A Blacksmith's Bellows

by: A. Inversin and D. Sanguine

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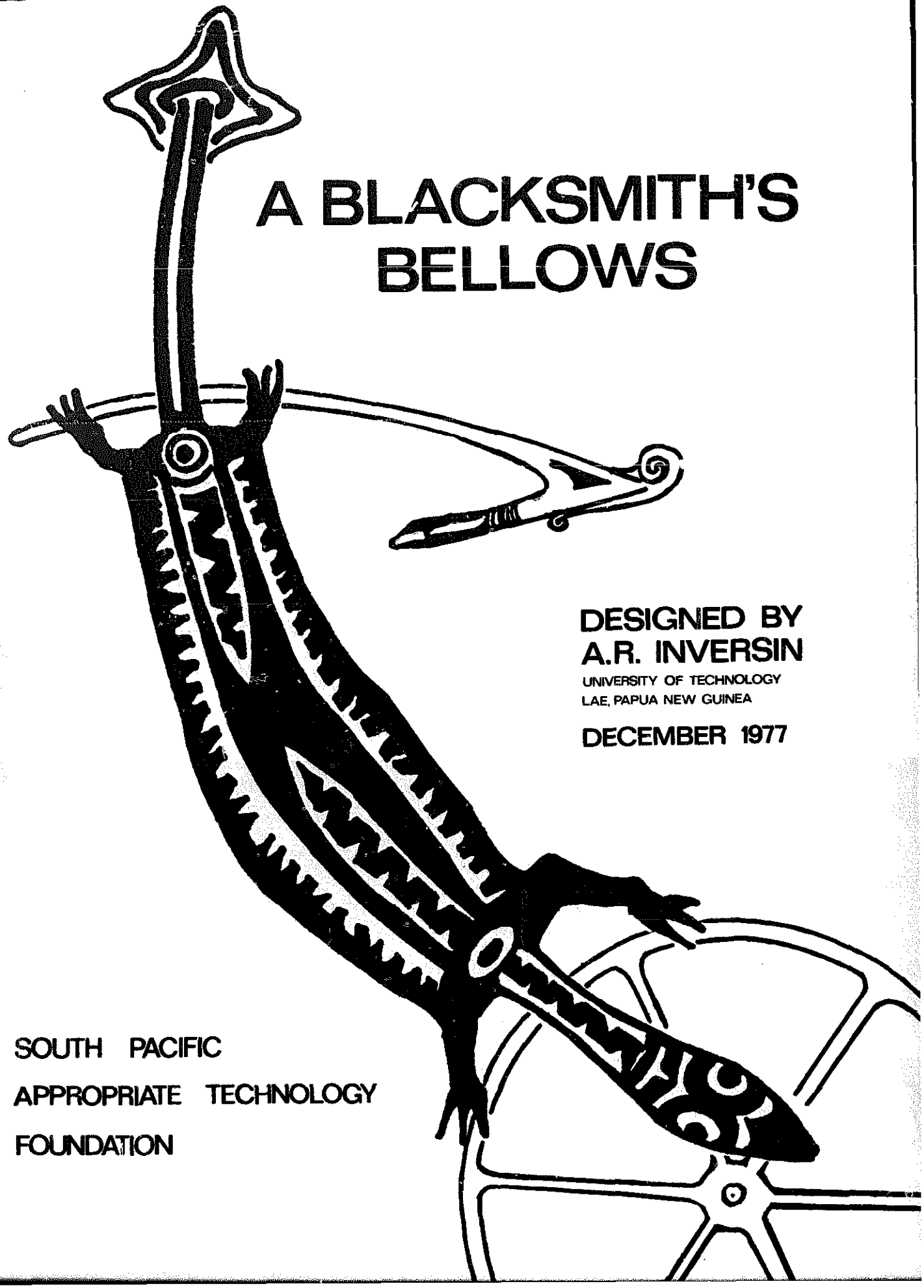

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Drawings by DAVID SANGWINE

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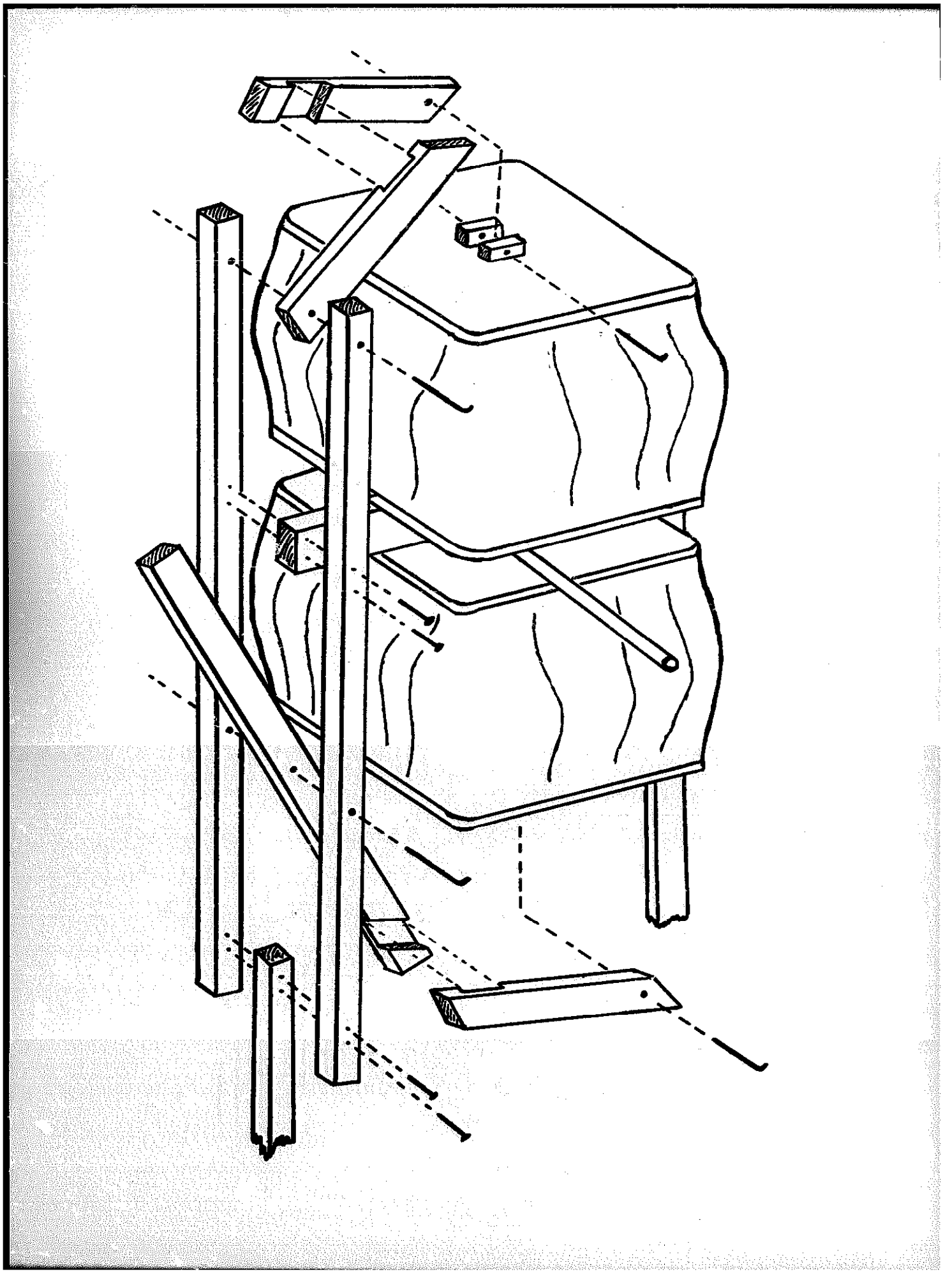
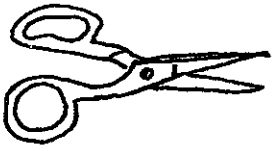
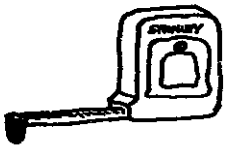


TOOLS

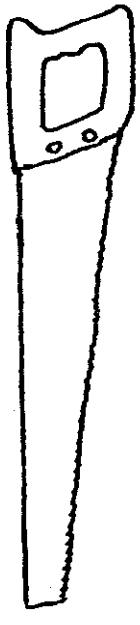


SCISSORS

HAMMER

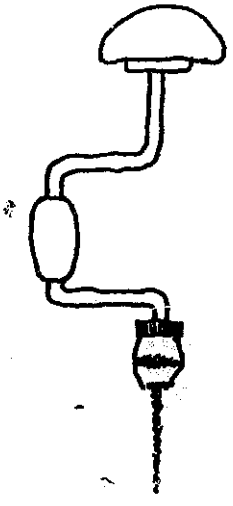


TAPE MEASURE



SAW

METAL FILE



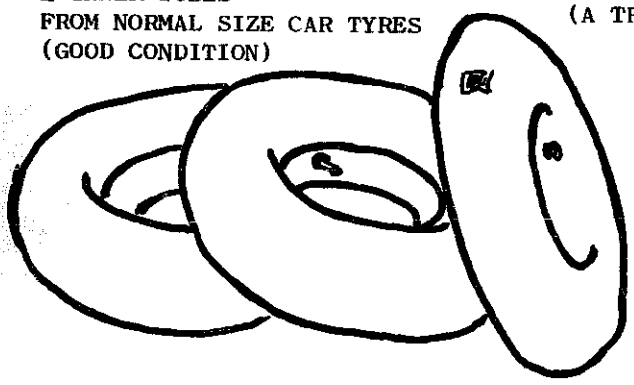
DRILL WITH
6 mm. (1/4 in.) BIT

TIN SNIPS

CHISEL

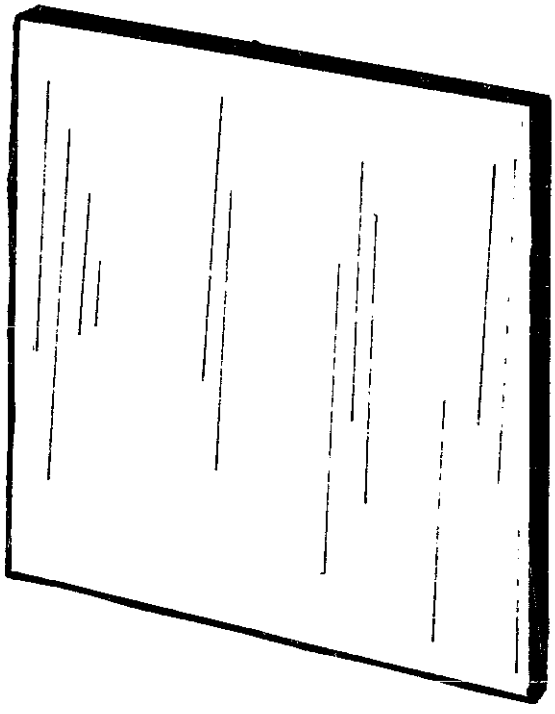
MATERIALS

2 INNER TUBES
FROM NORMAL SIZE CAR TYRES
(GOOD CONDITION)

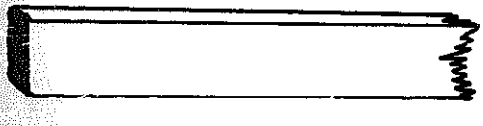


1 INNER TUBE FOR CUTTING
(A TRUCK TUBE IS GOOD)

PLYWOOD ABOUT 12 mm. (½ in.) THICK
1 METRE x 1 METRE (4 ft. x 4 ft.)



PIECES OF WOOD ABOUT 5 cm. (2 in.) WIDE
AND 2 cm. (1 in.) THICK
ENOUGH TO MAKE ABOUT 6 METRES (20 ft.)

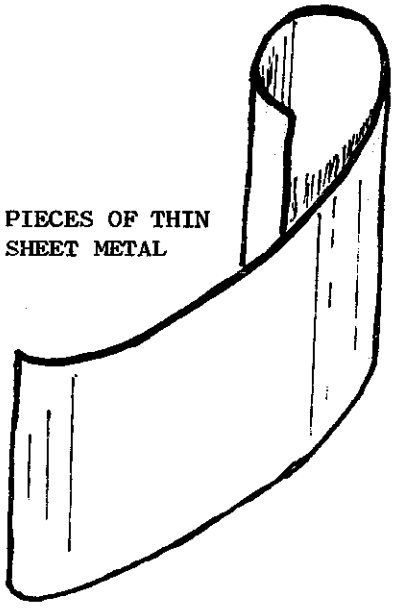


ABOUT 40 4 cm. (1½ in.) NAILS

ABOUT 200 2 cm. (3/4 in.) NAILS

2 cm. (3/4 in.) STEEL PIPE
ABOUT 60 cm. (2 ft.) LONG

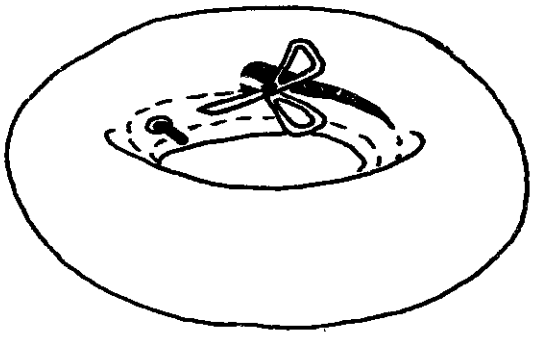
PIECES OF THIN
SHEET METAL



6 mm. (1/4 in.) METAL ROD
4 PIECES EACH ABOUT 10 cm. (4 in.) LONG

BUILDING THE BELLOWS

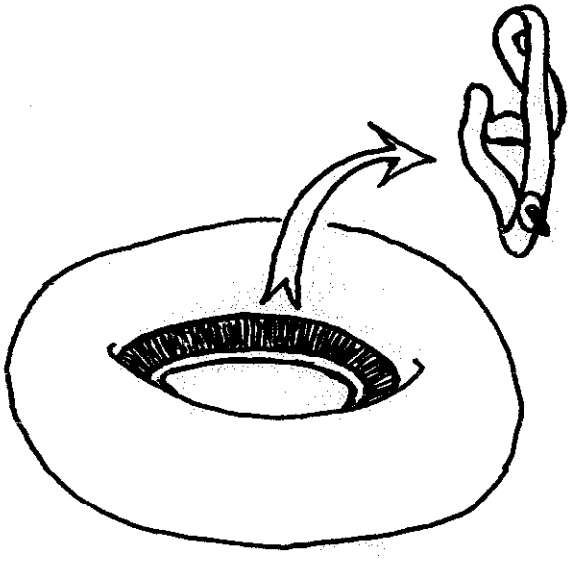
1



CUT A STRIP FROM

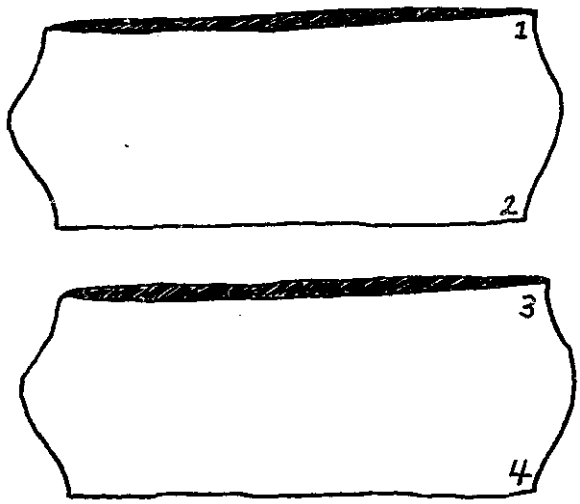
2 OLD CAR INNER TUBES.

2



THROW AWAY THE STRIPS.

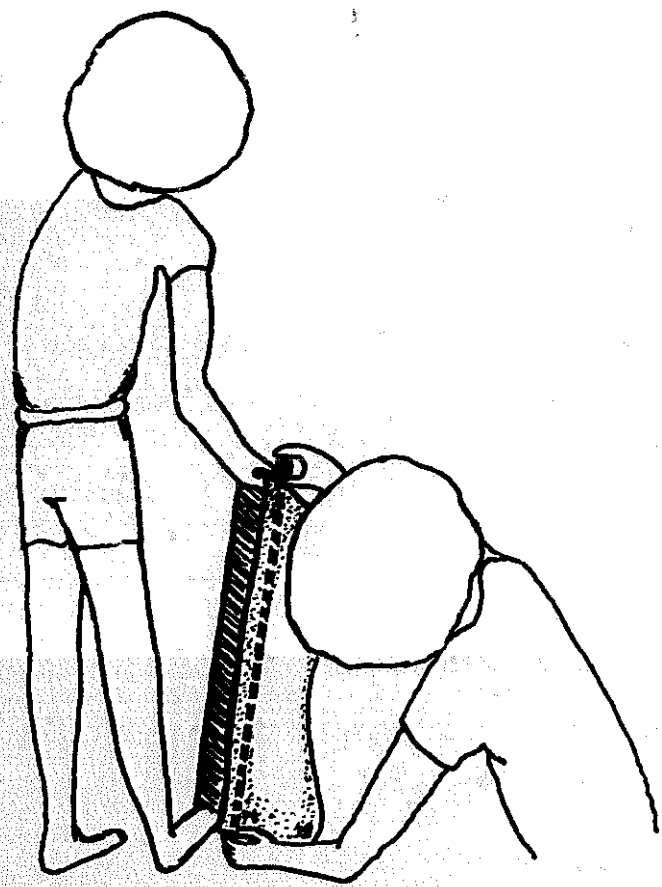
3



OPEN OUT THE TUBES LIKE THIS.

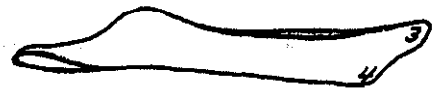
NUMBER EACH OPENING.

4



PULL OPENING NUMBER 1 TIGHTLY

AND MEASURE ONE SIDE.



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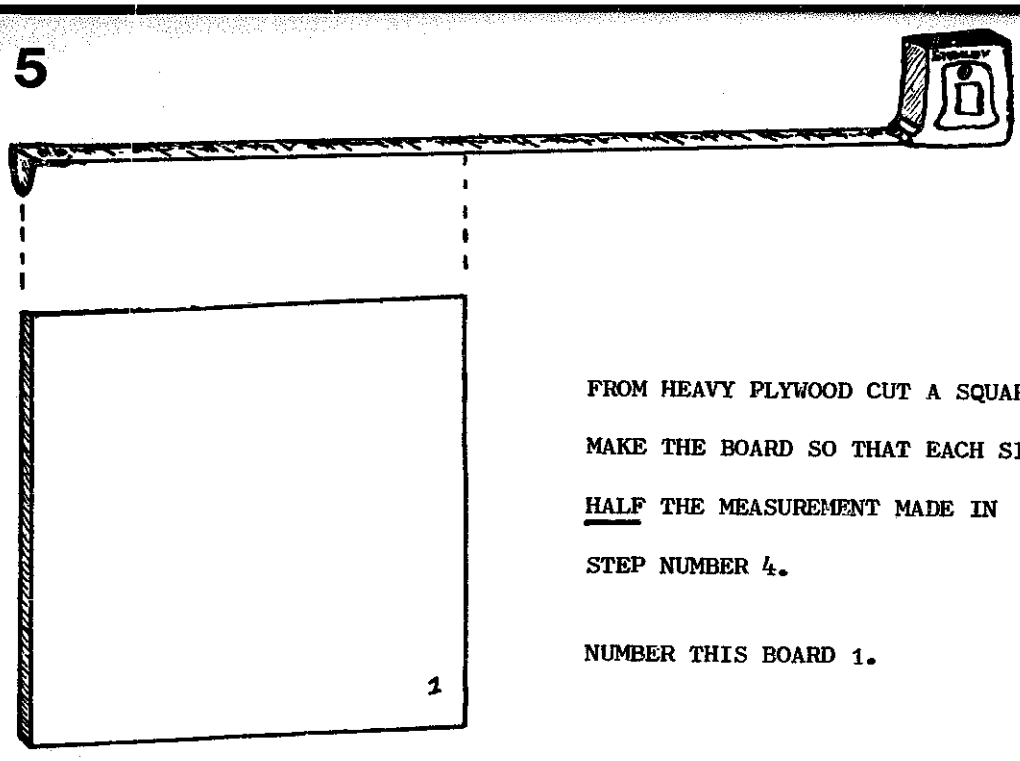


FROM HEAVY PLYWOOD CUT A SQUARE BOARD.

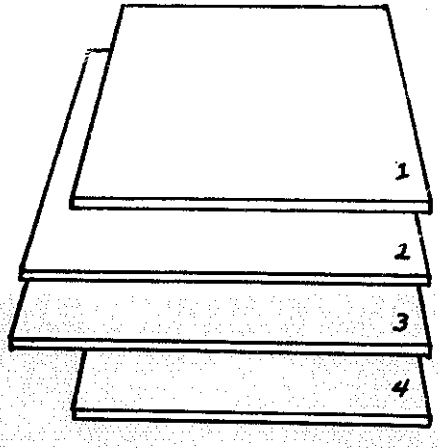
MAKE THE BOARD SO THAT EACH SIDE IS

HALF THE MEASUREMENT MADE IN

STEP NUMBER 4.

NUMBER THIS BOARD 1.

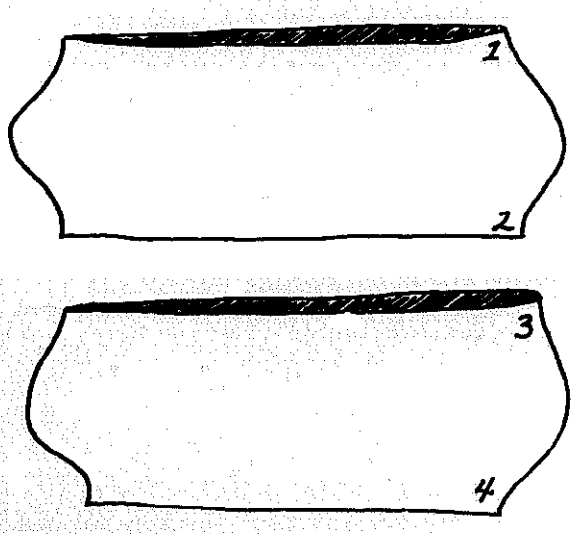
6



CUT 3 MORE BOARDS IN THE SAME WAY

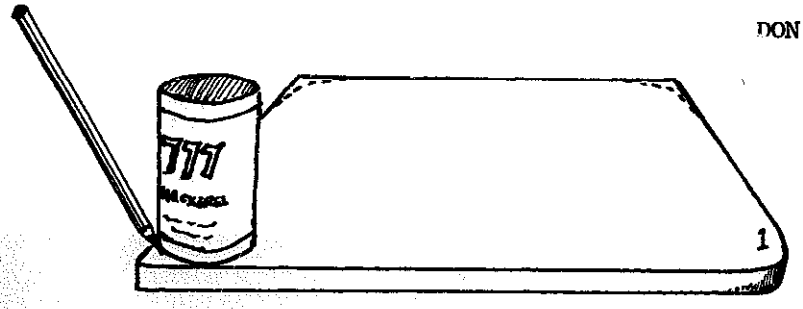
FOR OPENINGS NUMBER 2, 3 AND 4.

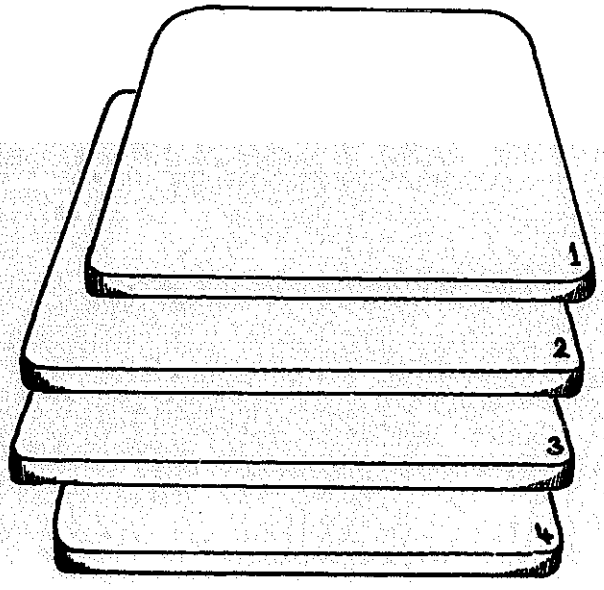
NUMBER EACH BOARD.



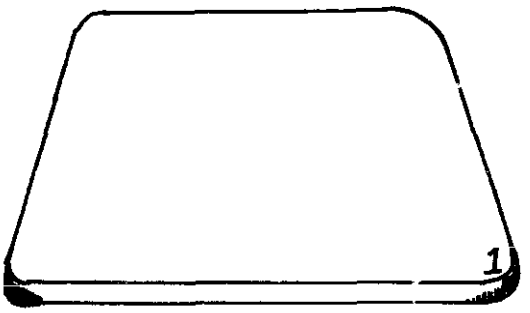
MAKE THE CORNERS ROUND.

DON'T CUT OFF TOO MUCH.

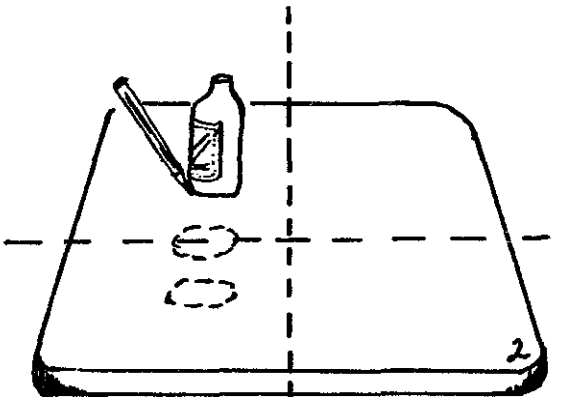




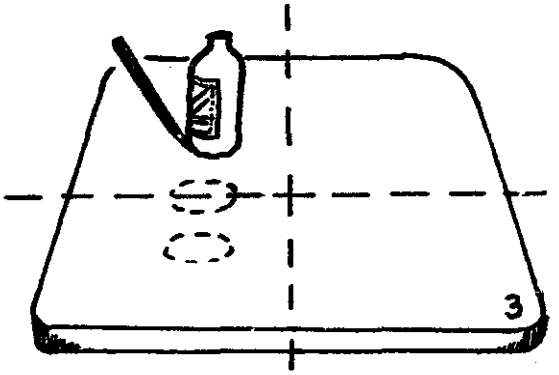
IN BOARDS NUMBER 2, 3 and 4,
CUT 5 cm. (2 in.) HOLES
FOR THE AIR TO PASS THROUGH.



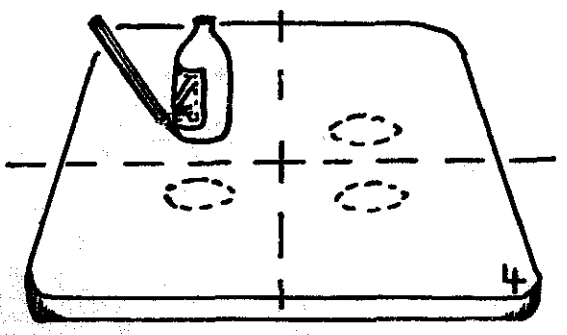
NO HOLES



2 OR 3 HOLES

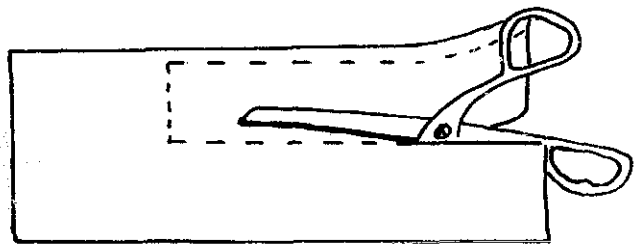


3 HOLES



4 HOLES

9



CUT 3 PIECES OF HEAVY RUBBER

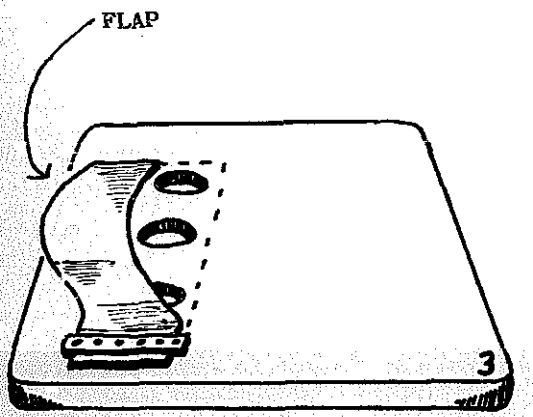
TO MAKE FLAPS.

MAKE THEM BIG ENOUGH

TO COVER THE HOLES

AS SHOWN IN STEP NUMBER 10.

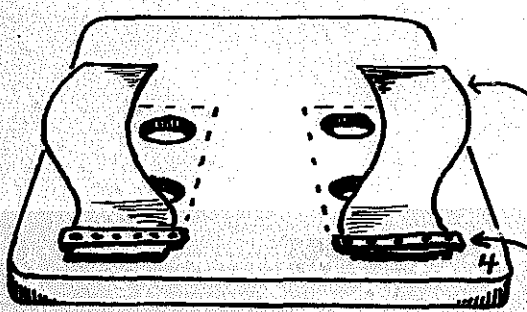
10

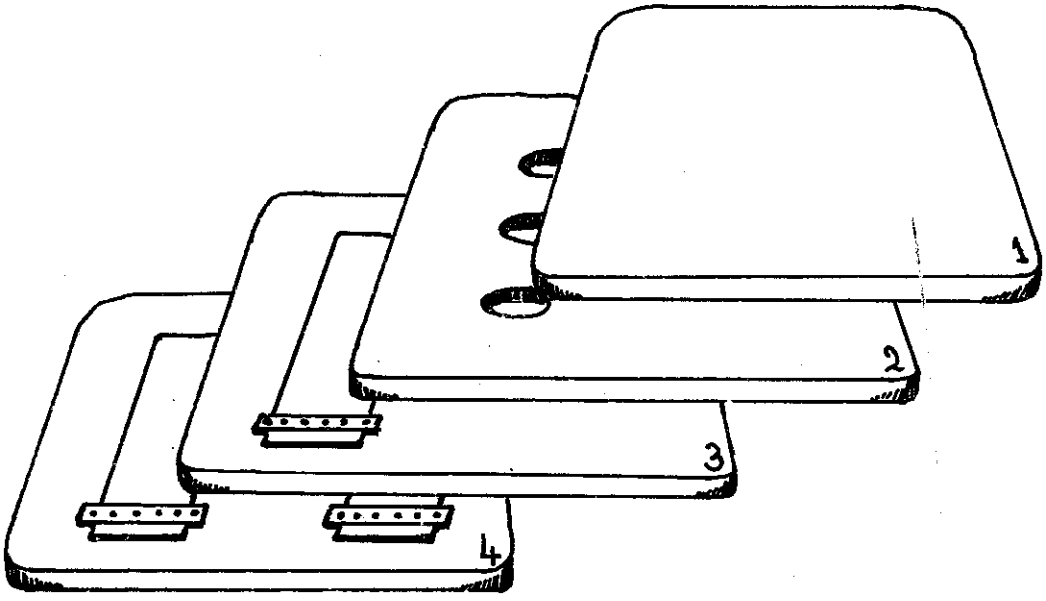


USE A STRIP OF SHEET METAL

TO NAIL THE RUBBER FLAPS OVER THE HOLES

IN BOARDS NUMBER 3 AND 4.



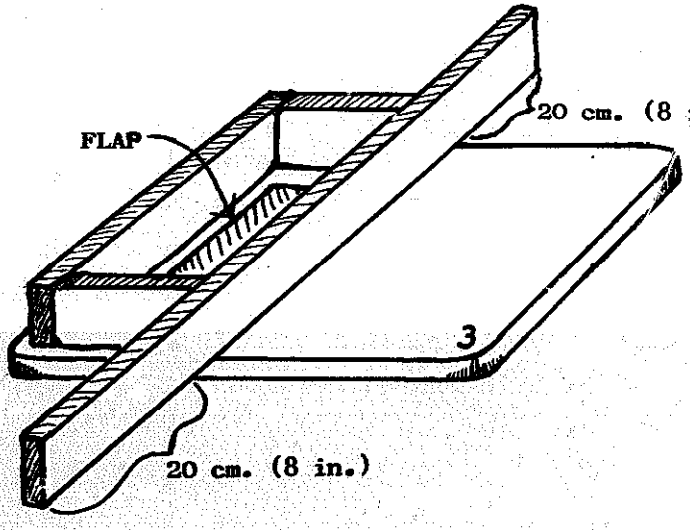


NOW THE BOARDS SHOULD LOOK LIKE THIS.

11

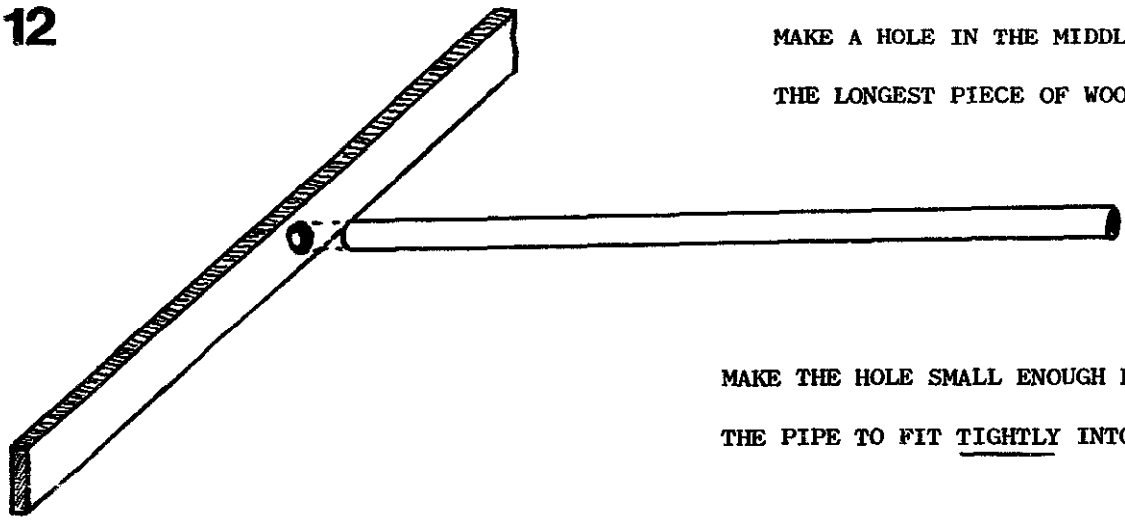
CUT 4 PIECES FROM THE 5 cm. x 2 cm. WOOD.

CUT THEM SO THEY WILL MAKE A BOX LIKE THIS TO FIT AROUND THE FLAP ON BOARD NUMBER 3.



THE LONG PIECE WILL GO IN THE MIDDLE OF THIS BOARD.

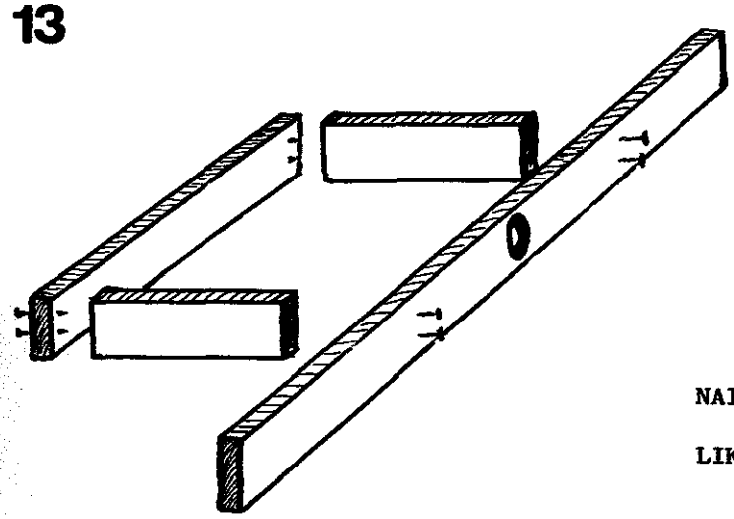
12



MAKE A HOLE IN THE MIDDLE OF THE LONGEST PIECE OF WOOD.

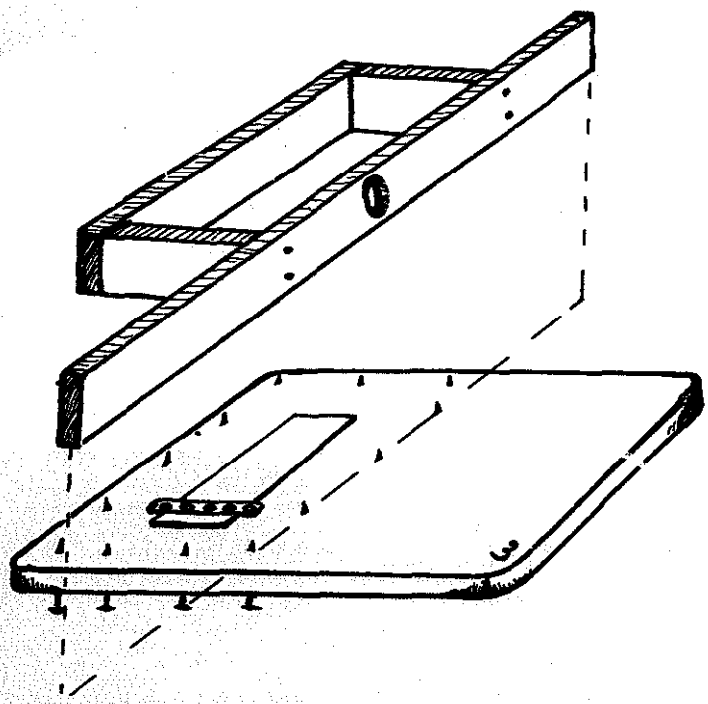
MAKE THE HOLE SMALL ENOUGH FOR THE PIPE TO FIT TIGHTLY INTO IT.

13

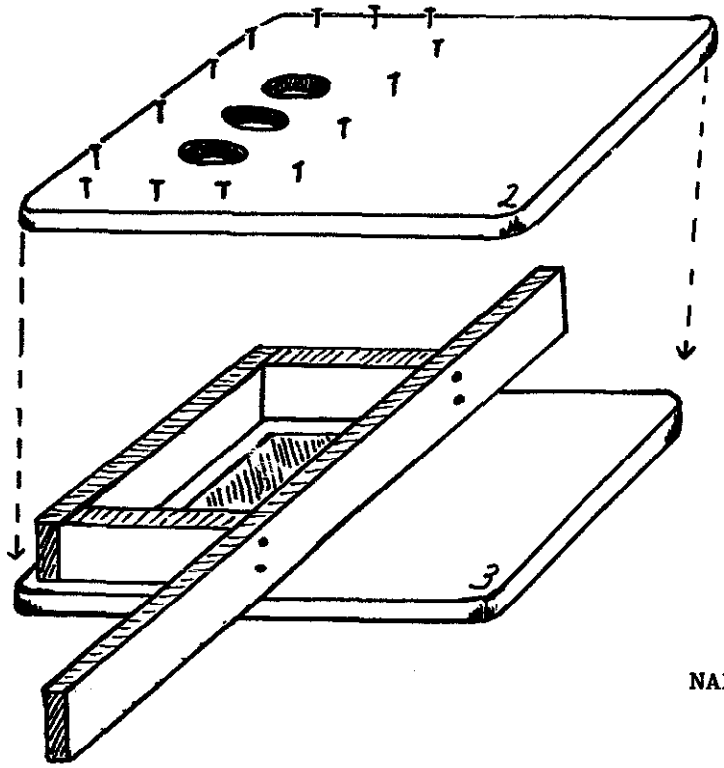


NAIL THE 4 PIECES OF WOOD TOGETHER LIKE THIS.

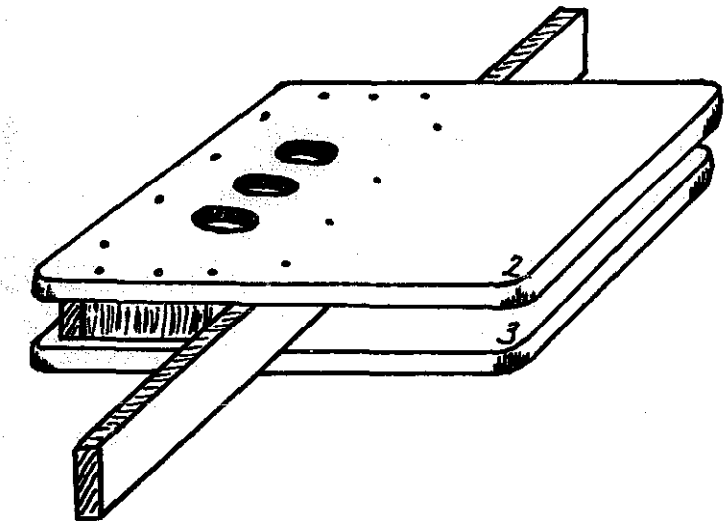
14



NAIL THE BOX TO BOARD NUMBER 3.



NAIL BOARD NUMBER 2 OVER THE BOX.



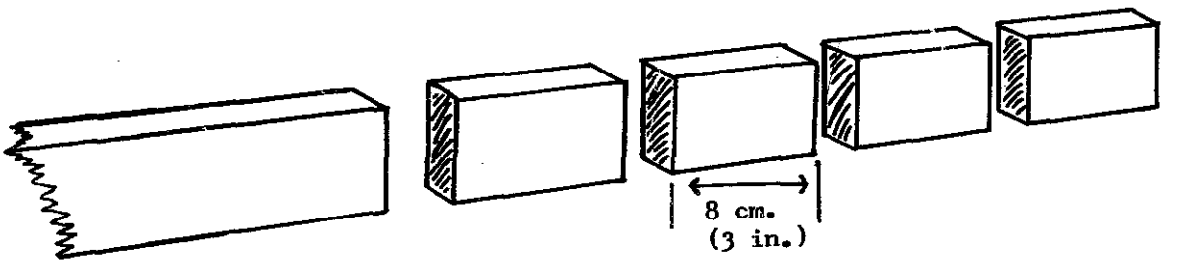
NOW IT LOOKS LIKE THIS.

THIS BOX SHOULD BE WELL MADE
WITH AIR-TIGHT JOINS.
USE CARPENTER'S GLUE OR
GUM FROM THE BUSH.

16

CUT 4 SMALL PIECES FROM THE

5 cm. x 2 cm. WOOD.

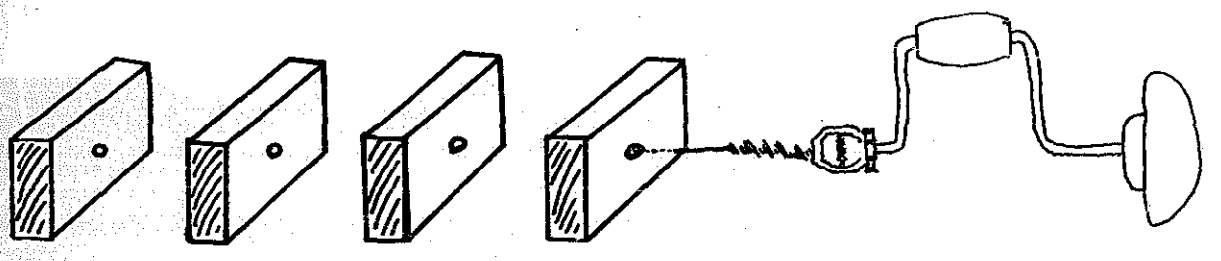


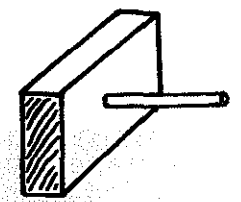
EACH PIECE SHOULD BE ABOUT 8 cm. (3 in.) LONG.

17

DRILL A HOLE THROUGH

THE CENTRE OF EACH PIECE.

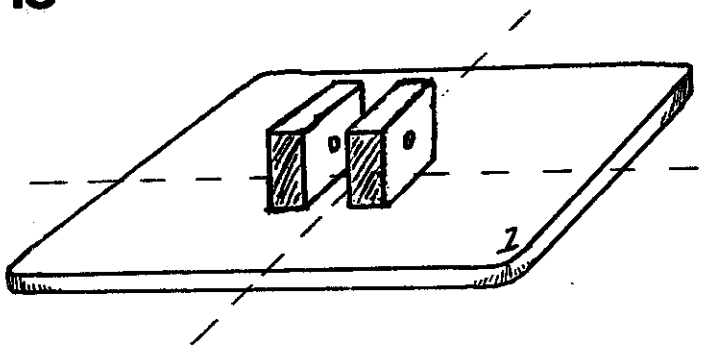




MAKE THE HOLE BIG ENOUGH

FOR ONE OF THE METAL RODS.

18

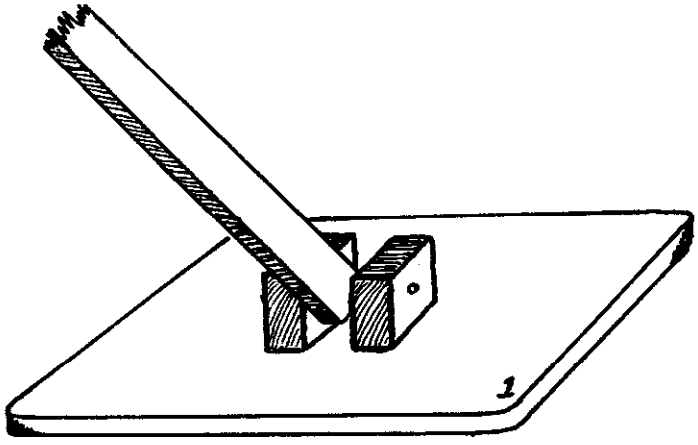


NAIL 2 OF THE PIECES

TO BOARD NUMBER 1.

PUT THEM IN THE MIDDLE

OF THE BOARD.



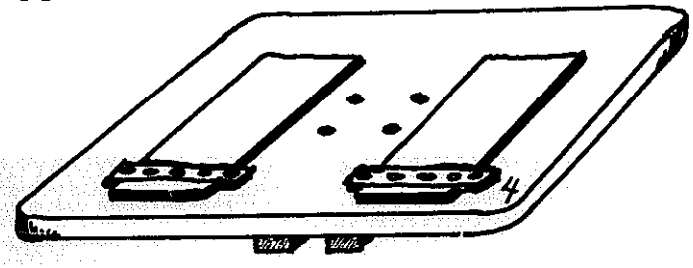
PUT THEM FAR ENOUGH APART

THAT A PIECE OF

THE 5 cm. x 2 cm. WOOD

WILL FIT LOOSELY BETWEEN THEM.

19



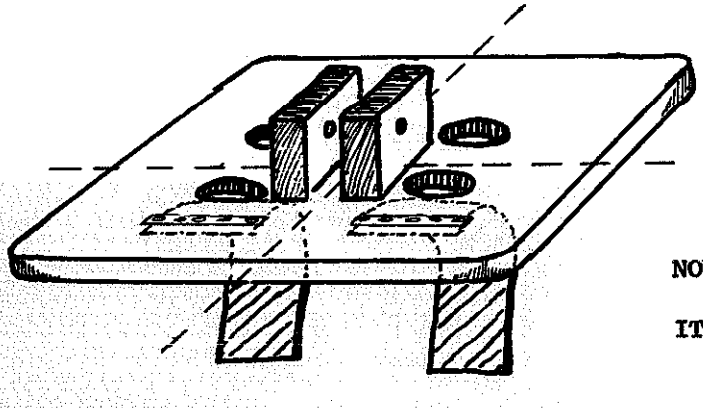
NAIL THE OTHER 2 PIECES TO BOARD

NUMBER 4 IN THE SAME WAY.

PUT THEM IN THE MIDDLE

OF THE BOARD,

ON THE SIDE WITHOUT FLAPS.

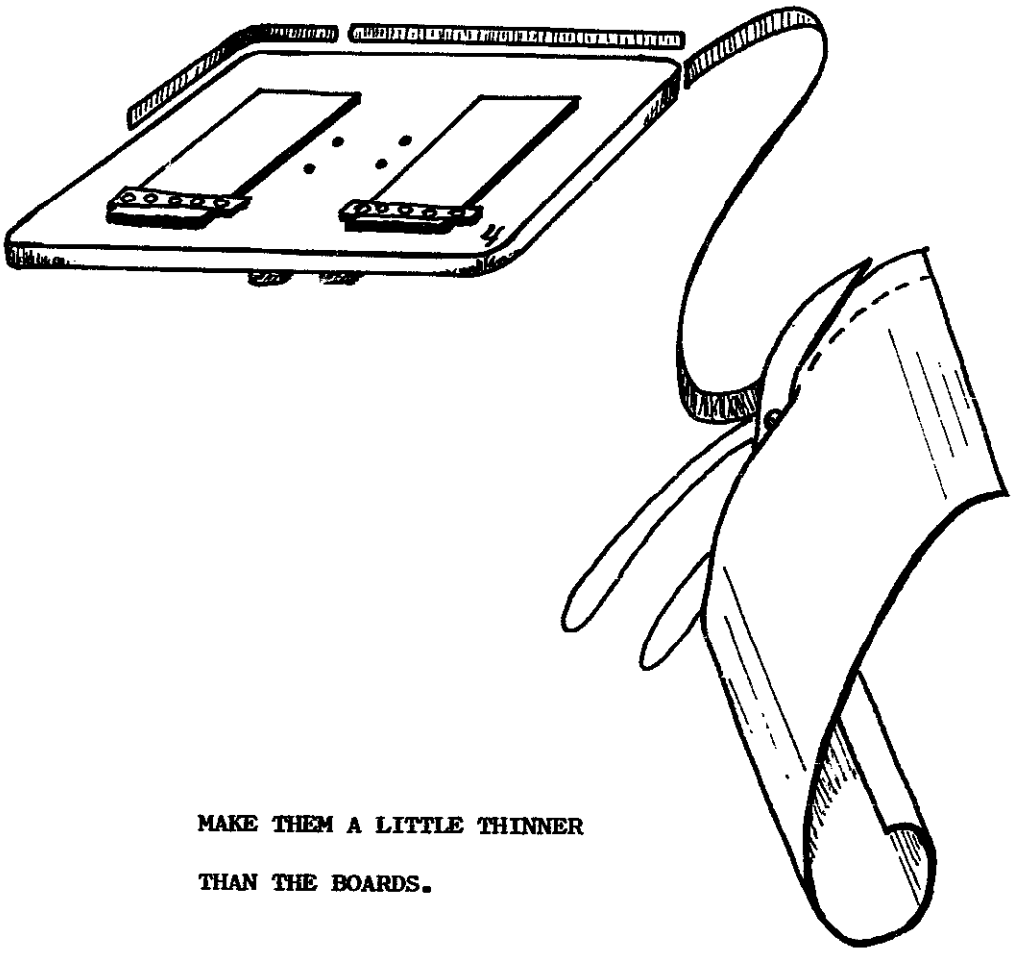


NOW IF YOU TURN OVER BOARD NUMBER 4

IT WILL LOOK LIKE THIS.

20

CUT THIN STRIPS OF SHEET METAL.



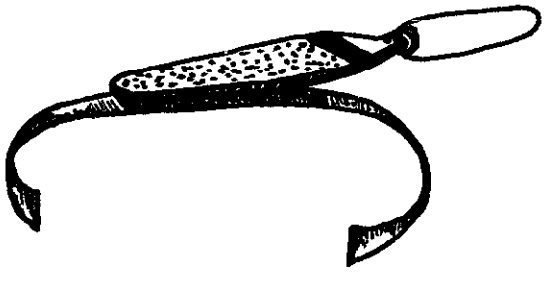
MAKE THEM A LITTLE THINNER

THAN THE BOARDS.

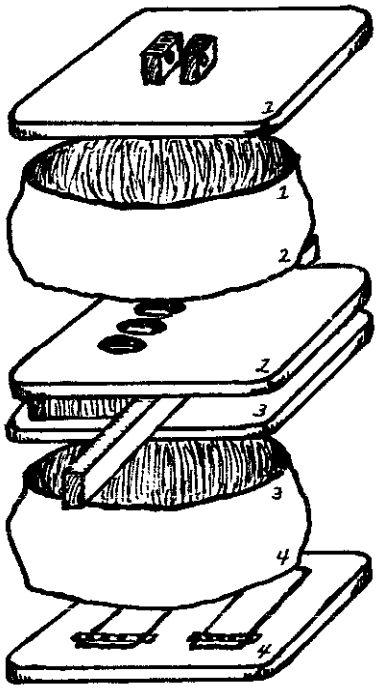
CUT ENOUGH PIECES TO GO

ALL AROUND THE BOARDS.

21



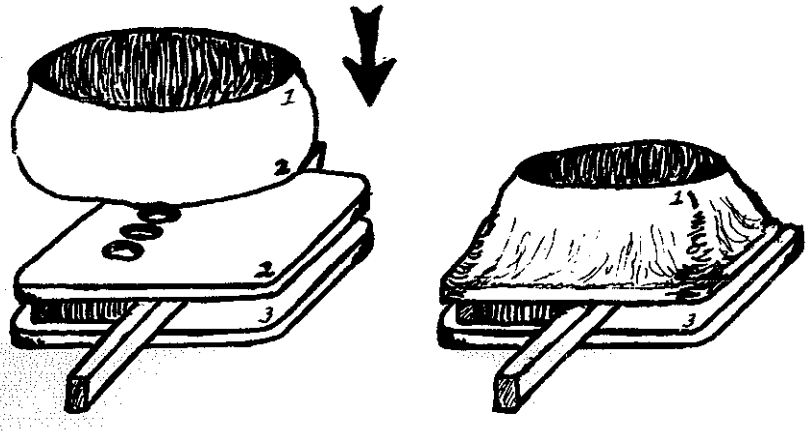
FILE OFF THE SHARP EDGES.



THE PIECES YOU HAVE MADE

WILL GO TOGETHER LIKE THIS.

22



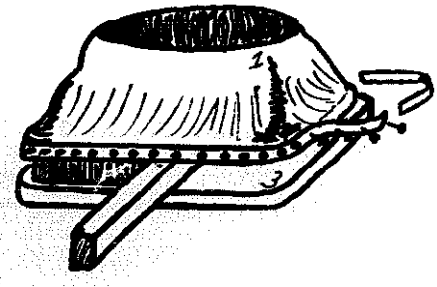
PUT TUBE OPENING NUMBER 2

OVER BOARD NUMBER 2.

23

USE SHORT NAILS TO NAIL STRIPS OF SHEET METAL

AND THE TUBE TO THE BOARD.



PUT THE NAILS CLOSE TOGETHER --

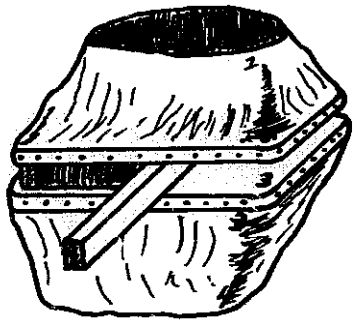
3 cm. (1 in.) APART.

THE STRIPS OF METAL MUST NOT

GO OVER THE EDGES OF THE BOARD

AND CUT INTO THE TUBE.

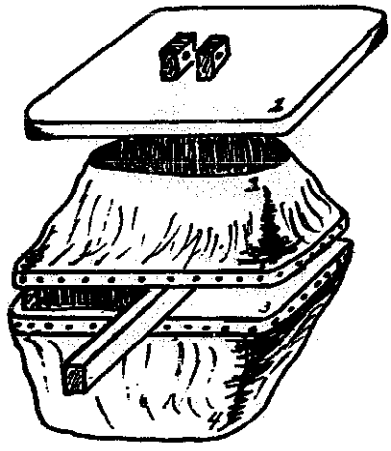
24



NAIL OPENING NUMBER 3 TO BOARD NUMBER 3

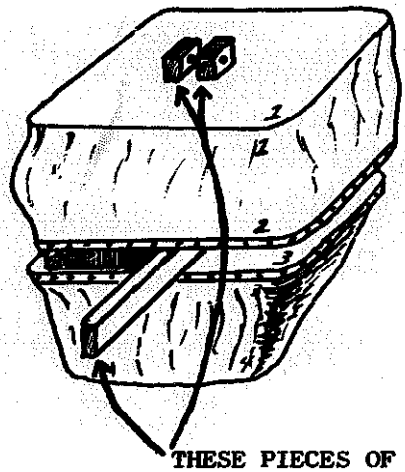
IN THE SAME WAY.

25



FIT BOARD NUMBER 1

INTO OPENING NUMBER 1.



THESE PIECES OF WOOD

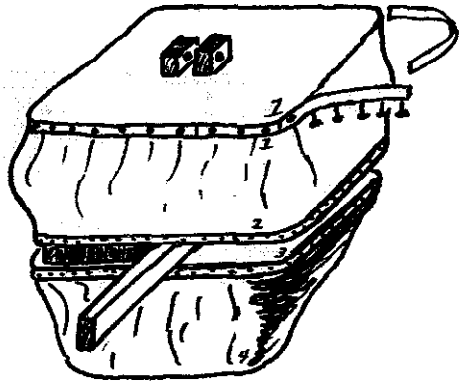
POINT IN THE SAME DIRECTION.

THE SIDES OF BOARD NUMBER 1

MUST BE <u>PARALLEL</u> TO THE SIDES OF

BOARDS NUMBER 2 AND 3.

26



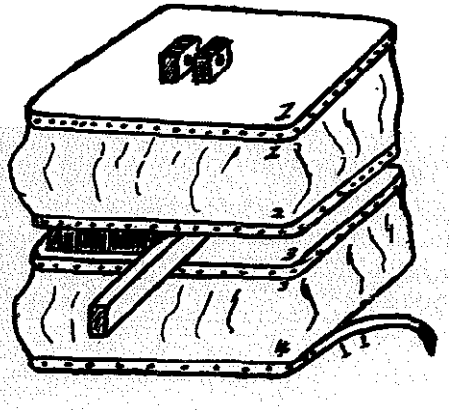
AGAIN USE STRIPS OF METAL

TO NAIL THE TUBE TO THE BOARD.

27

NAIL OPENING NUMBER 4 TO BOARD NUMBER 4

IN THE SAME WAY.



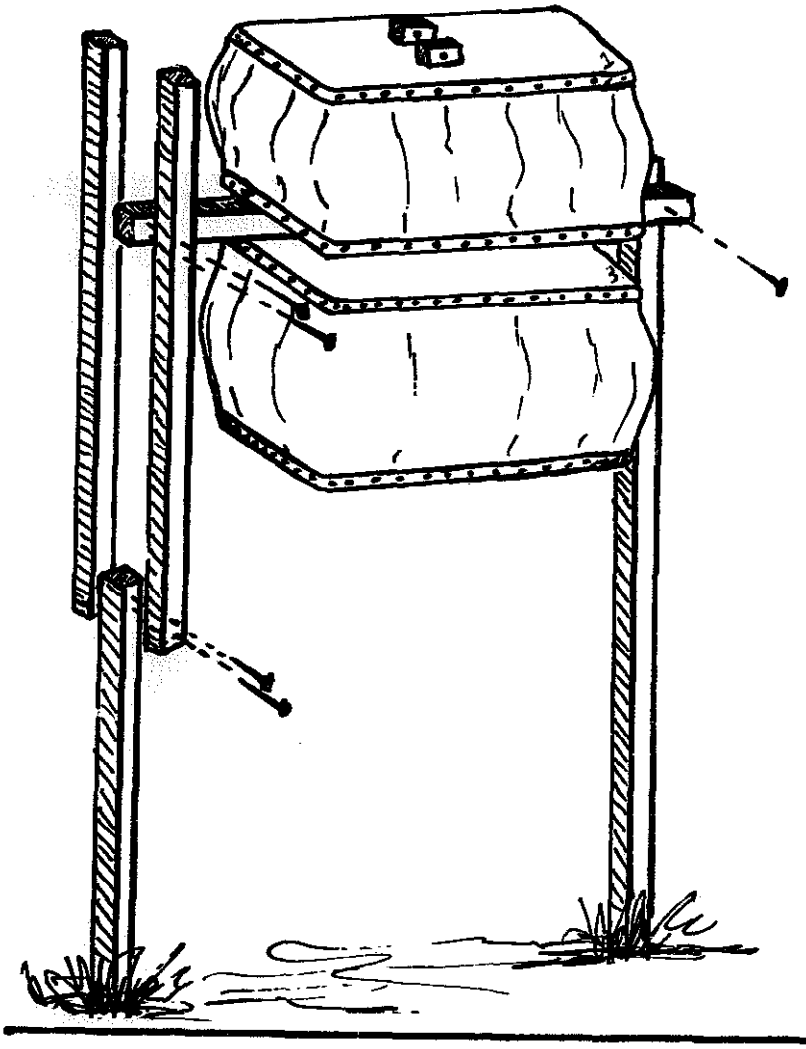
THE SIDES OF BOARD NUMBER 4

MUST ALSO BE PARALLEL TO THE

SIDES OF BOARDS NUMBER 2 AND 3.

BE SURE THE FLAPS ARE INSIDE THE TUBE.

28



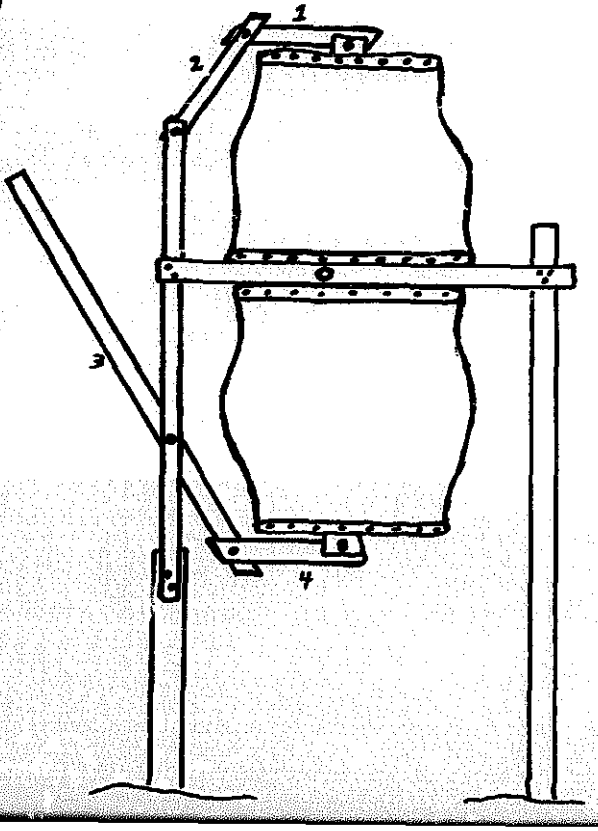
FROM THE REST OF

THE 5 cm. x 2 cm. WOOD

CUT PIECES

TO MAKE SUPPORTS.

29

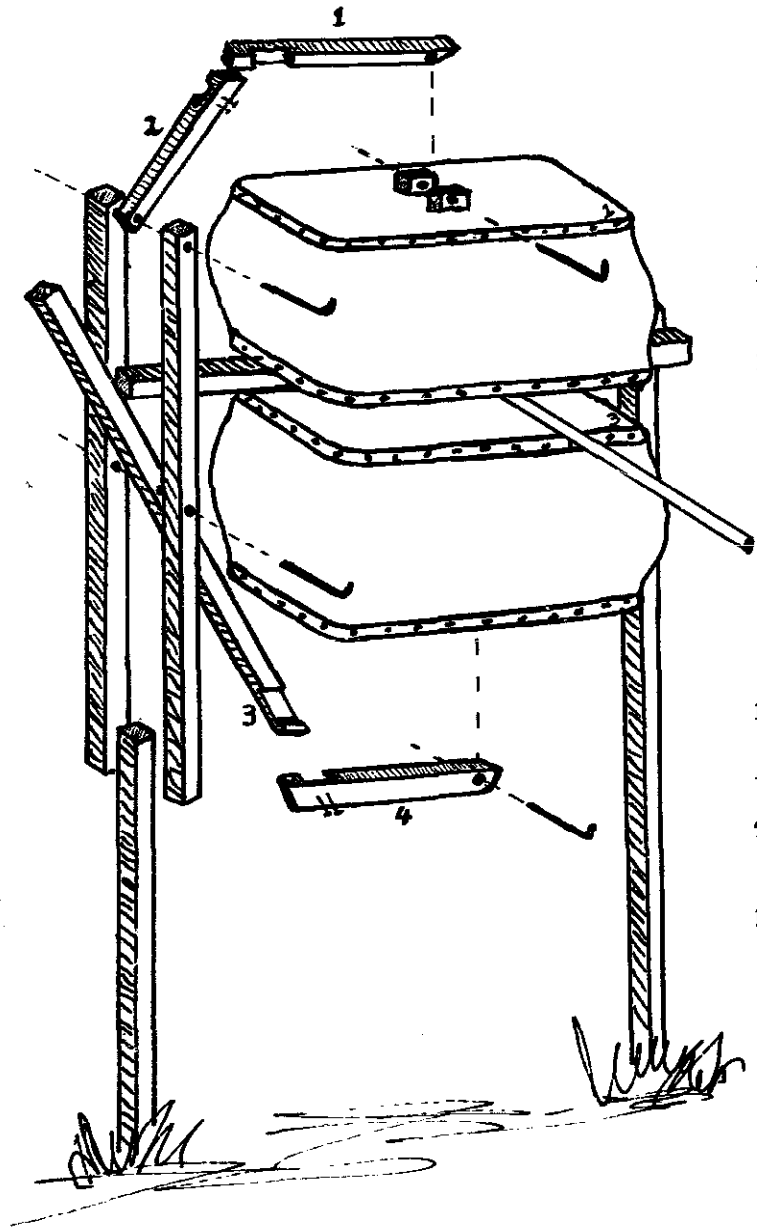


CUT 4 MORE PIECES OF WOOD

TO MAKE ARMS.

MAKE THEM LONG ENOUGH SO THEY FIT

ONTO THE BELLOWS AS SHOWN.



DRILL HOLES IN THE SUPPORTS

AND ARMS WHERE SHOWN.

NAIL TOGETHER ARMS 1 AND 2.

NAIL TOGETHER ARMS 3 AND 4.

PUT THE ARMS IN PLACE

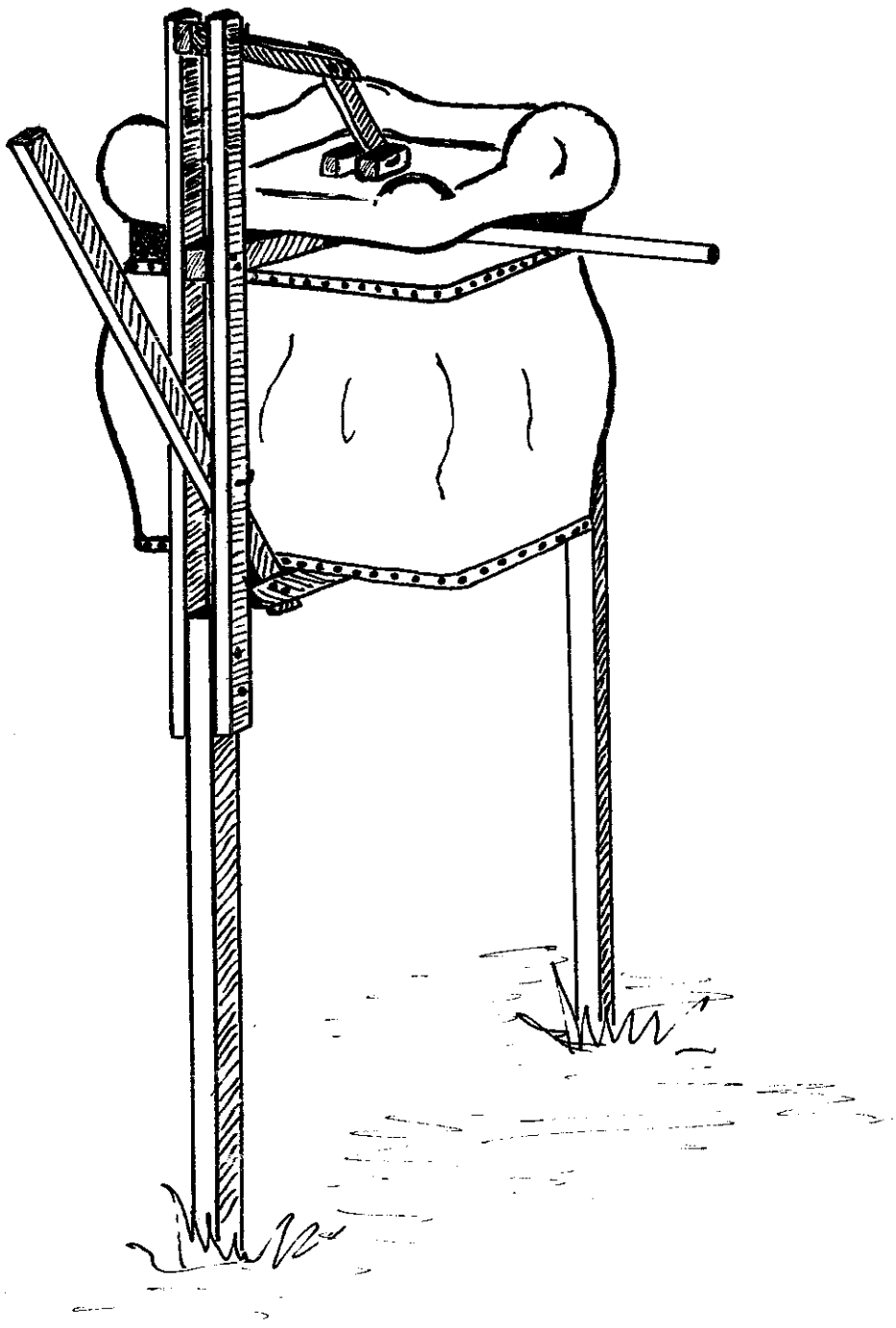
AND PUT THE METAL RODS

THROUGH THE DRILLED HOLES.

MAKE SURE THE ARMS MOVE FREELY.

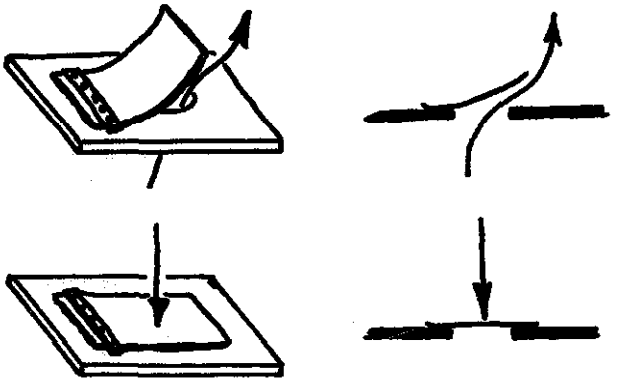
FIT THE PIPE INTO THE HOLE

MADE IN STEP NUMBER 12.



THE FINISHED BELLOWS LOOK LIKE THIS.

HOW IT WORKS



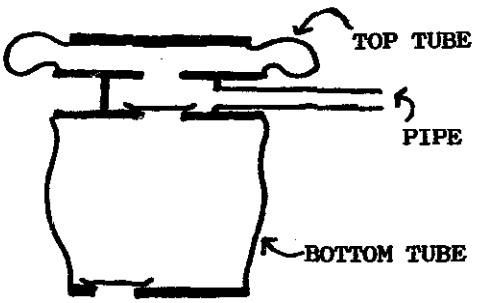
AIR MOVES THROUGH THE HOLE

IN ONE DIRECTION.

THE FLAP STOPS THE AIR

FROM MOVING BACK

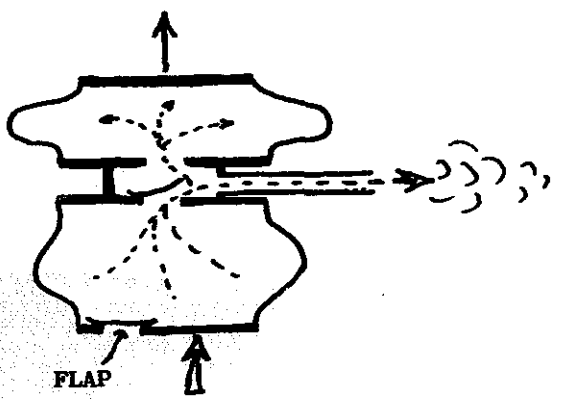
IN THE OTHER DIRECTION.



WHEN YOU START TO USE THE BELLOWS,

THE TOP TUBE HAS NO AIR IN IT.

THE BOTTOM TUBE IS FULL OF AIR.



THE HANDLE PUSHES UP THE BOTTOM TUBE.

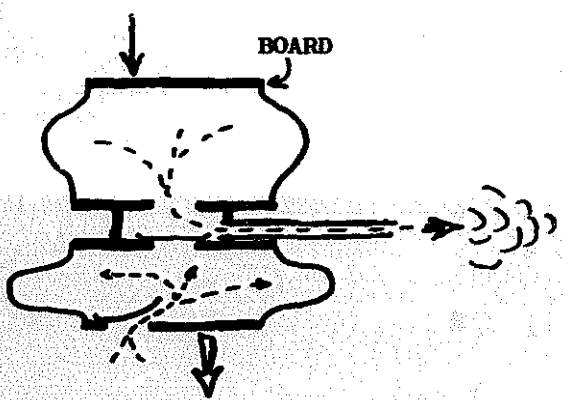
THIS FORCES AIR OUT THROUGH THE PIPE,

AND INTO THE TOP TUBE.

THE BOTTOM FLAP STOPS THE AIR

FROM GOING OUT THROUGH THE HOLE

IN THE BOTTOM BOARD.



THEN THE BOTTOM TUBE FALLS DOWN AGAIN.

THIS SUCKS AIR BACK INTO THE

BOTTOM TUBE THROUGH THE HOLE.

AT THE SAME TIME, THE AIR

IN THE TOP TUBE IS BEING FORCED OUT

THROUGH THE PIPE BY THE WEIGHT OF

THE BOARD ON TOP.

SO THERE IS ALWAYS AIR

COMING OUT THROUGH THE PIPE.