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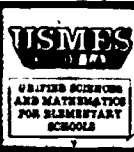
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IDENTIFIERS National Science Foundation; *Unified Science Mathematics for Elementary Schools

ABSTRACT

The major emphasis in all Unified Sciences and Mathematics for Elementary Schools (USMES) units is on open-ended, long-range investigations of real problems. Since children often design and build things in USMES, 26 "Design Lab" cards provide information on the safe use and simple maintenance of tools. Each card has a large photograph of the tool or tools on the top. The first frame on most cards is a photograph of a child holding the tool, providing the user with an understanding of how the tool is held. Remaining frames describe important skills in using the tool. Primary grade students or older students with reading problems should find the large photographs/illustrations useful in understanding the material presented with little reliance on accompanying word descriptions. Tools described include: electric tools (saber saw, electric drill, glue gun, soldering gun); handsaws (crosscut, coping, keyhole saws and hacksaw); other hand tools that cut (files, circle cutter, wood chisel, block plane, hand drill); holding tools (pliers, "C" clamp, screwdriver, hammer, size of nails); and measuring tools (combination square, rafter square, level). Additional cards provide instructions for maintaining a saber saw and electric drill and for making a sawhorse, tri-wall slot, and bend in a tri-wall.
(Author/JN)

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HOW TO SERIES



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DESIGN LAB

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Mary Ashford

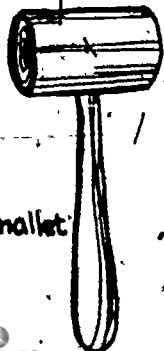
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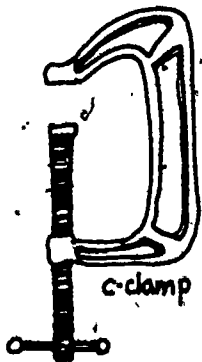
wood chisel



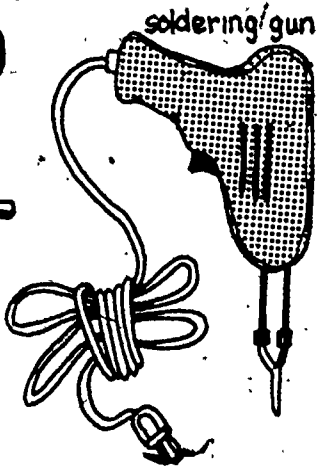
half-round file



mallet



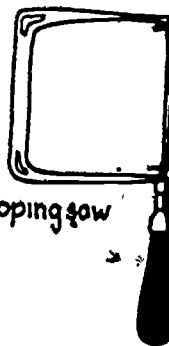
C-clamp



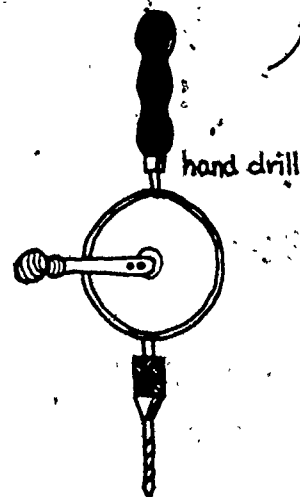
soldering gun



slip-joint pliers



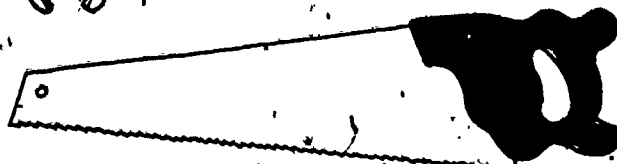
coping saw



hand drill



block plane



crosscut saw

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WHAT IS USMES ?

USMES challenges students to solve real problems within their school and community. Children tackle problems like a busy or unsafe intersection near their school, classroom furniture that doesn't fit them, or playgrounds that are crowded or uninteresting. These problems have immediate and practical impact on students. They have no established, correct solutions--students take or recommend action based upon whatever data they collect and analyze. Furthermore, the children themselves, not the teacher, direct the problem-solving process.

Solving real problems is interdisciplinary: skills, processes, and concepts from science, mathematics, social science, and language arts all play a part. For example, students conduct opinion surveys, build measuring devices, write letters, and make and use graphs. They also make decisions, work productively in small groups, and develop and clarify values.

The USMES curriculum is organized into twenty-six problems, or units, that have been developed in the classroom by teachers and students in a wide variety of schools. Most units can be used in grades K-8 although the level at which students approach a problem and develop a solution will vary according to age, ability, and interest.

RESOURCES FOR AN USMES PROGRAM

In addition to the USMES "How To" Series, there are--

The USMES Guide: This book describes the USMES project, real problem solving, classroom strategies, the Design Lab, the units, and the support materials as well as ways that USMES helps students learn basic skills.

Teacher Resource Books (one per unit): Each of these guides to using USMES units describes a broad problem, explains how students might narrow that problem to meet their particular needs, recommends classroom strategies, and presents logs from teachers whose classes have worked on the unit.

Design Lab Manual: This guide helps teachers and administrators set up, run, and use a Design Lab--a place with tools and materials where students can build things they need for their work on USMES units. A Design Lab may be a corner of a classroom, a portable cart, or a separate room.

Background Papers: These papers, correlated with the "How To" Series, provide teachers with information and hints that do not appear in the student materials.

Curriculum Correlation Guide: By correlating the twenty-six USMES units with other curriculum materials, this book helps teachers integrate USMES with other school activities and lessons.

The How To Series is a resource developed by the USMES project, Earle L. Lomon, Project Director, Betty M. Beck, Associate Director for Development, Thomas L. Brown, Associate Director for Utilization Studies, Quinton E. Baker, Associate Director for Administration

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THE USMES DESIGN LAB "HOW TO" SERIES

HOW TO USE THE CARDS

Please look over all the cards in the Design Lab "How To" series before using them with children.

Hanging the Design Lab "How To" Cards on a bulletin board or on the wall near the tools is a good way to make the cards easily accessible to young builders. A clearly marked box of a loose leaf notebook kept near the tools are other good places to keep the cards.

Students should use the Design Lab series as the need arises. Give the students a brief explanation of how the cards can be used and leave the rest up to them (all electrical tools require an adult to be present when students are using tools).

When students do have questions, it might prove useful to know how the cards have been arranged.

- o Each card has a large photograph of the tool or tools at the top.
- o On most cards, the first frame is a photograph of a child holding the tool. This provides the young user with an understanding of how the tool is held.
- o The remaining frames describe important skills in using the tool. Those skills which children have used most frequently have been placed first.
- o As much as possible, directions, warnings, and types of arrows, etc., have been consistently used throughout the series. One problem is metric vs. English. Metric is used as much as possible, but lumber and many tools are still only available in the English system.

USMES and Skills

USMES students often see a need to learn new skills to help them get a problem-solving job done. Children seeking to improve a street crossing may want to learn how to use a stopwatch or how to make a trundle wheel. Children comparing different brands of paper towels may want to learn how to design an experiment and how to make a bar graph. The list can go on and on, but the pattern is clear; solving a real problem requires skills.

PURPOSE OF THE DESIGN LAB "HOW TO" SERIES

Children often design and build things in USMES. They may, for example, decide to build tables during a Classroom Design challenge, or they may build testing equipment while working on a Consumer Research challenge. Whatever children decide to build, they will need to have skills with tools. The Design Lab "How To" series provides children information on changing saw blades, doing simple preventive maintenance, and, most importantly, using tools safely.

Primary age children or older children with reading difficulties should find that the large photographs and illustrations make it possible to understand most of the material being presented with little reliance on the accompanying word descriptions.

OTHER USMES 'HOW TO' SERIES

Beginning "How To" Series: This series helps children learn skills like designing an opinion survey and choosing the appropriate measuring tool. Its cartoon-style format helps younger children and those with reading difficulties acquire the skills and knowledge they need to do things like redesign their classroom, find the best buy in potato chips, run a school store.

Intermediate "How To" Series: This magazine-style series covers in more detail essentially the same material as the cartoon-style series with a few booklets on additional skills. This series gives students a chance to read something they have a need to read.

DESIGN LAB "HOW TO" SERIES

ELECTRIC TOOLS

HOW TO

Use a Saber Saw
Use an Electric Drill (Yellow)
Use a Glue Gun
Use a Soldering Gun

HAND SAWS

HOW TO

Use a Crosscut Saw
Use a Coping Saw (Blue)
Use a Keyhole Saw
Use a Hacksaw

OTHER HAND TOOLS THAT CUT

HOW TO

Use a File
Use a Circle Cutter (Green)
Use a Wood Chisel
Use a Block Plane
Use a Hand Drill

TOOLS THAT HOLD

HOW TO

Use Pliers
Use "C" Clamps
Use a Screwdriver (Brown)
Use a Hammer
Find the size of Nails

TOOL MAINTENANCE

HOW TO

Maintain a Saber Saw (gray)
Maintain an Electric Drill

MAKING A...

HOW TO

Make a Sawhorse
Make a Tri-Wall Slot (Orange)
Make a Bend in Tri-Wall

TOOLS THAT MEASURE

HOW TO

Use a Combination Square
Use a Rafter Square (Pink)
Use a Level

Created by Charles Donahoe, Barbara Low, and John Saalfield.

Photography by Jim Byler.

Thanks to the teachers who helped in the evaluation of these cards, and to Frank O'Brien, Wesley Perusek, Ed Manfre, and Peter D. Zevitas for their technical assistance.

Special thanks to the hands: Kerri Donahoe and Kyle Gore

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HOW TO

USE A SABER SAW

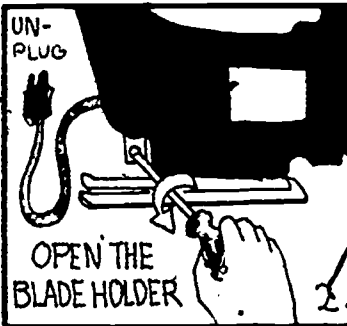


USIMES
DESIGN LAB
UNIFIED SCIENCES
AND MATHEMATICS
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WARNING: ALWAYS HAVE AN ADULT PRESENT WHEN YOU USE A SABER SAW.

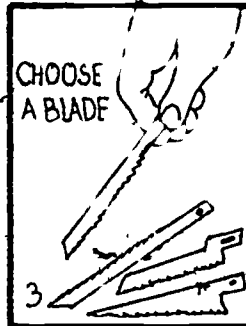


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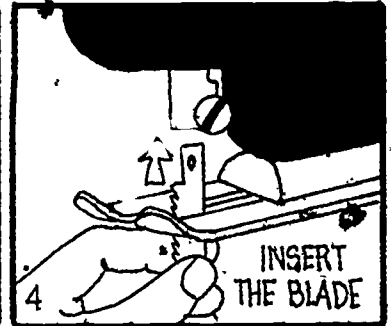
OPEN THE BLADE HOLDER

2



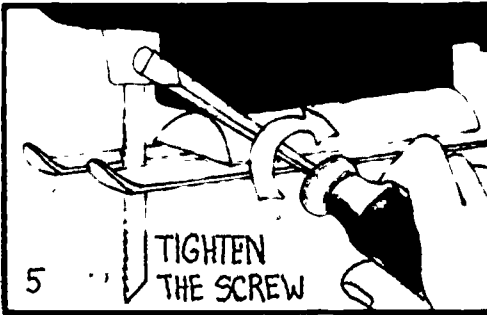
CHOOSE A BLADE

3



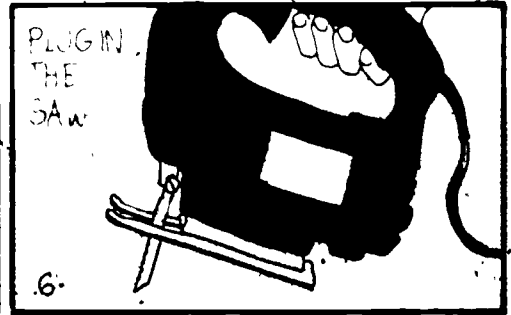
INSERT THE BLADE

4



TIGHTEN THE SCREW

5



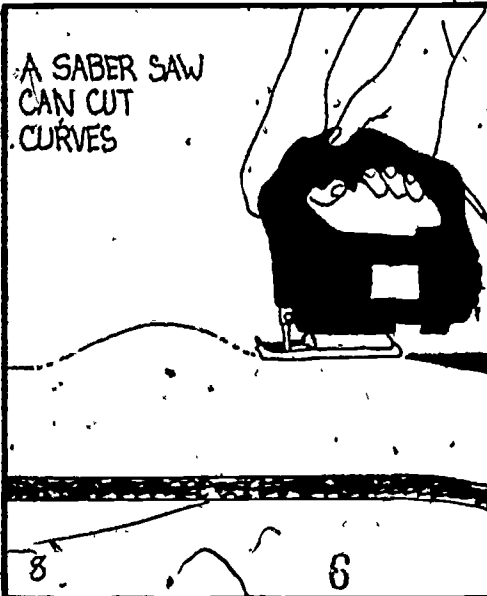
PLUG IN THE SAW

6



START THE SAW BEFORE CUTTING

7



A SABER SAW CAN CUT CURVES

8

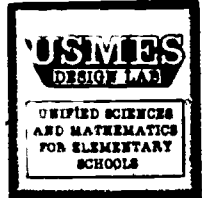
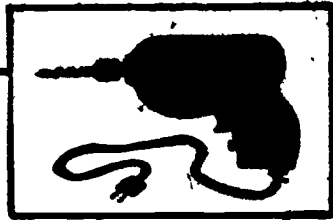


UNPLUG WHEN FINISHED

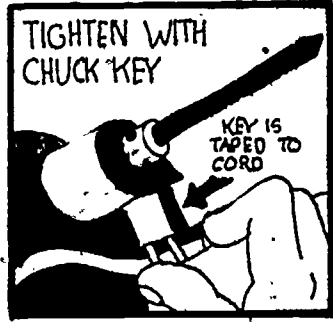
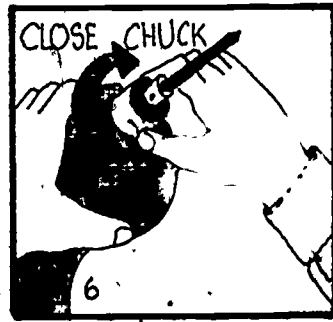
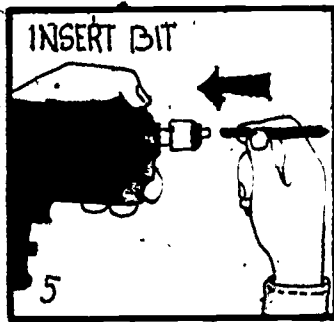
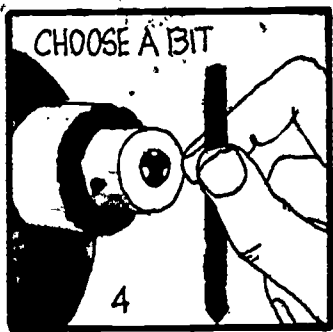
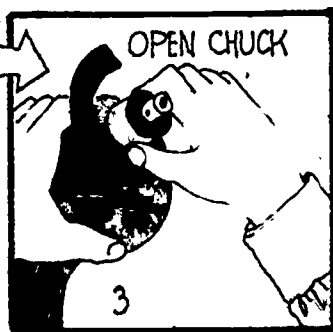
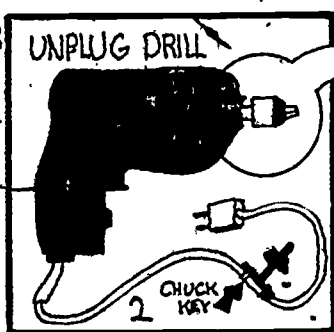
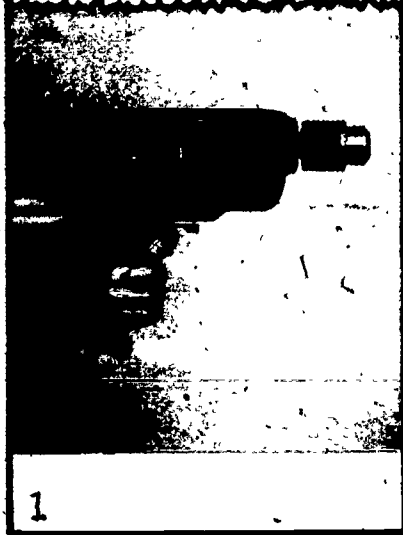


HOW TO

USE ELECTRIC DRILL

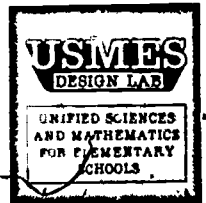
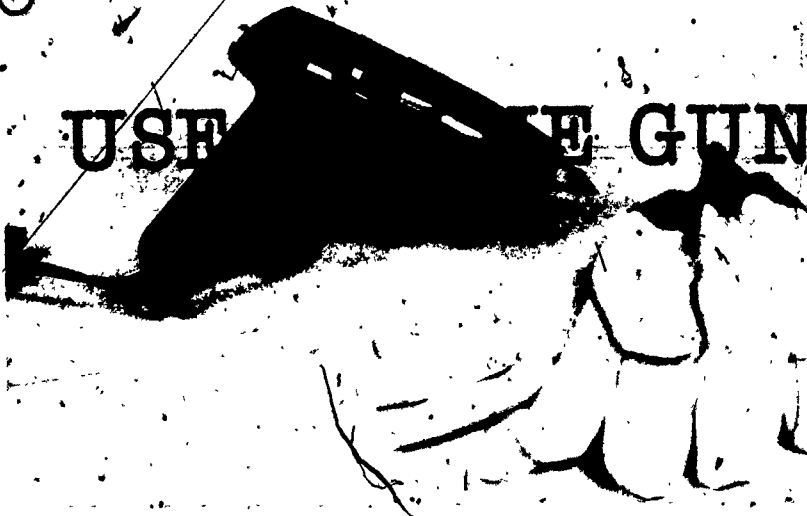


WARNING: ALWAYS HAVE AN ADULT PRESENT WHEN YOU USE THE ELECTRIC DRILL.



HOW TO

USE THE GUN



PLUG-IN (II)

HEAT GLUE GUN 2 MINUTES (2 min)

INSERT A GLUE STICK

ONE WAY TO GLUE: ZIG ZAG THE GLUE

ANOTHER WAY: GLUE ONE SIDE...

GLUE THE OTHER SIDE

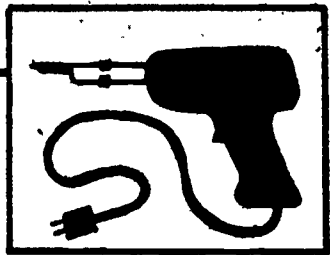
COOLING OFF STATION UNPLUG (II)

LET IT COOL 1 MINUTE

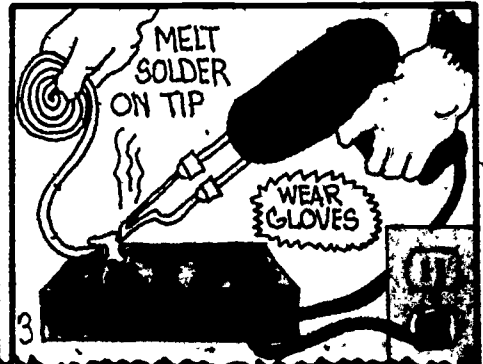
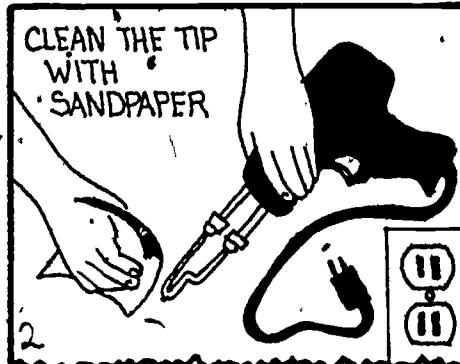
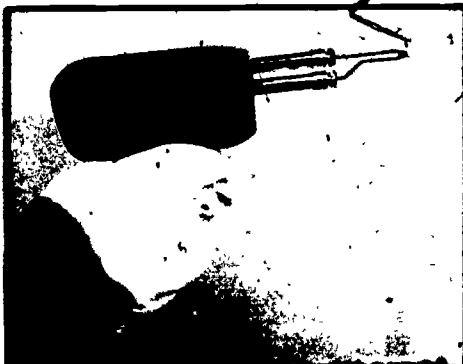


HOW TO

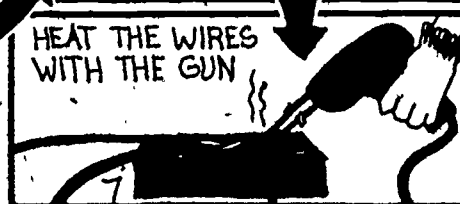
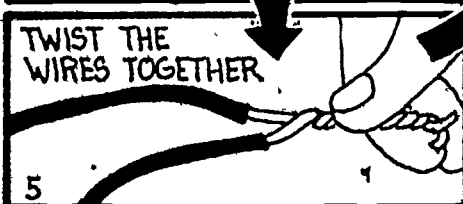
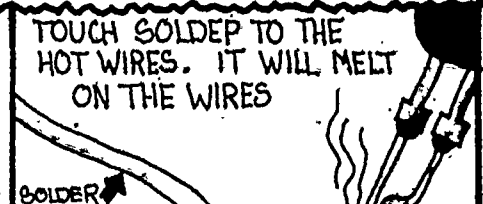
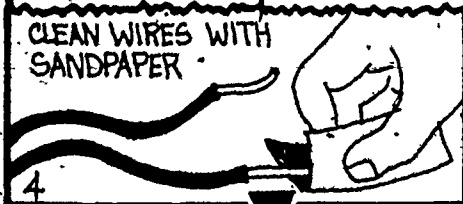
USE SOLDERING GUN



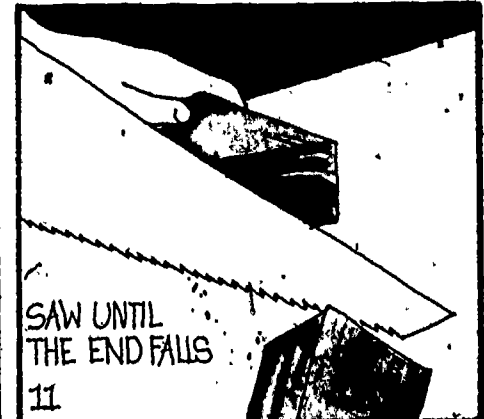
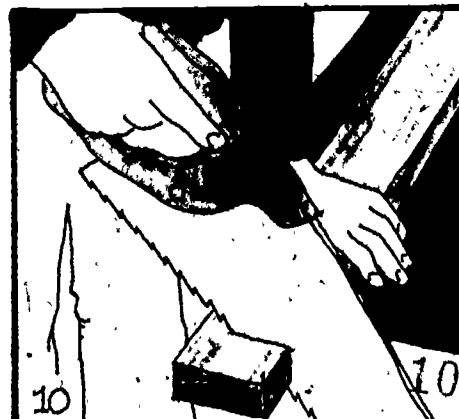
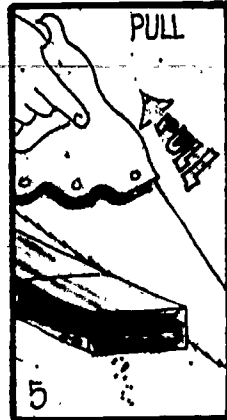
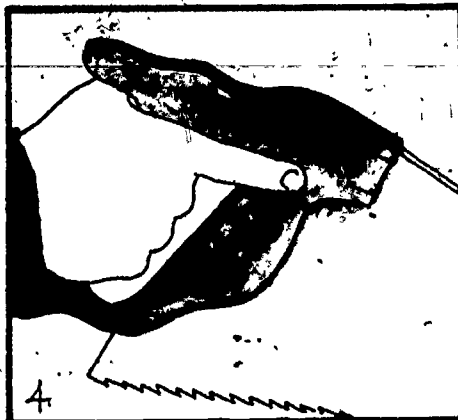
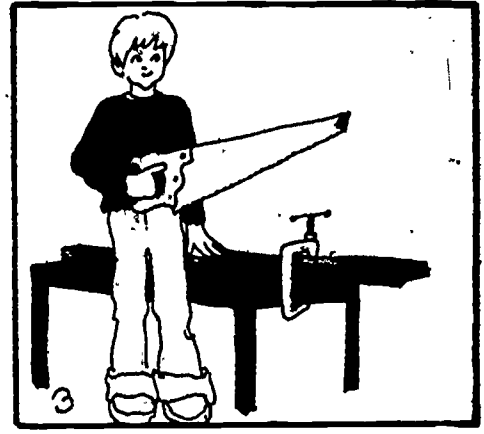
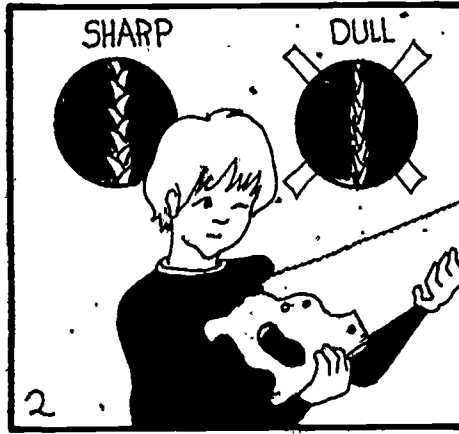
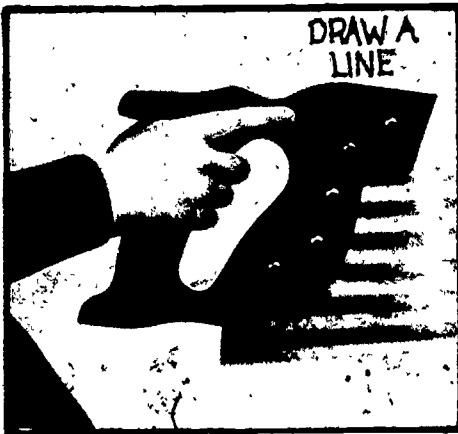
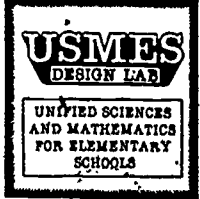
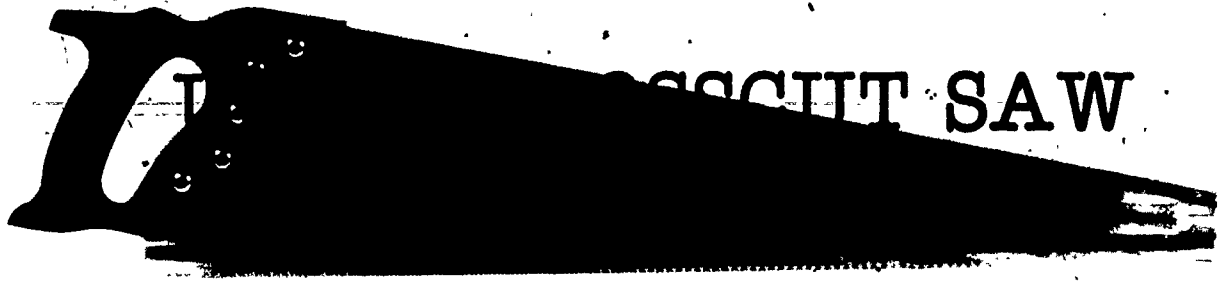
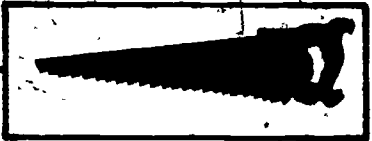
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CAUTION: DO NOT TOUCH THE FRONT OF THE SOLDERING GUN!

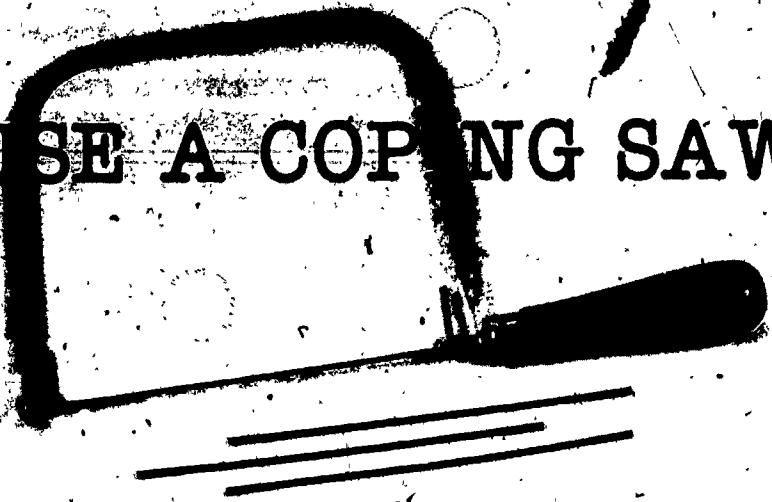
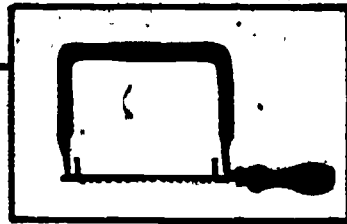


HOW TO



HOW TO

USE A COPING SAW



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1 TO CHANGE A BROKEN BLADE...

2 TURN HANDLE TO UNSCREW

3 DROP BLADE ENDS IN SLOT

NEW BLADE

TEETH FACE THE HANDLE

4 TURN HANDLE TO TIGHTEN THE BLADE

5 PULL DOWN

6 PULL AGAIN TO MAKE A NOTCH

7 SAW UP AND DOWN

8

9 TO CUT A CURVE...

10 KEEP CHANGING THE TOP AND BOTTOM OF THE BLADE SO IT FOLLOWS THE LINE

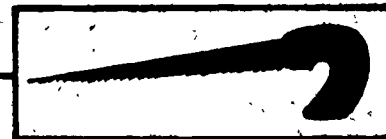
11 BACK-UP THE SAW

12 TURN TOP

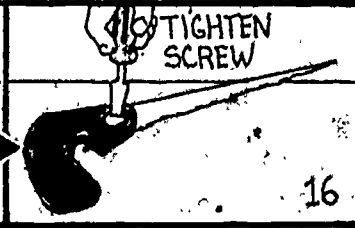
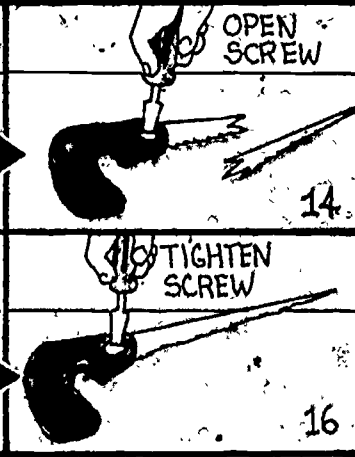
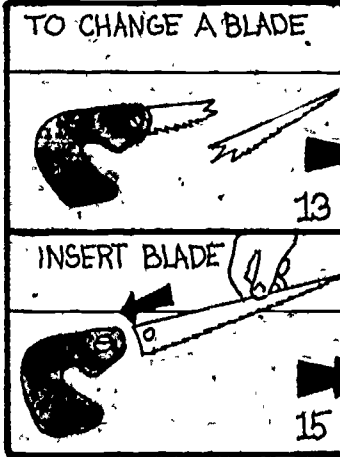
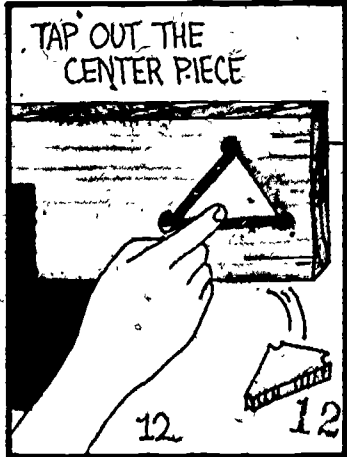
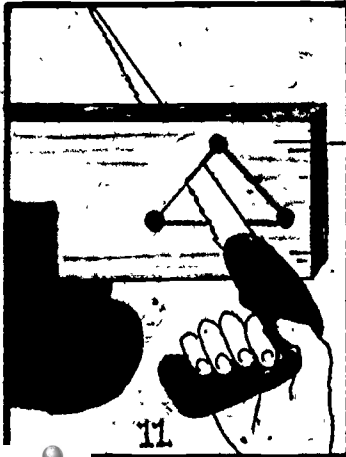
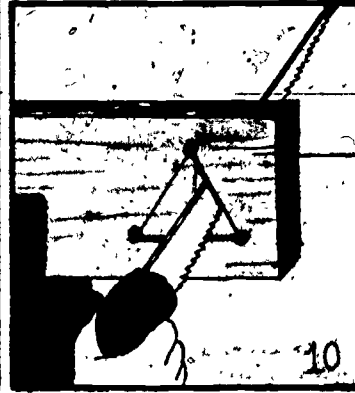
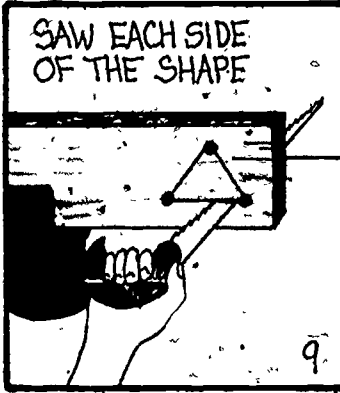
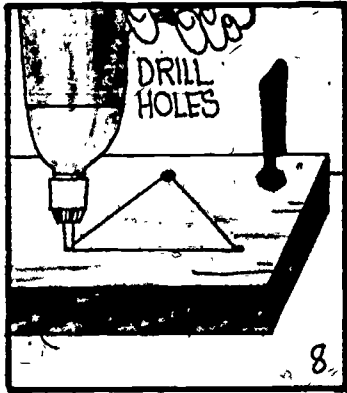
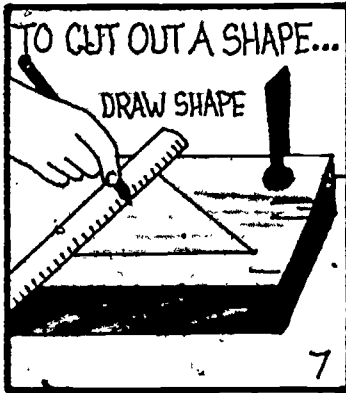
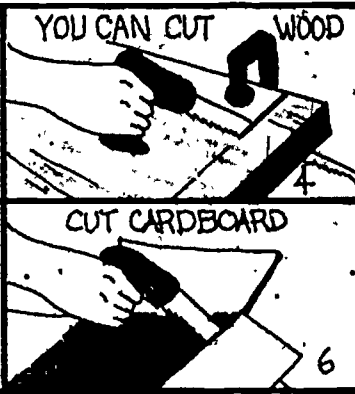
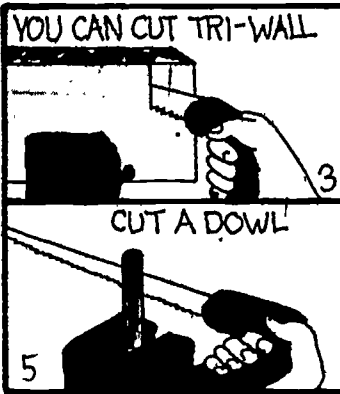
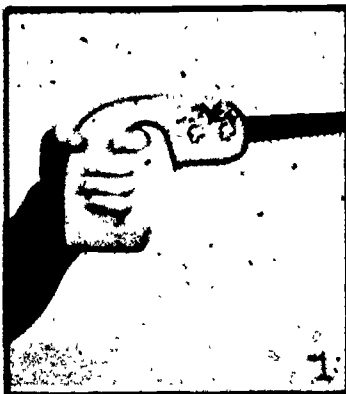
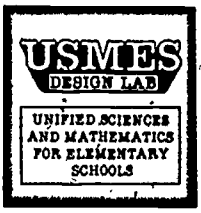
13 TURN BOTTOM

14 SAW UP AND DOWN

HOW TO

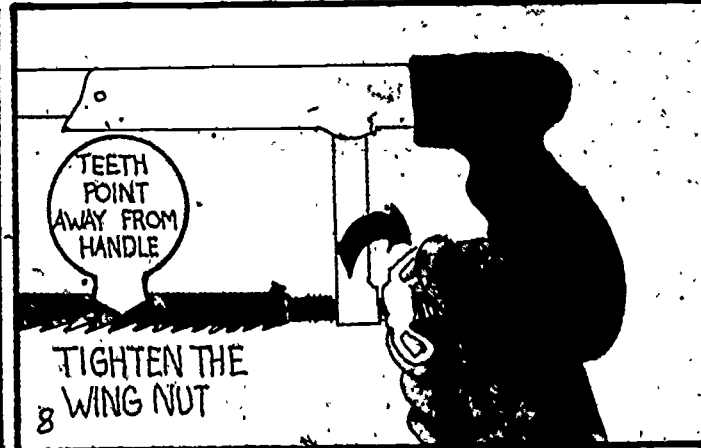
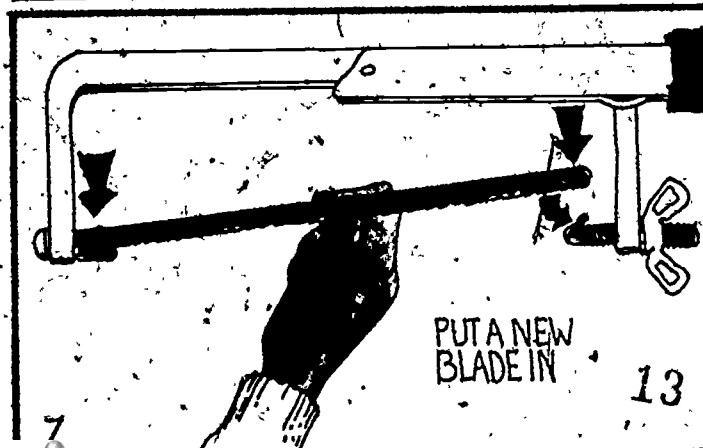
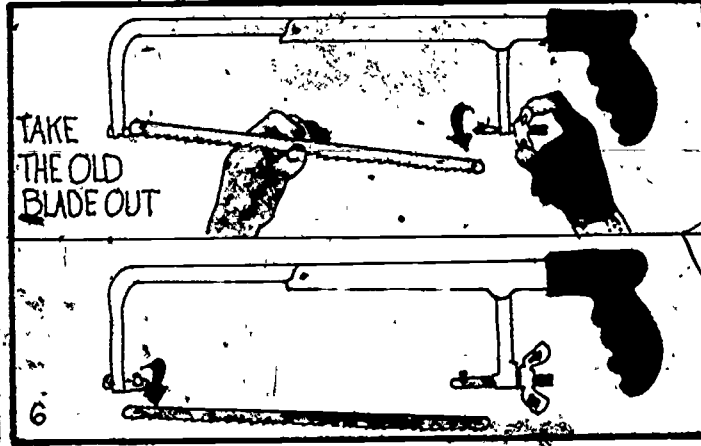
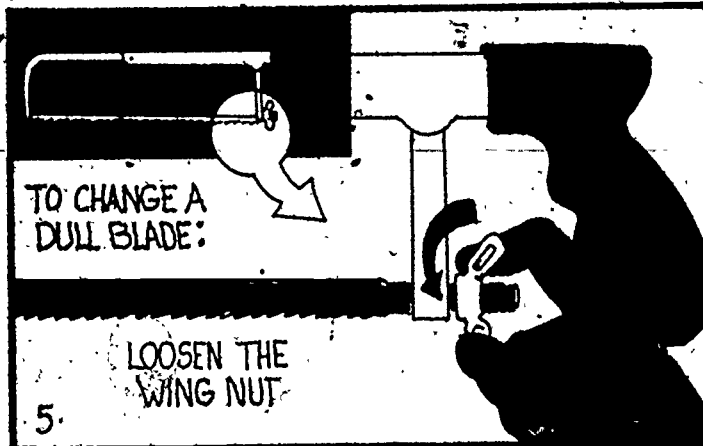
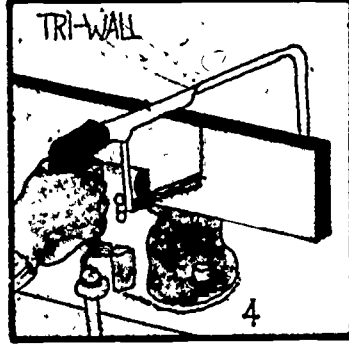
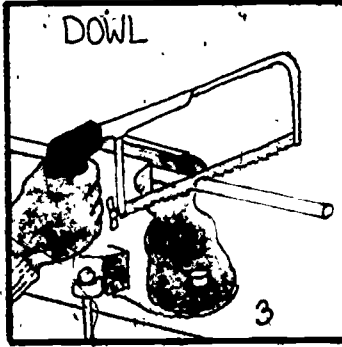
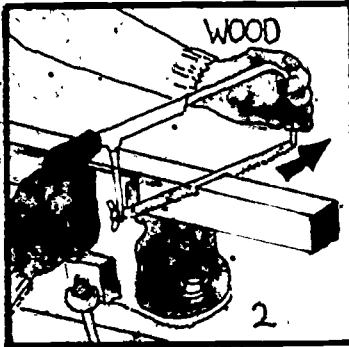
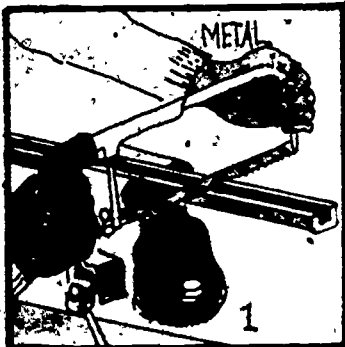
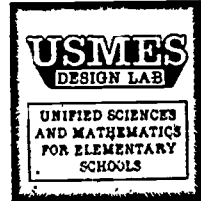


USE A KEYHOLE SAW



HOW TO

USE A HACK SAW

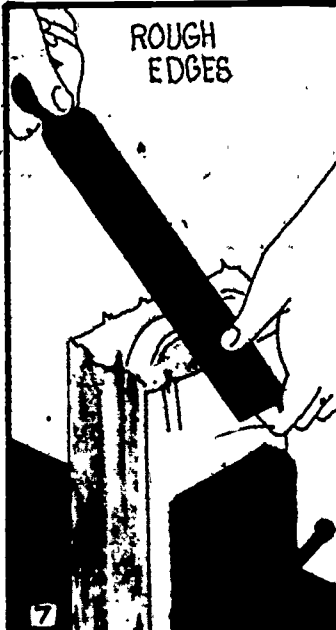
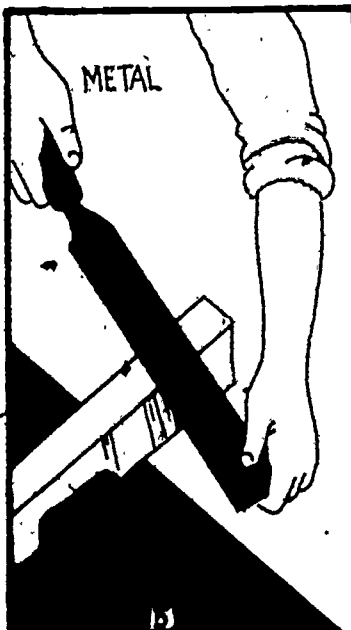
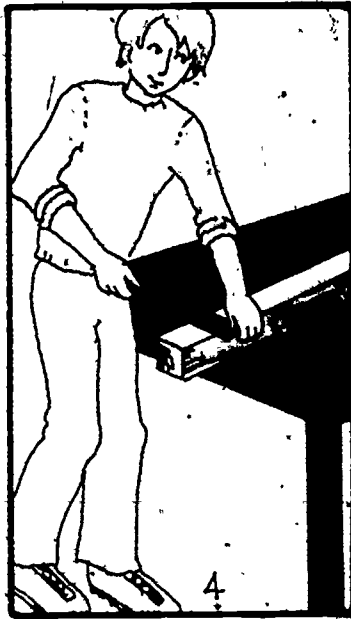
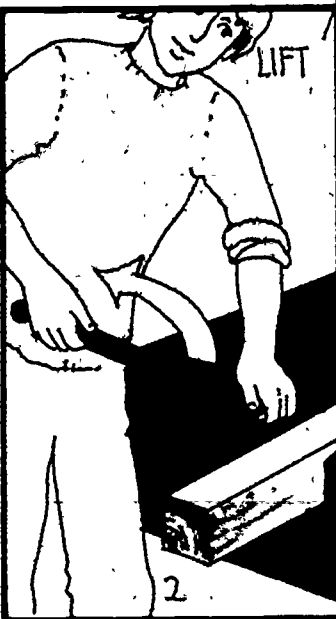


HOW TO

USE A FILE

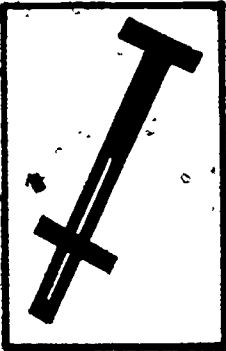


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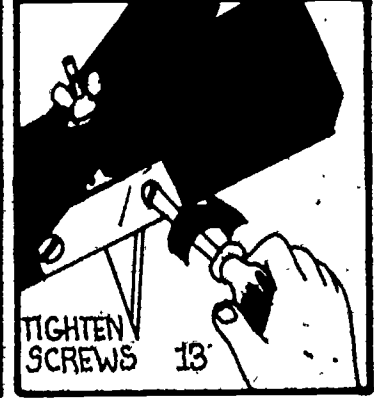
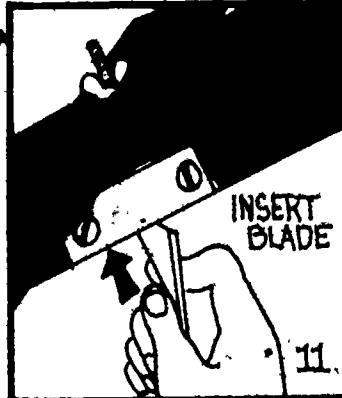
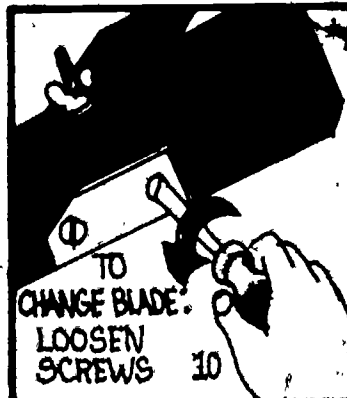
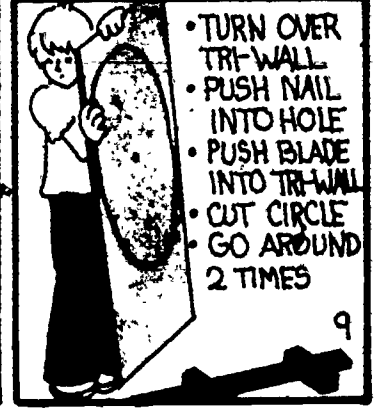
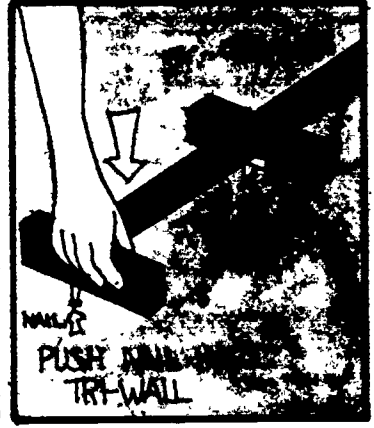
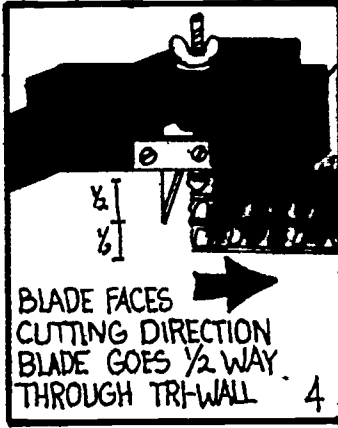
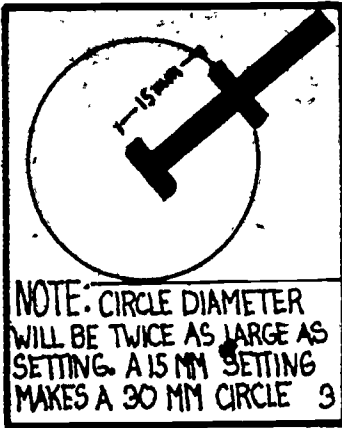
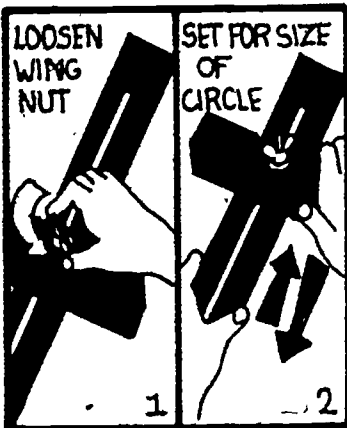


HOW TO

USE A CIRCLE CUTTER



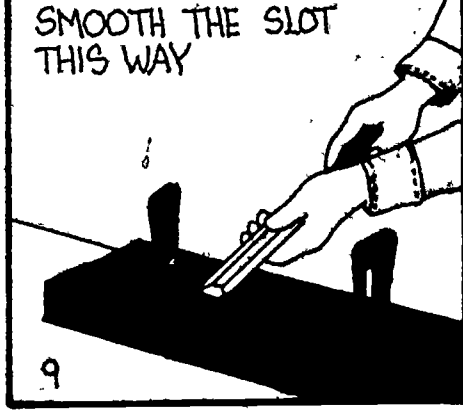
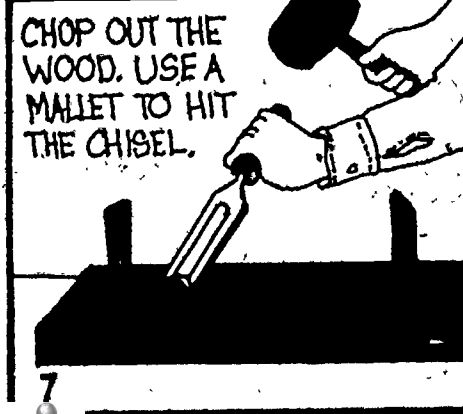
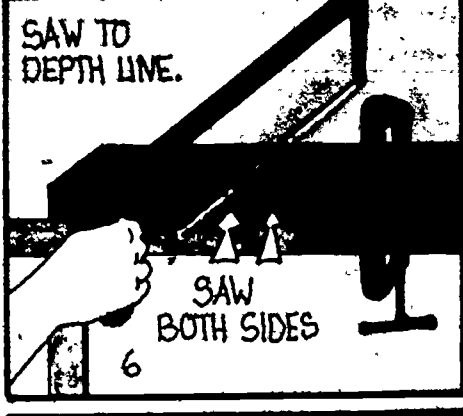
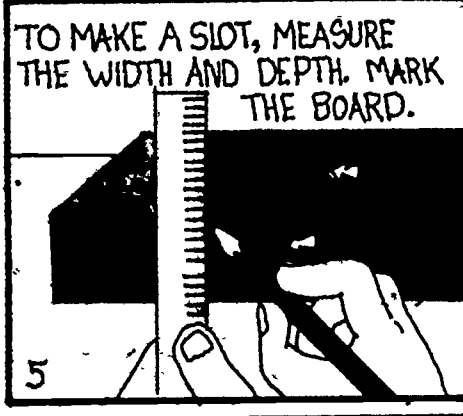
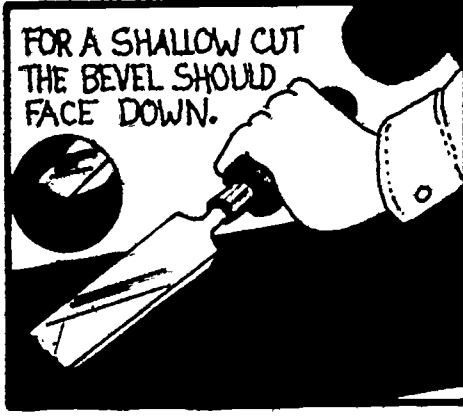
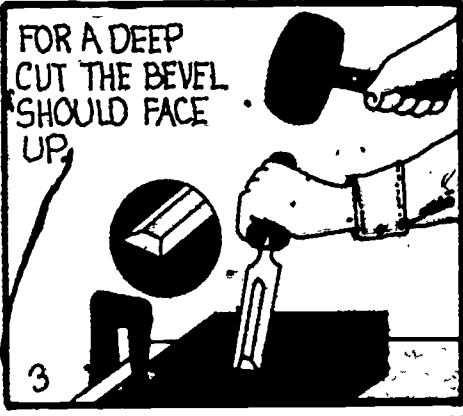
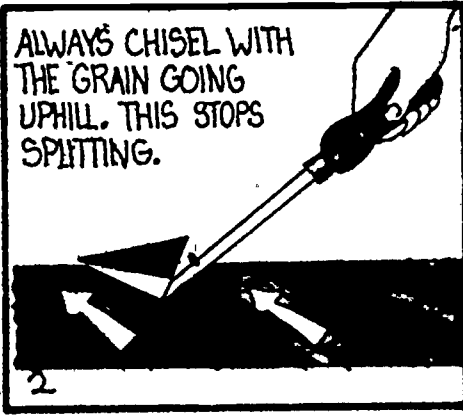
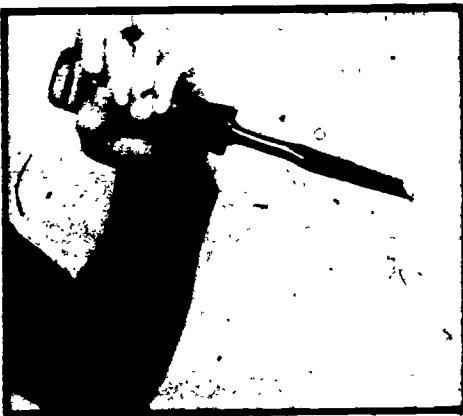
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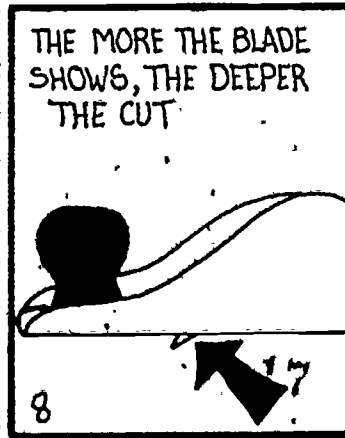
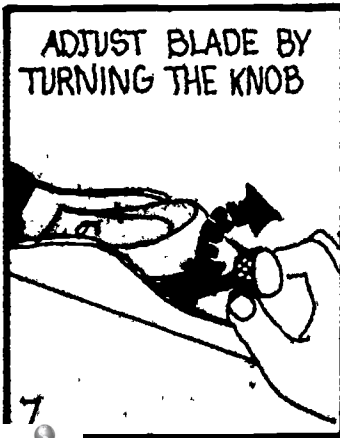
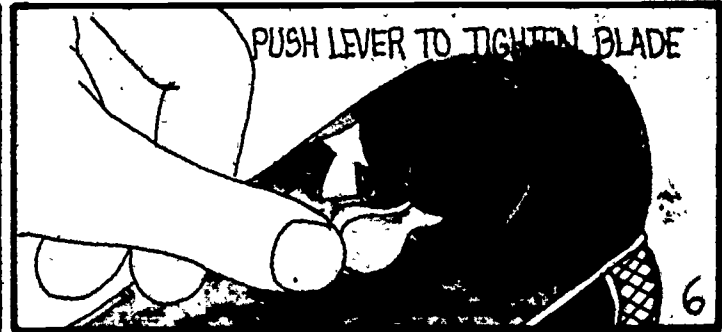
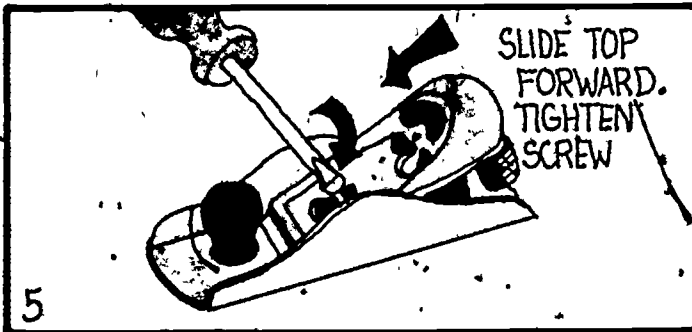
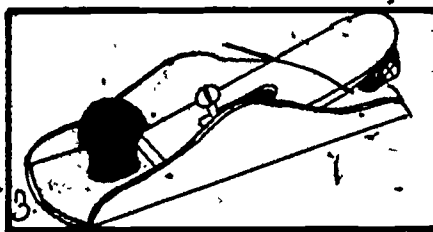
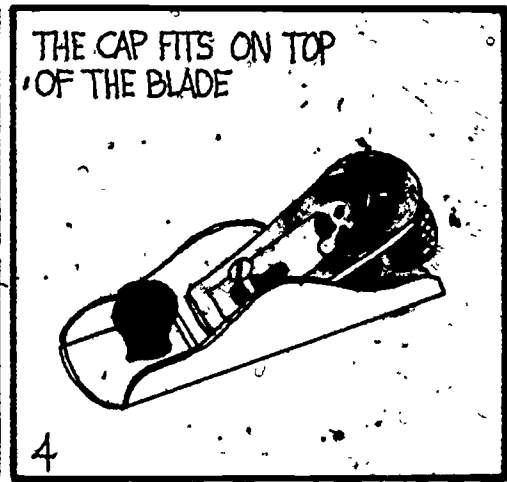
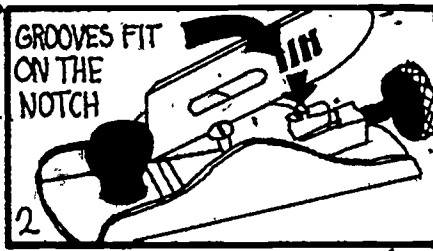
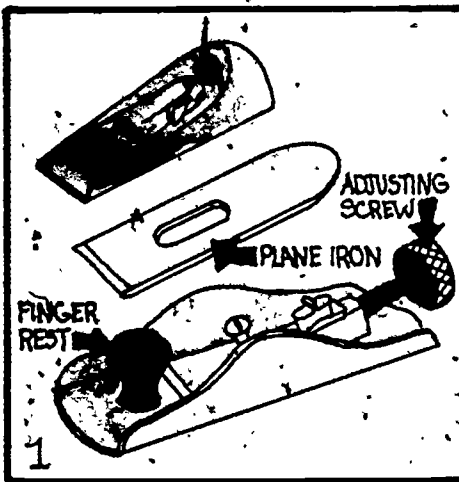
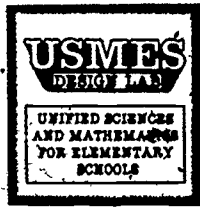
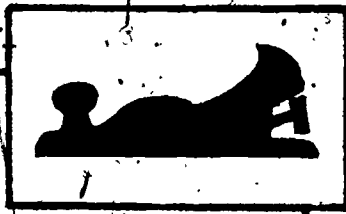
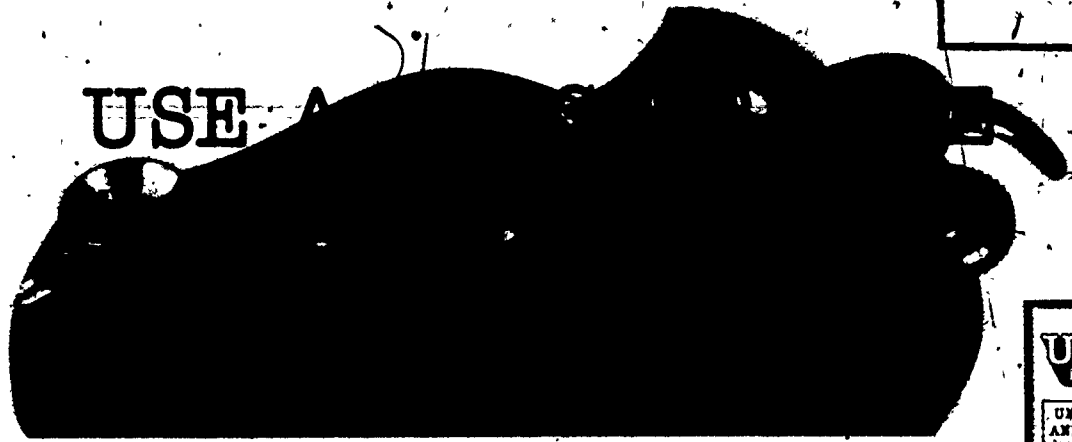


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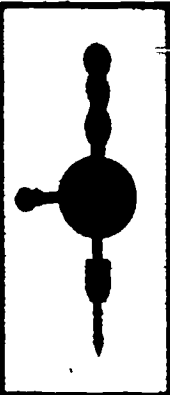
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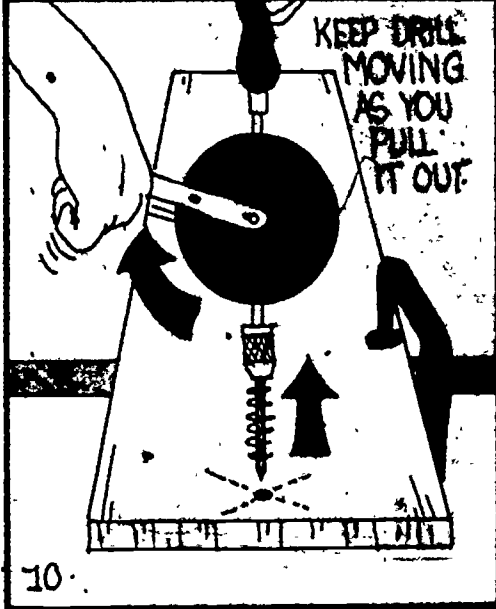
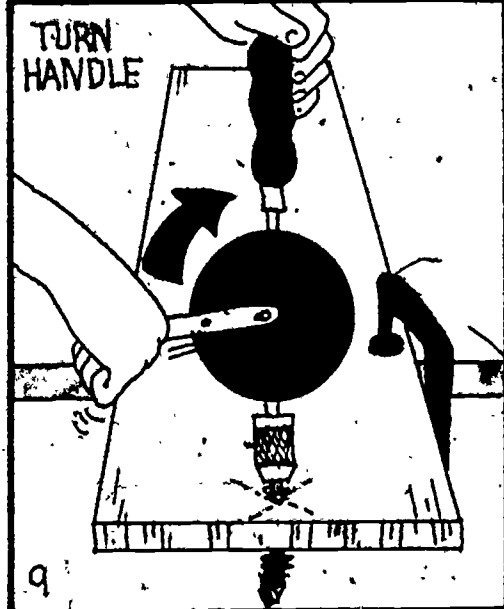
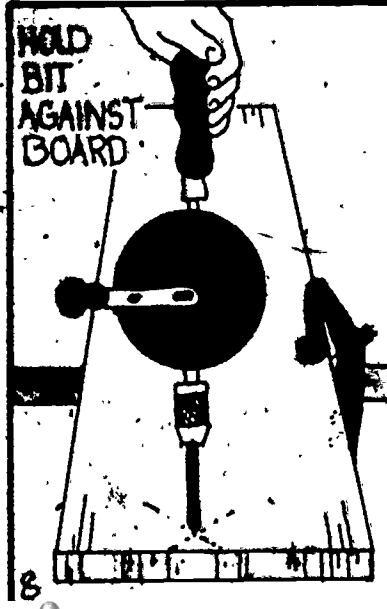
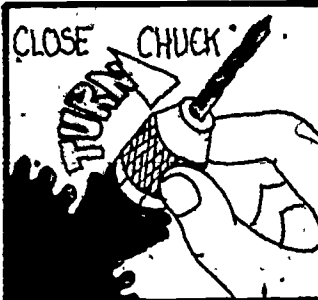
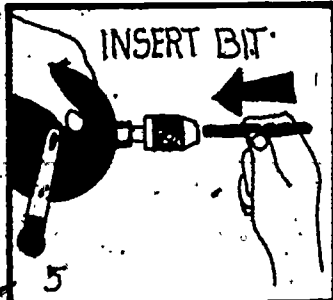
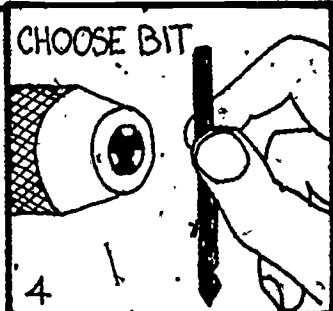
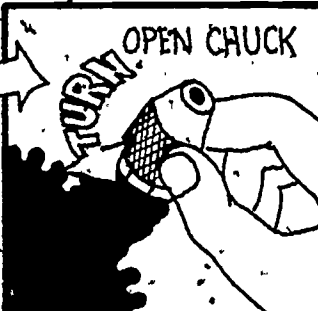
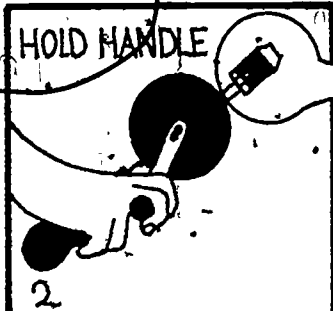
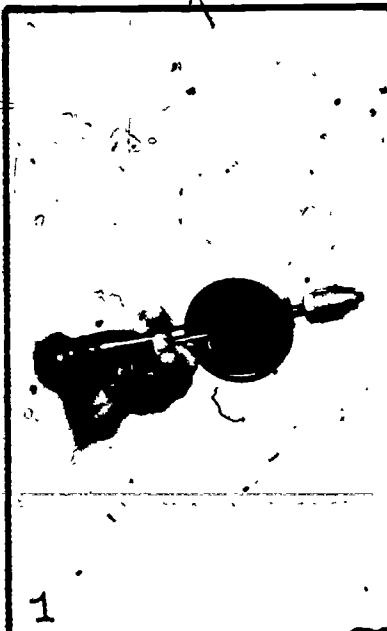


HOW TO

USE HAND DRILL

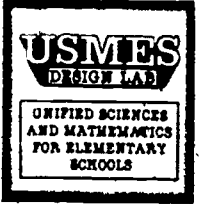


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HOW TO

USE PLIERS

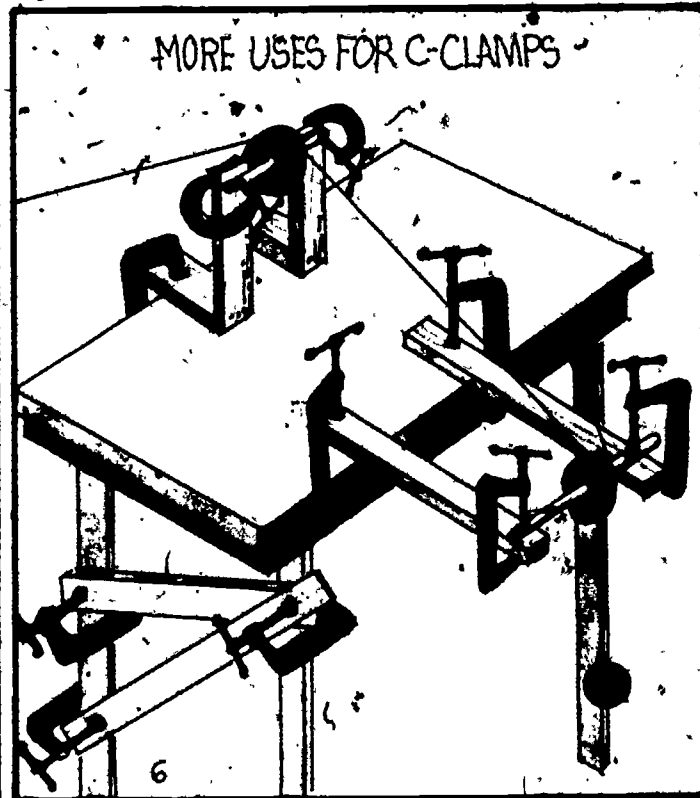
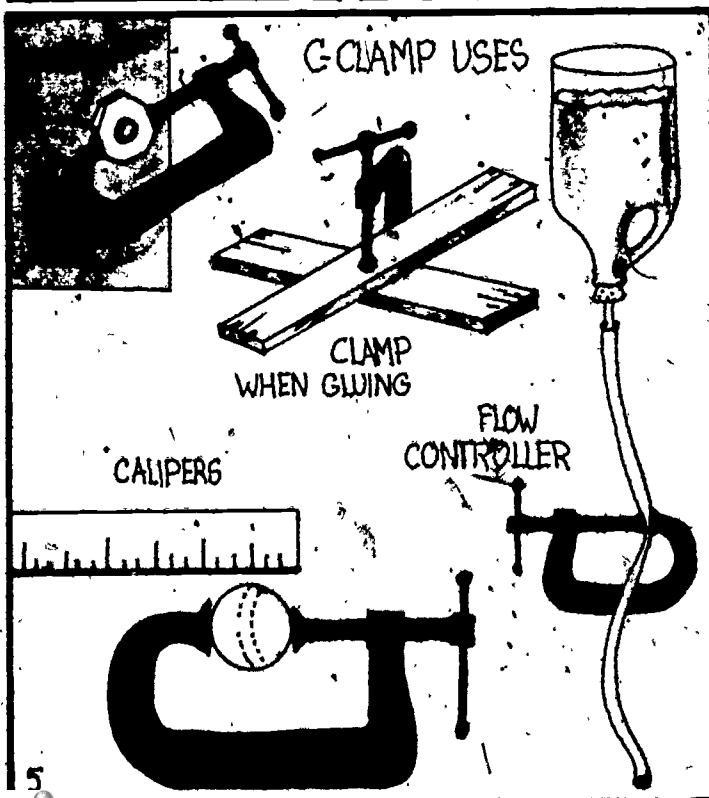
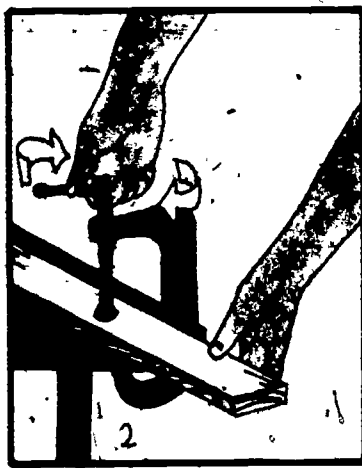
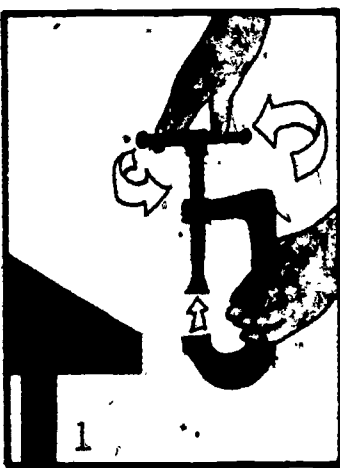


<p>1 SLIP JOINT</p>	<p>2 LINEMANS</p>	<p>3 LONGNOSE</p>	<p>4 DIAGONAL-CUTTING</p>
<p>5 VICE GRIP</p>			
	<p>6</p>	<p>7</p>	
<p>THE KNOB ADJUSTS FRONT</p>	<p>TURN KNOB TO CLOSE</p> <p>TURN TILL PLIERS ALMOST GRIP THE NUT</p>	<p>SQUEEZE HANDLES TO TIGHTEN PLIERS</p>	<p>PUSH LEVER UP TO OPEN PLIERS</p>

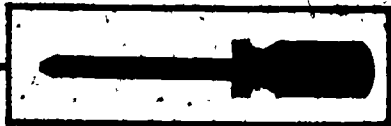
HOW TO



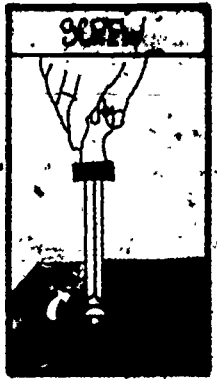
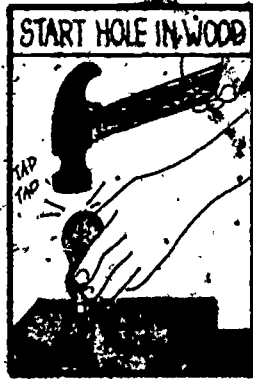
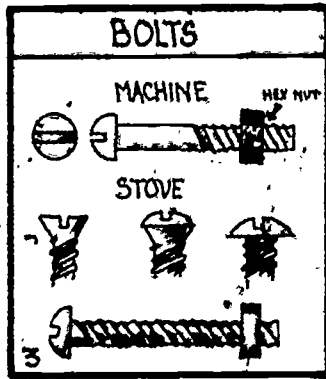
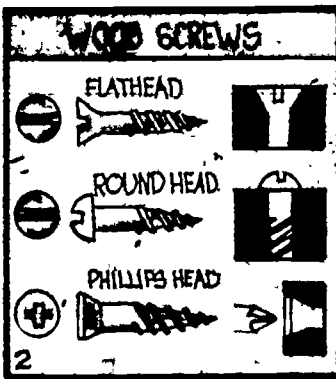
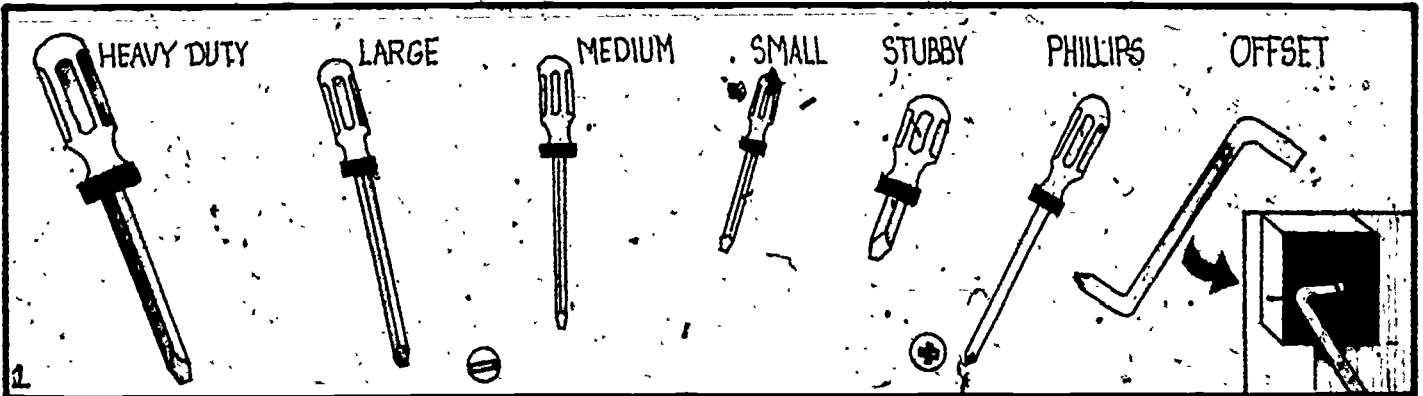
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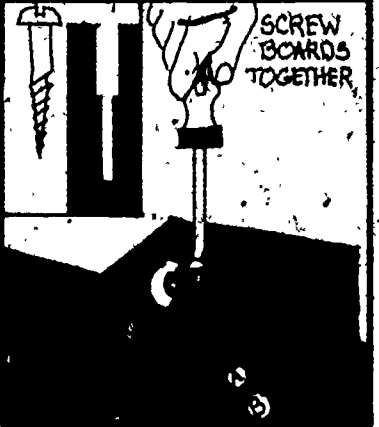
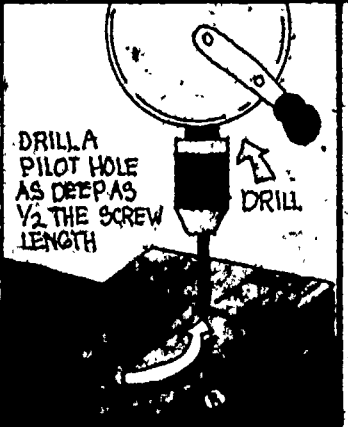
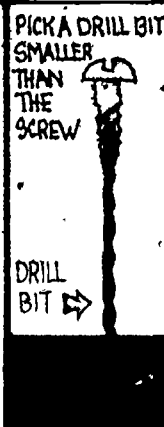
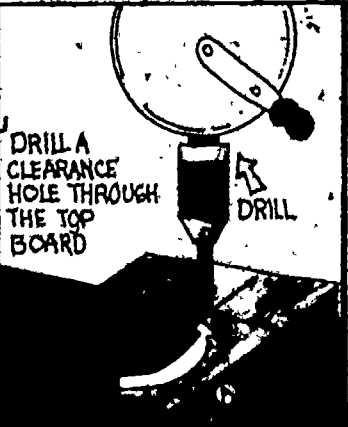
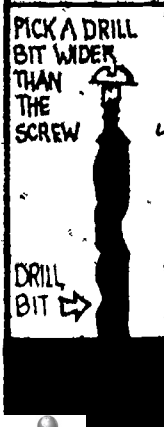
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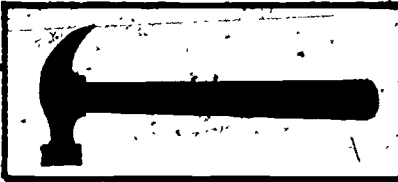
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HOW TO USE PILOT AND CLEARANCE HOLES TO SCREW TWO PIECES OF WOOD TOGETHER.

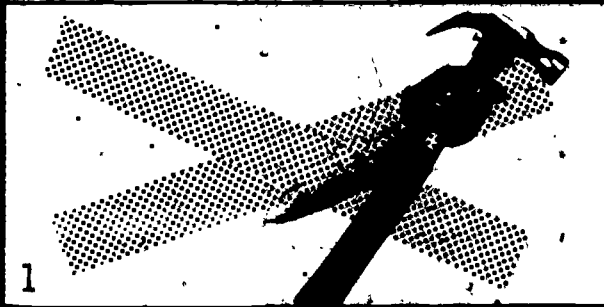


HOW TO

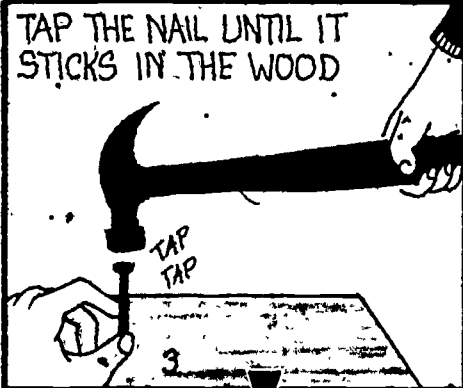


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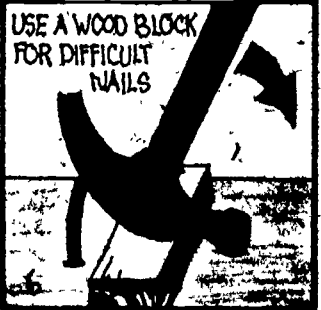
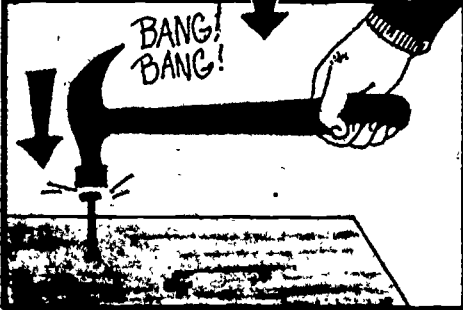
HOLD THE HAMMER AS CLOSE TO THE END AS IS COMFORTABLE.



TAP THE NAIL UNTIL IT STICKS IN THE WOOD

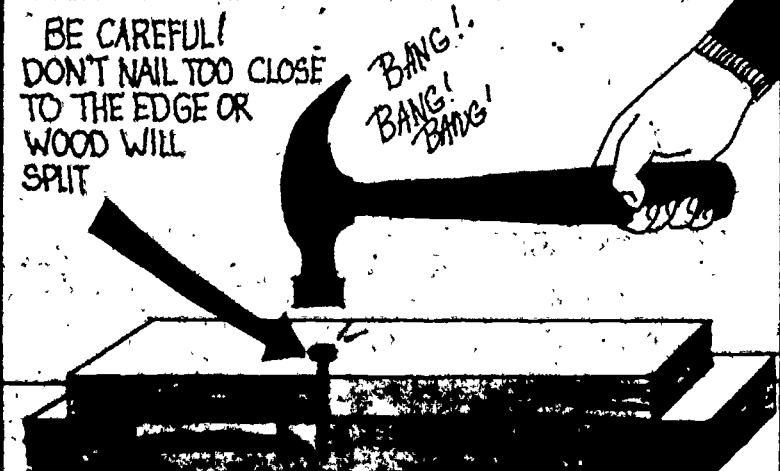


USE THE CLAW TO PULL NAILS OUT



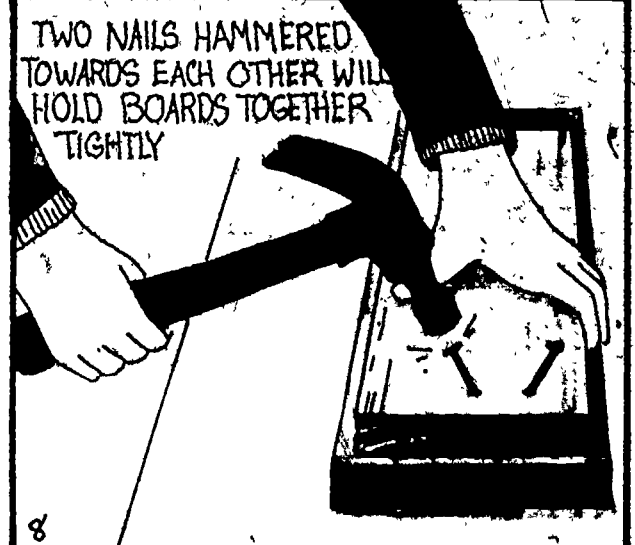
BE CAREFUL!
DON'T NAIL TOO CLOSE
TO THE EDGE OR
WOOD WILL
SPLIT

BANG!
BANG!
BANGS!

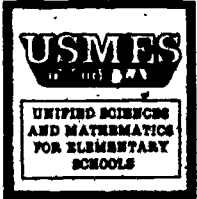
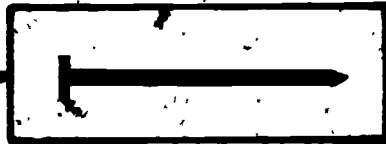


THE NAIL SHOULD GO ABOUT THIS FAR INTO THE WOOD

TWO NAILS HAMMERED
TOWARDS EACH OTHER WILL
HOLD BOARDS TOGETHER
TIGHTLY

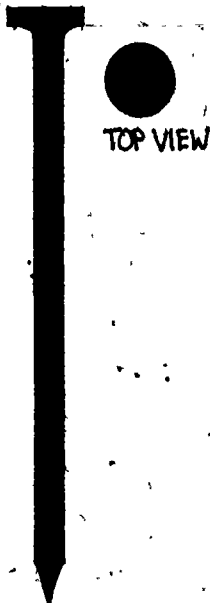


HOW TO



COMMON NAILS

COMMON NAILS HAVE HEADS
USE A COMMON NAIL
IF YOU WANT TO TAKE
THE NAIL OUT LATER

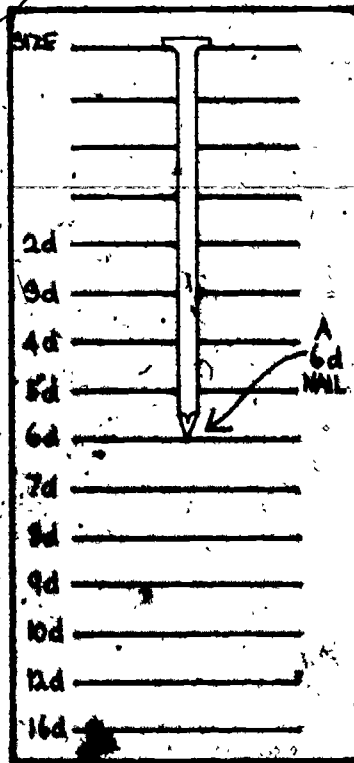


COMMON NAILS ARE
CALLED PENNY COMMON
NAILS

1

PENNY NAIL GAUGE

IF YOU WANT TO KNOW
HOW LONG A NAIL IS
HOLD IT UP TO THE
NAIL GAUGE CHART

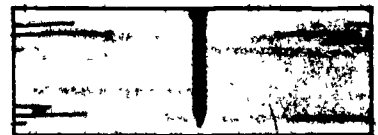


THE LETTER d STANDS FOR
PENNY
A 6d NAIL IS CALLED A
6 PENNY NAIL

2

FINISHING NAILS

FINISHING NAILS DO NOT
HAVE HEADS
USE A FINISHING NAIL
WHEN YOU DO NOT
WANT IT TO SHOW



3

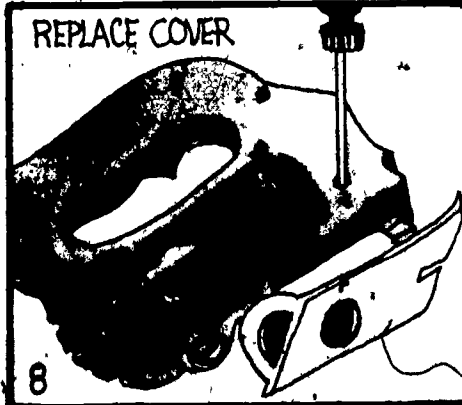
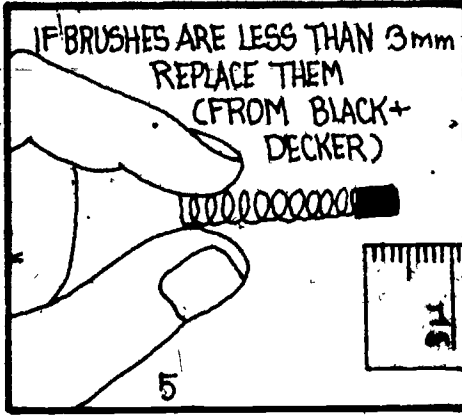
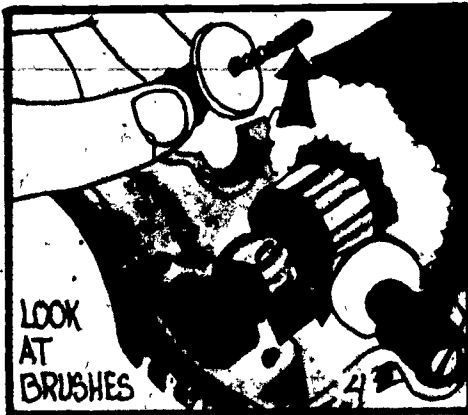
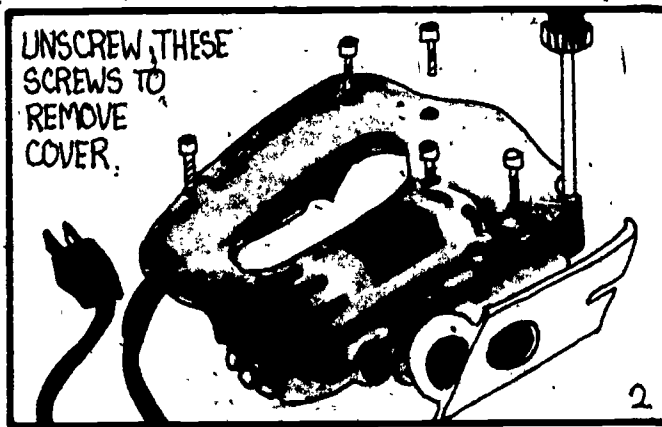
HOW TO

MAINTAIN YOUR SABER SAW



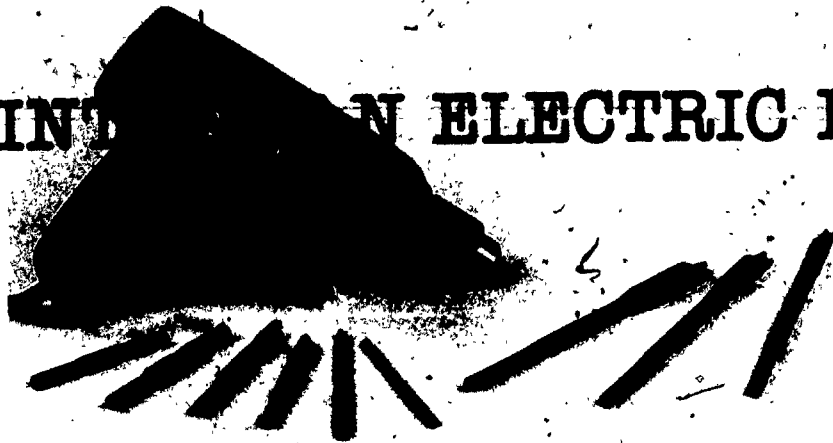
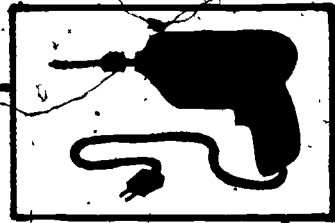
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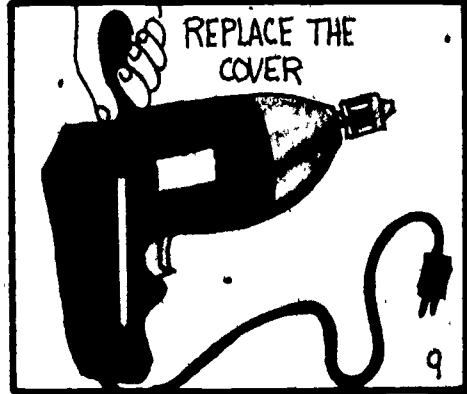
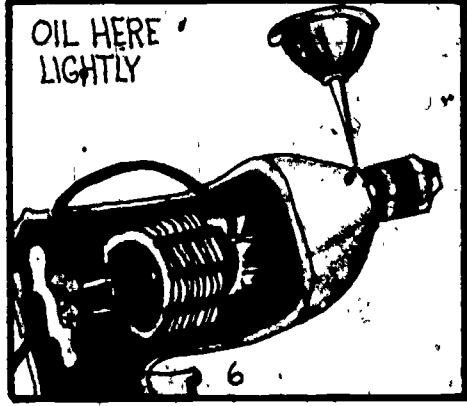
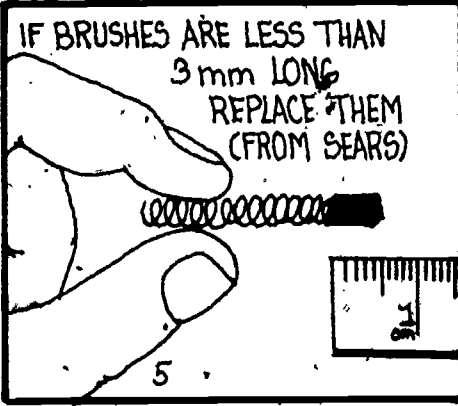
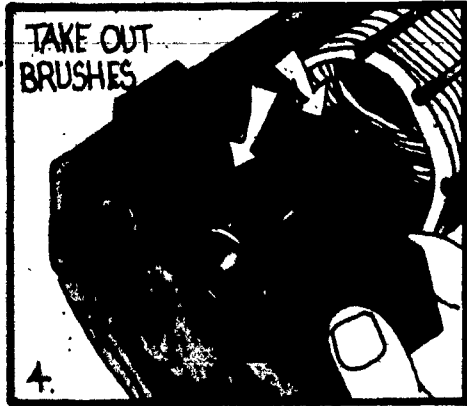


HOW TO

MAINTAIN AN ELECTRIC DRILL

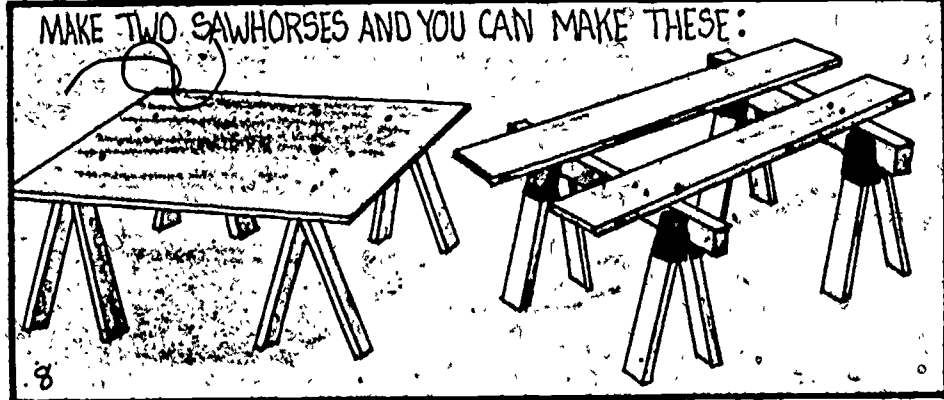
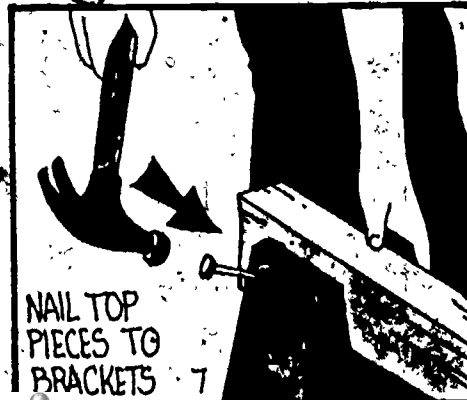
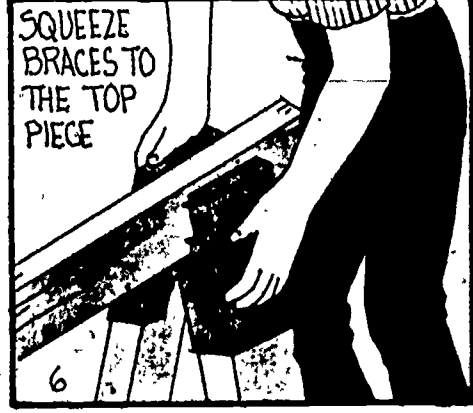
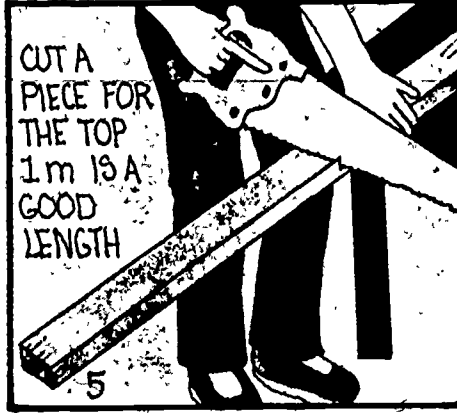
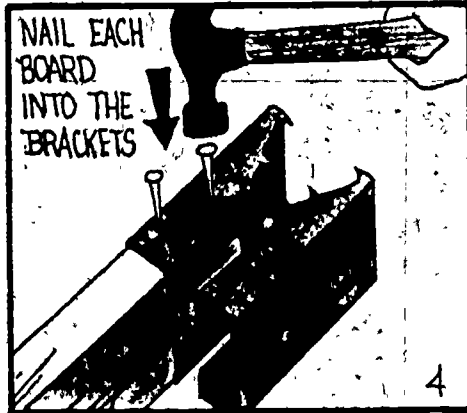
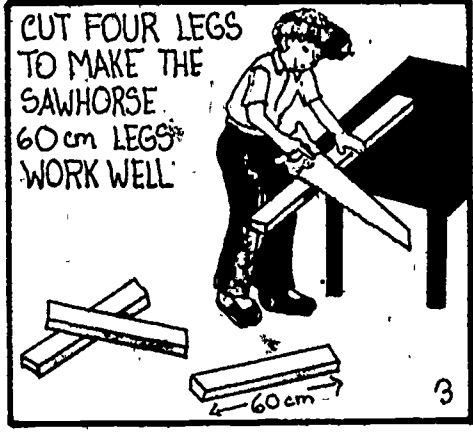
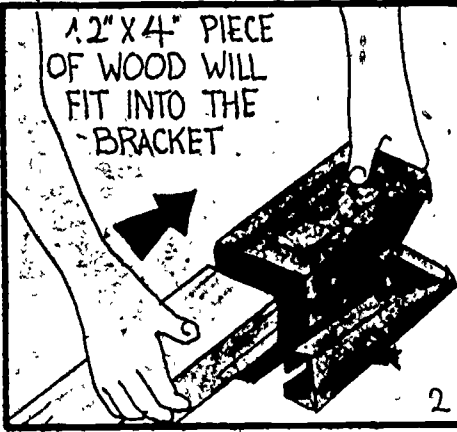
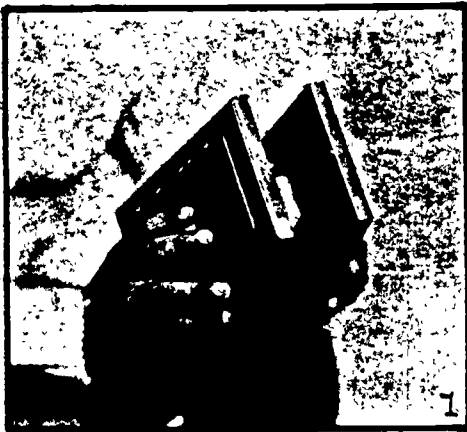
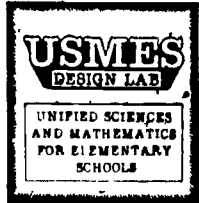
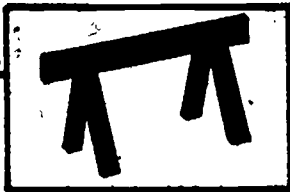


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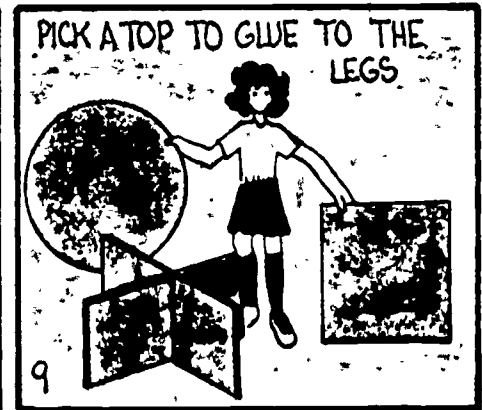
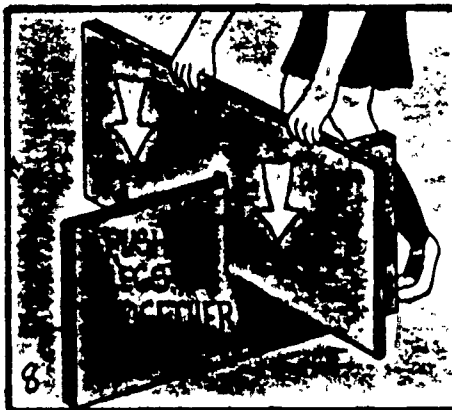
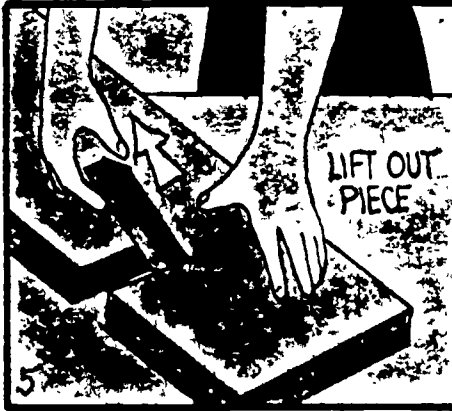
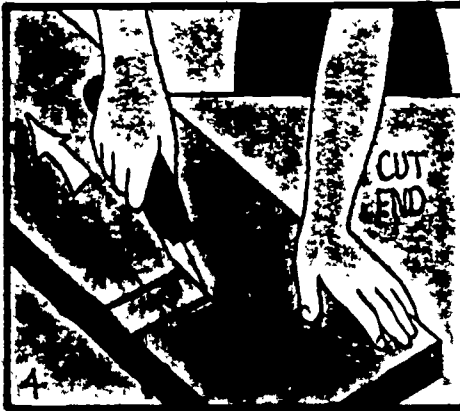
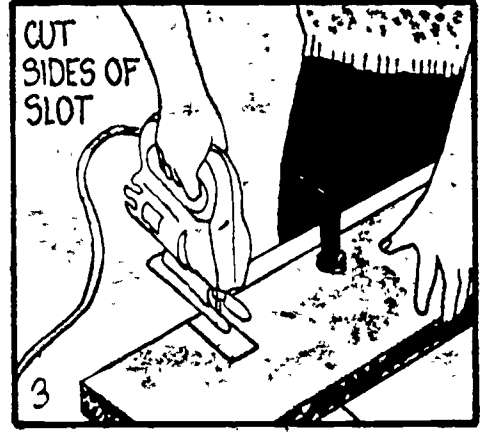
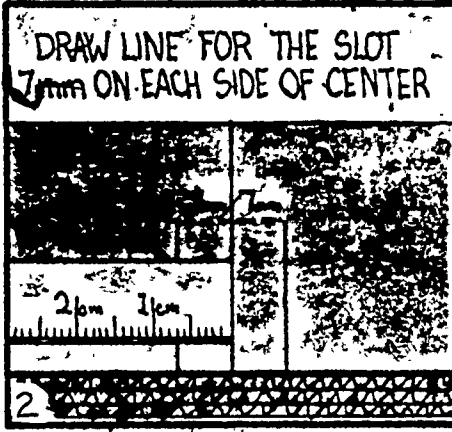
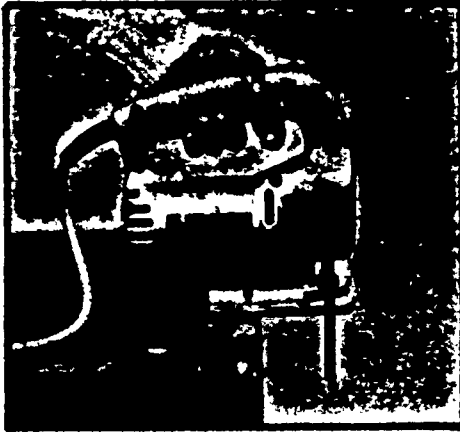
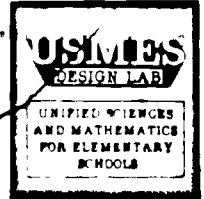
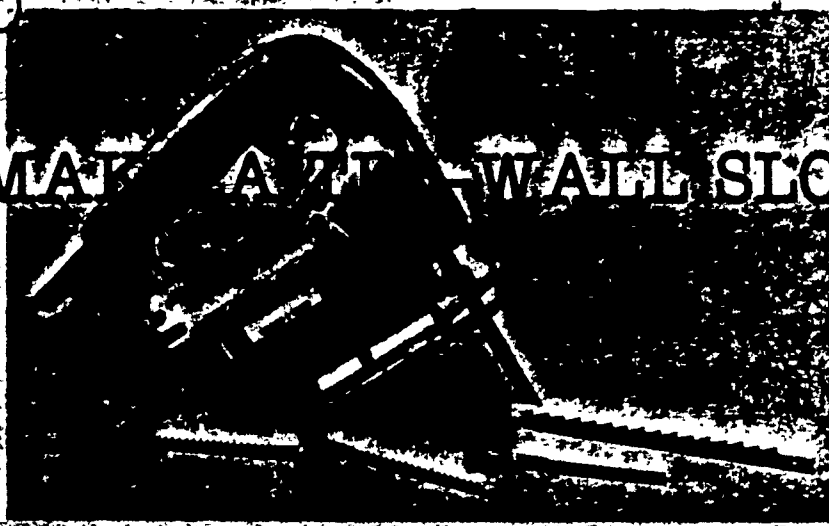
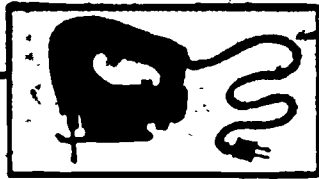
HOW TO

MAKE A SAWHORSE



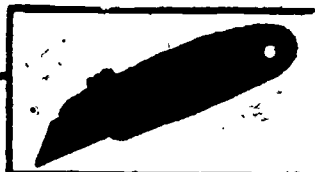
HOW TO

MAKE A TV WALL SLOT

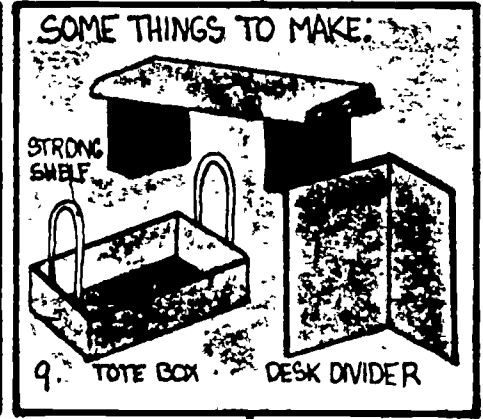
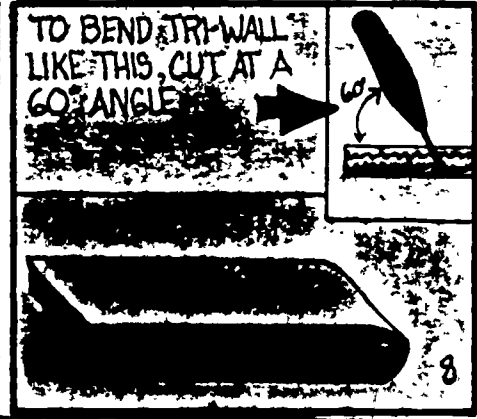
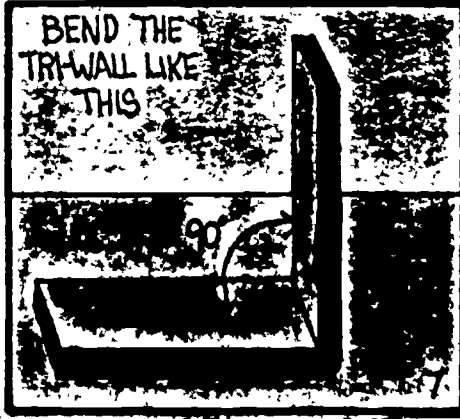
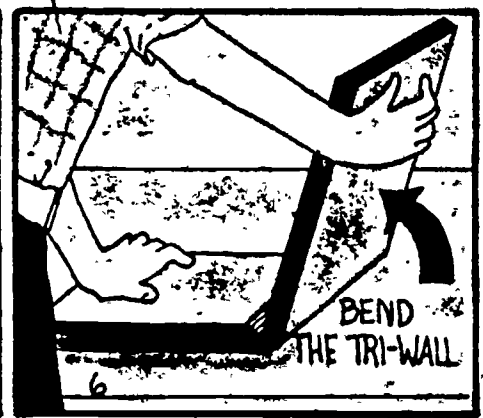
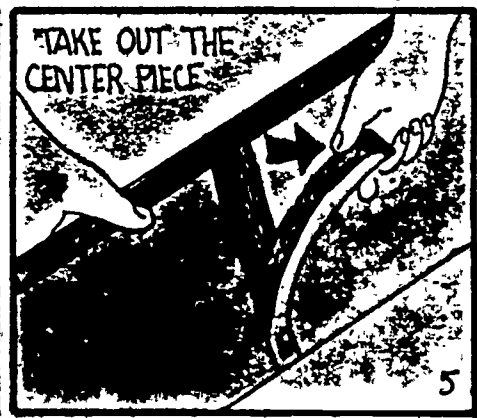
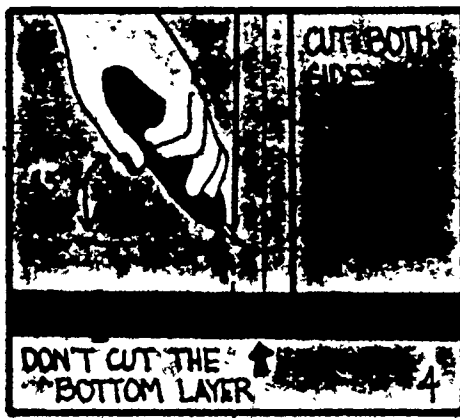
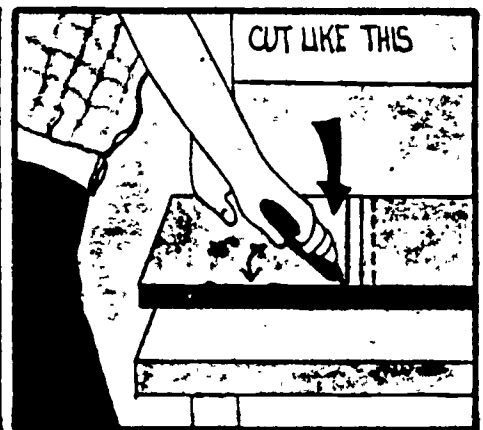
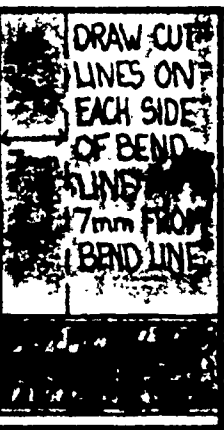
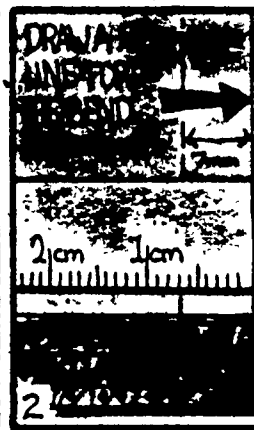
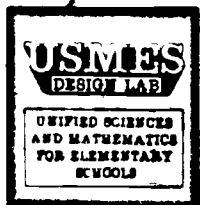


HOW TO

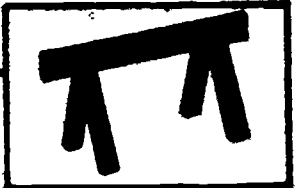
MAKE A TRI-WALL



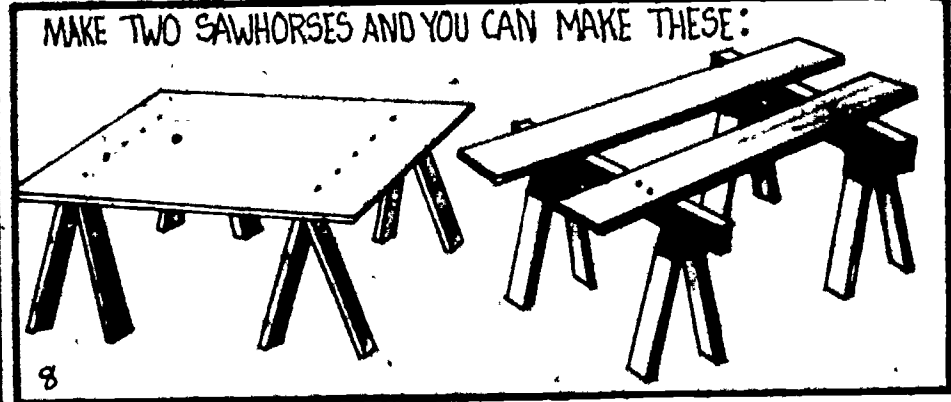
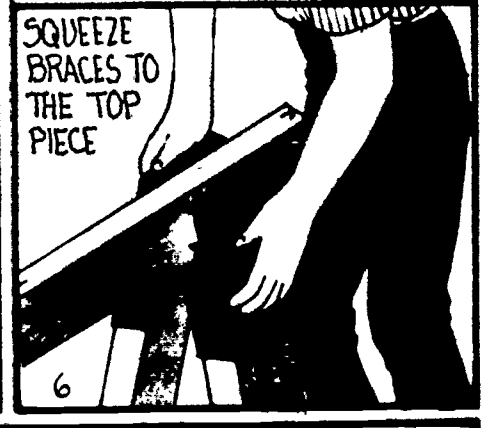
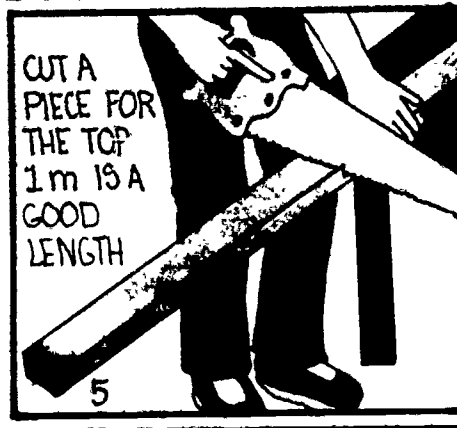
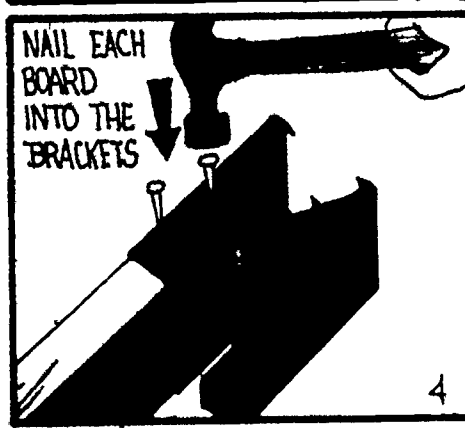
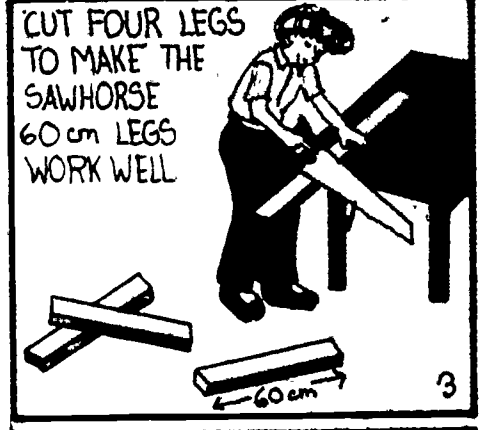
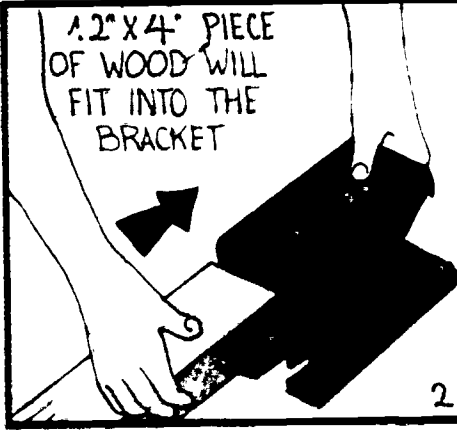
WARNING:
ALWAYS CUT
AWAY FROM
YOUR BODY



HOW TO



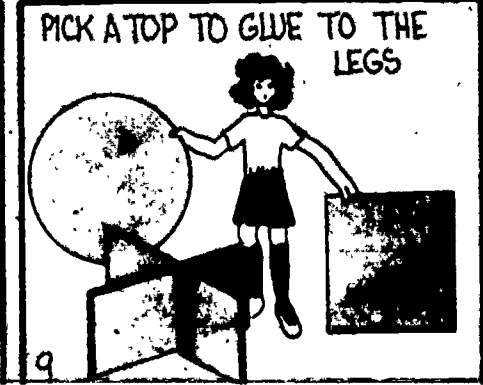
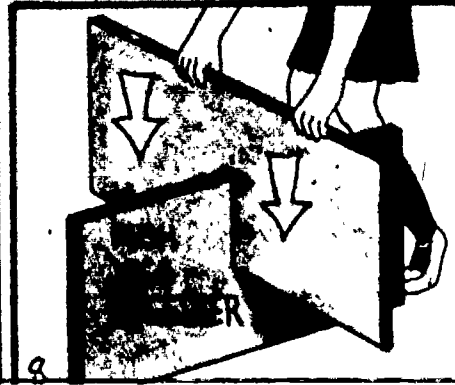
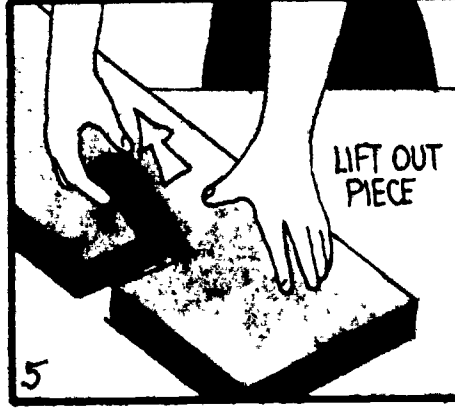
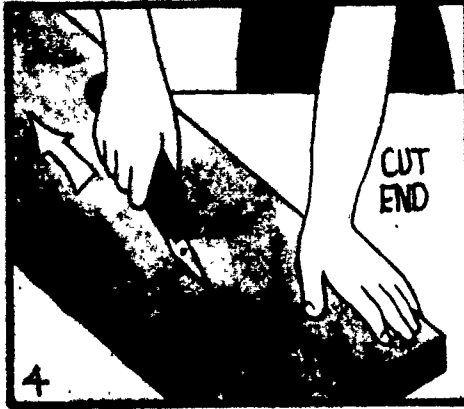
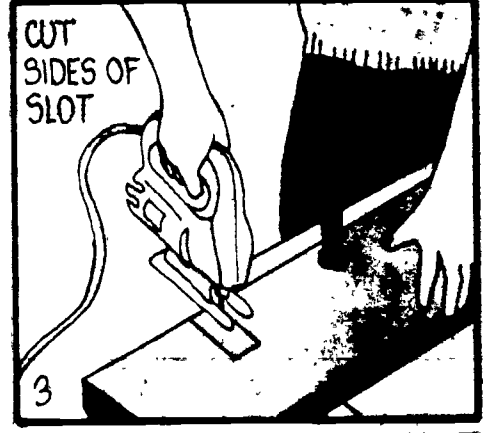
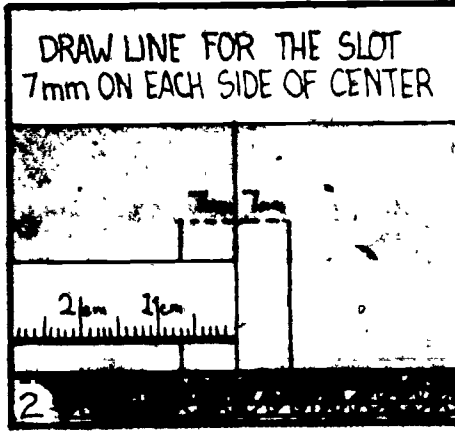
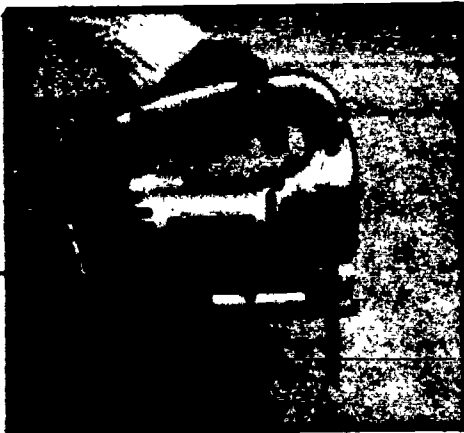
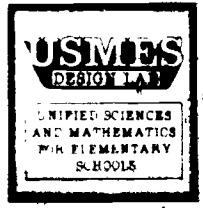
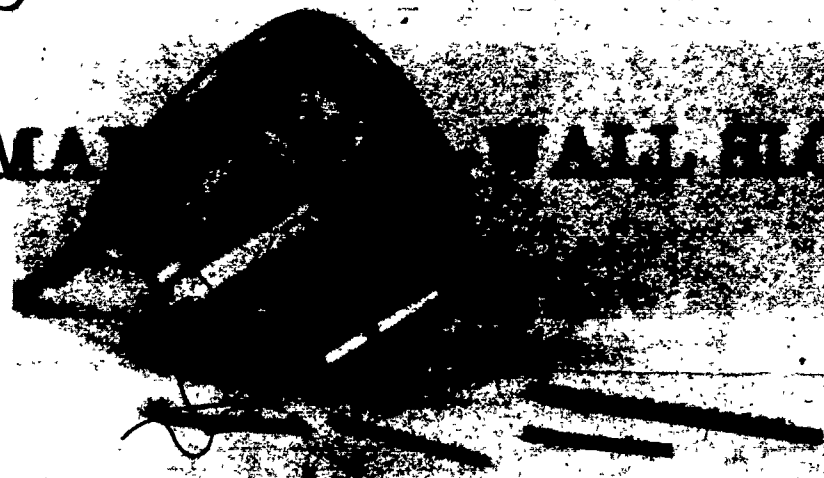
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HOW TO



MAKE WALL SLOT

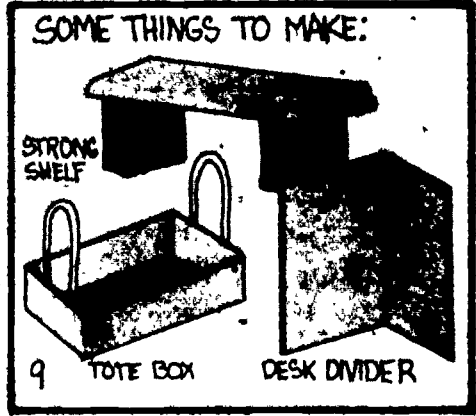
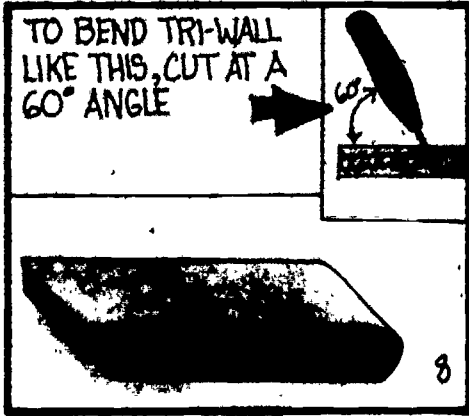
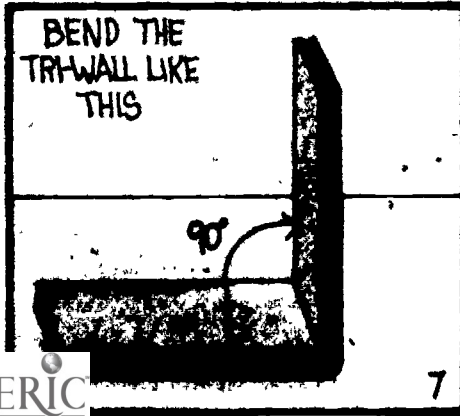
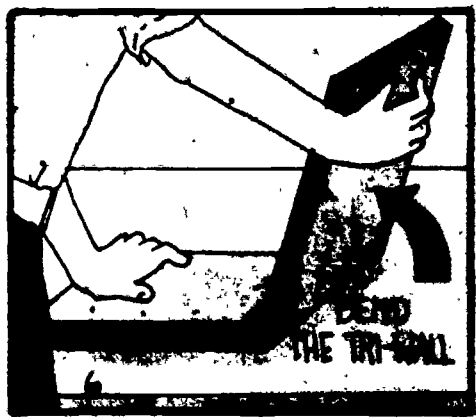
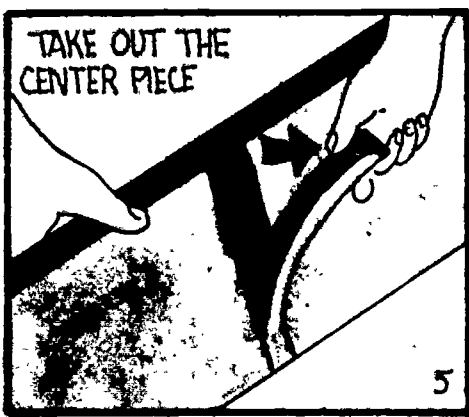
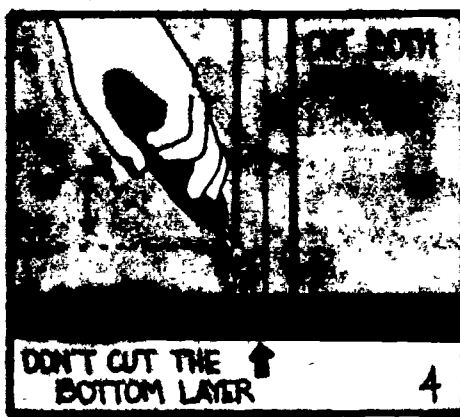
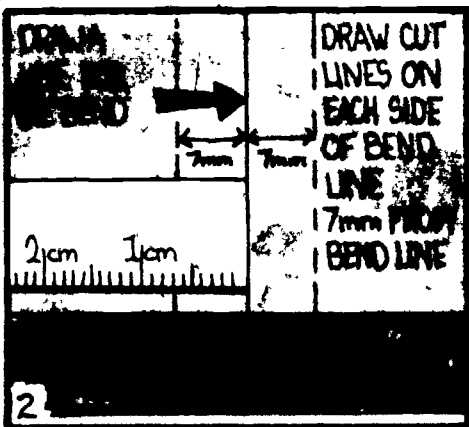
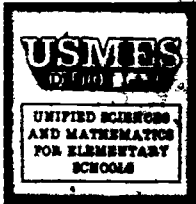


HOW TO

MAKE

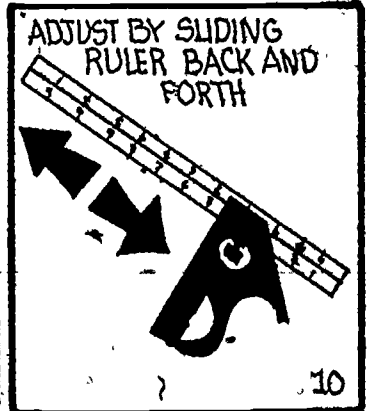
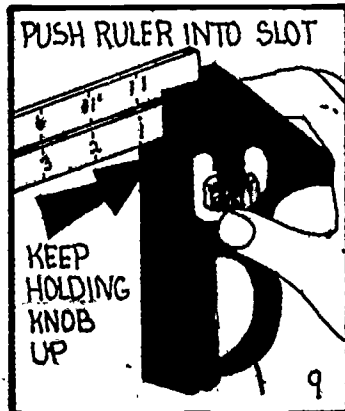
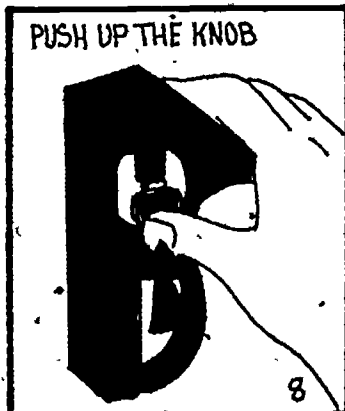
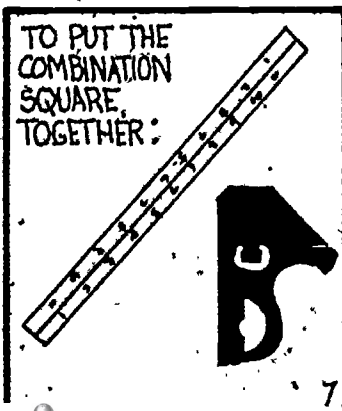
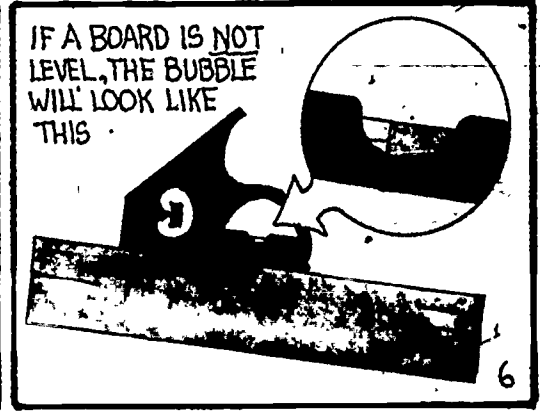
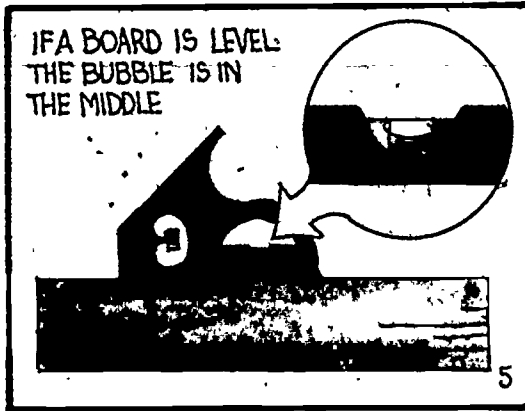
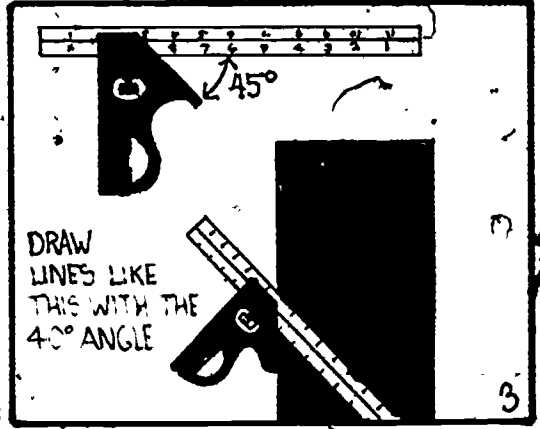
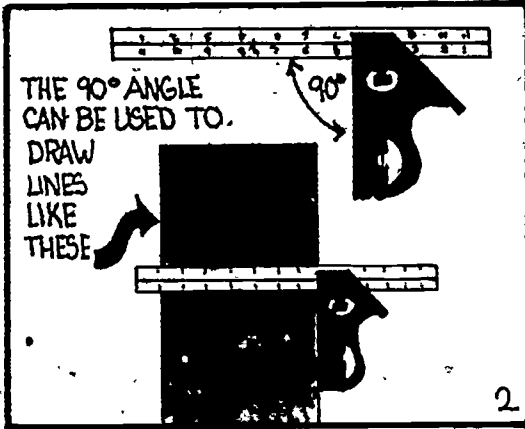
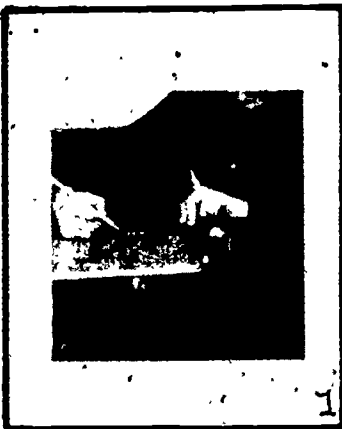
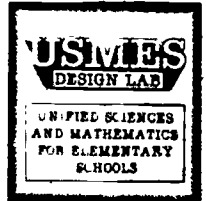


WARNING:
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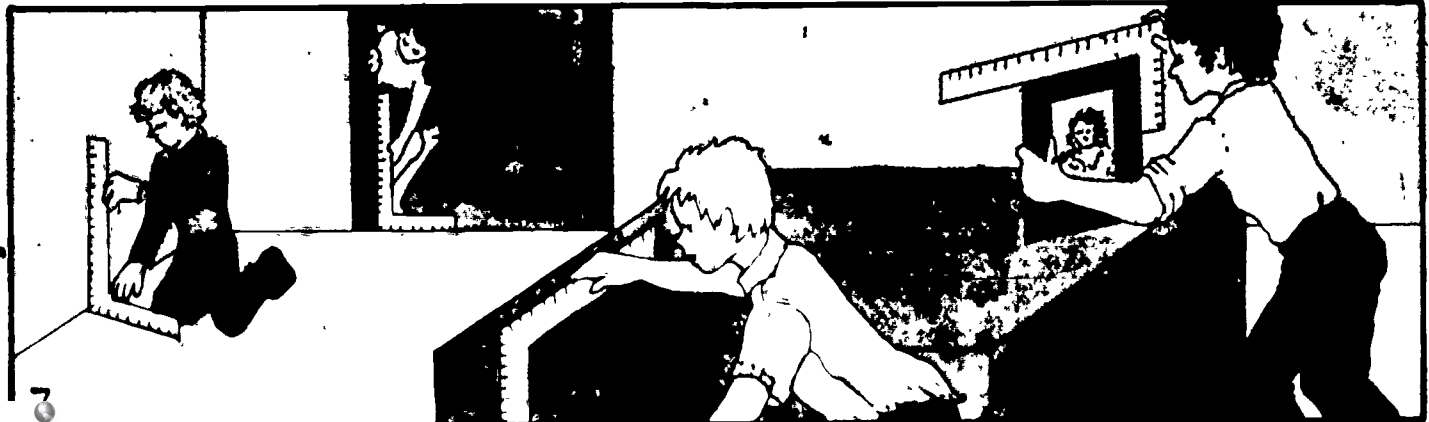
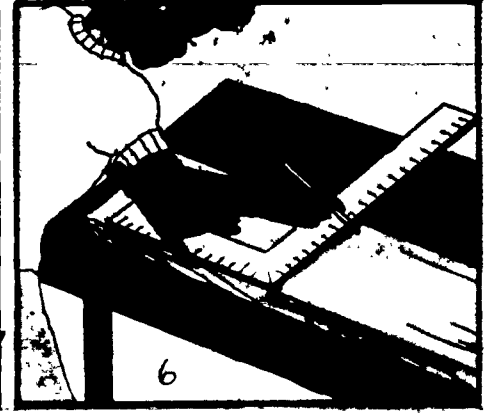
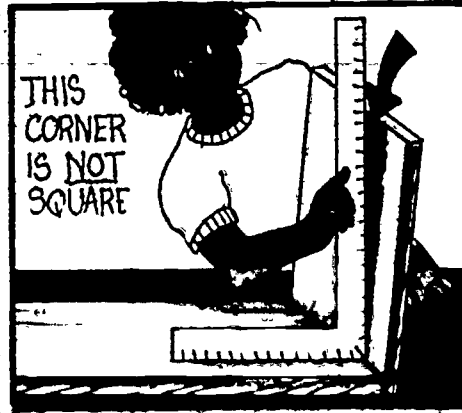
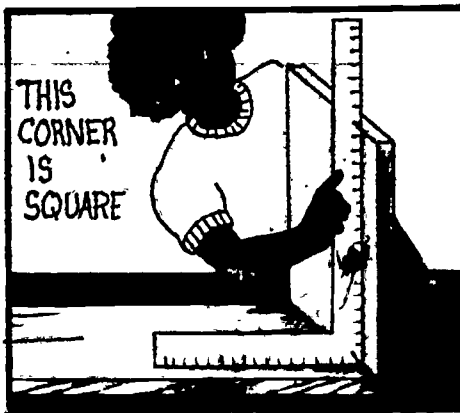
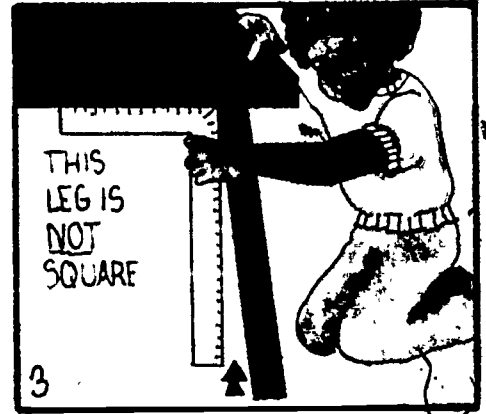
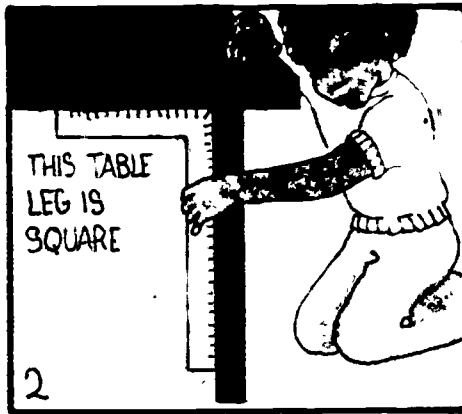
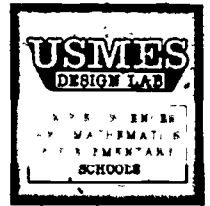
HOW TO

USE A COMBINATION SQUARE



HOW TO

USE A RAFTER SQUARE



HOW TO

USE A LEVEL

