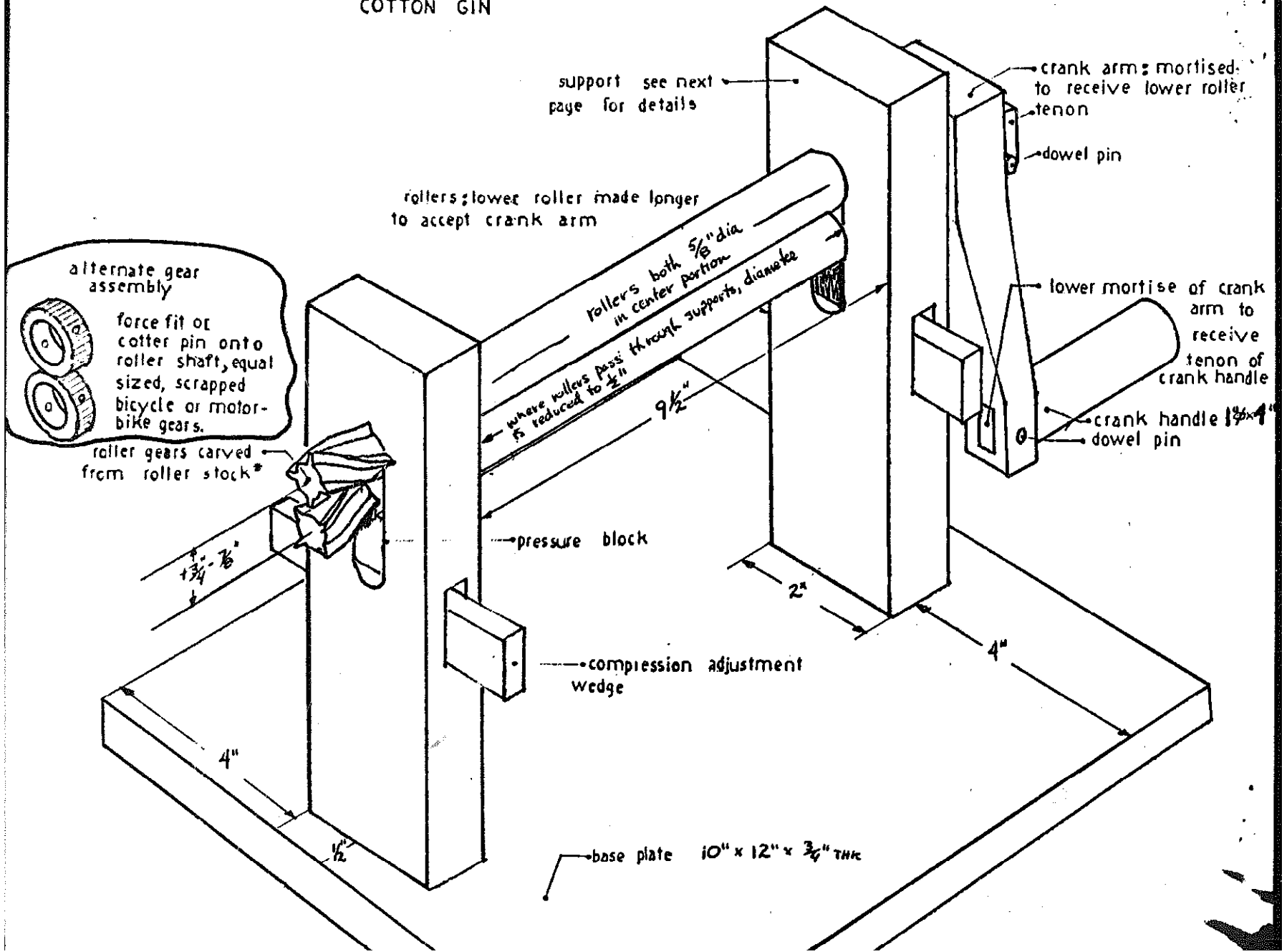


CRANK ASSEMBLY





# COTTON GIN



support see next page for details

rollers; lower roller made longer to accept crank arm

rollers both  $\frac{5}{8}$ " dia in center portion

where rollers pass through supports, diameter  $\frac{5}{8}$ " reduced to  $\frac{1}{2}$ "

9  $\frac{1}{2}$ "

pressure block

compression adjustment wedge

base plate 10" x 12" x  $\frac{3}{4}$ " THK

crank arm; mortised to receive lower roller tenon

dowel pin

lower mortise of crank arm to receive tenon of crank handle

crank handle  $1 \frac{3}{4}$ " x  $\frac{1}{2}$ "

dowel pin

alternate gear assembly

force fit or cotter pin onto roller shaft, equal sized, scrapped bicycle or motor-bike gears.

roller gears carved from roller stock\*

$\frac{1}{4}$ " -  $\frac{7}{8}$ "

4"

$\frac{1}{2}$ "

2"

4"

### Tools and Materials

Tools consist of those items normally available in the village carpenter shop: means of drilling holes 1/2" diameter, chisels, hammers, saws, and a wood lathe or equivalent.

Materials can best be obtained by making your own list on the basis of the diagrams. All parts should be hardwood, especially the rollers. In the interest of economy, the plan calls for carving the gears out of the roller shaft itself. A better approach is to fit two equally sized gears onto the roller shaft. Such gears would be obtainable from motorcycle or possibly bicycle transmissions.

### Construction

Details are covered in the diagrams.

#### Notes:

1. Do not drill the hole for the dowel pin which is to retain the crank arm on the tapered shaft, until the crank arm has been fitted onto the shaft. The dowel should fit tightly against the crank arm.
2. You will notice that the crank arm is shaped in such a way as to bend outward from the cotton gin itself. This is done to allow the operator's hand to clear the protrusion of the tapered shaft as he rotates the crank. No exact dimensions are required other than the fact that the mortise and tenon joints be made tightly, and that the crank be 6" in length from the center of the lower roller to the center of the crank handle.
3. The finished gin is shown mounted to a base plate with screws. If screws are unavailable, this connection can be made via a tapered mortise and tenon arrangement, not unlike the crank arm and lower roller joint.
4. Some other sources of information indicate that depending on the type of cotton seed encountered, it may be necessary to use smaller rollers made out of steel rod  $\pm 1/2$ " diameter. While the design shown in these plans works best for smooth seed varieties like Sea Island, steel rollers may be necessary for different seed shapes. Other design possibilities include fluted rollers or one small steel roller (lower) with a large wooden upper roller.

### Operation and Adjustment

Operating the gin is simply a matter of feeding the seed cotton into the rollers with one hand, while cranking with the other. The rollers should be adjusted so that they are just touching. Accomplish this by tapping the compression wedge at the larger end.

44

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Making Coir Rope      VITA Technical Bulletin 44

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# TECHNICAL BULLETIN 44

## MAKING COIR ROPE

There are many models and types of rope making machines, most of them automatic. Virtually all are designed to handle sisal, cotton or other long fibered material and are complicated and expensive. Prior to the invention of automatic machinery, ropes of all types were manufactured with the use of simple homemade tools, all of wood.

Coir (coconut fiber) is short, rough, and difficult to handle, but the finished rope is relative strong, rot resistant, and buoyant in water.

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### Definitions

Yarn: a twisted cord about 1/8" in diameter made up of overlapping fibers.

Strand: a twisted cord (the twist is opposite that of the yarn) about 1/2" in diameter made up of yarns.

Rope: a twisted cord (the twist is opposite that of a strand) made up of three strands.

Right Hand Twist: if the rope is hung vertically, the fibers run up and to the right.

Left Hand Twist: if the rope is hung vertically, the fibers run up and to the left.

### Fiber Preparation

- A. The coconut husks must be soaked in water for a few weeks or until the fibers can be separated. Try to make the separated fibers as long as possible. The longer the fibers, the easier it will be to make rope with them.
- B. When a large mass of fibers has been collected, it must be combed to straighten the fibers. Since the coir fiber is short, it may be straightened by hand.

### Twisting

Yarns, strands and ropes are all made by twisting fibers. Figures 2 and 3 illustrate single and multiple twisting reels. Both are designed to be made of wood with a minimum of tools. Each reel has a strong hook on the business end.

### Yarn

One-Ply Yarn: Select a large batch of fibers and tuck it under your arm. Station someone to turn the reel. Take a small bunch of fibers (enough to make a 1/8" dia. yarn--say 15 to 18 fibers) and tie the end to the hook on the reel. Feed additional fibers so as to intersperse them with the first fibers (1/2 to 2/3 overlap) while providing a right hand twist to the yarn. Back away from the turning reel while continuing to feed fibers to the yarn. Put approximately 12 to 14 turns per foot of length. When you have twisted the length of yarn you desire, remove yarn from reel and secure both ends to the ground with rocks. A single yarn is unstable so must be prevented from untwisting.

Make a large number of yarns the same length as the one above. For small ropes, say 4" circumference and smaller, single ply yarns are grouped together to make a strand. For larger ropes two-ply yarns should be used.

FIGURE 1

Fiber Combing Board

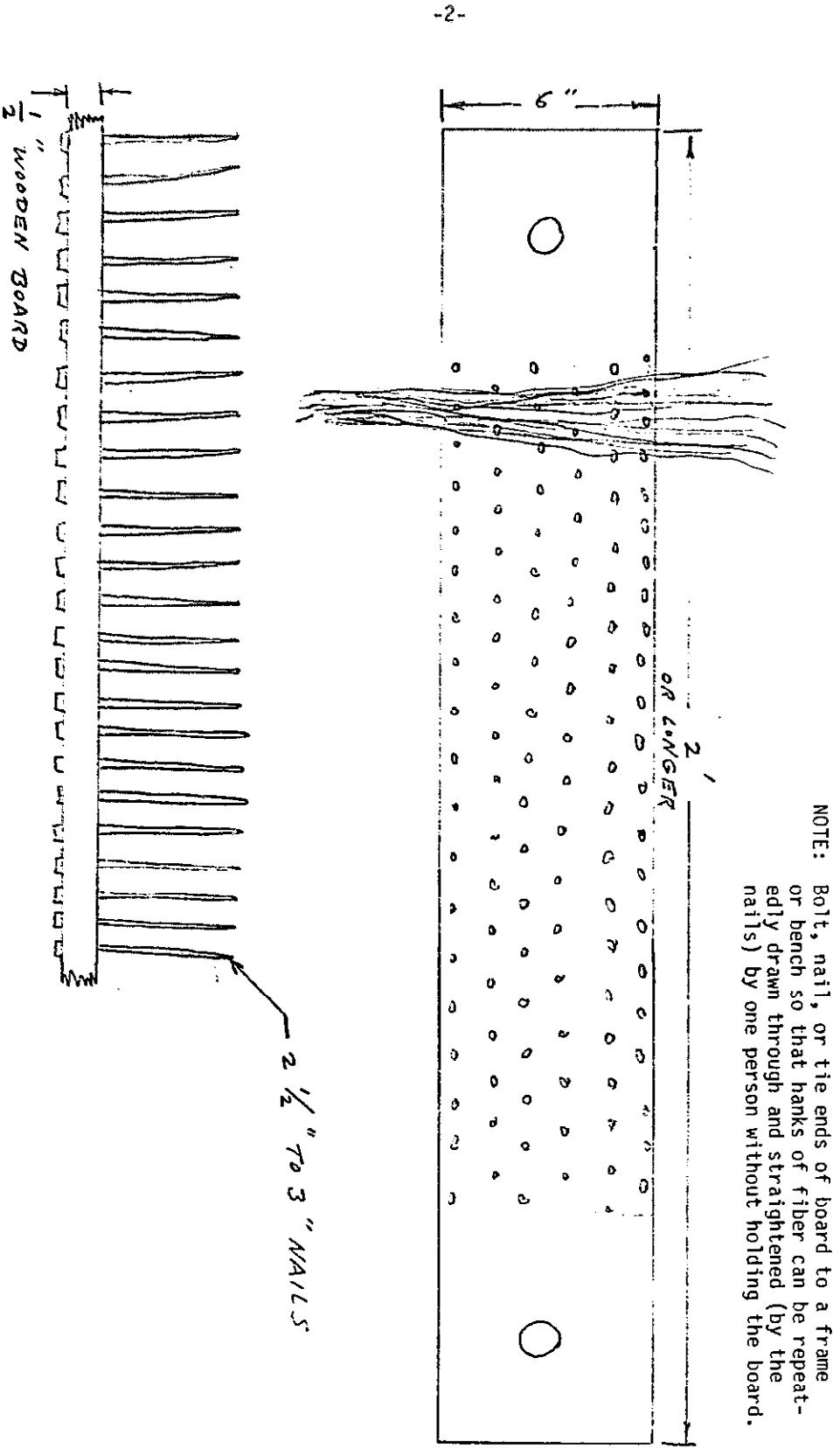
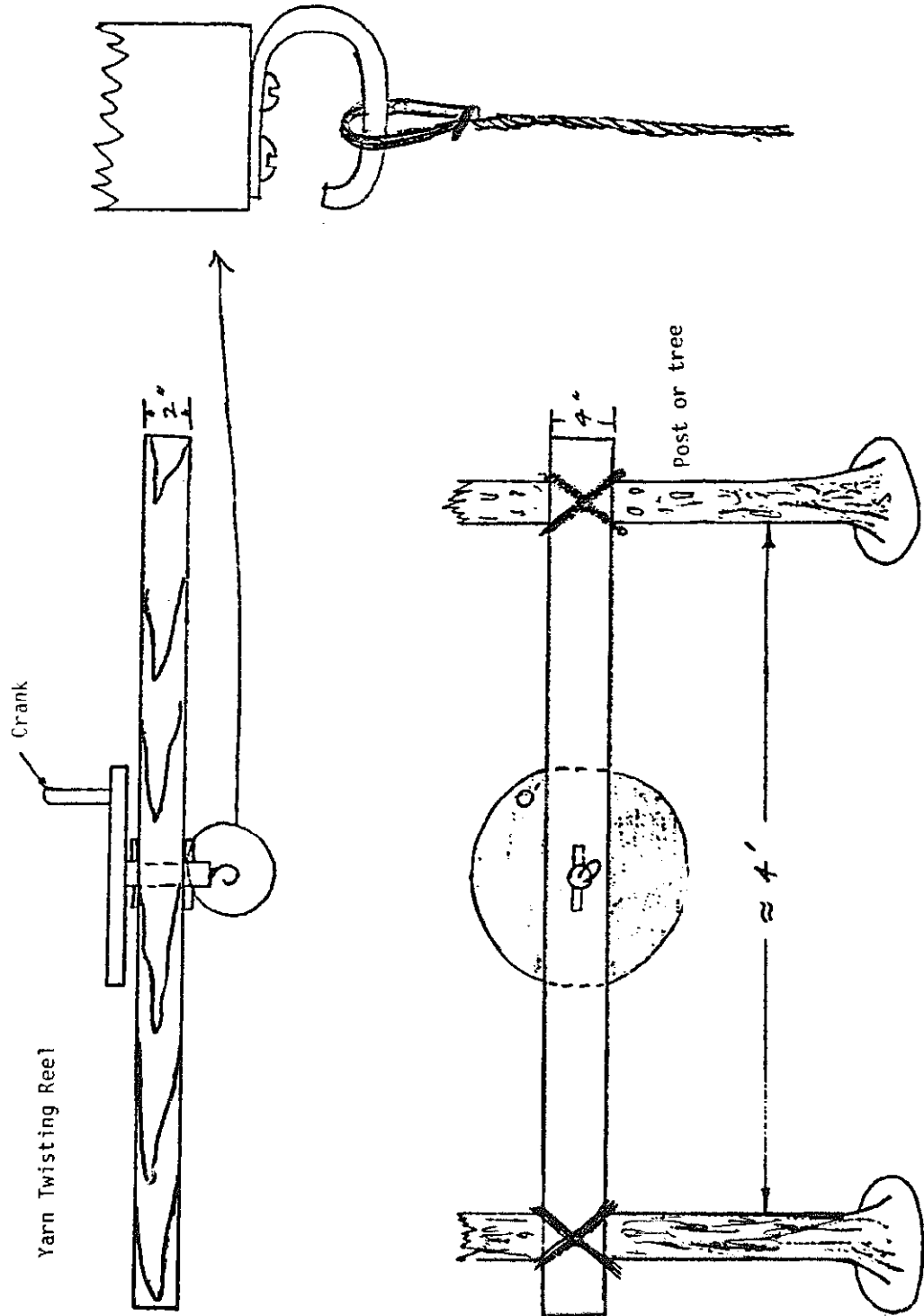


FIGURE 2

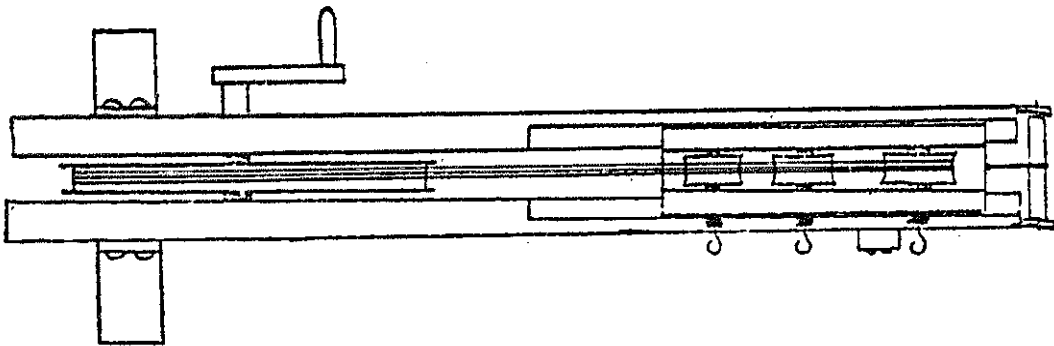
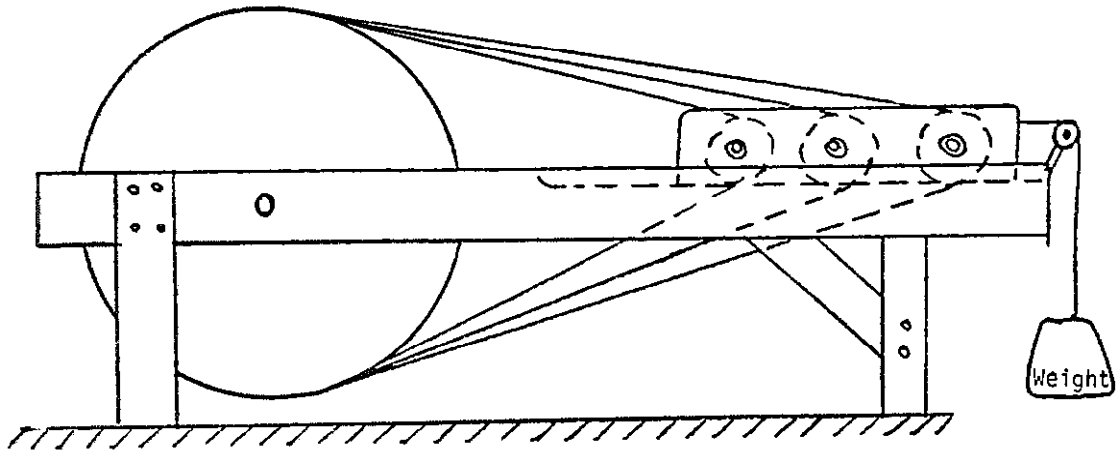


Yarn Twisting Reel



FIGURE 3

Multiple Yarn Twisting Reel



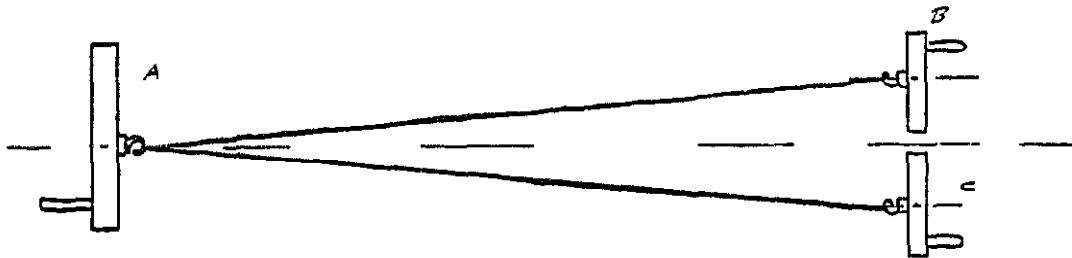
NOTE: Three yarn twisting hooks twist three yarns simultaneously. One continuous cord operates spindles. Weight keeps constant tension.

Two-Ply Yarn: To make a two-ply yarn, fasten one end of each of two single-ply yarns to a reel hook (A) and prevent the reel from turning. Fasten the other end of each yarn to reel hooks (B and C, Figure 4). Figuring about 10 turns per running foot, crank an additional twist into each yarn. For example, if the yarns were 30 feet long, crank in an additional 300 turns into each yarn. Note that the yarns will tend to shorten during twisting. Now prevent the two reels from turning. Unlock the single reel (A) on the opposite end and crank a 300° turn left-hand twist to the two yarns. The yarns will neatly twist together and when you are through, each yarn will have exactly the same twist you originally imparted to it.

In making a two-ply yarn, two yarns with a right-hand twist are over-twisted and then twisted together with a left-hand turn. The opposite twisting action results in a limp stable yarn that can be handled without unraveling.

FIGURE 4

Making a Two-Ply Yarn



1. Lock Reel A
2. Crank Additional right-hand twist into each yarn with reels B and C
3. Lock Reels B and C
4. Unlock Reel A and crank in a left-hand twist (same number of turns as step 2). Yarns will twist together.

Note: Step 4 takes out the twist put in by reels B and C.

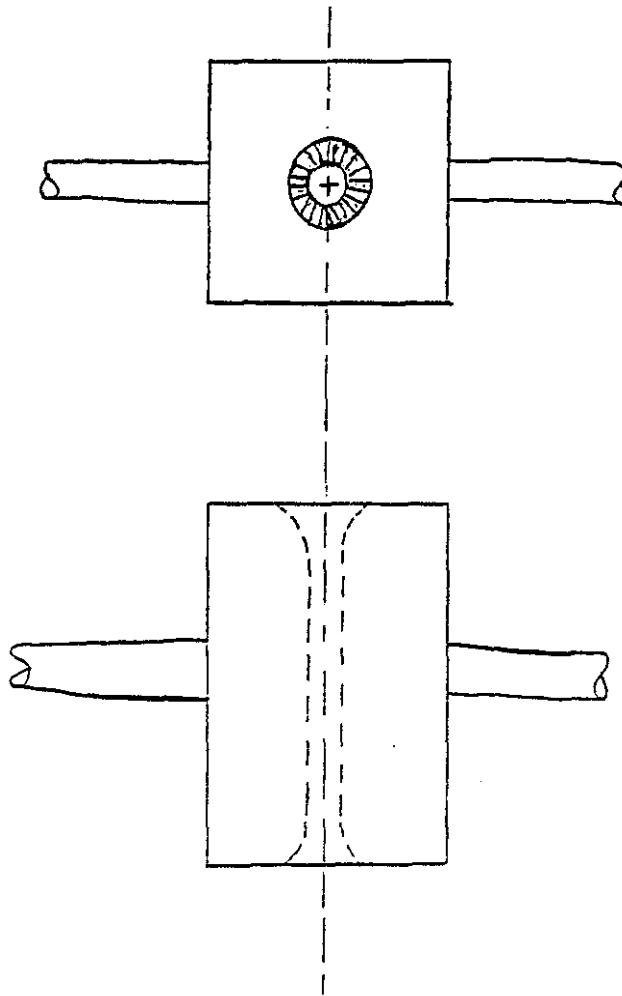
### Strand

The size of a three-strand rope will be twice the diameter of the strand. For example, a rope with three strands  $\frac{1}{2}$ " in diameter would be 1" in diameter. Assume a  $\frac{3}{8}$ " diameter strand is desired. Drill a  $\frac{3}{8}$ " diameter hole in a block of wood approximately 6" long and 4" square (Figure 5). Flare the hole at the ends of the block. Lay out a sufficient number of yarns (single or two-ply) to fill the hole and pass them through. Tie the ends to a twisting reel (Figure 2 or 3). NOTE: Prior to passing the yarns' ends through the block, wind each yarn on a separate bobbin, preferably with a number of bobbins on a vertical rack. This is not necessary but makes the yarns easier to handle.

Start turning the twisting reel with the block close to the reel. Impart a left hand twist to the strand while turning, move the non-rotating block away from the reel. The purpose of the block is to form the yarns into a more circular, uniform cross-section when twisting. When the entire length of the strand has been twisted, remove the block and reel and secure the ends. The strand is unstable by itself.

FIGURE 5

Strand Block



### Rope

A rope is made with three strands in the same manner as the two-ply yarns. Tie one end of each of three strands to a twisting reel (A--Figure 6). Tie the other ends to separate reels (B, C & D) placed close together. Prevent reel A from turning. Turn reels B, C, and D to put additional twist into each strand. Make the number of twists the same for each strand. Twist until the strands are about to kink. Station one person at each reel B, C, and D. Place the Strand Guide (Figure 7) near reel A with each strand in a groove and the small end of the guide nearest the reel. One person holds the guide steady and prevents it from turning. Turn reel A to impart a right-hand twist to the rope. At the same time the strand guide is moved away from the reel.

It is important to note that the additional left-hand twist imparted to the strands is what makes them want to wrap around each other to keep the final rope from unraveling. Also, as reel A puts a right-hand twist to the rope, it is also untwisting the three strands. For short ropes (say up to 40 feet in length) it will be necessary to add approximately one turn of additional left-hand twist to each strand (with reels B, C and D) for each turn of reel A. If this is not done, the strands lose the tendency to wrap around each other to form a rope, and the rope comes undone when taken from the rope making apparatus.

For rope lengths of 40 feet and over it is absolutely necessary to put maximum twist (left hand) to the strands before laying up a rope. The reason is that, in long lengths, you cannot compensate twist for twist with reels B, C and D as it cannot be transmitted the length of the rope, and you have uneven lays all through the length.

NOTE: When overtwisting the three strands prior to making rope, the reels will have to be moved together somewhat because the strands will shorten when twisted. This prevents straining strands.

The finished rope may be treated with wax, tar, or some other preservative to make it easier to handle and more resistant to rot.

Good luck.

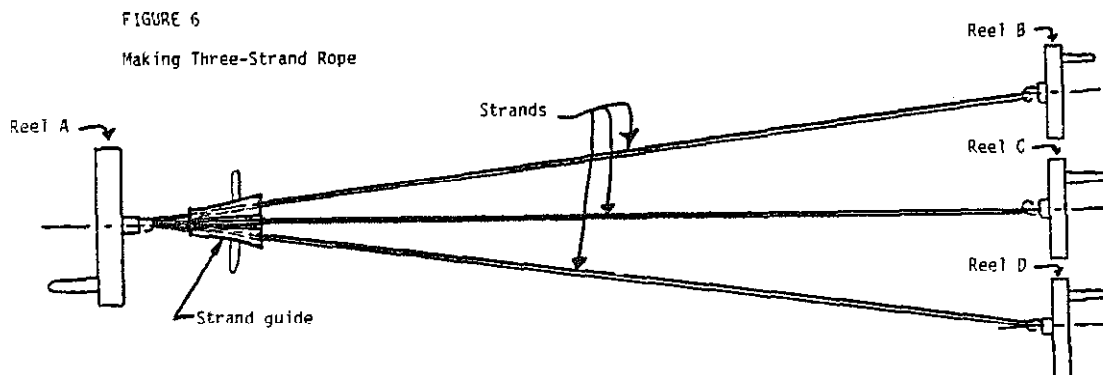
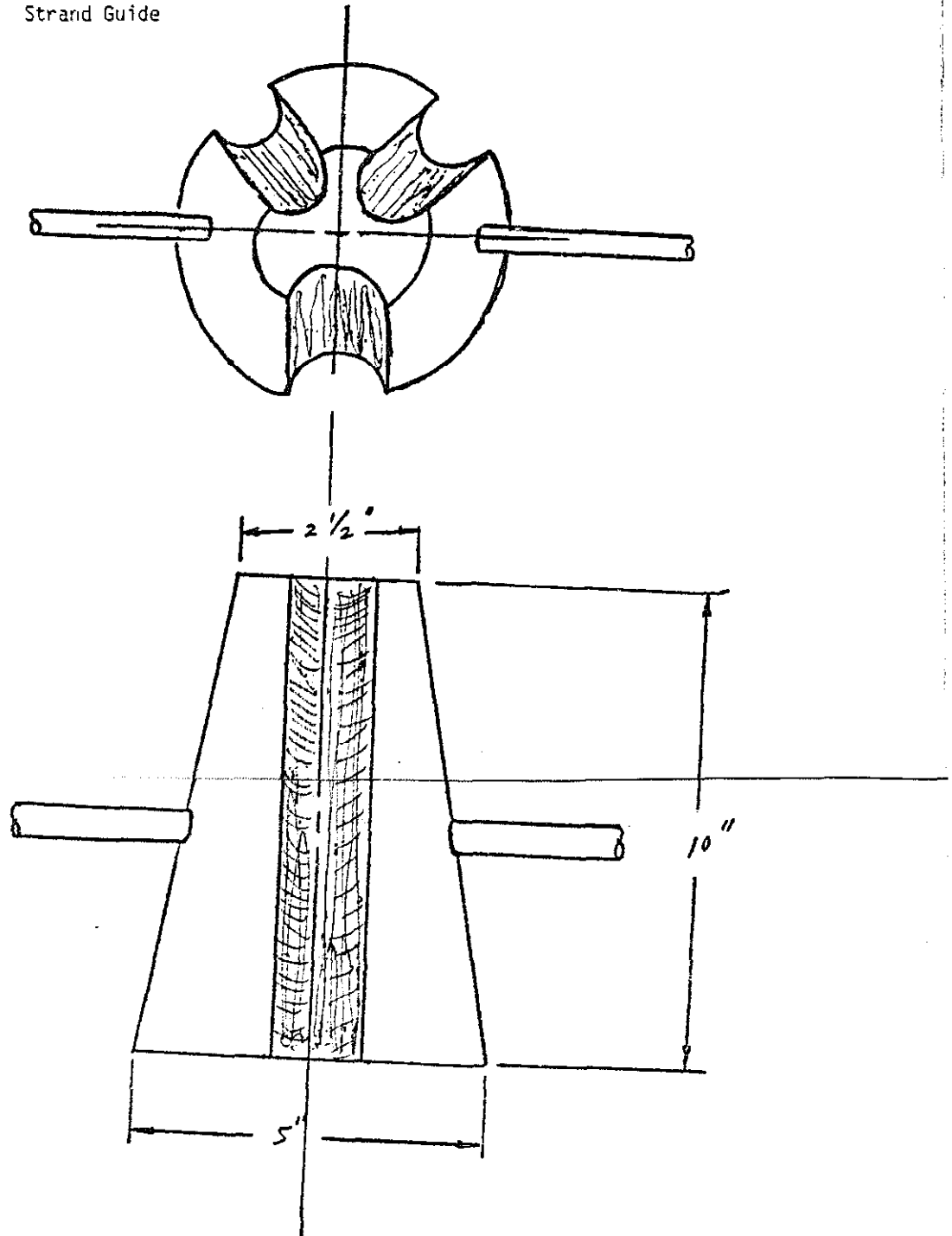


FIGURE 7

Strand Guide



3

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A project of Volunteers in Asia

Poultry Feed Grinder VITA Technical Bulletin 31

by: Frank Redeker

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# TECHNICAL BULLETIN 31

## Poultry Feed Grinder

**FRANK REDEKER**

This is a plan for a grinder used to prepare feed for poultry. The grinder as shown here is relatively easy to construct and was put together using tools and equipment likely to be available in a large village.

The grinder, designed for use with a small motor, was originally constructed to respond to a request which came to VITA from Ghana. VITA Volunteer, L. Z. Eggleton, a specialist in poultry marketing at Iowa State University, worked with Redeker, an agricultural engineering student and with Redeker's professor, Wieliard Anderson.

The prototype machine was taken to Yucatan, Mexico, where it was adapted to hand cranking as illustrated.

Please send testing results, comments, suggestions and requests for further information to:

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3706 Rhode Island AVE  
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**VOLUNTEERS  
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## GRAIN GRINDER

### Specially Constructed Parts:

1. Side plates	SP*	7. Lower delivery form	LDF
2. Rotor drum (4 1/2" O.D.)	RD	8. Hopper	H
3. Stator (from 5 1/4" O.D. tube)	S	9. Adjustable side	AS
4. Rotor face discs	RFD	10. Adjustment link	AL
5. Upper delivery form	UDF	11. Baseboard	BB
6. Deflection scoop	DS		

\*As designated on drawing

### Standard Items:

12. Rotor shaft: 3/4" diam. and 10 1/2" long.
13. Clamp-bolts (4) 5/16" diam. and 6 1/4" long.
14. " " (2) 1/4" diam. " " " "
- Bolts are threaded at both ends. Half an inch of threading for most. Baseboard bolts call for 1 inch.
15. Clamp-bolts (1) 1/4" diam. and 2 7/8" long-(threads to 3/8 inch)
16. Nuts for 5/16" screws (14)
17. Nuts for 1/4" screws (6)
18. Two suitable 3/4" ball-bearings (with holders)
19. Two attachment screws for the hopper - 3/16" diam. and 3/8" to 1/4" long.

### Construction Procedure:

Side plates (SP): After clamping two suitably sized 1/4" thick plates together, cut and drill the holes according to the dotted outline on p. 1, which will provide the pattern. The identity of the two plates is more important than the accuracy of the shape and the hole positions.

Rotor drum (RD): The rotor drum (RD) is rough-cut as a piece of 4 1/2" o.d. steel tubing, slightly over 5" long. Mount it on a lathe and face it to a length of 5". This is the rotor drum.

Drill two rough-cut discs with central holes 3/4" in diam., and weld them onto the shaft (12) with a space of 4 3/8" between them. Weld from the inside only. The shorter end of the shaft should protrude 1 1/2".

Turn the discs by the shaft on the lathe and trim them to fit the inner diam. of the drum. They should each be inset by about 1/16". The rotor drum is now a rigid unit.

Stator (S): Face the larger (5 1/4" o.d.) rough-cut tube to a 5-inch length. Cut and shape the stator as indicated on p. 1. Avoid twisting it. Most of the lower semicircle should have its o.d. approximately 3/16" greater than the o.d. of the rotor drum. The upper 2 to 2 1/2 inches must be suitably flattened to the degree called for by the diagram.

Parts 5 (UDF), 6 (DS) and 7 (LDF): These are shown in the assembly on p. 1 and half size on p. 2. They are all to be cut from 1/8" thick sheet and should be accurately 5" wide. Their lengths are not critical. Shape them as in the diagram on p. 1. The welding on of the clamp bolts is postponed till the initial assembly. (The stator (S), upper deliver form (UDF), and deflection scoop (DS) are to have clamp bolts (CB).)

Hopper (H): Is to be shaped as indicated on p. 2, with the dimensions shown on p. 1. Holes for the two attachment screws may be of 3/16" diam. and counter-sunk with centers about 1/4" from the lower edge. The adjustable side (AD) is to be 2" wide (9).

Adjustment links (AL): Cut from 1/4" thick steel as shown on p. 2 (full size). Round off the 1 1/4"-long end by grinding or filing to approximately 5/16" diam. and thread it for 5/16" nuts. The lug (L) should be made ready with a 11/32" hole centered 3/8" from its lower edge. It may be 1" wide (perp. to the figure). Its upper edge should be suitably shaped for welding to the stator. It projects (at the left) 7/8".

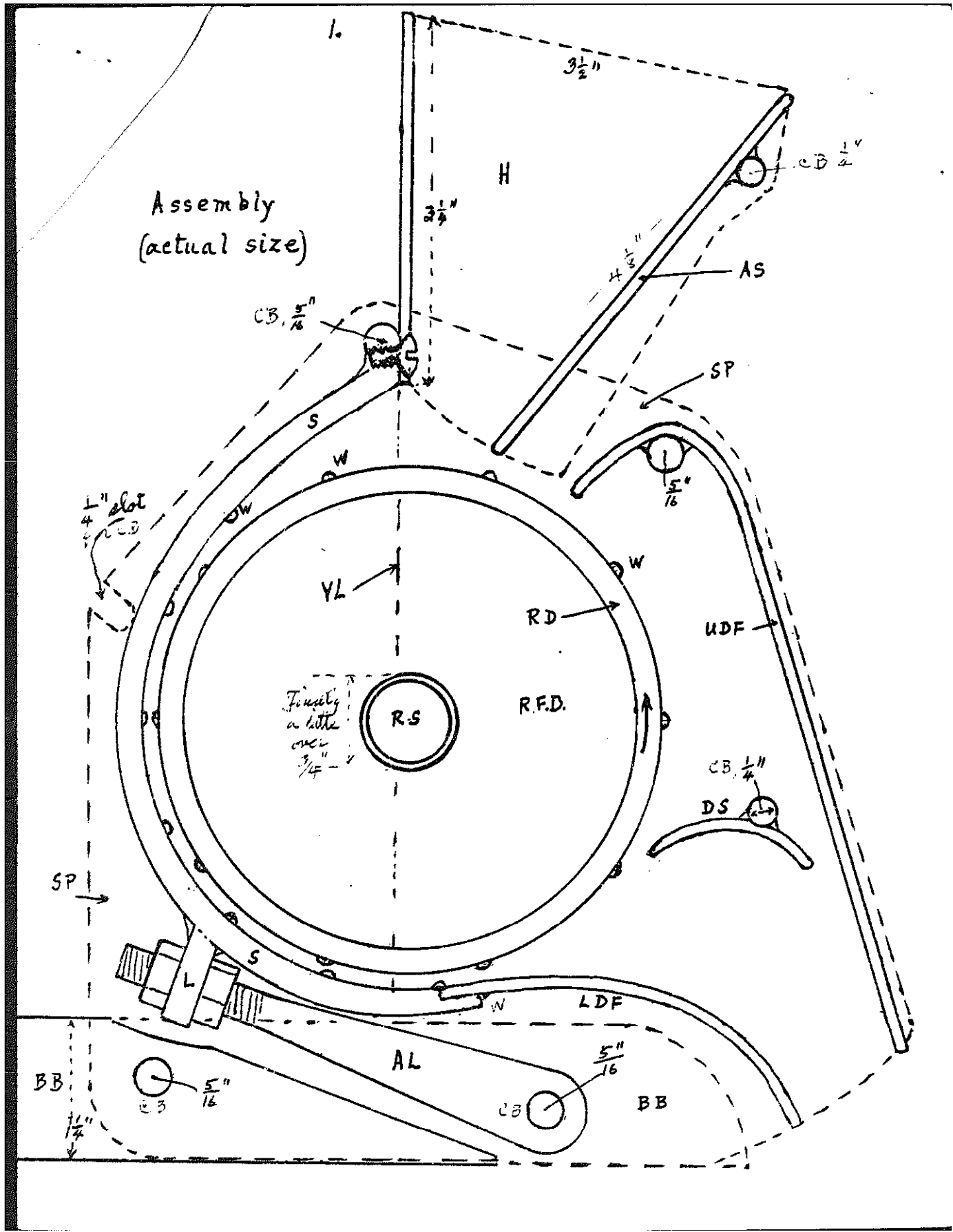
Baseboard (BB): May well be made of wood. The length may be 12 to 18" as needed to accommodate a 1/3 h.p. motor.

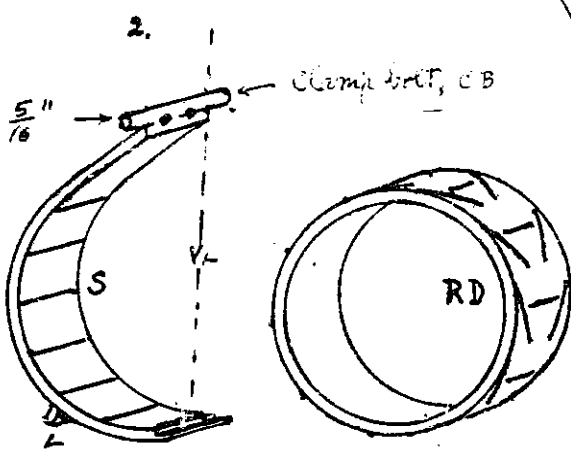
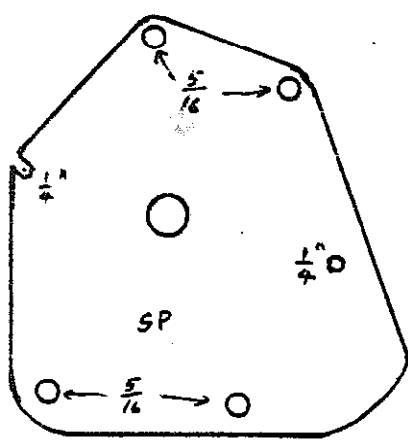
Initial Assembly:

- a. All the parts shown on p. 1 except the hopper and the UDF, and the second nut on AL are clamped in their proper positions against the 5" width. The bolts should project equally through the two side plates.
- b. Make positioning weld-attachments for the clamp bolts onto S and DS, and for L on S.
- c. Declamp enough to remove the baseboard and AL, and put in UDL in a reversed position (its upper tip projecting outward). Tighten again and make positioning welds for the LDF on S and the UDF on its clamp bolt.
- d. Disassemble and complete the welds (W). In the hopper the clamp bolt may be welded onto AS directly in one operation.

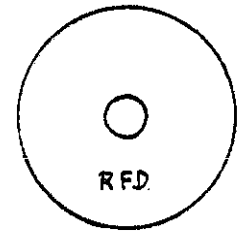
Final Fittings and Adjustments:

- a. In the middle region of the head formed by the welding of the clamp bolt to S, flatten the "right" side to make a face parallel to the vertical line (VL). Drill and tap out two holes for the hopper attachment screws (19) as indicated on p. 2.
- b. Using surface hardening rods, weld on the ridges for S and RD. Check the direction of turn with motor. (see p. 3)
- c. Mount the rotor in the lathe and reface both edges of the drum, leaving gaps of about 1/64" to allow free turning.
- d. It will probably be necessary to grind down the weld ridges to a near uniform height - say about 3/64". The final adjustments and trials after mounting with the ball bearings are matters for the person making this grinder to handle. Suitable pulleys will be needed.

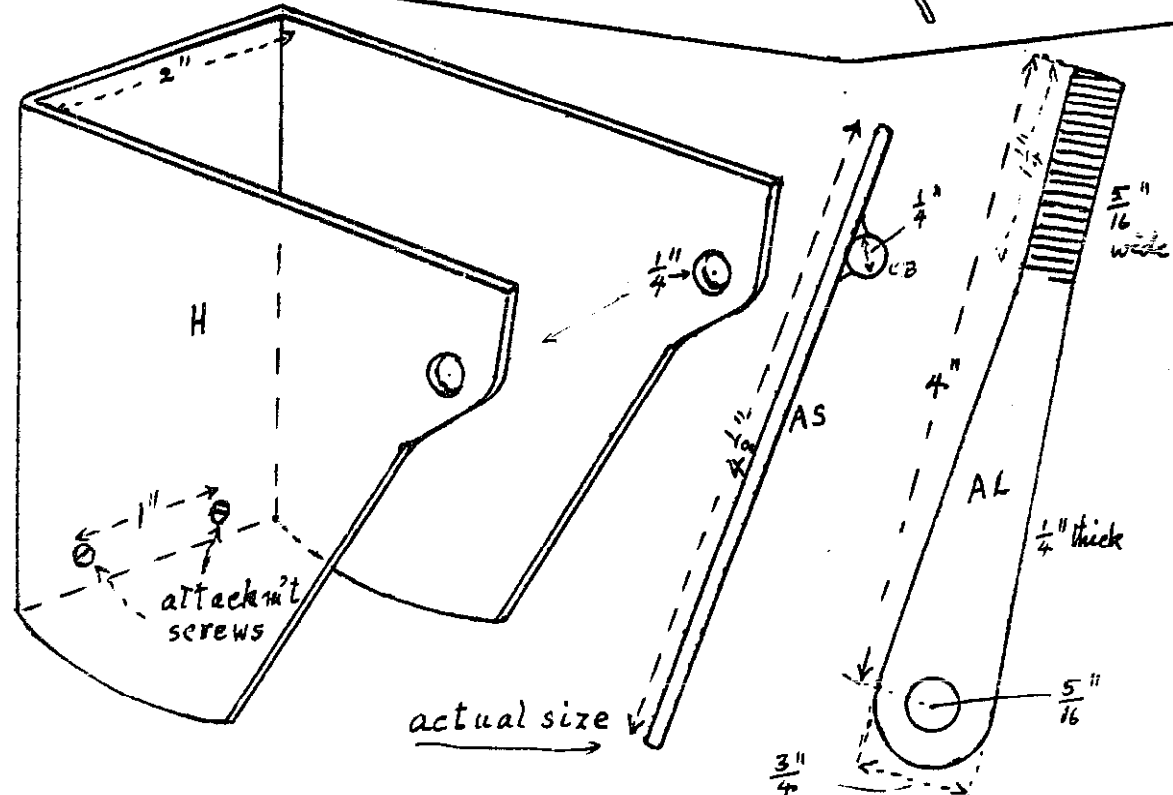
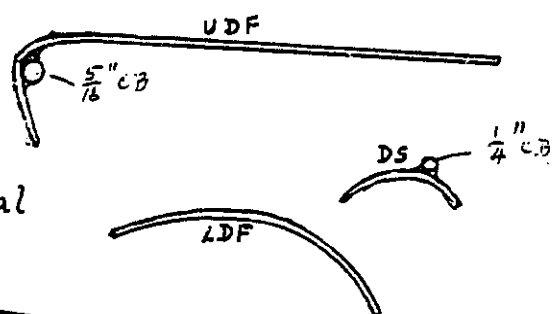




$\frac{1}{3}$  actual size



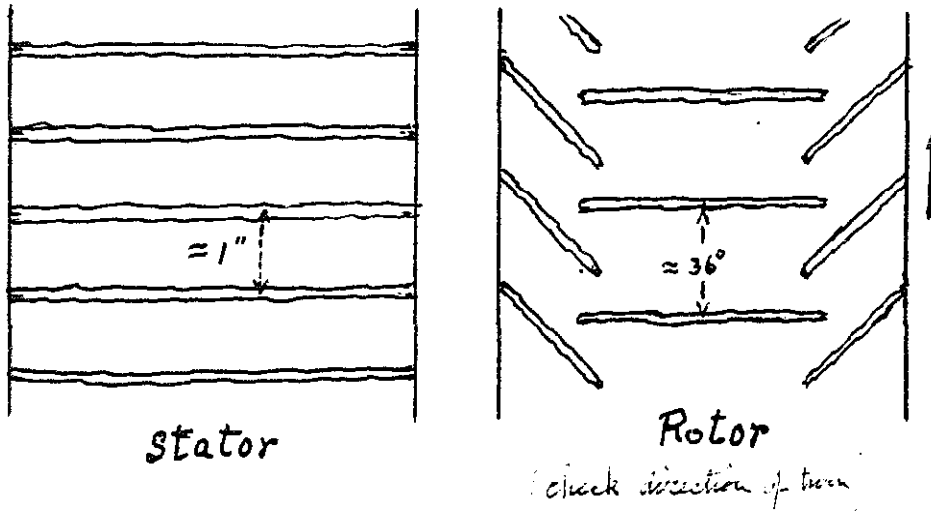
Half actual size



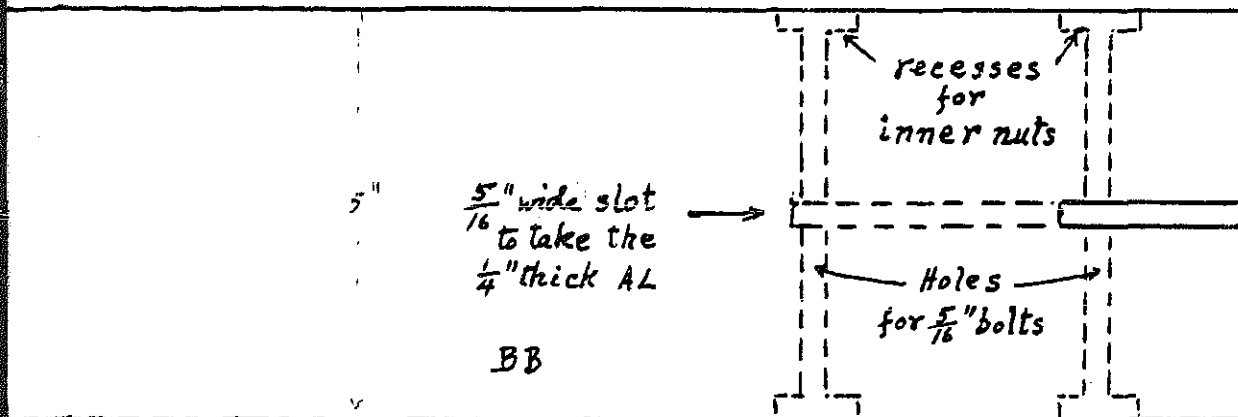
actual size

3.

Scheme of welded ridges



(Half actual size)

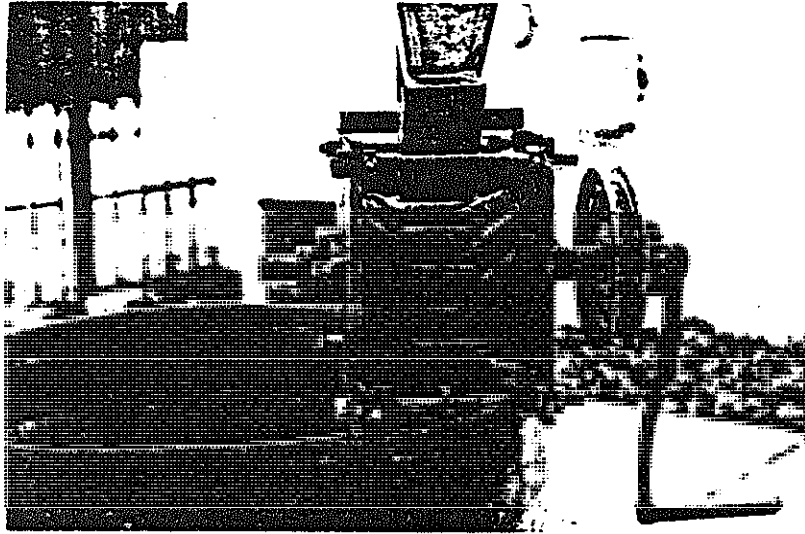


Plan of base-board

FEED GRINDER ADAPTED FOR HAND CRANKING

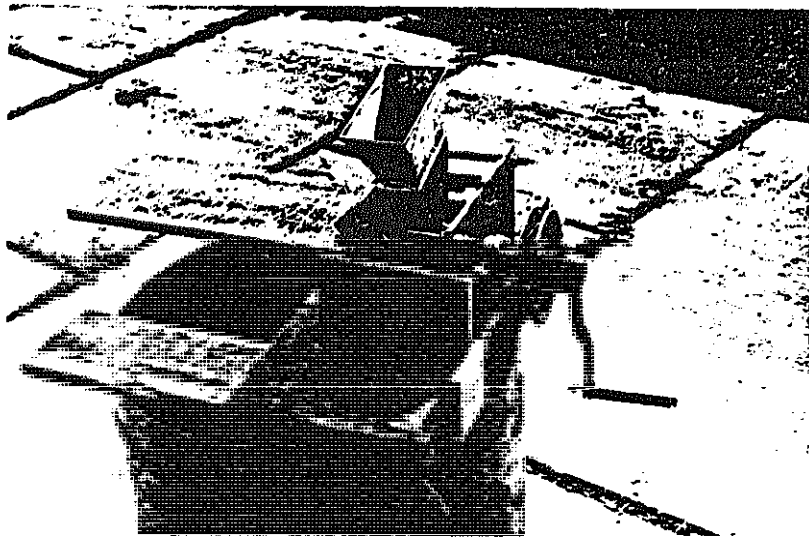
Initial Use:

"I think the grinder fills a need, especially for grinding grain for animals."



FRONT VIEW

Front cover removed--note weld beads on rotor. Adapted with hand crank on shaft outside (motor) pulley. Grain chute has been lengthened.



TOP VIEW

Ground grain drops into 3/4 bbl. Front guard replaced by a board.

Because the user needed the grinder for limited application, the hand crank was added. It was mounted on a 55 gallon drum but could be mounted and a bag placed underneath to catch the corn. When the hand crank is used, the corn may have to be ground twice. This occurs when the rotor drum moves slowly: some grain is likely to drop back and fall behind. This can be avoided by adjusting the chute and by driving the rotor at a steady, fairly high speed.