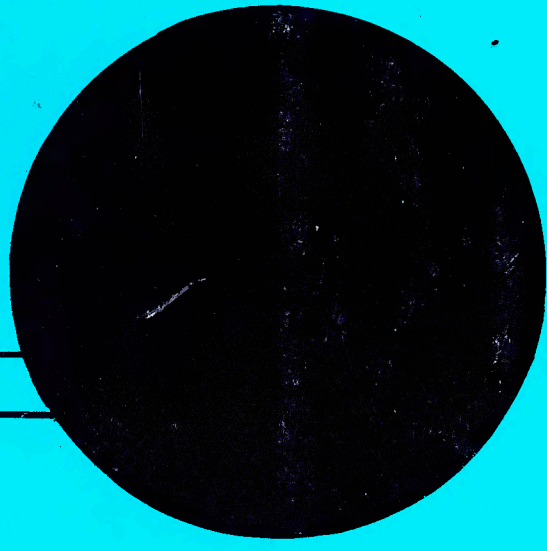
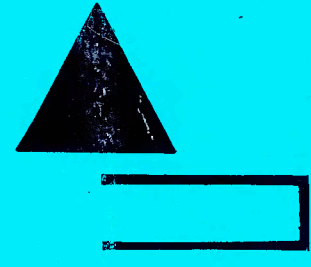
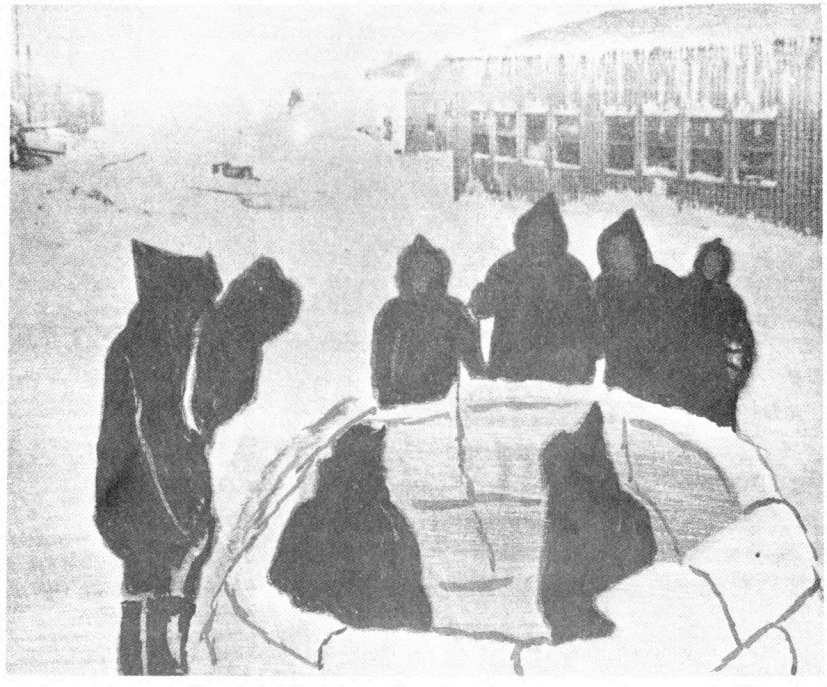
PRACTICAL PROGRAMS IN INDUSTRIAL ARTS AND RELATED ACTIVITIES





Vocational Education Section
Department Of Indian Affairs
And Northern Development
Ottawa 1969



FOREWORD

The programs outlined herein are designed to meet the special needs of pupils and teachers. They are predicated upon the convictions that the courses of studies which comprise a curriculum should have their origins deep set in activities common to the area where learning takes place. To validate in this respect the Industrial Arts programs, every effort is made to build course material and units of work around the everyday activities of the people.

The purpose of these programs is to inculcate that knowledge, to develop those attitudes and skills which will aid pupils to appreciate the backgrounds upon which their lives are built and to offer a deeper insight into the activities in their own communities. In this way pupils will become not only more knowledgeable and more productive members of their own communities but will be better to adapt to change.

It is hoped that these new programs will aid teachers in developing pupil interest, in furthering curriculum integration and in adding broader dimensions to learning. In this way it is believed that pupils will develop skills and formulate positive attitudes toward the kind of human activities which serve to sustain life in the areas where they live.

Because a major problem in curriculum building in the north relates to the difficulty in communication over vast distances, and because

in the building of a program such as this, authenticity must be rigidly respected, every effort has been made to involve competent people who have first-hand knowledge and experience in northern setting and Indian reservations.

PREFACE

This booklet contains suggested programs which represent hesitant steps towards an integrated program for pupils who, through no fault of their own, have become age-grade retarded. The program is intended to meet a wide spectrum of needs ranging from those of pupils who will engage in wage employment to those who will return to the traditional life on the land.

During the past few years, the Industrial Arts and Home Economics Supervisors have been visiting and conferring with teachers, parents, projects' officers and other interested people, and have been collecting material and ideas for inclusion in an integrated program. During the past years, the effort to integrate this material and to authenticate the work has been intensified. Several meetings with community councils have been held to try to ascertain the wishes of the native people and to take these wishes into account in the building of curriculum. One such fruitful experience occurred in Rankin Inlet where the Eskimo Council was extremely co-operative and gave their frank opinion of the type of courses they wished the children of their community to receive. Very evident was the peoples' wish that their children be taught to benefit from the new way of life. They also expressed concern over the loss by the children of their traditional skills some of which, they felt, might effect their survival in the north country. Consequently, it was agreed that the school should budget time suitably, and an Eskimo man should come to the school to teach the children to

build an igloo (see frontispiece). A similar arrangement was made with one of the ladies who is an excellent bead-worker. She came to the school and, with the class under the supervision of the home economics teacher, she taught the girls her traditional skills.

It is hoped that this collection of programs will stimulate the staffs of our schools to try to implement the philosophy which advocates the involvement of persons who possess the skills and talents necessary in the teaching and learning. In this way, the teacher may make use of the human resources available anywhere for the benefit of his pupils.

It is earnestly hoped that wherever any program of this nature is offered, whether it be included in this booklet or not, the people involved will share their experiences with other educators in this vast area of responsibility. Surely the most efficient way to accomplish this sense of unity of purpose, is to help the supervisors co-ordinate effort by reporting on all activities.

Acknowledgements

This book has been revised under the direction and guidance of J.L. Caverhill, Vocational Training Specialist, Vocational Education Division, Department of Indian Affairs and Northern Development, Ottawa. We are particularly grateful for the assistance of instructors and superintendents in the Northwest Territories who contributed time, ideas and drawings and to Miss Linda Craig for many of the illustrations and drawings.

TABLE OF CONTENTS

INDEX

INTRODUCTION

This collection of programs is intended to assist:

1. Industrial Arts teachers.
2. Teachers who feel capable of teaching or supervising this form of *"Industrial Arts"* in schools in small settlements. Wherever possible teachers should endeavour to utilize anyone with particular talent or skill that may be available in the community. Such people may offer courses outlined herein or any other courses that the Superintendent of Schools may approve.

Selection of Students

Selection of students should be at the discretion of the principal or teacher. Note that the grade of the student should not be considered as a major criterion. Academic level requirements will vary according to which program is followed.

Accommodation

Programs can be carried out in:

1. Schools which have shops.
2. Schools which have access to any form of shop or building which can be utilized for the purpose of this type of instruction. Many schools have janitors' rooms, or other rooms which can be utilized for this purpose. Some schools may carry on part of

a program in the classroom. Two teachers may co-operate, one teaching the girls, the other the boys. Experimentation should be encouraged. Some processes involved in Industrial Arts may profitably be taught to girls. This will be left to the discretion of the teachers who will take into account the strength of tradition in the community and the women's role in the society. Some of the programs could best be introduced as co-curricular activities, for example, the course on care and use of firearms can be taught though the medium of a rifle club.

Objectives

1. To develop group identity while maintaining a sense of individual worth.
2. To develop a pride in workmanship which leads to self-confidence and an appreciation of aesthetic values.
3. To introduce the pupils to simple tool operation as they apply in his environment.
4. To develop skill in the use of tools and materials commonly found in the north.
5. To develop lasting respect for tools and to improve skills in sharpening and maintenance.
6. To develop familiarity with good maintenance techniques.
7. To teach the concomitant and developmental skills of planning, reading, writing, drawing and calculating.

8. To develop the perseverance required to carry long and difficult projects through to completion (note, long and difficult are relative words which in this case apply in terms of the development of the child).
9. To assist the pupils to bridge the gap from the traditional ways of doing things to more modern methods.
10. To develop the ability to work with a minimum of direction and supervision and to encourage initiative and creativity.

Class Size

No definite maximum size of class can be prescribed in any but regular industrial arts or vocational shops. The size of class must be determined by such factors as safety, accommodation, equipment, materials and the skill, energy and ingenuity of the teacher.

Teachers are cautioned against overcrowding classes. It would be better to try to organize two small groups than have one group so large that the learning situation deteriorates and the risk of accidents increases.

Programs Offered

The programs offered in schools which do not have recognized industrial arts program will depend almost entirely on the talents and skills brought to the job by the teachers and the resource people available in the community, and will be related to the equipment and supplies available.

Time Allotment

The principal should check the time allotment for a program of this nature with the Superintendent of Schools. Sufficient time should be provided to see projects and programs completed. Care should be taken not to use the program as a replacement for important class subjects but rather as a means of making regular courses more meaningful.

Equipment

Most of the projects suggested in this guide can be made with simple hand tools. Care should be taken to define the objectives well before embarking on any course. Use of power tools, even when they are available should be limited to the teacher and to anyone to whom he grants permission. Only where a qualified instructor is available should class instruction in power tools be carried on. Equipment should be requisitioned with the regular school requisitions and the purpose clearly stated.

Supplies

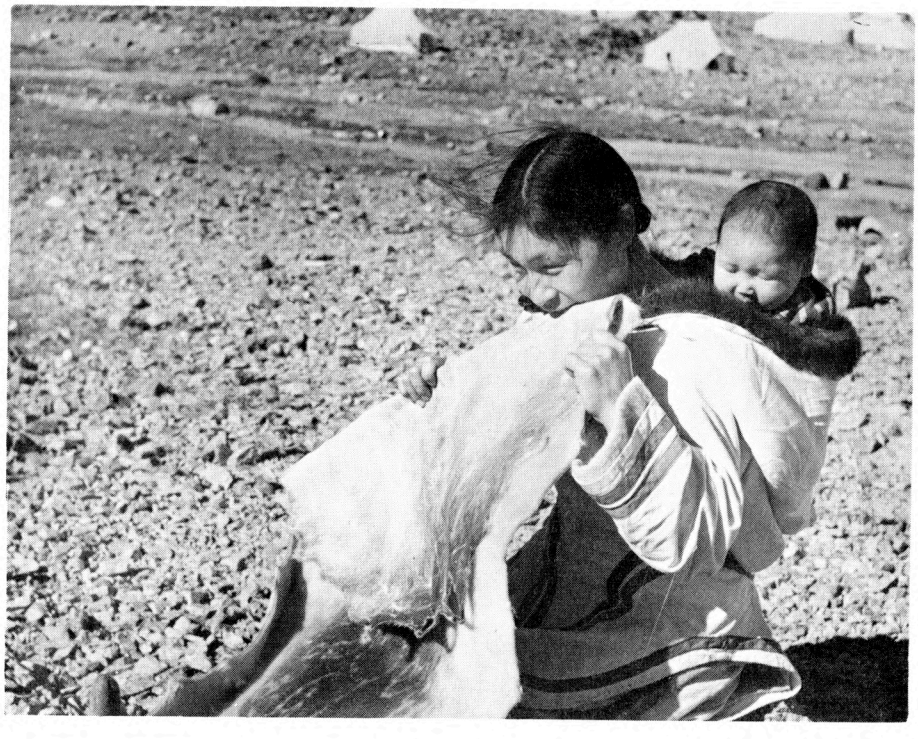
The amount of money to be spent on supplies for Home Economics and Industrial Arts will vary with the different regions. Materials should be ordered with the regular school requisitions and a clear and detailed explanation should be given of the purpose of the supplies.

Note: Supplies and equipment may be supplemented by local purchase with the authority of the local administrator. Any special equipment or supplies should be requested through the Superintendent of Vocational Education.

TRAPPING AND FUR PREPARATION

CONTENT

Page



National Film Board Photo

FUR PREPARATION

Introduction

This outline is intended merely as a guide for the teacher. Traditionally the economy of northern residents has centered on the fur trade. There is no doubt that a course of trapping and fur preparation is directly applicable to the lives of the young people in the schools of the north. Ideally pupils should learn the fur trade from their parents as they work the trap line together. However, in some cases, this is no longer practicable. If this knowledge and the accompanying skills are to be preserved, the school will be involved. In recent years the tendency has been for native trappers to receive low prices for their pelts. It is believed that this is partly the result of poor preparation of the pelts for market.

Every effort should be made to keep this course practical in nature and related to the local situation. While much of the information in this course is fairly universally applicable, the teacher should ensure that traditional methods used in the community are recognized in the instruction. It is emphasized that the skill and knowledge of local trappers and of game officers should be fully utilized in this program. No program of instruction should be undertaken without first providing for consultation with local trappers and game officers.

Objectives

1. To integrate the geographical and historical aspects of the fur trade in Canada with the day to day activity in the school and community.
2. To instil an understanding of the importance of game regulations to the conservation of natural resources.
3. To encourage diligence and reliability in tending traps regularly and carefully.
4. To improve the trapping technique of the pupils.
5. To encourage co-operative effort and group skills through working together on the trap line and through discussions of co-operative marketing techniques.
6. To endeavour to improve the quality of fur pelts and so increase their value.
7. To broaden the knowledge of the process of fur marketing from animal to garment.

Class Organization

This course should be taught to both boys and girls. The principal in consultation with the Superintendent of Schools should decide upon the selection of pupils.

Equipment

Since this course requires only equipment which can be found in the local community, it may be carried on in any school in the north or on reservations.

COURSE OUTLINE

A. Skins and Furs

1. Identification
2. Classification of Quality
3. Skinning
4. Fleshing and Cleaning
5. Drying

B. Game Laws of Northwest Territories

1. Local Regulations
2. Permissable Methods of Trapping

C. Trapping

1. Organization of Project
2. Resource Material

D. Geographical Distribution of Furs

1. Local
2. Canada
3. Other Services

E. Historical Significance of the Fur Trade in Canada

1. Local
2. Hudson's Bay Company
3. Montreal Merchants
4. Explorers, Voyageurs, etc.

F. Fur Garment Industry

G. Marketing

1. Outlets
2. Packing and Shipping

GEOGRAPHICAL DISTRIBUTION OF FURS

The Hudson's Bay Company has designated the fur sections of Canada as shown on the accompanying map.

Note to teacher: Teachers will wish to introduce this outline by a look at the local setting - by such an introduction the rest will become more meaningful.

Abbreviation	Section	Samples of Fur-Bearing Animals
YUKON	Yukon	Lynx, Ermine, Fisher
NW	North West	Badger, Grizzly Bear, Beaver
WA	Western Arctic	Polar Bear, Fox
MKR	Mackenzie River	Beaver
YF & MKR	York Fort and Mackenzie River	Fox, Lynx Fox, Mink
YF	York Fort	Badger, Beaver, Ermine, Lynx, Fisher
YF C & S	York Fort - Central and Southern	Badger, Beaver, Ermine, Lynx, Fisher
EA	Eastern Arctic	Polar Bear, Fox
	Moose River West	
LS	Lake Superior	Beaver, Ermine, Fox, Lynx
EM & FG	East Main and Fort George	Beaver, Ermine, Fox
MRW MRE	Moose River West) Moose River East)	Beaver, Ermine, Fox, Lynx
EB	Eskimo Bay	Beaver, Ermine, Fox, Lynx

Abbreviation	Section	Samples of Fur-Bearing Animals
CANA	Canada	Beaver, Ermine, Fox
NF	Newfoundland	Beaver, Ermine, Muskrat, Otter
NS	Nova Scotia	Beaver, Muskrat
	North West	Badger, Grizzly Bear, Beaver, Ermine, Fisher, Marten, Muskrat, Otter, Prairie Wolf (Coyote), Raccoon, Squirrel, Timber Wolf, Wolverine
	Western Arctic	Polar Bear, Fox, Marten, Muskrat, Seal
	Eastern Arctic	Polar Bear, Fox, Seal
	Lake Superior	Beaver, Ermine, Fox, Lynx, Marten, Otter

Geographic Locations of Fur as
Designated by the Hudson's Bay Company.

GAME LAWS, NORTHWEST TERRITORIES

Reference: Game Laws, Northwest Territories, Canada.
Office Consolidation, January 1, 1963.
Queen's Printer, Ottawa.

This booklet can be obtained from the Game Officer or Regional Administrator of the community.

Emphasis should be placed on the following:

The Game Ordinance

1. Interpretation
2. General Prohibitions
3. Issue of Licences
4. Records and Reports
5. Trapping Areas
6. Game Preserves and Sanctuaries
7. Schedules

The Game Regulations

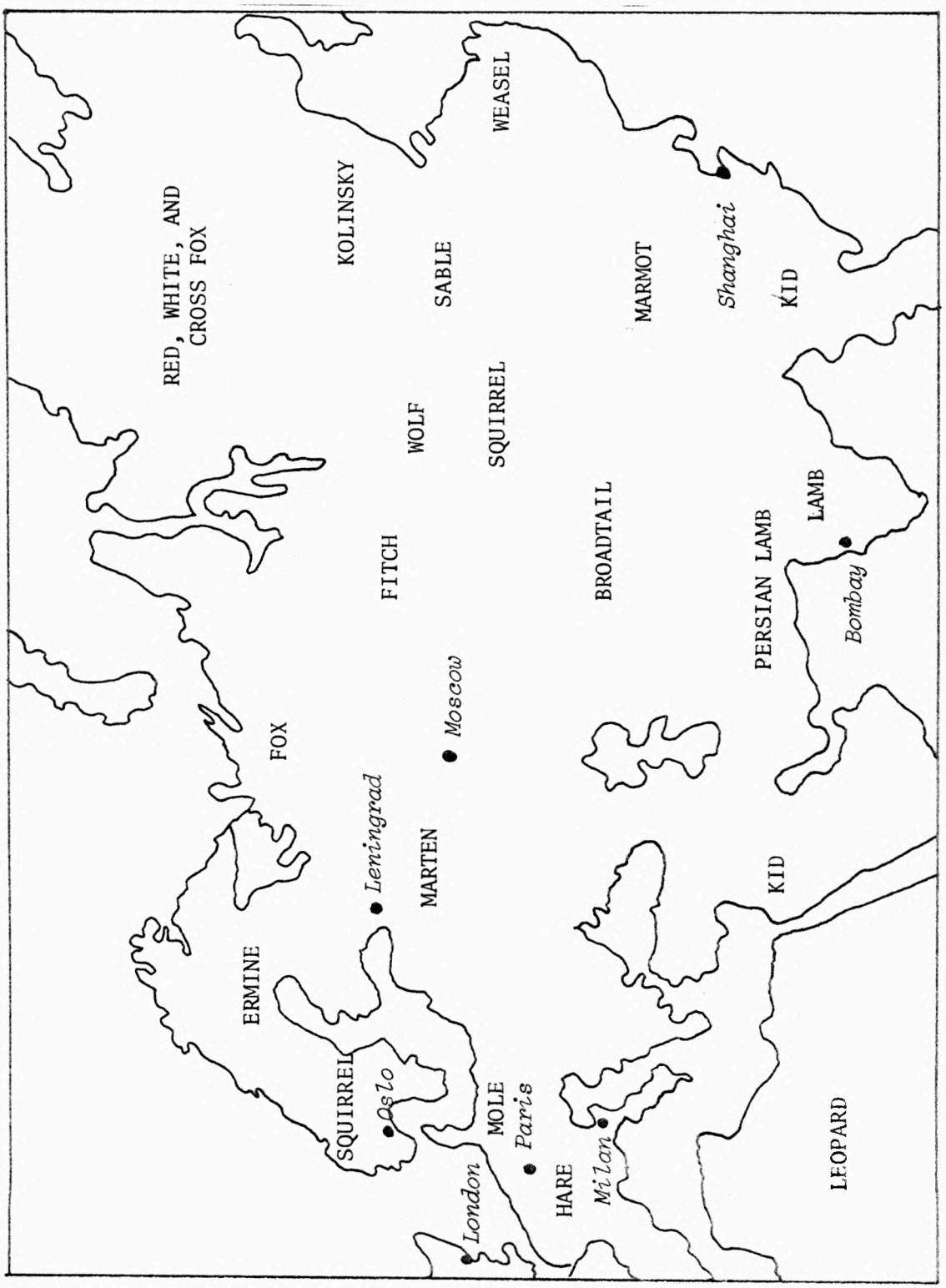
1. Game Management Zones
2. Open Seasons and Bag Limits
3. Outfitters
4. Schedules

The Fur Export Ordinance

The Game Export Act

(Obtain the latest information from the game officer.)

Furs Found In Some Other Countries



TRAPPING

Equipment

In planning a course of this nature, requisitions for special equipment should be arranged through your principal and superintendent together with a detailed outline of the proposed program including such information as the age and number of students involved and the area in which the traps will be set. Again remember to consult the Game Officer and local trappers.

Course Organization

As a guide, reference is made to the following report on a trapping project conducted by students of the Fort Simpson Federal School in November and December 1966. This report was submitted by Mr. W.S. Button, Instructor of Industrial Arts during this time, and his frank appraisal of the course and recommendations and suggestions for improvements should be studied by everyone considering a similar program.

THE FORT SIMPSON TRAPPING PROGRAM REPORT

November and December, 1966

Following the formalities of careful planning and preparation the first Fort Simpson Trapping Program commenced on November 2, 1966. The program and course outline were developed and organized to operate within the Industrial Art Program and was co-ordinated to receive the co-operation of the Departments' Game Resource Branch. I should like to state here that the success of this course were due greatly to the close co-ordination between myself, Mr. Watsyk, Mr. Monaghan (Game Officer) and his assistant, Moise Antoine.

With regard to the report rather than presenting a day by day account of the trapping proceedings, I have condensed the report to briefly account for the highlights and most important aspects of the course.

The Fort Simpson Trapping Program commenced on the 2nd day of November 1966. Mr. Monaghan was introduced to the boys following the lectures and a review of important points of the course. He spoke briefly of conservation and the principles of modern trapping. Together we mapped out the exact trapping area and proceeded by grouping the boys in groups of two. Previously we have divided the 22 boys into two groups. One group, the main group, was allocated Monday, Wednesday and Friday afternoon. The other groups were given Saturday afternoon.

Keeping the instruction as short as possible we assembled the first group and all the trapping gear into the Game Department Bombardier and headed for the trap lines. Accompanying us was the Game Warden's assistant, Moise Antoine.

Upon reaching the start of the trapping area Moise proceeded to give the boys information regarding trapping in the area and show the various *"trap sets"* and *"snare sets"* where and under the correct conditions when each type of set should be located. We then allocated each group of two boys a mile section along the Sibbeston Lake Road and proceeded to drop them in the center of their trapping plots with the instructions to use their axes, to construct a suitable lean-to close to the road to protect themselves from the weather and if time were available to make a few seats. It had been previously decided that Moise and I and when possible the Game Warden, would accompany the various groups in turn to assist and instruct when and where necessary. Therefore we each chose a group and for the remainder of the first day got them off to a good start. Due to the lateness of the season we were all assembled at the road before dark so the Bombardier could make its pick up. The first and most important day of the trap setting ended. Once having the trapping lines set the actual trapping took place on Monday and Friday afternoons. During this time the furs were gathered and the traps reset for the next pick up period.

I should like to mention here that we utilized two dozen #4 traps, two dozen #1½ and 12 dozen #1 and 50 rolls of snare wire. Likewise each boy was given an axe and matches.

The course as previously mentioned was set up on a rotation basis. We found that Wednesday afternoon proved to be the most suitable time for skin and fur preparation. Therefore having established the trap-lines we turned our attention to preparation of the animals we had taken. The Game department provided the correct size stretcher plans and the students each prepared their own stretcher boards. The majority were constructed to fit squirrel and ermine.

The completion of a sufficient number of stretcher boards required the use of two Wednesday periods. During this time all the animals that had been taken were kept in cold storage. Following the completion of the stretcher boards, the next Wednesday was utilized for skinning. During this period Moise Antoine, the Game Warden's assistant, demonstrated the correct methods of skinning each of the animals taken, which included squirrel, ermine, and martin. As each group had kept their animals in separate burlap bags, they proceeded to follow the instructions given by skinning their take. We circulated through the entire group giving pointers and assistance where possible. Following the skinning and stretching, the furs were placed in a drying locker in the shop. We kept them here for a period sufficient to dry the skins. Then we removed the skins and again packaged them in groups and returned them to cool storage awaiting sale.

Following the same routine of Monday and Friday trapping days and Wednesday skinning, the course continued. On the 15th of December, the boys took in all their traps and snares. These were checked and recorded. On the 17th all the remaining animals were skinned and stretched and placed in the storage locker.

During this time the second group of students had been going out on Saturdays. Each trip had a volunteer teacher (male) accompanying a member of the Game Department staff. This group of boys had little experience and had only a limited time in Industrial Arts. We did however co-ordinate the two groups where possible for instruction and the processing carried out in the shop during the skin preparation periods.

On December 20 the groups were assembled and carefully examined their furs in preparation for sale. This completed, we packed the furs into separate envelopes and went to the local Hudson Bay Company store to market the furs. I had previously contacted the manager who was most pleased to co-operate with us.

The store manager first took the time to explain the business of the fur trade and the desired qualities expected. He then took each group in turn and as he examined their fur he explained exactly what he was looking for ..... the different points between a good fur, an average fur and a poor fur. During this time several of the boys questioned

him and through this dialogue a great deal of value was gained. Completing the grading of the furs, each group received payment for their products.

In conclusion, I would like to state that a total of 14 ermine, 42 red squirrel, 2 flying squirrel, 1 marten, and 36 rabbits were taken for a cash value of $36.37. Likewise, even though some boys had previous trapping experience, it was proven sound fact that all boys gained considerable information by Moise Antoine and myself being on hand from the start to give assistance and helpful hints to those requesting such and also in one or two cases preventing the complete set of traps from being hung up to reduce the amount of work. I can quite justifiably state that all concerned were completely satisfied with the course and look forward to further activity along these lines of education. Likewise, as the trapping course was observed by several trappers in the surrounding area, they felt it was quite unique in its organization and would provide a means of retaining the ties between the cultures and tend to close the cultural gaps in our present society.

W. BUTTON

Industrial Arts Specialist
Thomas Simpson School

General Trapping Tips

The following trapping information is to be found in the Trapper's Guide issued by Conservation Information Service, Regina, Saskatchewan.

1. Do not rush the season. Pelts taken before the season opens are not prime and are of little value.
2. Check the trapping area carefully. Look for the signs of fur animals. Learn their habits, where they live, and where and when they travel.
3. Always boil traps to remove manufacturer's oil prior to setting the traps.
4. Check traps before setting out. Be sure they are in good working order.
5. Do not set traps haphazardly or carelessly. Make set as natural as possible in a location where the animals travel. Mink like to run under or through something. Foxes usually do not like to approach a set in heavy cover.
6. Use gloves to keep sets free of human scent.
7. Do not set the pan too hard, necessitating extra weight to set it off. Set the pan even with the jaws for a level set rather than a bulge over the pan.
8. Check sets regularly.
9. Remember, clean pelts mean more money.

MUSKRAT

Trapping Suggestions

Look over the muskrat trapping area early in the fall and before the snow comes. Close observation should be made of the muskrat populations and the locations where it is planned to set traps. If the population is high, some muskrats should be taken in the fall to ensure enough winter food for those left.

Areas with water less than 26 inches deep should be salvage trapped in the fall. If left, the muskrats will be killed anyway by freeze-out.

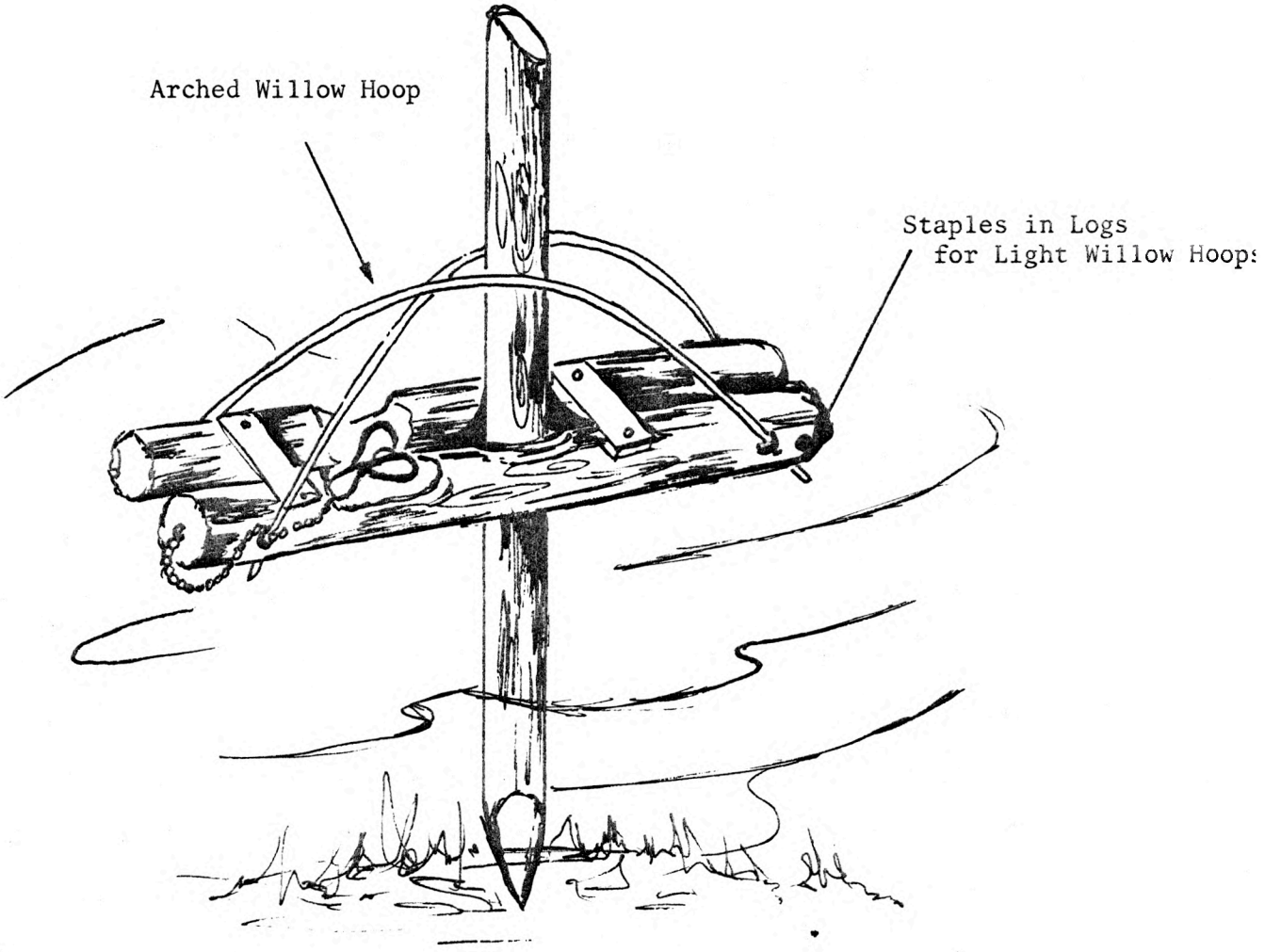
If muskrats are allowed to overpopulate an area, the feed supply will be greatly depleted and the marsh will be damaged. Several years will pass before the feed grows back.

Use numbers 1, 1½, or number 1 *"stop-loss"* traps for taking muskrats.

Muskrats should be skinned, fleshed, stretched and dried as soon as possible after trapping.

To construct a muskrat float set (see figure on next page) fasten together two 4-inch logs by nailing two blocks of wood across the top. Scoop out the logs to hold the trap, and cut out a hole so that the vertical pole will allow the platform to move freely up, down and around. Staple light willow poles across the top to prevent ducks from being caught. Set the pole in the lake or stream bottom deep enough to prevent trap from drifting away or working loose.

MUSKRAT FLOAT SET



BEAVER

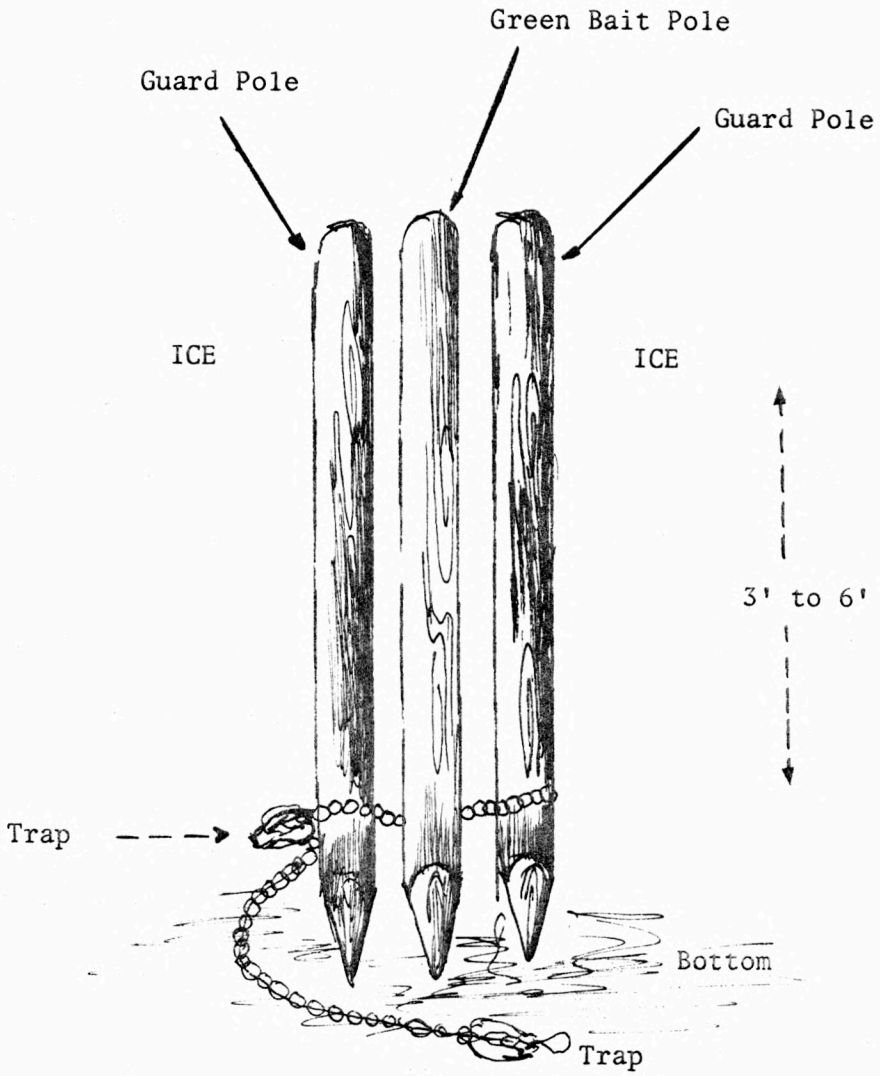
Trapping Tips

The following trapping information is to be found in the Trapper's Guide issued by Conservation Information Service, Regina, Saskatchewan.

Beavers taken under the ice bring better prices.
Tooth marks on beaver skins indicate a lack of food and too high a population. Increase the harvest.
Shot or damaged pelts lose much of their value.
Overscraping exposes the roots of the fur on the skin.
Overstretching spoils the skin and gives it a paper-like appearance.
Large beaver pelts are worth more than small ones. Leave the small ones to grow.

The simple set shown in the figure on the following page has been quite effective in deeper water. Locate the set ten to 25 feet from a beaver lodge. Cut a hole in the ice. Cut two 4-inch diameter dry poles (guard poles) and one 4-inch diameter green pole (bait pole) long enough to reach lake bottom. Shove one of the dry poles into the bottom of the lake to see how far it goes into the mud. Pull it out and fasten a number 4 trap to each of the guard poles near the top of the mud line. Then set the poles and traps back into the lake bottom. Set the green bait pole firmly into the lake bottom between the guard poles. Move the traps into correct positions with long sticks.

BEAVER STAKE SET



Centre Pole is for Bait

Locate the set shown in Figure 1 about 10 to 25 feet from a beaver house. The depth of water should be about 16 inches from the bottom to the underside of the ice. Cut two dry poles about three inches in diameter and five feet long. Shove one pole into the bottom to see how far it goes into the mud. Fasten a number 4 trap to each dry pole at the top of the mud line. Nail a foot long green bait stick across the dry poles about one foot above the mud line. Shove the poles and bait stick into the mud bottom. Place two dry poles about six feet long in the mud about one foot on either side of the trap poles. Cross these brace poles and tie all poles together at ice level. Carefully position the two traps between the upright poles and the brace poles.

The Conibear trap is one of the best traps on the market today for the humane taking of beavers (Figure 2). Other useful sets are shown in Figures 3 and 4.

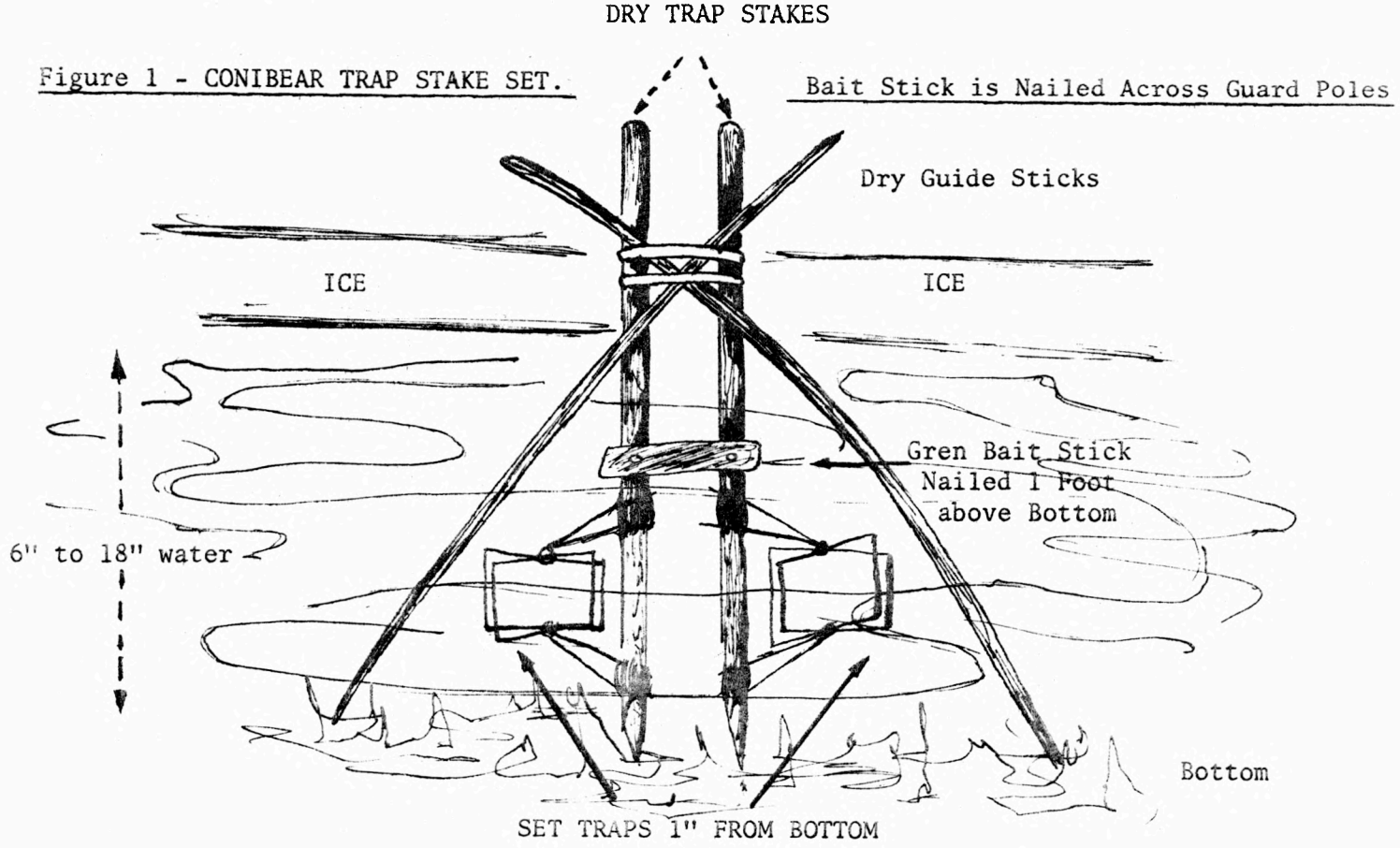
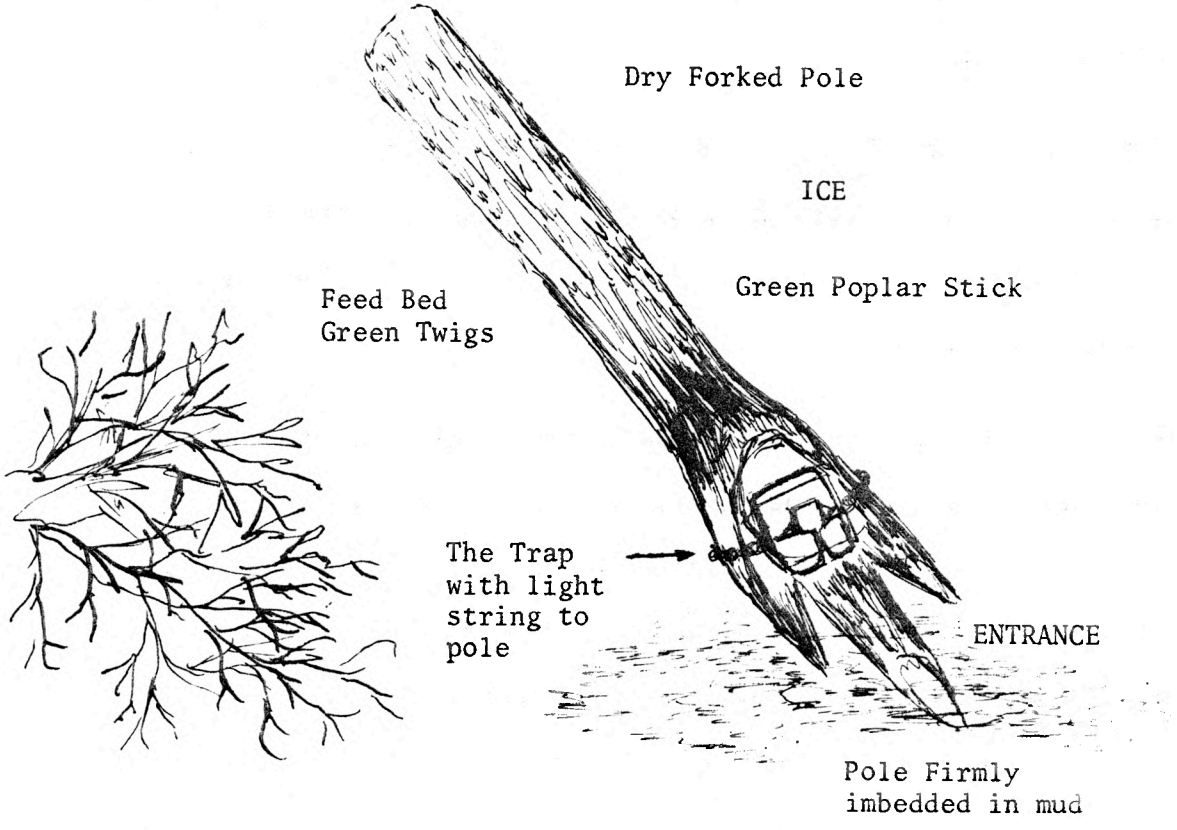


Figure 1 - CONIBEAR TRAP STAKE SET.

Figure 4 -

Beaver Lodge Entrance Pole Set. Bait stick used is green poplar.



MINK

Trapping Suggestions

These fine, little furbearers are seldom found very far from water. Their favorite haunts are the banks of creeks where there is good cover. They travel through the woods only when crossing from one body of water to another. Mink den in the ground in old muskrat burrows, rock piles, bluffs, and sometimes in hollow logs, but never far from water.

The mink is strictly carnivorous in its feeding habits. Its diet consists of fish, crayfish, frogs, mice, muskrats, rabbits and other small animals and birds. The young are born in April or May, and the average litter is five or six.

Mink are great travellers, following the banks of streams and lakes for long distances in the night. Like most other wild animals, they follow the same route at periodic intervals, unless disturbed in this routine. The female mink usually covers her regular hunting route every other night. The male is apt to make longer trips and may not cover the same route more than once a week.

In these travels, they invariably visit certain spots on each trip. These favorite places may be a deserted muskrat den, a ground-hog hole, a pile of driftwood, a hollow log or tree, a rock pile, a bluff or the bottom of a narrow stream bed. The trapper will acquaint himself

with the location of these places and make his trap sets in or near to them. When there is snow on the ground, these spots are quite easy to find.

Another characteristic of mink is that they enter and leave the water at the same place. By careful observation, even when there is no snow on the ground, these places can be located by signs. They make excellent places for trap sets.

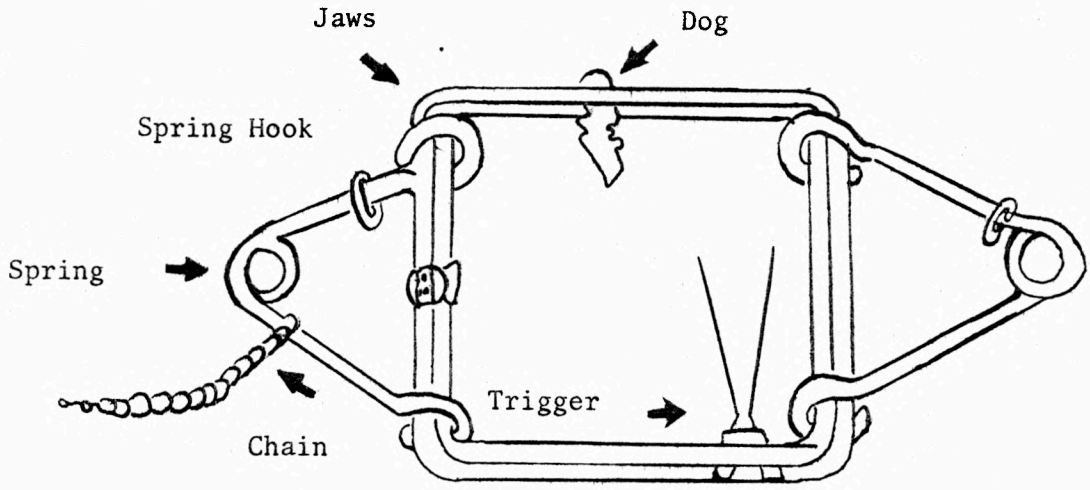
Methods of trapping the mink vary as the trapping season progresses. Best results are obtained from early fall trapping, as soon as the pelts are prime. The second week in November usually shows a good pelt.

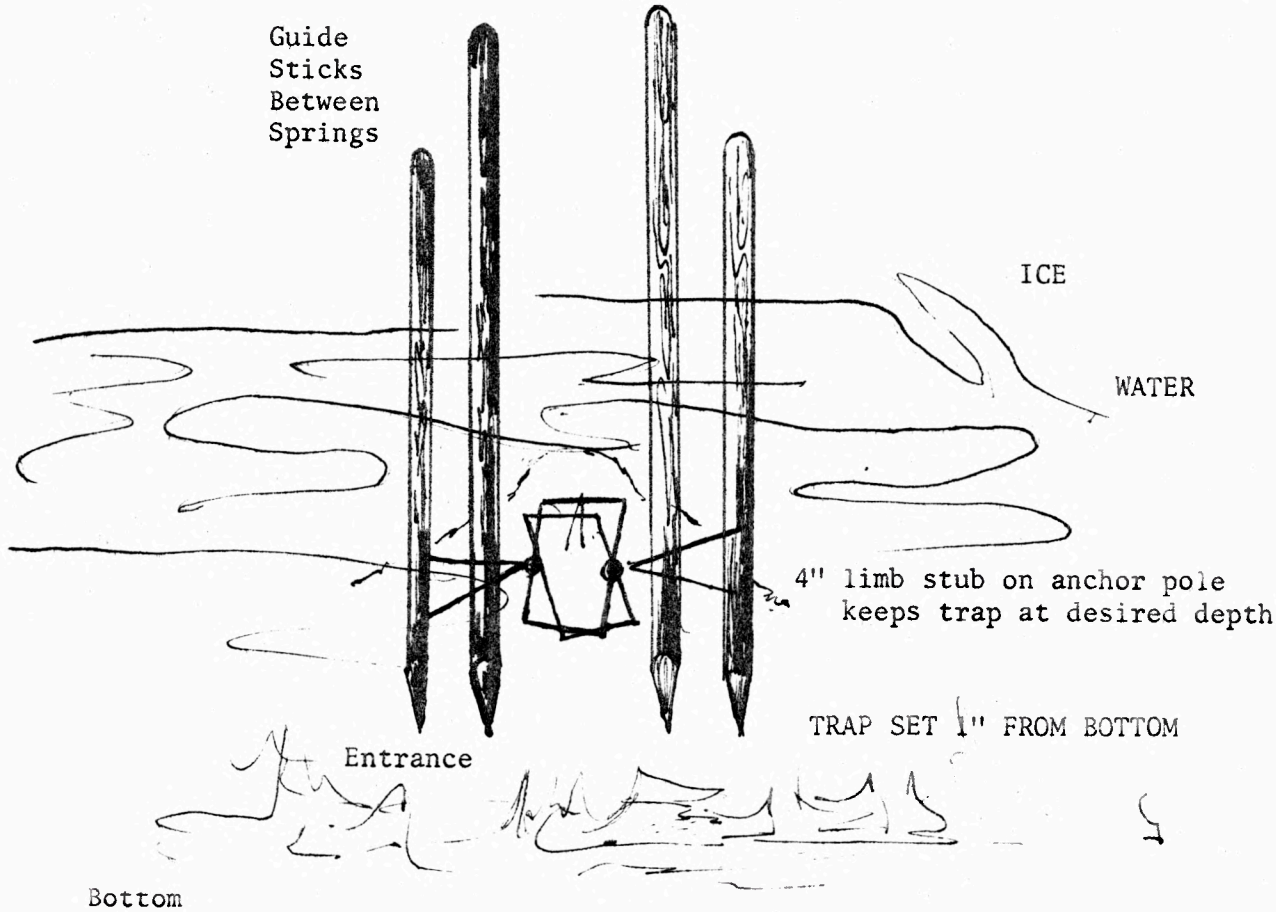
Do not set traps on the ground or on snow. Place a few dry twigs as a foundation for the trap. This prevents the jaws of the trap from freezing down. Camouflage the trap with feathers, dry leaves, dry grass or material such as a deserted squirrel nest. This material should be scattered lightly over and around the trap.

Another good location for a trap is in a narrow stream below a beaver dam, about four inches below the surface of the running water. If the water is too deep, a platform of sticks placed in the mud may be made.

Traps set in a ground-hog hole should be at least 14 inches down the hole. The entrance should be very lightly plugged with a handful of grass.

Conibear Trap ... etc.



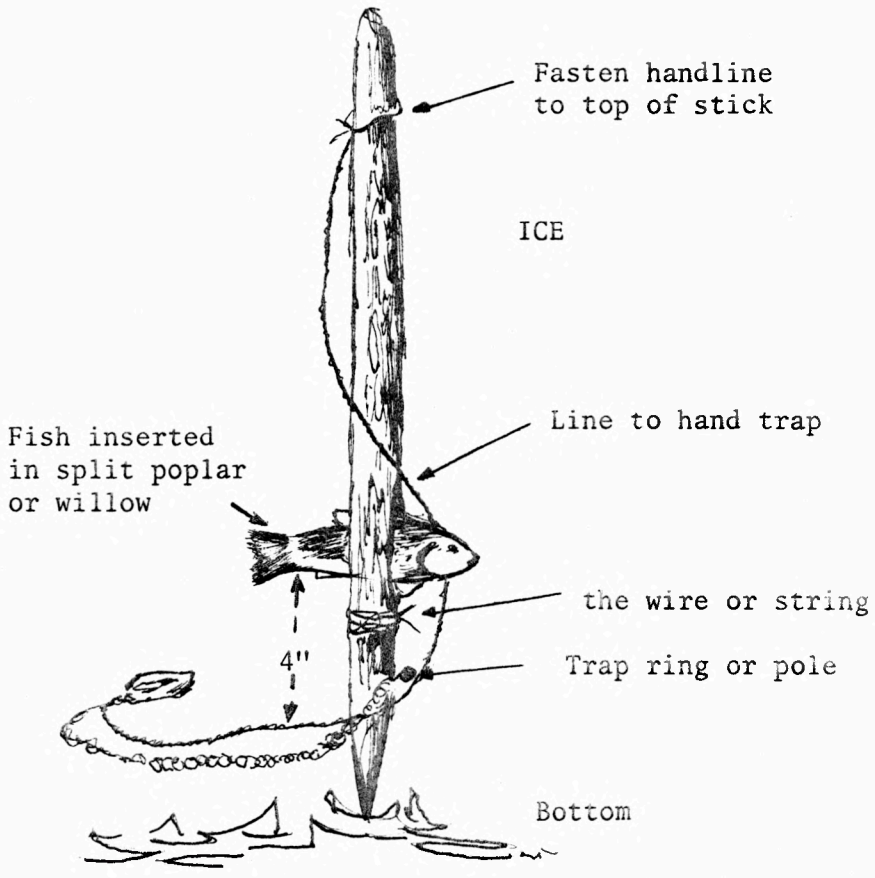


Winter Trapping

Once the very cold weather sets in, the water levels of beaver ponds and the midstream ice usually drop, creating additional travel surroundings for minks. Near the shore, the ice frozen onto the banks cannot drop and the space created under the ice makes a runway for minks, and an excellent trapping place. At this time, traps should be set in old runways leading to abandoned beaver houses. No bait is necessary, but the trap should be camouflaged and set on a dry twig foundation.

Another winter set, using a fish as the lure, is described in Figure 5.

Figure 5 - MINK FISH BOTTOM SET



Fall Trapping

Mink travel more in early fall when there is less snow. They will take bait quite readily and do not spend much time under the ice. If possible, fall sets should be made at beaver dams, preferably just below the dam in a natural cave or cubby. A cubby may consist of a few sticks or logs placed in such a fashion as to make a box about two feet square. It should have only one entrance, and should not be wider or higher than is necessary to allow the trap to close properly. The cubby should be covered with grass, moss or spruce branches to protect the trap and bait from ravens, jays or magpies. The bait may consist of almost any fresh meat, or the scent glands of a previously caught mink, if available. Offal, available from any mink ranch, also makes excellent bait.

WEASELS

Trapping Suggestions

Number 1 traps are the most practical size for weasels. Sets should be covered with brush or placed in cubbies to avoid catching scavenging birds, and also to prevent the traps from being snowed-in. A properly constructed cubby will also prevent loss of trapped animals to owls and hawks.

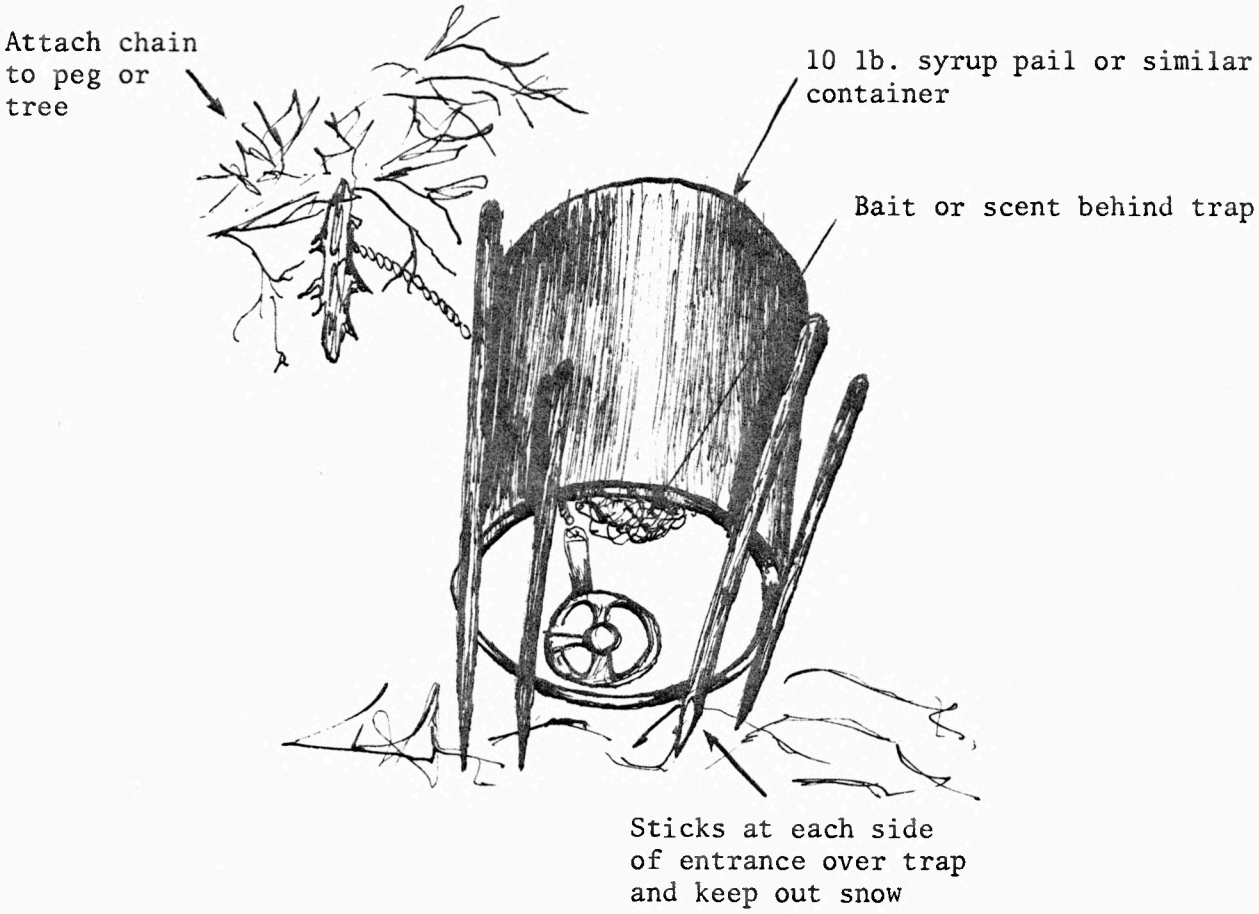
The best locations for weasel traps are where mice are commonly found. Locate sets in rock piles and small brush patches.

Weasels will take bait most readily during November, with some tapering off during the mid-winter months. Fresh meat or blood are excellent baits. Rabbits, muskrats, fish or any waste parts from slaughtered animals can be used with success. Well-blooded meat is most desirable.

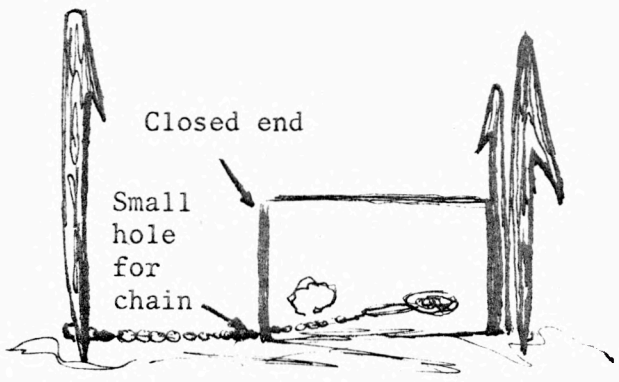
Weasel sets should be checked frequently for damage by mice or shrews. If mice are abundant, re-bait sets frequently.

Do not thaw out frozen weasels too near a stove. Hands should be washed before skinning, and rinsed again before stretching pelts. Clean weasel pelts bring far greater returns in money to the trapper and dealers.

WEASEL OR MINK SET



WEASEL OR MINK SET (side view)



BADGER

The badger is mainly carnivorous, its food consisting largely of gophers, prairie dogs, mice, ground squirrels, snakes and frogs, birds and their eggs, grasshoppers, and other insects are also included in its diet when they are available.

There seems to be a great deal of doubt as to the domestic life of the Canadian badger. The British badger mates in the autumn, but there are some who maintain that the Canadian animal mates in early spring like most of the other Canadian fur-bearing animals. The evidence is not conclusive either way and the period of gestation is therefore still a matter of doubt. The young are born late in the spring and are usually three in number, although litters of four and five have been known.

BEAR - OURS

Bears occur widely throughout Canada. There are several species but the black bear is the most common, being found throughout most of the forested areas from coast to coast. This animal is omnivorous and its range of food is indeed extensive. Although it lives largely on nuts and berries when these are available, it will also spend hours fishing patiently, or turning over stones and old logs to lick up the ants and other insects underneath. Everything is game for it and it will rob a bee's hive or a trapper's food cache with equal relish.

Black bears breed only every second year. Mating occurs in June or July and the twin cubs are born approximately 210 days later, while the mother is denned up for the winter in a state of semi-hibernation. The cubs are hairless at birth and weigh less than one pound each. They will remain with the mother for two years before striking out on their own.

The grizzly bear is a larger and much more formidable animal than the black bear. It is one of the world's largest land carnivores and has the reputation of, often, attacking man on sight. Like the black bear, the grizzly will eat almost anything. Its range extends from the eastern slopes of the Rocky Mountains through to the west coast and it may be found in valleys throughout this area, fishing the streams and feeding on berries. The grizzly dens up for three or four months of the winter and the cubs, averaging two, are born in this period. The female breeds every second year.

The polar bear is found only in the Arctic regions, its range extending throughout the Arctic Islands, along the coast of the Arctic Ocean and down into Hudson's Bay. This carnivore is about the equal in size of the grizzly bear but is peculiar for its long, slender neck and rather pointed head. It feeds chiefly on seals and fish, however, it can subsist on lemmings, and even on moss and berries when other foods are not available.

This bear is white in colour (sometimes with a yellowish cast) throughout the year and the soles of its feet are covered with close set hairs that enable it to grip and walk securely on the ice. It is a very powerful swimmer and spends much of its time on drift ice and in the water, sometimes being seen at sea miles from the nearest shore. The polar bear has few natural enemies in his home range, although, when he is in the water, he generally steers clear of the male walrus whose strong tusks make him a formidable adversary.

The male polar bear is active throughout the year, but in late fall the female chooses a sheltered spot in the icefields and fashions a makeshift den. During the winter months the two cubs are born there, remaining in the den until spring when they are old enough to accompany their mother on foraging expeditions.

BEAVER - CASTOR

An amphibious animal and the largest of the rodent family, the average adult beaver weighs around 40 pounds, although occasionally heavier specimens are found. Like most aquatic animals they have webbed feet and, in addition, have valves in their ears and nostrils that close when they swim under water. The range of the beaver in Canada is across the forested parts, north to the timberline, and they are generally found in lakes and along streams where birch, willow and aspen abound.

Beaver are monogamous and when they choose a mate in February or early March, they remain mated for life. The young are born late in May or early in June and generally number three or four. The beaver live in colonies of eight to twelve animals, including the adults, the kits, and the young from the previous year. In their third year the young leave the colony and set out to found homes of their own.

Beaver are well known for their engineering feats of building lodges and dams. The lodges are very stoutly constructed from sticks, mud and stones, and may be 20 feet in diameter, extending from the water bed to several feet above water level. There are one or more under-water entrances leading to the inner living space. In time, the exterior of the lodge becomes hard and strong enough to afford complete protection against other marauding wildlife. Since fluctuating water levels would render the lodge untenable, the beaver construct a dam

to ensure the necessary constant level. A typical dam may be four or five feet high and up to several hundred feet in length, depending on the terrain. All hands, adults and young, pitch in on the project, the dam being constructed from the same types of material as the lodge.

The beaver's food consists largely of the bark of birch, willow and aspen trees, the young bark and twigs of many other hardwoods and, in summer, many kinds of vegetation and berries. Before freeze-up, food supplies must be provided to last through the winter months and the beaver takes care of this by storing smaller tree trunks and branches on the water bed close by the lodge. The pieces are held in place by being pushed part way into the mud. During the winter they are taken one at a time into the lodge, the tasty bark is stripped off, and the bare pole is then discarded.

Prior to the institution of conservation measures, uncontrolled trapping had practically eliminated beaver throughout large areas, occasioning considerable hardship to the native population which depended largely for its livelihood on fur trapping. Enlightened game management techniques, including restocking the depleted areas with beaver from other parts of the country, were effective in assisting the animal to stage a comeback. Also, in many fur-producing areas a system of registered traplines has been instituted, whereby trappers are allotted a specific trapping area for their sole use. This system puts the responsibility on the trapper for the conservation of beaver and other fur bearers in his area, and encourages him to trap less intensively

any species which show signs of becoming scarce. As a result of these and other conservation measures the beaver population has been enabled to build up rapidly and, in 1960, throughout the country it was estimated that this hardy rodent was again as numerous as it had ever been since the early days of settlement.

Economically, the beaver has been and still is the most important fur bearer to the trapper. Beaver is the staple of the Canadian fur industry and the rich, dark brown underfur of the sheared and plucked skins has achieved popularity in fur salons throughout the world.

RED FOX - RENARD ROUGE

Foxes are the smallest members of the dog family, which includes wolves, coyotes and domestic dogs. They are found in all areas of Canada, from coast to coast and north to the timberline. The cross fox and the silver fox are colour phases of the red fox and red fox litters often include one or more cross or silver pups.

The red fox is the most common of these coloured foxes. Averaging about ten pounds in weight, its colour varies from dark red to light yellow, shading to white on the belly. In common with the cross and the silver, the tail (or brush) of the red fox is very bushy, with a white tip.

Cross foxes vary greatly in colour, ranging from a pale yellow or orange tone to dark red, inter-mixed with black and white hairs. Its chief characteristic, however, is the cross on its back from which this fox derives its name. The cross is formed by bands of black hairs running down the centre of the back and across the shoulders.

The colour of the silver fox varies from entirely black to full silver. This is actually a black fox which achieves its *"silvery"* effect through white hairs sprinkled on the back and sides. Most of the silver fox pelts on the market today are raised on fur farms.

Foxes mate in February or March and the young are born in April or early May, following a gestation period of approximately 60 days. During the whelping season the foxes occupy dens among rocks, or holes which they dig for themselves. These usually have two or three exits running in opposite directions. The litters contain from two to nine young and both the male and the female assist in looking after the offspring.

In addition to inhabiting the forested areas of the north, the red fox has adjusted successfully to life in the settled areas, frequenting bushland and meadows neighbouring on farms, where mice are plentiful. Foxes eat practically anything. Their main foods are mice, rabbits and birds but they will also eat insects and berries and, in the settled areas, they are not averse to raiding a chicken coop.

Although the demand for fox furs increases or falls off in accordance with the dictates of fashion, the fox pelt at all times remains a thing of beauty. The striking colour contrasts and the long, glossy guard hairs overlaying the deep pile of the underfur produce a luxurious effect that embodies all the magic contained in the word fur.

MUSKRAT

The muskrat is an aquatic rodent, about 20 inches in length including a tail of about nine inches. It is well adapted to its form of life, having a dense, waterproof underfur and a protecting coat of long, glistening guard hairs. Its ears are almost concealed in the fur and the eyes are small. The hind feet are large and partly webbed and the tail is long and scaly. Because of its appearance and the presence of glands which emit a musky odour, it has been appropriately named a muskrat.

The muskrat may be found practically everywhere in Canada, north to the timberline, and in some areas right up to the Arctic Ocean. The habits of the beaver and the muskrat are similar in many respects. They are both amphibious rodents which choose for their habitat marshy ponds and lakes and the banks of slow running streams. Muskrats may live in bank burrows or in lodges built largely of twigs and mud. When a new home is to be constructed, vegetation and mud are brought to the spot and a little island is gradually built up. When this is well above water, the muskrat digs a tunnel into the structure under the water level, and keeps excavating until it has a living chamber with, generally, two entrances under water to facilitate escape in case of attack.

Muskrats living along streams and creeks where the banks are steep and the water deep, usually burrow into the bank underneath the surface of the water and excavate until they arrive above the water level, where

the tunnel is widened into a large room for living quarters. These burrows sometimes extend 40 or 50 feet and the entrances are always in deep water where there will be little danger of them freezing up.

The muskrat is very prolific, producing two or three litters per year with, generally, from five to seven kits in each litter. The gestation period is about 30 days. The young muskrats are able to fend for themselves when they are about four weeks old, and muskrats born in the spring will breed in the fall. This high reproduction rate would soon lead to an overabundant population, however, the muskrat has many enemies, the chief of which are mink, otter, foxes, wolves and the larger owls. The worst of these is probably the mink since it frequents the same areas and, being aquatic, can follow the muskrat right into its home. In addition to the depredations of these marauders, disease, drought and flooding also serve to keep the muskrat population in check.

The food of the muskrat consists principally of aquatic vegetation but they will also eat clams, frogs, fish and even young birds when these can be obtained. When an area becomes overpopulated, the resulting shortage of foodstuffs forces many to leave the area and journey, often overland, to find new homes.

The fur of this mammal is nearly as fine and dense as that of the beaver and through the years muskrat has contributed a great deal to the fur industry. In addition to the annual catch made by Northern trappers, muskrats are still taken in good numbers in the central

portion of the country, even in many of the settled areas, and returns from the sale of the pelts provides supplementary income for many part-time trappers.

At the manufacturing level, following dressing, some of the finest quality pelts are *"sealed"*, that is to say the guard hairs are removed and the underfur sheared, then dyed black to produce *"Hudson Seal"* muskrat coats. Other pelts are used for natural coloured garments. The majority however are dyed various shades of brown, then striped and grooved so that the finished garment resembles, to a degree, mink.

LYNX, LYNX CAT AND BOBCAT

The lynx is a member of the cat family. It has a large head with a rather flat face and the ears are quite prominent, with tufts of black hair projecting from the tips. The feet are large and heavily furred, and the tail is not more than a stub, grey on top and white below, with a black tip. The rather shaggy fur is silvery, mottled with brown, on the back and sides, shading off to white beneath. The characteristic stance of this animal is with the hindquarters higher than the shoulders.

The lynx is primarily a wilderness creature, its range extending throughout the more remote forested areas where it is seldom seen even in periods of comparative abundance. Although the adult lynx weighs up to 40 pounds, its large paws enable it to walk easily in soft snow where other animals would flounder helplessly, and the lynx makes good use of this advantage when hunting.

The chief food of this animal is the rabbit and the fluctuations or 'cycles' in the abundance of lynx correspond closely to the increase and decline in the numbers of rabbits. The lynx also preys on mice, birds and any other small game that may come its way.

Lynx mate during February or March and the gestation period is approximately 60 days. The litters containing from two to five young are born in dens under windfalls or in crevices among rocks. The young are suckled for about three months and appear to follow the mother for the greater part of a year. Although the male is seldom

seen with the family after they leave the den, the indications are that he stays in close proximity to them during the greater part of the year, giving rise to the belief that the lynx is monogamous.

The lynx cat and the bobcat, or wild cat, are sub-species of the lynx that are found in forested areas, usually further south than the range of the true lynx. In Canada they occur mainly in central and southern British Columbia, and in some parts of the eastern provinces.

They are smaller than the lynx and, although similar in appearance, the fur of the lynx cat and the bobcat is usually reddish-brown, with dark spots on the flanks and underside. Also, the tail has several dark bars on top and the tip is black on top only, whereas the lynx has a full black tip.

Like the lynx, the lynx cat and the bobcat are shy animals and are seldom seen by hunters, probably due to the fact that they are nocturnal, remaining in their dens during the daylight hours. Their diets consists almost entirely of small animals, game birds and their eggs. Infrequently they attack livestock.

The deep silky fur of the lynx is prized by the fur industry, being used mainly as trimming on a wide variety of cloth garments. The pelts of the lynx cat and the bobcat are also used for this purpose but generally realize prices considerably below that of the true lynx.

OTTER - LOUTRE

The northern otter is to be found throughout the forested area in Canada, along the larger streams and lakes. It belongs to the weasel family, like mink and ermine, and its chief characteristics are a long body, very short legs, webbed feet and a long, tapering tail which, at the butt, is almost as thick as its body. The colour ranges from medium brown to glossy black.

The most playful and sociable of the weasel family, the otter, in company with its kind, is very fond of sliding or tobogganing down the steep banks of a stream or lake into the water. These animals may be seen climbing and sliding and thoroughly enjoying themselves for hours on end. They appear also to enjoy playing their own watery versions of tag and hide-and-seek.

The otter spends practically all of its time in and around water, frequenting, especially, the larger lakes and rivers where there is clear water and plenty of fish. In winter it is often found around areas of open water near falls or rapids. The diet consists principally of fish, supplemented by waterfowl, frogs, muskrats and other small animals. Although rather awkward on land, otter will travel long distances overland from one body of water to another, progressing with a peculiar bounding and sliding gait.

In the latter part of April the young (from one to four) are born, in dens under overhanging rocks or among the roots of an old tree. Sometimes the otter will burrow into the bank of a lake or river, making the entrance to the den under water. Both parents assist in caring for the young, which are able to fend for themselves at around three months of age.

The finest otter come from Northern Quebec, pelts from this area possessing a silky texture and a density of fur unequalled in the otter from other areas. At the processing level, otter pelts are treated much the same as beaver, the long guard hairs being removed and the top of the underfur sheared. The underfur that is left is very dense, more so even than that of the beaver.

More recently the practice has been perfected of bleaching otter pelts then dyeing them in pastel colours. The resulting garment is very attractive and, in addition, this treatment serves to camouflage a fault found with otter - the very light colour of the lower underfur which, in a natural coloured garment, has a disturbing tendency to reveal itself with the movement of the garment when worn.

RED SQUIRREL - ECUREUIL

The red squirrel is a member of the rodent family. Its range extends throughout the forested areas, from coast to coast and north to the timberline. This noisy creature is undoubtedly the most familiar of all Canadian mammals and throughout the year its chattering and scolding can be heard in almost every section of evergreen woodland.

The diet of the squirrel consists mainly of nuts, seeds and berries. During the fall period it harvests large quantities of these items and stores them for use in winter. A deserted woodpecker hole or a small hollow in a tree serves as a nest and the young, generally four to seven, are born here in April or May.

Squirrel are taken in many parts of Canada and although the value of the individual pelt is low, trapping returns are distributed throughout countless central and northern villages, providing a welcome source of additional revenue for many part-time trappers as well as for the professionals.

The province of Alberta accounts for approximately half of Canada's squirrel production, the bulk of the pelts coming from the Peace River and Grande Prairie sections. The largest and finest quality Canadian squirrel come from the Yukon Territory, followed closely, from point of view of quality, by squirrel from northern Alberta and northern Saskatchewan.

WEASEL OR ERMINE - BELETTE OU HERMINE

The range of the weasel extends throughout Canada from coast to coast and north to the Arctic Islands. There are three sub-species, the long-tailed weasel which is usually found in the more open sections of western Canada, the short-tailed weasel or ermine which frequents forested areas from coast to coast and the *"least"* weasel which occurs in all areas. The long-tailed weasel is by far the largest of this family. When fully prime its fur is pure white while the winter coat of the smaller short-tailed ermine is white with, usually, a slightly yellow coat. In the summer the coats of both these animals change to reddish-brown, the tip of the tail remaining black in all seasons. The least weasel averaging about five inches, is of no commercial value.

This animal frequents thickets and stoney places, as well as tree roots and the deserted burrows of moles and other ground creatures. Slender and wiry in body, with short legs and small feet, the weasel is a wanton killer and does not hesitate to tackle animals much larger than itself. It lives mainly on mice but will also kill rabbits and birds. Its depredations in chicken houses are well known to farmers for it will often kill 20 to 30 birds in a single night. Often the weasel will simply suck the blood, leaving the rest of the carcass untouched.

Mating takes place during March and the young, usually numbering six to twelve, are born in April or May. Both parents appear to assist in rearing the young.

Throughout history ermine has been associated with majesty and at one time the wearing of this fur was restricted to royalty. It is still used for state robes, the station of the wearer being indicated by the presence, absence or disposition of the black tail tips.

TIMBER WOLF - LOUP DE BOIS

The timber, or grey wolf as it is frequently called, is much larger and much more heavily built than the prairie wolf or coyote. Formerly found nearly all over Canada, it has now been largely restricted to the more remote areas of timber-land and the barren lands of the sub-arctic.

It varies greatly in colour and size according to the areas in which it ranges. On the northern barrens it is almost white except for a few black markings down the back. Further south in the timber areas, the colour varies from a yellowish to blue grey along the back and sides fading to white underneath while the back markings on the back are much more pronounced.

The timber wolf is, apparently, more social in its insticts than its smaller cousin, the coyote, for small packs, usually family parties, up to seven or nine in number, will frequently be found hunting together. This may be occasioned by necessity, however, rather than any special hankering for the company of its kind. Since the wolf has to depend on the successful hunting of moose, deer, muskox and the other larger animals for the main part of its food and as these animals are well able to defend themselves in a fair fight the advantages of hunting in packs must soon have become evident to an animal as cunning and resourceful as the timber wolf.

Like the coyote, the timber wolf mates during February and the young are brought forth in a rough den about April, the number in a litter varying from five to ten or even more. The young continue with the parents until late autumn when they separate apparently for good.

What has been said regarding the difficulties of trapping coyote applies even more emphatically to the timber wolf. It has all the cunning and wariness of the coyote and, in addition, is a much heavier and stronger animal.

WOLVERINE - GLOUTON

The range of the wolverine extends throughout the northern forested areas in Canada, this animal being found most frequently in northern British Columbia and the Yukon and Northwest Territories. It is the largest and most formidable member of the weasel family, having a squat, heavy body, broad head, heavy limbs with long, powerful claws and a short bushy tail.

Its colour ranges from yellowish-brown to dark brown. Pale bands which vary in colour from light brown to near-white extend across the forehead and along both sides of the body, to the tail. Like the other members of the weasel family it has glands at the base of the tail that produce a musky odour. The adult wolverine weighs up to 40 pounds.

Its food consists largely of mice and other rodents but it will successfully attack larger animals including moose, deer and caribou that may have become weakened or bogged down in deep snow.

Trappers claim that the wolverine will follow a line of traps, eating the bait, destroying any animals caught, and even pulling up the traps and burying them. It is said to be expert at breaking into food caches, destroying or spoiling whatever it is unable to eat.

The little information that is available concerning this animal indicates that the wolverine mates in February or March and the young are born late in April or May. Usually the young number two or three and it seems likely that they remain with the parents until fall.

FISHER - PEKAN

The fisher is one of the larger members of the weasel family. About the size of a large domestic cat, its fur is dark brown to greyish-brown, generally lighter in colour, and often somewhat grizzled, towards the head. The fisher's head is short and broad, the ears are quite short and the tail is long and rather bushy. It is probably the most agile of all the arboreal animals, being faster in the trees than either the squirrel or the marten, while on the ground it can run down a hare in open chase. Despite its name, the fisher does not fish and, as a matter of fact, has not much inclination towards water.

At one time fisher roamed throughout the forested areas of Canada but they are quite scarce now, being found mainly in isolated northern regions. Their principal foods are rabbits, porcupines, squirrels, mice and birds, but they are fearless and savage marauders and will successfully tackle large animals.

The fisher generally makes its den in the hollow of a tree, high off the ground, although it may sometimes be found under a windfall or in a crevice in the rocks. Mating takes place in March or April and the young (an average of three) are born after a gestation period of approximately 350 days. Judging by observations made on fur farms, fisher are polygamous and the males do not play any part in raising the young. In fact they maintain a safe distance from the litter and keep a fearful and wary eye on the female.

FOX, ARCTIC

The Arctic or white fox inhabits the Arctic and sub-Arctic regions. In winter its pelage colour varies from a clear, dazzling white to white with a slightly creamy tinge. In the summer months it is greyish-brown, with a lighter belly. The white fox is smaller in size than the red fox and the bushy tail is shorter than that of the red.

The blue fox is a colour phase of the white fox and blue pups may occur in white litters, although production of the blue phase does not generally exceed about one percent of the total production of white foxes. The colour of the *"blue"* fox varies from a slate blue to a rather drab brown.

Lemmings form the principal food of this fox which feeds also on birds, bird's eggs and the leavings of the larger carnivora. The white fox is subject to marked fluctuations in numbers from year to year and these fluctuations or 'cycles' notably affect the number of pelts taken annually. The cycle of white foxes coincides with a similar cycle in lemmings and is perhaps caused by it.

White fox furs are the staple of the Eskimo trapper. At the retail level this fur is perennially popular for evening wear, in capes, stoles and collars. The finest quality pelts come from Western Arctic sections, clear white pelts being the most valuable. Due to the feeding habits of the animal, and also arising out of improper pelt handling methods, many of the pelts that reach the market are badly stained by grease, with a consequent reduction in the value of the pelt.

MARTEN - MARTRE

The marten, sometimes called the Canadian Sable, is a member of the weasel family and has the reputation of being the most unsociable of that unsociable family. Originally it was found throughout the forested areas in Canada but many years of trapping has now reduced its range to the more isolated areas. Its lair is usually in a hollow high up in some old tree, although, sometimes, it may be found in burrows or in crevices among the rocks.

Since it will live only in the densest forest and underbrush, much less is known about its habits than about those of most other animals. It is smaller in size than an ordinary house cat, with rather short legs, small feet and a fairly thick bushy tail. Very shy of man, it is seldom or never seen near a habitation of any kind. It is most agile in the trees and will climb and jump from tree to tree with tireless energy.

The value of the marten lies in its rich silky fur which is often of a very rich dark brown colour shading into almost black at the tail, with a large irregular patch of pale buff or orange at the throat.

It will eat practically anything. Its main food consists, however, of rabbits, squirrels, mice, birds and their eggs, nuts and many kinds of wild fruits and berries and particularly rowan berries. Unlike the ermine, it does not appear to kill wantonly. What it cannot eat, it caches away for future use.

The same unusual circumstances apply to the breeding habits of marten as to fisher. The young are apparently born about April, but it is contended that the gestation period extends over about eight and a half months so that mating under these circumstances would take place about July or August. Litters usually run from four to seven and the young continue with the mother probably until winter sets in, after which they take up their individual solitary existence. Except for the brief period of mating, marten usually show a consistent cold-blooded ferocity to each other, regardless of sex or relationship.

PRAIRIE WOLF - LOUP DE PRAIRIE

This branch of the wolf family is found all over Western Canada on the prairies and in the sparsely wooded sections bordering on them. Smaller and more slenderly built than the timber wolves, they are just as rapacious and predatory in their habits. Ordinarily they may be found hunting in couples. The bands that are reported as having been seen from time to time are most likely family parties, as it is known that the young continue with the parents until well on in the autumn. The efforts that have been made by governments and individuals to exterminate these animals in certain localities have been singularly unsuccessful. This has been due largely to the cunning of the coyote which it has shown in eluding man's efforts to capture and destroy it.

There is reason to believe that the coyote is monogamous. Mating takes place about February and the young are born about April, in a burrow dug on a hillside by the female, or in a natural den in broken rocky country. Litters may contain as many as ten or twelve. During this time, while the female is tending the young, the male provides for the family and will desperately protect it against intrusion. The young are able to move around when about four or five weeks old and keep company with their parents until about the end of October when, apparently, the family breaks up.

In colour, the coyote is yellowish grey, relieved on the back with a sprinkling of black hairs. The head is long and pointed as also are the ears. The tail is black tipped and bushy.

When the buffalo were numerous over the plains of Western Canada, they were followed by bands of coyotes. With the disappearance of the buffalo the coyotes had to look elsewhere for their prey and consequently turned their attention to the cattle and sheep of the farmer, as well as extending their range in the mountain districts of the west. So numerous are they in certain districts that they have become a real menace to the farmer and nothing that he can do seems to lessen their numbers in any material way.

RACCOON - CHAT SAUVAGE

This animal is like the bear in many respects, it hibernates during the cold months and it is omnivorous, yet it cannot be classed as a bear, for it uses its flexible front paws while feeding in a manner quite different from that of the bear, and its way of breeding and caring for its young is different also.

It is a thickly built animal about the size of a badger, with a shaggy coat of rather coarse, greyish-brown fur interspersed with yellowish and black hairs. The underfur is dark and dense. The short club-shaped tail, with alternate black and yellowish rings, makes the animal readily recognizable. The nose and ears are rather pointed and there is a distinct black mask across the yellowish white face. The toes, particularly of the forefeet, are long and well separated and are used much as a monkey uses its hands.

The coon, as it is commonly called, is found mostly in Western British Columbia and Ontario, Quebec, and the Maritime Provinces, living usually on the edges of hardwood forests near water or marshy ground. It is an excellent climber and also swims well. Nocturnal in its habits, it does practially all its hunting and travelling at night. The ideal den is a hollow branch high up in a tree well exposed to the sun, but although arboreal in its nesting habits, it hunts and obtains most of its food on the ground. It will eat practically anything and when near water it has the peculiar habit of washing its food before eating it. Among its

principal items of food, frogs, cray-fish, crabs, birds, eggs, berries and nuts might be mentioned. It is also inordinately fond of green corn and if there is a cornfield around, that is where the coon will be found most nights. The raccoon is a night prowler at all times and has a great amount of curiosity that gets it into no end of trouble. Any bright object like metal will cause it to stop and investigate, and persons engaged in hunting it make good use of the habit.

Being a hibernating animal, there is some doubt whether the coon mates in the fall or in the spring. The weight of opinion, however, favours the spring. In any case, the young born late in April or early in May and may number from three to six in a litter. The male and female both assist in bringing up the young and the family continue to live together well through the following year. The coon is very sociable and it is but rarely it is found alone. There are usually a pair or a family together.

TERMS USED BY FUR TRADE INDICATE QUALITY

It is important to know the meaning of the common terms used by the trade in classifying skins according to quality. The following definitions of trade classifications will give some idea of the essential points that determine the class into which a pelt is placed.

FIRSTS (I)	- Pelts of best quality. Generally speaking these are faultless skins, being fully furred, prime pelts, free of blemishes.
NUMBER TWOS (No. 2)	- These are essentially FIRSTS with slight blemishes which do not materially affect the use of the fur. Pelts in this class may be slightly unprime, or have a very slight amount of damage or a slight weakness in the fur.
SECONDS (II)	- This grade covers a wide range of qualities and is often divided into two sections, i.e., *"good"* seconds and *"common"* seconds. SECONDS may be unprime or blue pelted, with short underfur and guard hair. They may be badly handled, singed or of coarse texture. Also, SECONDS may be badly faded or off-colour.
THIRDS (III)	- These are skins that have decided defects. The leather may be blue all over, the fur short and thin, or the skin may be long past its prime and shedding badly.
FOURTHS (IV)	- Low grade skins with little or no top hair.
DAMAGED	- Damaged skins, including shot skins, are graded and valued according to their merits and the extent of the damage.

PREPARATION OF PELTS FOR THE MARKET

Source: Livestock Division,
Canada Department of Agriculture,
Ottawa, Ontario.

Trapping calls for skill and patience and often exposes the trapper to hardship. Catching the animals is, however, only part of the battle. The skinning and the preparation of the pelts for the market still remain to be done. These are important operations, for upon the skill and care devoted to them depends to a great extent the value of the pelts in the fur market. There is no doubt but that clean, well-handled skins will always realize better prices than skins of similar quality which have been poorly fleshed or improperly stretched.

SKINNING - Two methods are used *"open"* and *"cased"*. Animals customarily skinned *"open"* are, however, badger and bear. Beaver is of course the most important of these three and this animal is always skinned *"open"*. Raccoon and wolverine may be either *"open"* or *"cased"*, but all other animals are *"cased"*.

If the animal is to be skinned *"open"*, the skin should be cut from the point of the lower lip along the centre of the chest and belly to the vent. The pelt is then worked off to the legs which are pulled through after they have been cut off at the first joint. It is then quite easy to finish taking the pelt off.

If the skin is to be *"cased"* the skin should be slit on the inside of the hind legs from the paws to the vent, the hind legs, the rump and

the tail, skinned out and the animal hung up by tying the hind feet together over a hook or the limb of a tree. It will then be found easy to work the skin off, inside out, with very little use of the knife. When the forelegs are reached, they should be pushed back and worked out of the skin until the paws are completely skinned out. Particular care should be taken when skinning around the eyes and the lips. The tails of most animals should be split and the bone removed.

The tails and paws of the beaver and muskrat are of no value and should be cut off where the fur ends.

If an animal is frozen when taken from the trap, it should be thawed out very slowly and never put in too warm a place.

FLESHING - After the skin has been taken off, remove all fat and flesh with the dull edge of a knife or similar tool, care being taken to avoid overscraping or cutting the pelt. Opinions vary on the direction of scraping, but it is usual to start with the head, working towards the tail. Work so as to keep the fur free from grease to the greatest possible extent. Following fleshing, lukewarm water with mild soap will remove most of the fresh blood and grease from the fur. Never use hot water - this will burn the leather and completely spoil it.

STRETCHING - No matter how good a skin might be, it will lose in value if it is not properly stretched. All *"open"* skins should be tacked on to a flat surface with the flesh side up, or laced in a frame made by

bending and tying green willow into an oval-shaped hoop. For *"cased"* skins, use a wedge-shaped stretcher made of soft wood, 1/4" to 3/4" thick. The edges of the stretcher should be rounded off and made perfectly smooth. If a solid board is used, a center wedge should be inserted on the belly side, to permit easy removal of the pelt after drying.

DRYING - Always dry in a cool place, away from the direct rays of the sun or the heat from a stove. *"Open"* skins, and all *"cased"* skins of types which are normally sold with the leather side out, should remain until dry. Those *"cased"* skins which are normally sold with the fur side out, should first be placed on the stretcher pelt side out, then removed after they have dried sufficiently to hold their shape. To turn the skin, start by folding in the nose and work the pelt inwards little by little. Replace the turned skin on the stretcher until it is thoroughly dry.

PACKING - All furs should be thoroughly dry before shipping. It is best not to fold fur skins if it is possible to avoid doing so, and beaver skins especially should never be folded. Lay them fur to fur and skin to skin, and pack them flat or, if only a few skins are available, they can be rolled and shipped in this manner.

Following are the approximate sizes for stretching boards, for use on the undernoted fur-bearers.

ERMINE (WEASEL)	Length 18 inches, width at shoulders 1" to 1½" (for large skin) width at base 1 3/4" to 2½". Ermine should always be *"cased"*, with the fur in.
FISHER	Length 36 inches, width at shoulders 4½", width at base 6". Fisher skins should be *"cased"* with the fur side out.
FOX	Length 45 inches, width at shoulders 6", width at base 8". Fox skins should be *"cased"* with the fur side out.
LYNX	Length 60 inches, width at shoulders 7", width at base 9". Lynx should be *"cased"*, with the fur side out.
MARTEN	Length 25 inches, width at shoulders 3½", width at base 4½". Marten should be *"cased"* with the fur out.
MINK	Length 30 inches, width at shoulders 3", width at base 4". Mink should be *"cased"* with the pelt, or leather side out.
MUSKRAT	For a large skin, length 20 inches, width at shoulders 5", width at base 6½". Muskrats should be *"cased"*, with the pelt side out.
OTTER	Length 60 inches, width at shoulders 6", width at base 8". Otter should be *"cased"* and shipped pelt side out.
WOLF	Length 60 inches, width at shoulders 8", width at base 11". They should be *"cased"*, with the fur out.
SQUIRREL	Squirrel should be *"cased"*, with the fur out.

PREPARATION OF FOX PELTS FOR MARKET

Source: J. Melfair,
Churchill, Manitoba.

After a fox has been caught there are still several operations necessary to make the skin ready for marketing. These are very important and the following suggestions and information may be helpful.

SKINNING

In skinning the fox, great care should be taken not to cut and damage the skin. Using a sharp pointed knife, begin with the front legs and slit the skin from the centre of the paw down the underside to the elbow of each foreleg. The legs are skinned out to the toes. The toes are taken out to the last joint, then severed with a small pair of snips or sharp knife, the toe nails being left intact in the pelt. With the hind legs, commence at the foot pad and cut directly to the hock joint, and from that joint down the back of the leg in a nearly straight line to the vent. The greater part of the work of removing the pelt from the legs is done with the fingers. Like all other pelting operations, it requires some practice to acquire the proper skill to make an incision of the proper depth and to develop speed in the performance of the whole operation.

After skinning the legs the pelt is removed from the abdominal region and, in so doing, care should be taken that it is not torn. By using a notched stick, which is inserted between the cords of the hind legs, the fox should now be hung up. The underside of the tail should be

split about two inches from the base, and working around the tail from this slit, free the skin from the tail bone so that there is sufficient space to get a good hold of the bone with one hand, then holding the base of the tail with the other pull the bone out.

The body of the pelt is then removed as far as the head. This step is largely accomplished by applying a downward pressure on the pelt, and, at the same time, loosening it from the body with the fingers. Care should be taken to exert only a slight pressure as otherwise there is danger of overstretching the pelt. Very little use should be made of the knife until the base of the neck is reached, after which it will be needed to remove the pelt from the head. Care should be taken to avoid cutting the arteries of the neck and head. If these are damaged, a considerable quantity of blood escapes, which hinders the removal of the pelt. When they are reached, the entire ears should be severed from the body, leaving them attached to the pelt. The gristle is removed from inside the ear after the pelt is off. The next point of importance is the eye, which is left in the carcass, but the eyelids and eye lashes are removed with the pelt, and in doing this, great care should be exercised for if it is not skillfully done an unsightly gap will result. The skinning of the head is then continued, until the operation is completed, the lips and nose being removed with the pelt.

SPLITTING THE TAIL

The pelt is now entirely free from the carcass, the next operation is to slit the tail from end to end. It is important that this slit be made straight down the middle of the tail on the underside.

FLESHING

The next step is the removal of the flesh and fat from the pelt. This can be accomplished best by placing the pelt fur side in on a fleshing board. Before this is undertaken, it is a good plan to allow the pelt to cool and the fat to solidify. It is a tedious and disagreeable task to attempt this procedure while the fat is still warm and liquid. While it is desirable that all the fat and flesh should be cleanly removed, the process can be overdone and the pelt scraped so closely that the roots of the hair will be exposed.

STRETCHING

After the fleshing, with the fur inside, draw the pelt gently over the stretching board. A frequent error is to over-stretch the pelt. If this is done, the guard fur on the neck and shoulders is made to appear thin and scanty, which detracts from its appearance and lowers the value of the pelt. Be careful to place the pelt squarely on the board so that the centre of the pelt will coincide with the centre of the board. Beginning at the nose the pelt is fastened to the end of the board by a small nail, then work gently back until the sides are even. On the under, or belly, side of the pelt about one inch in front of

the foreleg, grasp the skin with each hand and draw towards the nose about one inch and here tack with two nails. This gives the pelt a chance to thicken at the neck and shoulders where many pelts are weak in fur. Tack a narrow strip of wood across the back of the pelt about two inches behind the forelegs. This strip prevents the stretching of the neck and shoulders when the backs and butts of the pelts are being placed on the boards. Without stretching, adjust the pelt so as to have it fit snugly, draw the skin of the butts which is near to and on each side of the tail towards the centre where the tail joins the main part of the pelt, and tack with three or four nails to hold in place.

The tail is then brought down the centre of the stretcher, but before tacking, take the tail about four to five inches from the butt and push it back towards the pelt about two inches, enough to allow the skin, as it contracts in drying, to close in the space that in many pelts makes them appear to disjointed or thinly connected. Spread out the tail and fasten it along the board with slats tacked to the boards. On either side of the tail, tack the hind legs so that they will be in line with the butts.

The front legs are spread open, stretched and tacked on two slats about one quarter inch thick and tapered from one and one quarter inch to three inches wide, the full length of the forelegs. Care should be taken to see that the paws are split to the point of each toe and the bone removed. No matter how good a skin may be it will lose in value if it is not properly stretched. Therefore, it is most important that stretching be carefully and correctly done.

CLEANING AND FINAL PREPARATION

Never expose the skins, when drying, to the direct rays of the sun or to the heat of a stove. Allow it to dry slowly in a cool shaded place. After two days all excess fat should be carefully scraped off the skin as it will *"burn"* as if it had been exposed to excessive heat. After the scraping, rub the pelt with a piece of coarse sacking. When the pelt is 90% dry take it off the stretching board and turn the pelt, fur side out. To do this, start by folding in the nose and then work the pelt slowly inwards, a small piece at a time, to avoid cracking or tearing. The pelt is then replaced on the stretcher board fur side out. For this no tacking is required. The pelt is then left in a cool place until ready to be sold.

PREPARATION OF HAIR SEALSKINS

Source: Industrial Division,
Department of Northern Affairs
and National Resources,
Ottawa, Ontario.

1. To eliminate the most common defects of discolouration and stain on hair sealskins, it is imperative that the skins be rendered absolutely free of fat, oil and blood in the process of *"Native Tanning"* immediately after being removed from the carcass.

2. When grease is left on the skin, oxidation quickly develops that burns irremovable stains into the hair that no known treatment can remove.

3. It is also advisable to take similar precautions against contamination when it is found necessary for unskinned seals to be kept in storage caches.

4. Discolouration and stain are directly attributable to improper handling during the initial stages of cleaning and drying. Since it is impossible to supervise every individual effort there seems only one alternative; that is to instigate selective purchasing, emphasizing the importance and value of cleanly handled pelts.

5. The following instructions are laid down as an easy and convenient method to ensure top quality skins. These simple rules of procedure are adaptable to facilities found almost everywhere.

(a) After removing the pelts, all fat should be scraped off and the skins washed with warm (not hot) water and soft green soap (Fels Naphtha) until every indication of grease disappears. Then, in turn, make certain that no trace of soap remains by two rinsings in clear warm water.

(b) Prepare the skins for the drying frames by drawing together the flipper holes and puncturing the edge of the skins for lacing into the frames.

(c) Mix a salt solution using approximately one pound of salt to five gallons of water, and soak the skins in this for twelve to fifteen hours. This will brighten the sheen of the hair, neutralize any particles of grease that may remain, and tend to leatherize the pelt. It also imparts a sort of a set condition to the fabric of the skin, thereby toughening it appreciably for further processing. For this reason it is advisable to prepare as in (b) before immersing in the solution. The solution may be used once over again providing the salinity is not seriously reduced. However, for best possible results mix a fresh supply for every batch of pelts. Let excess water drain off from original washing before pickling. Pure, fine grain rock salt should be used.

(d) Rinse again thoroughly after taking out of pickle, in at least two waters. Clean, fresh warm water to be used.

(e) Lace in frame without over-stretching. Just enough strain to take up all slackness is sufficient.

(f) Best results are obtained by frost drying in the open air during the coldest part of the winter. Place frames outside in leaning position with fur side uppermost. The drifting snow and wind will beat and drum the hides to perfection.

(g) Never expose to the direct rays of the sun with outside atmosphere above freezing temperature.

(h) During adverse weather conditions there is no other resource but drying the skins inside buildings. When this is done the frames should be placed away from direct heat.

(i) The skins should never be scraped (softened) after they are dry. Some people are inclined to penetrate too far and oft-times cause *"slippage"* by rupturing the roots of the hair.

(j) Keep in storage bulk by laying skins flat - alternately hair to hair and pelt to pelt. Never fold at anytime after drying. Folding will create a crease where the thin pellicle of skin on the fur side will eventually crack open and the hair on the crease line will become misshapen and broken. Skins may be rolled for convenient transportation.

(k) If in storage for any length of time, the skins should be aired outdoors at least every two months.

(l) Always keep in cool place or under refrigeration if possible.

(m) IMPORTANT! Spring *"jars"* taken on ice with indication of sunburn (curling hair) should not be tanned.

THE PREPARATION OF BEAVER SKINS FOR THE MARKET

Source: Livestock Division,
Department of Agriculture,
Ottawa, Ontario.

Hudson's Bay Company,
Northern Stores Department,
Winnipeg, Manitoba.

Beaver which are of a bluish colour in the leather have been too early trapped, probably before freeze-up, and they lack the depth of underfur to be found in an animal trapped later in the winter. The latter will be clear pelted. Beaver trapped too late in the spring, usually after break-up, are of poorer colour and quality. Discolouration appears on the leather side, the fur is open and weak and often rubbed around the flanks. In addition, the fur is loose and usually sheds. Late caught beaver, also, contain a very high percentage of damages. While neither of these beaver is desirable on the market, the late caught pelt is discounted the most.

On being taken from the trap, beaver should be cleaned of any blood, sand, mud, etc., either with water or by brushing in the snow. If possible, the fur should be dried and brushed on the carcass before skinning. Place the animal on a clean spot on its back. The feet are cut off where the fur ends, and with a sharp-pointed knife make one cut from the chin to the tail. Work out from this cut with short strokes, separating the skin from the flesh. Pull legs through the skin, but make sure not to enlarge the holes previously made by cutting off the feet. Skin carefully around the eyes and cut the ears close

to the skull. When skinning, leave as much fat and flesh on the carcass as possible. This will save extra fleshing work later. Sponge off all blood marks with water and toilet soap.

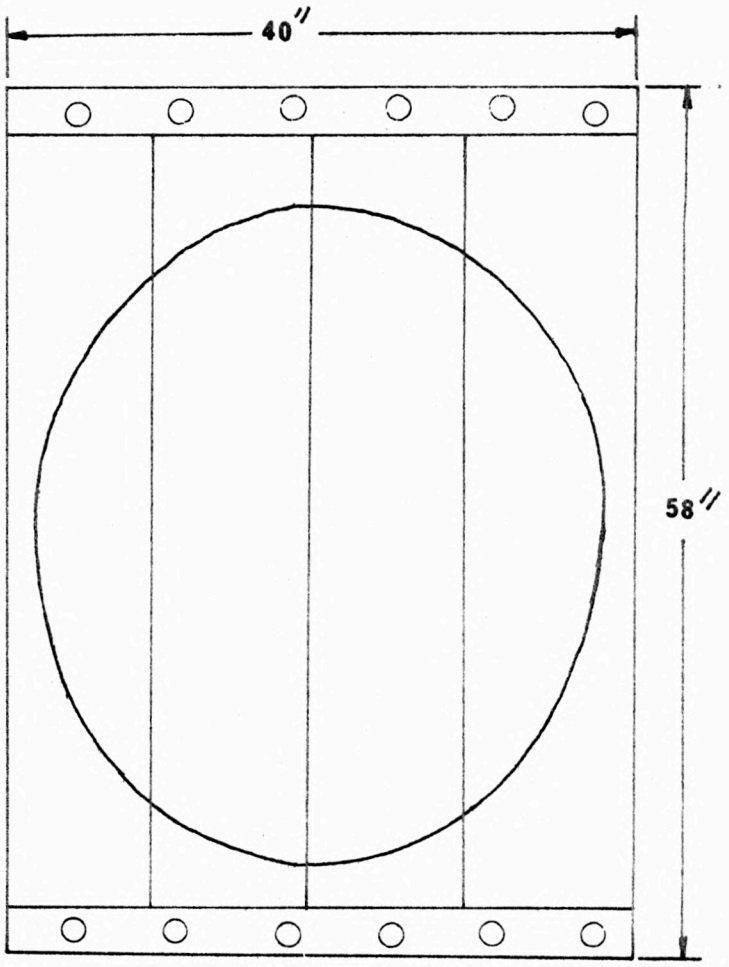
Two acceptable methods of stretching and drying are in common use: They are as follows:

1. The Hoop Method

Make a willow frame from willows about $1\frac{1}{2}$" in diameter; the frame to exceed the size of the beaver pelt by 8" on all sides. A large needle and twine are used to sew the skin to the frame. The skin is pierced at the edges about every inch and the twine taken around the willow and back through the skin. Do not have the twine too tight at first - just keep the skin taut.

Next, scrape the skin before it dries. Some dull instrument must be used (a bone, spoon, or specially shaped dull piece of metal). Every bit of fat must be removed before the skin dries to any noticeable extent, otherwise an undesirable, scraped appearance will result. Sew up the holes, both leg holes or damages with fine twine. Now tighten the twine between frame and pelt to get the desired shape but be careful not to over-stretch. Try to get as near as possible to a rectangular shape. Some trappers cut off about 3/8" of skin around the nose and tail in order to achieve the rectangular shape.

2. Board Method



Beaver, if real care is taken, can be well handled on stretchers made from boards or on a suitable wall, if one can be found.

Grasp the pelt by the nose, shake out and hold hanging in a natural position. That should be the length of the pelt on the stretcher. Nail on boards at that length at top and bottom.

Approximately 2/3 of the length is usually a desirable width. The rest of the pelt can then be nailed to the board by following a pattern similar to that shown in the sketch or by eye if the trapper is sufficiently skilful. The nailing of the pelt should be worked from both ends on both sides at the same time, i.e., from the ends towards the middle of the pelt. Fine nails should be used and spaced not more than 1" apart. The nails should be of sufficient length and strength however, to allow you to raise the pelt up on the nails and away from the board. This will allow good circulation and

the drying of the fur side of the pelt as well as the leather. Damp fur, if not dried with the pelt, will cause discolouration of the leather as well as matting of the fur.

After the pelt has been nailed on the boards, scraping and sewing, as outlined in Method 1, should be carried out, then the pelt raised on the nails and left to dry.

The material required to make a board stretcher for beaver is as follows:

4 boards	10" wide	58" long	3/4" thick
2 strips	2" wide	40" long	3/4" thick

This stretcher will allow you to handle two beaver on one board at the same time.

General

Beaver should be dried in a dry place, not too warm. They must not be placed to dry in the sun or near a stove.

Do not fold beaver after they have been dried. They should be transported flat, if possible, or rolled if this is not practical.

After your beaver are thoroughly dry, they can be removed from the stretchers. If you have used boards and did not dry the fur before skinning, check now for dampness on the fur side. If the fur is at all damp, the pelt should be hung up, independently, until free of moisture.

You can now add immeasurably to the appearance and value of your pelts by thoroughly brushing or combing them. A curry comb is handy in this regard, or a wire brush. Clean the fur free of all sand, mud, and mats, and keep shaking the pelt to rid it of freed particles of dirt. The fur will become glossier and more attractive and will be silkier to the touch than when it contained dirt, sand, etc.

THE FROST DRYING METHOD OF PREPARING BEAVER PELTS

Source: Frank C. Racicot,
Regional Fur Supervisor,
Northern Ontario Region,
Indian Affairs Branch.

The skill and care exercised in skinning and preparing a pelt for market are very important for they have a decided bearing on its ultimate value. Clean, well-handled pelts will command more money than those which are mutilated, dirty or badly handled.

The method outlined herein is widely used by Indian trappers - or rather their wives - and the art has reached a high degree of perfection amongst the Crees in the East Coast district of James Bay. The method is used for all species of fur except the muskrat but as the heading indicates this submission will deal only with the preparation of beaver pelts.

Skinning

Beaver are skinned 'open', that is the pelt has been slit down the belly in skinning instead of removing the pelt intact as in 'cased' pelts where the pelt is slit only down the inside of the hind legs to the vent. In skinning beaver the natives lay the animal on its back and, using a very sharp knife, slit the pelt starting at the lower lip and cutting in a straight line down the chest and belly to the vent.

They then cut off the legs at the first joint and pull them through leaving four round holes in the pelt. The tail is cut off where it meets the fur. Particular care is taken in skinning around the eyes and lips to prevent mutilation, but in general beaver pelts are not skinned quite as cleanly as fine fur pelts for reasons which will become apparent later in this paper.

Fleshing

After skinning, the pelt is laid fur side down on a flat surface and tepid water is rubbed on the flesh side of the pelt with the palm of the hand. This removes any blood that has been smeared on the pelt during the skinning process and removes the red corpuscles from any flesh still adhering to the pelt. Similarly, a piece of beef washed in water will have a pale and whitish appearance. If the blood is not removed the pelt sometimes becomes permanently blood stained with an understandable reduction in its market value.

Stretching

When the pelt has been thoroughly cleaned as outlined above, the natives stretch it by lacing it on a hoop type stretcher which, because it permits the free circulation of air around the pelt, is preferable to the widely used practice of tacking the pelt on a flat board or table type stretcher. The hoop is formed by taking two trimmed saplings - usually spruce, willow or birch and lashing the top of one and the butt of the other securely together with an overlap of about twenty

inches, after which the saplings can be laid on the ground and by standing on them, bend the other two ends together and lash with a corresponding overlap. The hoop can be properly formed by pressing over your knee. The result is an oblong hoop slightly larger than the pelt to be stretched and strong enough to hold its shape. This is assured by selecting saplings about $1\frac{1}{2}$" at the butt.

The pelt is now laid within the hoop, and using a large sailmaker's needle and number five baling twine is laced to the hoop, starting at the mouth and continuing outwards until a point opposite the front leg holes is reached. Next this process is repeated at the other end, starting at the centre and continuing until opposite the holes left by the removal of the hind legs. These two steps give the pelt its length and width is accomplished by stitching in the sides of the pelt again starting at the centre and working both ways to join the previous stitching.

The great care exercised by the James Bay Indians in this stage of preparing their beaver pelts does much toward the pleasing appearance of the finished product. The stitches are uniformly placed and not more than one inch apart and, while avoiding overstretching, they pull the pelt evenly, taking out all wrinkles with the result that they turn out a pelt not subject to any deduction in measuring since, in the case of the Old Factory natives they are almost square, and in the case of the Nottaway natives, they are oblong with only the corners rounded. They always avoid turning out any of the distorted fishtail and diamond shaped pelts too prevalent on the market.

Scraping

After stretching, the pelt is placed outside to freeze and is generally hung by the hoop either from a rack or from the lower branches of an evergreen where it is shaded from the direct rays of the sun. In a day or so at below freezing temperatures the pelt is ready for the first scraping which is done outside while it is still in the frozen state. To do this the pelt, still laced to the hoop, is stood on end against a support and scraped from top to bottom using long continuous strokes with a scraper grasped in both hands. The scraper is made in the shape of the capital 'L' and has a bevelled cutting edge like an adze to which it bears in miniature more than a superficial resemblance. The handle is from ten to twelve inches long and the blade about $1\frac{1}{2}$ inches wide, bevelled very slightly towards the outer corners which are rounded to prevent nicking or scratching the hide. With each stroke of the scraper a ribbon-like strip of fat or flesh is removed and scraping is continued until the leather itself makes its appearance. Great care is taken in the final stages lest the pelt be damaged by scraping too thin. However, the leather may be readily distinguished from the material that should be removed since it shows a more definite grain and is much more resistant to the scraper.

Cleaning

Only when the scraping has been completed is the pelt taken inside and allowed to thaw out gradually and always away from the direct source of heat. When the pelt has thawed out fully it is quite damp and using only this moisture toilet soap is rubbed into the leather working up a slight lather. Laundry soap is never used since it gives the hide a yellowish tinge. The last vestige of this lather and moisture is then scraped out of the hide using a dull half-moon shaped scraper - often made from the shoulder blade of caribou - since the use of a bone scraper lessens the danger of cutting at this stage of the process.

This is possibly the most important in the whole procedure and any lack of care will spoil the appearance of the pelt. Many of the pelts turned out by newcomers to this process are graded as stale simply because either laundry soap was used or final scraping was not persisted in long enough to completely remove the soap film or residue from the lather.

Scraping and cleaning tends to loosen the pelt so it is next tightened into final form - again avoiding overstretching - and the leg holes are sewn closed after which it is once more placed outside to freeze where the frost will remove the remaining molecules of moisture. This takes about two days after which the pelt, still on the stretcher, is brought into the tent or camp and allowed to thaw away from the heat. In thawing out a very light film of moisture forms on the leather and

as soon as this dampness has dried the pelt is removed from the stretcher and the process is complete.

Even though a first grade pelt has been produced it can still be spoiled by such lack of care as storing in a warm place which can cause taint or hair slip, by folding, which can cause cracking during the tanning process or by leaving the pelt exposed to vermin and mice. Along the East Coast beaver pelts are always rolled and generally placed in bags and left outside in the food caches where they are protected from the elements and safe from mice or birds.

Considerable time has been taken in setting out details of the process but the main points can be summarized quite briefly:

1. Skin clean but not too closely. The more flesh removed in skinning the less the pelt will have to be scraped.

2. Immediately after skinning wash the pelt to remove blood, using lukewarm water.

3. Use care in stretching pelt to symmetrical lines and natural oblong oval shape.

4. Use sharp scraper in fleshing, taking off all fat and flesh but exercising care to not scrape away any of the leather.

5. Wash using only fine toilet soap and scrape removing all traces of lather and moisture.

6. Tighten and sew up leg holes - avoid stretching.

7. Never at any time expose the pelt to direct heat or sunlight.

8. Roll pelts and store in a cold, dry place away from rodents and pets.

The main principle to be remembered is to use care and more care all the way through the various stages of the process so that the final product will be a clean leathered, lustrous furred skin of symmetrical shape commanding a premium price on the market which will amply repay the trapper for the time and energy required to turn it out.

TANNING

Source: EXTENSION LEAFLET E-62 ALASKA

The skins and hides from smaller animals - rabbits, muskrats, squirrels, and foxes - may be tanned by home methods with little work. Even larger skins may be treated at home to produce leather or fur, although chemicals, equipment, and considerable hard work go into the process of softening the hide and making the skins pliable. Even in the tanning factories much of the work is still done by hand as no machines can be devised to duplicate hand manipulation.

In the simplest method the raw hides are soaked in water and hung over poles and worked with blunt-edged tools as they dry. Soap and cod oil dissolved in water help to soften the skin.

Simple Indian Tan for Reindeer, Caribou, and Deer Hides (Dry or Salted)

Soak in fresh water and scrape off flesh with a blunt-edged tool.

Hang hides in warm room until hair slips off easily, scrape off the hair.

Put the wet skins into the following tanning solution:

1 pound white soap

1 pound cod or seal oil

5 gallons water

Boil the soap in water enough to dissolve it, add oil and rest of water. Cool it.

Soak skins in this emulsion 24 hours.

Dry them over poles out of doors. When dry, soak them in fresh water and work them over a beam.

Put the skins back in the soap solution and repeat the process. The oftener it is repeated, the softer the skins.

Commercial methods require the use of chemicals (generally poisonous that must be handled with care). Staking or softening is done with shoulder stakes or with the bare knee, stretching the leather over posts about knee high. The finishing is done by hand with a blunt-edged instrument.

Tanning Furs with the Hair On

To remove flesh:

Soak the hide in water several hours, depending upon thickness of the skin.

Spread softened skin on flat surface and scrape away all flesh. Soak it again if necessary until hard spots are gone.

To set the hair soak it two to six hours according to weight in following solution:

4 gallons cold soft water

½ ounce borax dissolved in water

½ pint salt dissolved in water

1 ounce sulphuric acid (Poisonous - handle with care)

Pour it slowly into the cold water

To soften the hide in tanning solution soak the hides 48 hours or until solution penetrates through the skin. Test by cutting through the hide and noting if there are light spots.

Tanning solution:

2 gallons soft cold water

½ pound pulverized oxalic acid (poisonous)

1 quart salt

When skin is soaked through, wring it out, hang it in the shade to dry over a smooth pole. As it dries, stretch it and work it to keep it soft. This solution protects fur against moths.

Tanning Leather with Hair Removed

To remove flesh soak skin in cold water until flesh side is soft. Scrape it with a dull knife.

Liming process (sufficient for two or three caribou hides):

Mix 8 pounds lime in a half barrel of water. Soak skins overnight.

Repeat this process every day for 8 days or until hair slips easily.

Scrape off all the hair and flesh.

To remove the lime with bran:

Sprinkle 2 handfuls of bran in bottom of barrel.

Put one skin in the barrel; sprinkle it with bran.

When all the skins are in, add water to cover and soak 24 hours.

They are then ready for the tanning solution. To prepare the tanning solution - white napa or alum tan:

Boil 3 pounds alum and 5 pounds salt in 2 gallons water. Add enough water to make 10 gallons in all. Be sure all the chemicals are dissolved and the solution cooled to lukewarm.

Add the skins and stir well. Soak skins for 24 hours. Remove skins and add a paste made of:

6 pounds of flour

1 quart neatsfoot oil

a little of the alum mixture

Add this to the barrel and stir well. Put in the skins and stir well ½ hour. Keep the skins in the solution 24 hours. Cut through the skin to see if solution has penetrated.

To finish off in natural color:

Rinse the skin as it comes from the tanning solution in clean cold water and lay it in the sun flesh side up until half dry.

Rub in the following dressing:

Dissolve 1 bar neutral white soap in ½ gallon boiling water.

Add 4 ounces borax and 1 quart neatsfoot oil.

Cool for 5 minutes.

Stir well.

Cool the solution and apply it to both sides of the skin.

Allow it to dry thoroughly.

Then soften with a dull knife on the flesh side.

This can be accomplished by laying the skin on a cushion or a carpet and pressing with a curved dull-edged tool.

University of Alaska Extension Service and U.S. Department of Agriculture, Co-operating. Allan H. Mick, Director, College, Alaska. Published in furtherance of the Acts of May 8, and June 30, 1914 ..... March 1949, re-issued February 1956.

FUR MARKETING

1. Possible markets for the trader's pelts:
   - independent traders
   - Hudson's Bay Company
   - direct dealing with outside fur buyer

2. Packing and shipping
   - See preparation of pelts.

3. Fur garment industry in the Northwest Territories.
   At present fur is imported to a fur garment factory run by a co-operative in Aklavik in the Mackenzie Delta. Garments from this factory are made from furs such as muskrat, seal, fox, marten, beaver, lynx, wolf and wolverine and are sold all across Canada. Another fur garment project at Tuktoyaktuk is being introduced and if successful, it is hoped that a small tannery may be developed in the Delta. This will serve both small industries and allow all steps, from trapping to the finished garment, to be carried on by local people in a local setting.

VOCATIONAL OPPORTUNITIES IN THE FUR INDUSTRY

Assistant Fur Buyer

Blender

Chemist

Clerical Worker

Cutter

Designer

Driver

Drum and Kicking Machine Operator

Dye Worker

Finisher (Manufacturing and Wholesaling)

Finisher (Retailing)

Flesher

Fur Buyer

Fur Repairman

Glazer

Greaser

Matcher

Model

Nailer

Operator

Sales Person

Salesman (Dressing and Dyeing)

Salesman (Manufacturing and Wholesaling)

Secretary

Shearing and Unhairing Machine Operator

Shipping Clerk (Dressing and Dyeing)

Shipping Clerk (Manufacturing and Wholesaling)

Stock Clerk

Trader

Trapper

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James Barrie
$6.00

Madson, John and Ed Kozicky,
For the Young Hunter
Olin Mathieson Chemical Corporation, East Alton, Illinois,
Free on request.

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Olin Mathieson Chemical Corporation, East Alton, Illinois,
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Oxford
$ .45

CARE AND USE OF FIREARMS

Introduction

It is generally accepted that a course in the care and use of firearms would be of benefit to any young person and of particular value to the peoples of northern Canada. This course can effectively teach the importance and necessity of the game laws and help familiarize the pupils with the services of game wardens and project officers. Good marksmanship is an important part of a conservation program, since wounded animals that escape only to die later create a drain on the game population without benefit to the hunter. The life and accuracy of any rifle can be greatly extended by careful maintenance and this must be an important part of this program.

Organization

This course can probably best be timetabled as a co-curricular activity and perhaps part-time as an aspect of the industrial arts program. Details of timetabling should be worked out between the principal and the teacher concerned and have the concurrence of the Superintendent of Schools.

Supplies and Equipment

Follow the general instructions in the introductory section of this guide when ordering supplies and equipment. As a guide for initiating a course the following is a suggested list of supplies and equipment:

For single classroom school - Two .22 calibre rifles

For schools having more than one room - 1 rifle per six riflemen

400 rounds of ammunition per rifleman. (Note: This will be sufficient for instructional purposes only.)

THOMAS SIMPSON SCHOOL RIFLE CLUB

A Short Report in Two Parts

A. Club Organization and Principles

B. The Rifle Range and the Backstop

A. Club Organization and Principles

The purpose of the club was:

1. To introduce the .22 calibre rifle to beginners,
2. To improve the shooting skill of *"old-timers"*,
3. To allow *"experts"* to qualify for awards. To effect the latter, the club was affiliated with *"Dominion Junior Marksmen"*. The age limit is followed for Dominion Marksmen Awards but the basic criteria for membership or shooting is the ability to cock the rifle, a single shot, and handle it safely. A certain strength of the wrists is a basic requirement for the former.

First rifle practice starts closer than 20 yards from the targets but at a safe distance. All shots must be on the target. Firing distance is increased as ability improves. Demonstration, coaching and firing discipline are continuous. Beginners first observe the *"old-timers"* go through the routine. In most cases, beginners will be firing during the first shooting practice. Lecturing is kept to a minimum. Practice, with coaching, is the basic idea. *"Nothing*

succeeds like success" and you cannot learn to shoot without firing the rifle. This can be followed because of high interest and there being no real *"beginners"* - the .22 rifle is known to practically all students. The use of automatic and tubular repeaters should be discouraged. They are dangerous when fired on an indoor range, with young people under instruction. Even for rifles with magazines, all shots should be single loaded.

DOMINION MARKSMAN (C.I.L.) provides free targets, organization literature, and awards. The standards are Canada-wide so the awards are of special value. Also, the award program is elaborate and continuous. For further information see Section C. References.

The only ammunition used is .22 long. It is much easier to handle and much easier to load single shot.

B. The Rifle Range and the Backstop

The school gym is the rifle range with gym mats used at the firing point. Targets are arranged in pairs on the three target *"bays"* so that six rifles can be used simultaneously. The target bays or backstops are conveniently stored under the stage, (similar to auditorium chairs), placed on a dolly that is easily rolled out.

Particular attention must be paid to the design, construction and quality of the backstops. These are an extremely important safety feature.

RIFLE ASSOCIATIONS

Rifle Associations

A. Canadian Civilian Association of Marksmen Inc.,
P.O. Box 635,
Station B,
Montreal, P.Q.

B. Dominion of Canada Rifle Association,
200½ Bank Street,
Ottawa, Ontario.
(for military cadets only)

C. Dominion Marksmen,
P.O. Box 10,
Montreal, P.Q.

D. National Rifle Association,
1600 Rhode Island Avenue N.W.,
Washington 6, D.C.

How to Organize a Rifle Club

Why?

1. Boys and girls like shooting.
2. Encourage everyone to take an active part in the sport (within the club).
3. To develop muscular co-ordination, perseverance, self-control and sportsmanship.
4. To maintain and contribute towards good safety practices.
5. To learn the fundamentals of good marksmanship and how to produce accurate results.
6. To teach and put into practice, conservation of animal life.

7. To teach the need for game laws and to show why they must be respected.

Where? A club requires at least ten boys or girls and one or more interested adults, one of whom will become the Rifle Instructor. When organized, the club may be affiliated with the Canadian Civilian Association of Marksmen Inc. All affiliated clubs receive free announcements on .22 Target Rifle, .22 Sporting Rifle and Handgun activities.

Annual membership, if desired is $2.50 per year per member. Members' Crests are available at $1.25 each and Members' Lapel Pins are available at $0.25 each. Club affiliation is $6.00 per year.

THE CANADIAN CIVILIAN ASSOCIATION OF MARKSMEN

1. Is the acknowledged governing body of Match Rifle, Sporting Rifle and Handgun (Pistol and Revolver) shooting in Canada.

2. Is Canada's Official Representative, as regards ALL civilian shooting, to:
   (a) The Canadian Olympic Association.
   (b) The International Shooting Union (which regulates all international shooting activities).
   (c) The Pan-American Sports Organization.
   (d) The Canadian Sports Advisory Council.

3. Prints, stocks, distributes and extends special prices to members and affiliated organizations (in keeping with operating and transportation costs) all items such as official targets for most types of shooting, centre patches, stickers, score and aggregate cards, official rule books and various other literature on the subject of shooting. Supplies, too, free of charge, literature on the establishment and organization of shooting clubs, the building of safe ranges, etc.

4. Has adopted the rules of the National Rifle Association of America and the International Shooting Union for Small-bore Rifle, Free Rifle, Pistol, Free Pistol, and International Rapid Fire (Silhouette) and applies and interprets these for special Canadian conditions.

Ranges — A range is a necessity whether it be indoors or out. Complete plans are given in the booklet How to Build a Rifle or Revolver Range - obtainable from Dominion Marksman - P.O. Box 10, Montreal, Quebec. It is advisable to build a 75 foot range whenever possible for .22 calibre rifle instruction because most championship matches are fired at 20 and 25 yards range.

Minimum Requirement per Group of Ten Pupils

1. Rifles - preferably 11 - one for instructor. Each rifle to be supplied with carrying case or box, cleaning equipment and sling.

2. Mats - at least eight feet in length, 10 in number. Depending upon range facilities, these items can be reduced to one-half if necessary. However, if insufficient rifles are purchased, they will have to be reset each instructional period for individual eyes.

3. Ammunition - .22 rim fire Long Rifle grease lubricated target ammo.

   Requirements - 6,000 rounds per group of 10. This allows for 10 rounds per pupil per week on a 40-week course with an additional 2,000 rounds for instructional purposes. If competition firing is entered by the group, additional ammunition will be necessary.

4. Instructors - Keep on hand additional supplies of:

   (a) .22 rifle cleaning patches

   (b) Gun oil - e.g. Hoppes Gun Oil

   (c) Gun Solvent Cleaner - Hoppes Gun Solvent

   (d) B.S.A. Saftipaste

   These items are absolutely necessary for the efficient operation and maintenance of your rifles.

Types of Rifles Available (7 lbs. or less)

The single shot bolt action *"sporting"* rifle put out by such companies as Winchester, Remington and Mossbert are usually production-made, less accurate, lighter and considerably less expensive than *"target"* sights and will weigh as much as 12 pounds.

The sporting rifle is ideal for the beginner and for those desiring target shooting at low cost. Automatic and tubular repeaters should not be purchased because of the danger of cartridges being left in the chamber. For safety, a single shot or a repeater with a cartridge clip is more advisable.

Others, both sporting and target, may be purchased from such companies as:

1. Winchester
2. Remington
3. Marlin
4. Savage
5. Stevens and Springfield
6. Harrington and Richardson
7. Iver Johnson
8. Cooey (Canadian)

Note: Any inexpensive single-action .22 will suffice for the beginner. These cost from $11.00 to $25.00.

Suggested Targets

Sporting Rifle

15 yards - 5-bull with x ring

20 yards - single bull

20 yards - 5-bull with x ring

When two or more competitors have a tie score, then x ring target will aid in determining who is the best shot.

Target Rifle

20 yards - 5-bull

25 yards - 5-bull with x ring

50 yards - 2-bull with x ring

Marking Devices

Each club should have more than one of these devices - preferably one to every two and no more than four pupils. Pupils usually work in pairs, one acting as *"pupil"* and one as *"instructor"*. Obtainable from N.R.A. at $1.00 each.

Resource Material

Canadian Civilian Association of Marksmen

1.	Aim - Official C.C.A.M. publication - issued free to each member and to the secretary of each affiliated club	Free
2.	American Rifleman - Canadian Resident Members only	$ 5.50 - 1 year 10.25 - 2 years 14.50 - 3 years
3.	The Rifleman - The Journal of the National Small-bore Association, London, England, Published Quarterly	2.00 - per year
4.	Basic Rifle Marksmanship	.25 - per copy
5.	Basic Instruction on Small-bore Rifle Shooting	.15 - per copy
6.	Basic Pistol Marksmanship	.25 - per copy
7.	Basic Pistol Marksmanship Instructors Guide	.25 - per copy

Dominion Marksman

1.	How to Build a Rifle or Revolver Range	

National Rifle Association

1.	Rifle Instructor's Manual	
2.	Junior Club Guide	
3.	Basic Rifle Instruction	
4.	Hunter Safety Course	
5.	Hunter Safety Handbook	
6.	How to Organize an N.R.A. Junior Rifle Club	
7.	Hunter Safety Handbook	
8.	Hunter Safety Course	
9.	Rifle Instruction Wall Charts Six charts 19 x 25 inches showing safety rules, positions, sight pictures, etc.	$ 1.00 set
10.	Rifle Instructor's Manual	.50 each
11.	Basic Rifle Instruction Manual	.50 each
12.	Paige Sighting Device	1.00 each
13.	Rifle Marksmanship School Student Registration card - one per pupil	.02 each
14.	Rifle Instructor's Report Card - one per pupil	.02 each
15.	Rifle Marksmanship Progress Cards - one needed for every 38 pupils	.10 each
16.	Rifle Marksmanship Student's Examination Written at end of course - one per pupil	.02 each

17. Safety Posters - 5 full-colour posters 14 x 22 inches illustrating firearms safety principles — $ 1.00 set

18. Small-bore rifle rule book — .25 each OR 5/1.00

The Following Areas should be Dealt with:

1. Knowledge of Guns and Ammunition
   - (a) names of parts
   - (b) types of guns
   - (c) sights
   - (d) safeties
   - (e) cleaning
   - (f) ammunition

2. Proper Gun Handling
   - (a) primary rules
   - (b) transporting
   - (c) storing

3. Safe Hunting
   - (a) zone of fire
   - (b) target identification
   - (c) self-control
   - (d) accuracy

4. The Rifle

   (a) recognize and name common parts

   (b) aiming

   (c) sighting-in

   (d) position

   (e) trigger squeeze

5. The Shotgun

   (a) name of common parts

   (b) position

   (c) printing

   (d) lead and swing

6. The Hunter's Responsibilities

   (a) safety

   (b) clothing

   (c) game identification

   (d) observing game laws

   (e) equipment

   (f) courtesy and sportsmanship

   (g) fires

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How to Organize a Shooting Club
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Montreal, P.Q.
Free on request

Ellacott, S.E.
Guns
Methuen
$2.00

Janes, E.C.
A Boy and His Gun
A.S. Narnes
$5.50

Madson, John and Ed Kosicky
For the Young Hunter
Olin Mathieson Chemical Corporation
East Alton, Illinois
Free on request

N.R.A. Hunter Safety Instructor's Guide
$ .25

Bow Hunting Supplement
$ .10

N.R.A. Basic Rifle Marksmanship
$2.25

N.R.A. Basic Shotgun Instruction
$ .25

N.R.A. Hunter Safety Handbook
$ .10

Shooting the .22 Rifle
$ .75

Basic Pistol Marksmanship
$ .25

Rifle Shotgun Instruction Charts
$2.00

National Rifle Association of America,
1600 Rhode Island Avenue, N.W.,
Washington 6, D.C.

The Guidebook to Rifle Marksmanship
O.F. Mossberg and Sons,
New Haven 5, Connecticut.

OUTBOARD MOTORS

Introduction

The widespread use of the outboard motor in the north makes this study of special interest to pupils in our schools. It seems evident to everyone that a course in the operation and maintenance of outboard motors should be part of the school program, however, a note of caution should be sounded here. Only persons who are competent in this area should attempt to teach this unit. It is possible that a teacher or principal may consider someone in the community to have the necessary skill to carry out this course. Advantage should be taken of any talent of this kind with the teachers and the students working and learning together.

Objectives

1. To introduce the student to an acceptable standard nomenclature.
2. To give instruction in correct operation of outboard motors.
3. To indicate the importance of adequate maintenance in extending the life and efficiency of any engine.
4. To make it apparent to the pupils that certain minor repairs can be done simply and to make it equally clear that major repairs should not be attempted unless adequate facilities, replacement parts and trained people are available.

In most communities there are old or unservicable engines and spare parts available for demonstration purposes and it may be quite possible to obtain a live engine. (Excellent visual aids can be made from unservicable parts, see the illustration.)

Equipment

Certain equipment may be requisitioned in the usual way, for example, motors, tool kits and special tools. The cost of this equipment will be beyond the regular $100.00 allotment and each requisition should be supported by an outline of the proposed program. A coarse outline should accompany every requisition of this nature. Each requisition will be processed by the Regional Superintendent of Education.

Excellent free or low-cost literature of an instructional nature is published by various manufacturers of outboards (see bibliography).

Classes

The criteria outlined in the introduction of this guide should be applied in this case. However, to get maximum benefit from a course of this nature, the pupils should be able to read well enough to understand manuals and/or instruction sheets prepared by the instructor. A decision on this matter should be made at the local community level because certain aspects of the course, particularly those relating to operation can be carried on without high reading proficiency.

"Prescription for Better Small Engine Overhauls", and *"Trouble Shooting"* may be obtained from the Perfect Circle Corporation, Hagerstown, Indiana, U.S.A. Outboard Marine of Peterborough, Canada also has many publications available on request.

Prescription for Better Small Engine Overhauls

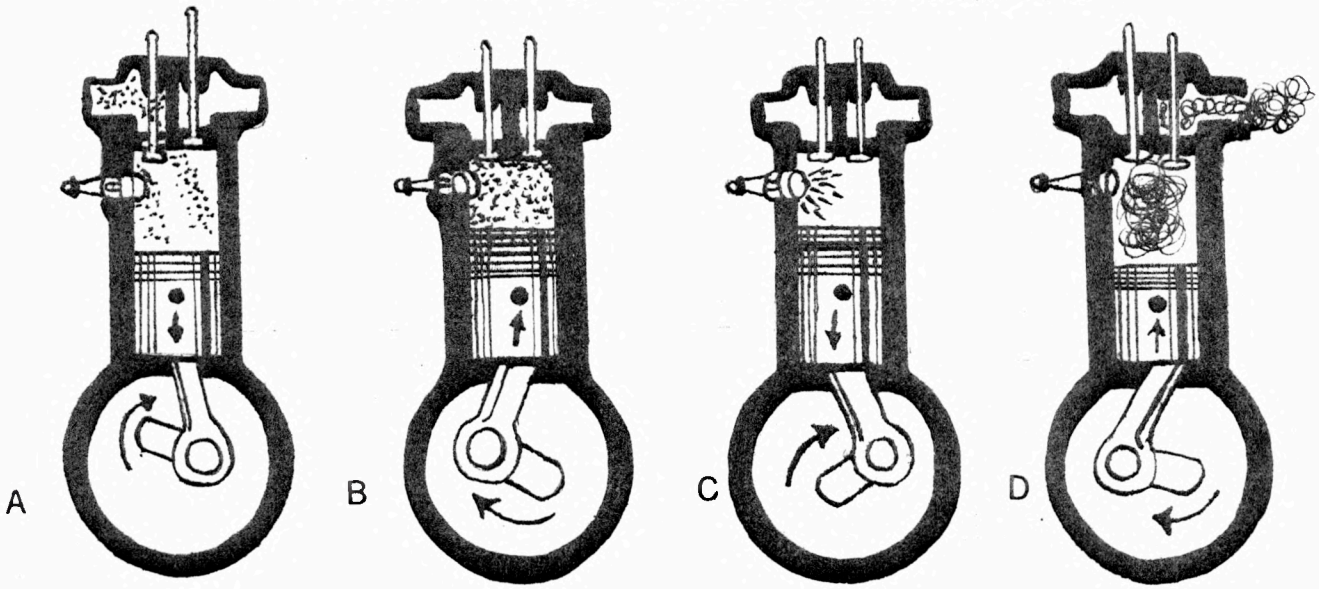
Small engines are found almost everywhere powering a wide variety of labor-saving and recreational equipment.

Although most owners realize the importance of periodic oil level checks, oil changes, spark plug inspections and other PREVENTIVE MAINTENANCE measures for their car engines, many apparently are not so careful with their small engines. Service requirements, however, are quite similar, and a scheduled PREVENTIVE MAINTENANCE program is just as necessary to assure efficient operation and long engine life. Proper overhaul procedures are equally important.

Four-Cycle Engine Operation

Before discussing service and overhaul procedures, the operation of 2 and 4 stroke cycle gasoline engines will be reviewed. This is how a 4 stroke cycle engine, the type used in automobiles, works: See Figure 1.

FOUR-CYCLE ENGINE OPERATION



FOUR-STROKE CYCLE ENGINE OPERATION

1. INTAKE - As the *piston* moves downward or toward the *crankcase*, the intake valve opens and a partial *vacuum* is created in the *cylinder*. A mixture of *vaporized fuel* and air is then forced into the cylinder by atmospheric pressure.

2. COMPRESSION - Next, the intake valve closes. As the crankshaft *rotates*, the piston moves upward and compresses the fuel-air mixture.

3. POWER - Just before the piston reaches the top of its travel, the *ignition system* fires the spark plug to *ignite* the *fuel vapor*. The expanding gases, resulting from the burning, force the piston downward to turn the *crankshaft*.

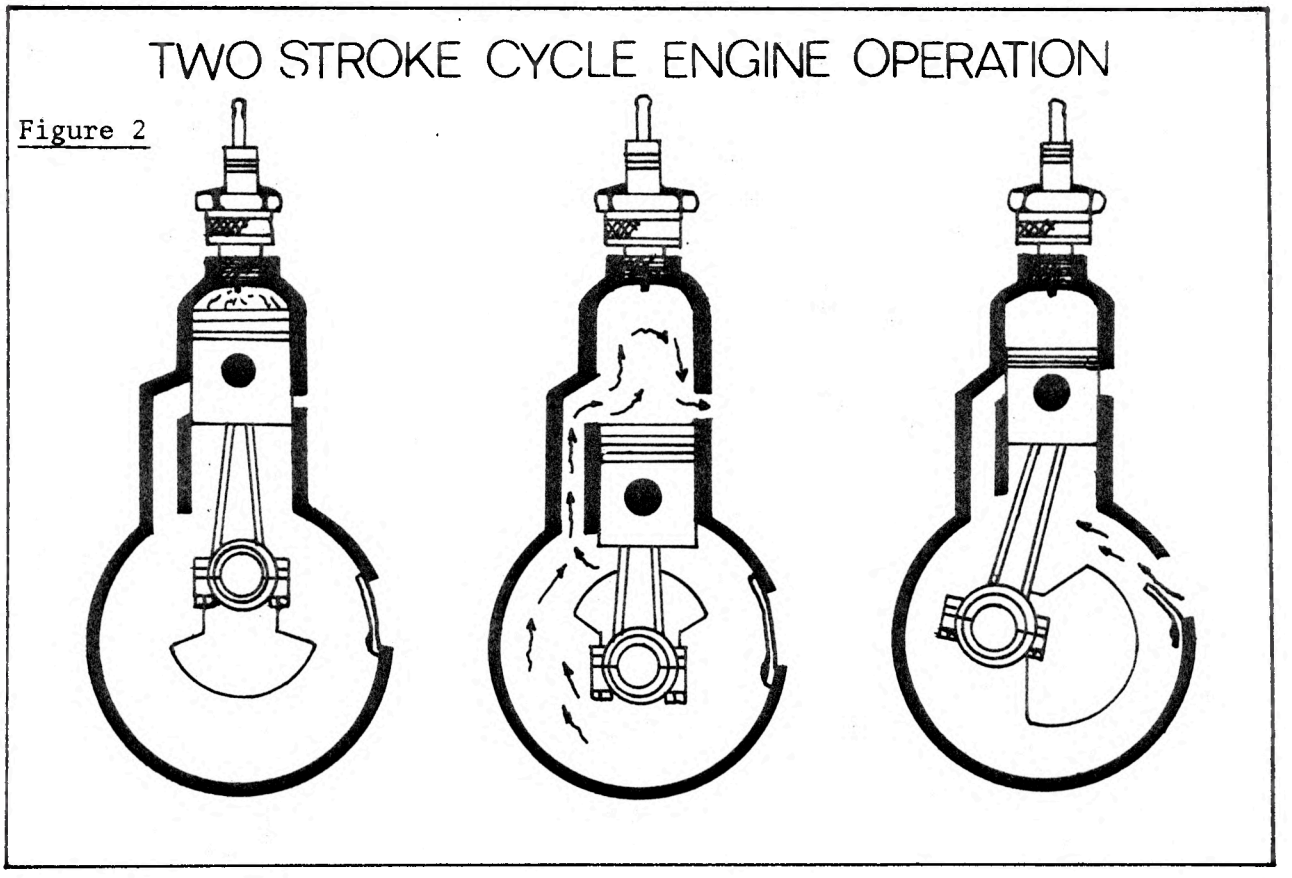
4. EXHAUST - After the fuel charge is burned, the *exhaust* valve opens. Burned gases are forced out of the cylinder when the piston moves upward again.

Then this series of events, called a cycle, is repeated. Since the piston makes four strokes, two up and two down, the complete name of the operation is 4 stroke cycle. The engine fires on every fourth stroke. A cycle involves two turns of the crankshaft.

Two-Stroke Cycle Engine Operation

Two-stroke cycle engines - many outboards, for example - combine the functions of a 4-stroke cycle engine in two strokes. Each time the piston reaches the top of its stroke the spark plug fires. Thus, power is delivered to the crankshaft on every downward stroke. Gases enter and leave the combustion chamber through holes, or ports, in the cylinder wall. Instead of oil in the crankcase, there is a vaporized mixture of fuel present that enters through a reed, poppet or rotary valve. This fuel vapor contains suspended droplets of oil that lubricate the surfaces of moving parts. A 2-stroke cycle engine works like this: See Figure 2.

Figure 2



TWO-STROKE CYCLE ENGINE OPERATION

1. DOWNSTROKES - After being ignited (A), the burning fuel vapor expands, driving the piston downward to deliver power to the crankshaft. In its downward travel the piston first uncovers the exhaust port, then the intake. As it moves downward, the piston also compresses the fuel mixture in the crankcase slightly by reducing the crankcase volume. The resulting pressure closes the fuel *inlet valve* and forces the fuel mixture through the intake port into the combustion chamber (B). There the fuel charge helps force exhaust gases out the exhaust port.

2. UPSTROKE - As the piston moves upward, it covers the intake and exhaust ports and compresses the fuel mixture in the combustion chamber (C). At the same time, the pump-like action of the piston moving up from the crankcase creates a vacuum in the crankcase. The fuel *inlet valve* opens due to low pressure in the crankcase and allows fuel vapor to enter the carburetor. The cylinder fires near the top of the upstroke, then the process is repeated.

Servicing A Small Engine

Servicing a small engine (less than 45 cubic inch displacement) is much like servicing any other engine. Most causes of poor engine performance - need for adjustment and tuneup, dirt accumulation around vital parts, and worn parts - are common to all engines.

Therefore, simple but thorough PREVENTIVE MAINTENANCE checks before storage and while the engine is in service are necessary for trouble-free operation.

Regular checks should cover the ignition, fuel and *lubricating* systems.

COURSE OUTLINE

Principles of the Two-Stroke and Four-Stroke Cycle

(a) Parts recognition

1. Cylinder block
2. Crankcase
3. Crankshaft
4. Piston and connecting rod assembly
5. Piston rings
6. Cylinder Head
7. Connecting rods (aluminum and steel)
8. Bearings
9. Compression ratio
10. Inlet and exhaust ports and/or valves
11. Valve operation

(b) Variations in the Two-Stroke Principle

1. By means of ports - 3 port
2. By means of ports and the spring loaded poppet valve - 2 port
3. Ports and valve in centre journal of crankshaft - 2 port (rotary)
4. By means of ports and an automatically operated reed valve arrangement - 2 port (see illustration)

(c) Lubrication (see illustration page 131)

1. Oil mixed with gasoline
2. Circulatory system

(d) Carburetion

1. Development of the modern carburetor from the simple mixing valve to the float feed multi-jet carburetor with bleeding orifices currently in use.
2. Combustion
3. Methods of vaporization to achieve combustion
4. Fuel induction to crankcase
5. Methods of fuel feed to carburetor
    (a) gravity
    (b) pressure
6. The crankcase bleeder system
    (a) To relieve the crankcase of condensed fuel vapor settling during slow and intermediate motor speeds

(e) Ignition

As much electricity and electronic theory as the class is capable of utilizing.

1. Fundamental theory of electricity
2. Current Flow
3. Magnetism

4. The ignition coil
    (a) the core
    (b) primary winding
    (c) secondary winding
    (d) the use of the condenser and breaker points

5. Magneto assembly as applied to the outboard motor (flywheel type)

6. Spark plugs
    (a) heat range
    (b) proper installation
    (c) cleaning and setting
    (d) trouble shooting

(f) The Lower Unit

1. Gear Train
    (a) forward, neutral and reverse
    (b) if students are far enough advanced, a set of gear ratio

2. Bearings

3. Lubrication
    (a) type of lubricant
    (b) oil seals

4. Cooling
    (a) circulation - waterpump

5. Underwater exhaust

    (a) relief for starting and slow speed running

6. Propellers

    (a) types

        - two blade
        - three blade
        - four blade
        - material
        - brass or aluminum
        - sizes
        - where students are capable, theory on pitch and diameter
        - shock absorbers and shear pins

(g) Boats

1. Safety in operation of an outboard motor.
2. Basic design for outboard motor installation (see illustrations)
3. Construction
4. Power recommendation

    (a) type of boat
    (b) shape of the hull
    (c) behaviour
    (d) characteristics
    (e) size and weight
    (f) how to lead
    (g) performance expected
    (h) suitable propeller

5. Attaching motor to stern of boat

    (a) stern height

    (b) stern angle

    (c) turbulence (see illustration)

6. Maintenance Procedures

    (a) how to treat a new motor

    (b) what to do if the motor is submerged

    (c) operating an outboard motor

    (d) winter storage

    (e) spring tune-up

FUEL AND OIL FOR THE OUTBOARD...

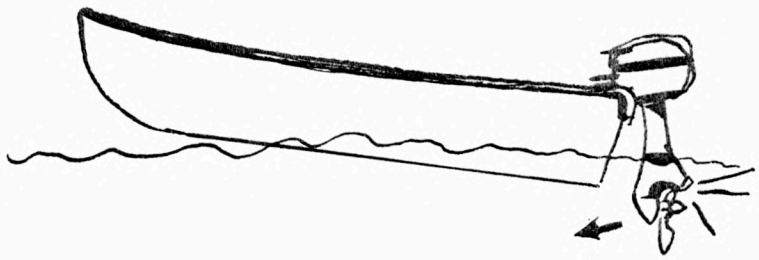
Oil provides a thin coating over all moving parts of the engine. Sometimes this oil film is only 1/1000 of an inch in thickness yet it holds the bearing surfaces apart and stops them from rubbing together and wearing.

Oil helps to control the temperature of the bearings and other engine parts. It does this by reducing friction and carrying away heat from the piston and cylinder walls.

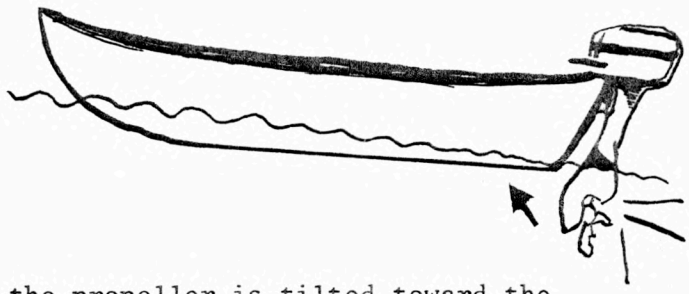
As the oil moves through the bearings and cylinder walls it washes everything clean. Bits of carbon and fine metal chips are carried away by the oil.

All two stroke engines that draw fuel through the crankcase to the cylinder are lubricated by adding oil to the gasoline. The oil and fuel mixture touches every part of the crankcase before being burned in the cylinder. Since oil burns slowly, some of it stays in the combustion cylinder to provide lubrication.

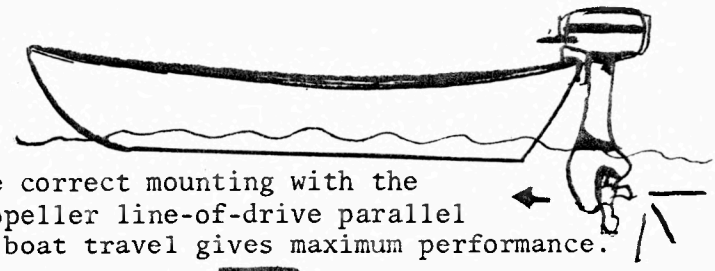
Oil used in these engines is called *"outboard motor oil"*, and has special additives to reduce carbon and oil fouling of the spark plug and cylinder. Manufacturers usually say how much oil to add to the gasoline. One half pint of oil to a gallon of gasoline is common.



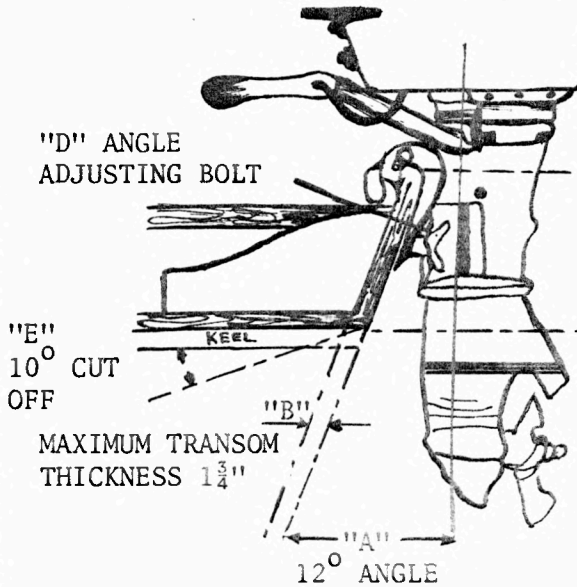
When the propeller is tilted away from the stern, it will cause the boat to squat. Incorrect.



When the propeller is tilted toward the stern, it will cause the boat to plow. Incorrect.



The correct mounting with the propeller line-of-drive parallel to boat travel gives maximum performance.



The correct way in which to mount an outboard motor on the transom of a boat.

TROUBLE SHOOTING AND TESTING

START ALL MAJOR DIAGNOSIS WITH A COMPRESSION TEST AND TEST WHEEL RPM CHECK

Taken from the Service Promotion Department, Outboard Marine Corporation of Canada Limited.

A. ENGINE REACTION	B. CHECK POINTS
1. Manual starter rope pulls out, but pawls do not engage.	(a) Friction spring bent or burred. (b) Excess grease on pawls or spring. (c) Pawls bent or burred.
2. Starter rope does not return.	(a) Recoil spring broken or binding (b) Starter housing bent. (c) Loose or missing parts.
3. Clattering manual starter.	(a) Friction spring bent or burred. (b) Starter housing bent. (c) Excess grease on pawls or spring. (d) Dry starter spindle.
4. Electric starter inoperative.	(a) Loose or corroded connections. (b) Micro or mercury switch open or out of adjustment. (c) Weak battery. (corroded battery terminals)

A. ENGINE REACTION	B. CHECK POINTS
4. Electric starter inoperative. (continued)	(d) Faulty starter solenoid. (e) Moisture in electric motor. (f) Broken or worn brushes in starter motor. (g) Faulty fields. (h) Faulty armature. (i) Broken wire in harness or connector. (j) Faulty starter key or push button switch. (k) Worn or frayed insulation.
5. Electric starter does not engage but solenoid clicks.	(a) Loose or corroded connections. (b) Weak battery. (c) Faulty starter solenoid. (d) Broken wire in electric harness. (e) Loose or stripped post on starter motor. (f) See steps in number 4.
6. Hard to start or won't start.	(a) Empty gas tank. (b) Gas tank air vent not open. (c) Fuel lines kinked or severely pinched. (d) Water or dirt in fuel system. (e) Clogged fuel filter or screens.

A. ENGINE REACTION	B. CHECK POINTS
6. Hard to start or won't start. (continued)	(f) Motor not being choked to start.
	(g) Engine not primed - pump up hose.
	(h) Carburetor adjustments too lean (not allowing enough fuel to start engine).
	(i) Timing out of adjustment.
	(j) Manual choke linkage bent - auto choke out of adjustment.
	(k) Spark plugs improperly gapped, dirty or broken.
	(l) Fuel tank primer inoperative (pressurized system).
	(m) Ignition points improperly gapped, burned or dirty.
	(n) Loose, broken wire or frayed insulation in electrical system.
	(o) Reed valves not seating or preloaded shut.
	(p) Weak coil or condenser.
	(q) Faulty gaskets.
	(r) Cracked distributor cap or rotor.
	(s) Loose fuel connector.

A. ENGINE REACTION	B. CHECK POINTS
7. Low speed miss or motor won't idle smoothly and slowly.	(a) Too much oil - too little oil. (b) Timing out of adjustment. (c) Carburetor idle adjustment - mixture lean or rich. (d) Ignition points - improper gap, worn or fouled. (e) Weak coil or condenser. (f) Loose or broken ignition wires. (g) Loose or worn magneto plate. (h) Spark plugs - improper gap or dirty. (i) Hand gasket, reed plate gasket, blown or leaking. (j) Reed valve standing open or preloaded shut. (k) Plugged crankcase bleeder, check valves, or lines. (l) Leaking crankcase halves. (m) Leaking crankcase seals, top or bottom. (n) Exhaust gases returning through intake manifold.

A. ENGINE REACTION	B. CHECK POINTS
8. High speed miss or intermittent spark.	(a) Spark plugs improperly gapped or dirty. (b) Loose, leaking or broken ignition wires. (c) Breaker points improper - gap or dirty. (d) Weak coil or condenser. (e) Water in fuel. (f) Leaking head gasket or exhaust cover gasket. (g) Spark plug heat range incorrect. (h) Engine improperly timed. (i) Carbon or fouled combustion chambers. (j) Mag or distributor poorly grounded. (k) Oiler wick bad.
9. Coughs, spits, slows.	(a) Idle or high speed needles set too lean. (b) Carburetor not synchronized. (c) Leaking gaskets in induction system. (d) Obstructed fuel passages. (e) Float level set too low.

A. ENGINE REACTION	B. CHECK POINTS
9. Coughs, spits, slows. (continued)	(f) Improperly seated or broken reeds. (g) Fuel pump pressure line ruptured. (h) Fuel pump - punctured diaphragm, check valves stuck open or closed, fuel lines leak. (i) Poor fuel tank pressure (pressurized system)
10. Vibrates excessively or runs rough and smokes.	(a) Idle or high speed needles act too rich. (b) Too much oil mixed with gas. (c) Carburetor not synchronized. (d) Choke not opening properly. (e) Float level too high. (f) Air passage to carburetor obstructed. (g) Bleeder valves or passages plugged. (h) Transom bracket clamps loose on transom. (i) Prop out of balance. (j) Broken motor mount. (k) Exhaust gases getting inside motor cover. (l) Poor ignition - see steps in number 8.

A. ENGINE REACTION	B. CHECK POINTS
11. Runs well, idles well for a short period, then slows down and stops.	(a) Weeds or other debris on lower unit or prop. (b) Insufficient cooling water. (c) Carburetor, fuel pump, filter or screens dirty. (d) Bleeder valves or passages plugged. (e) Lower unit bind due to lack of lubrication. (f) Gas tank air vent not open. (g) Not enough oil in gas. (h) Combustion chambers and spark plugs fouled, causing preignition. (i) Spark plug heat range too high or too low. (j) Wrong propeller (preignition). (k) Slow speed adjustment too rich or too lean.
12. Won't start, kicks back, backfires into lower unit.	(a) Spark plug wires reversed. (b) Flywheel key sheared. (c) Belt timing off. (d) Timing and synchronizing. (e) Reed valves not seating or broken.

A. ENGINE REACTION	B. CHECK POINTS
13. No acceleration, low top RPM.	(a) Improper carburetor adjustments.
	(b) Improper timing and synchronization.
	(c) Spark plugs - improper gap or dirty.
	(d) Ignition points - improper gap or faulty.
	(e) Faulty coil or condenser.
	(f) Loose, leaking or broken ignition wires.
	(g) Reed valve not properly seated or broken.
	(h) Blown head or exhaust cover gasket.
	(i) Weeds on lower unit or prop.
	(j) Incorrect prop.
	(k) Insufficient oil in gas.
	(l) Insufficient oil in lower unit.
	(m) Fuel restrictions.
	(n) Scored cylinder, stuck rings.
	(o) Marine growth, hooks, rockers or change in load of boat.
	(p) Sticky magneto plate.

A. ENGINE REACTION	B. CHECK POINTS
14. No acceleration, idles well, but when put to full power dies down.	(a) High or low speed needle set too lean. (b) Dirt or packing behind needles and seats. (c) High speed nozzle obstructed. (d) Float level too low. (e) Choke partly closed. (f) Improper timing and synchronization. (g) Fuel lines or passages obstructed. (h) Fuel filter obstructed, fuel pump not supplying enough fuel. (i) Not enough oil in gas. (j) Breaker points improperly gapped or dirty. (k) Bent gearcase or exhaust tube.
15. Engine runs at high speed only by using hand primer.	(a) Carburetor adjustments. (b) Dirt or packing behind needles and seat. (c) Fuel lines or passages obstructed. (d) Fuel line leaks. (e) Fuel pump not supplying enough fuel. (f) Float level too low. (g) Fuel tank or connector at fault. (h) Fuel filter obstructed.

A. ENGINE REACTION	B. CHECK POINTS
16. No power under heavy load.	(a) Wrong propeller. (b) Weeds or other debris on lower unit or prop. (c) Breaker points improperly gapped or dirty. (d) Stator plate loose. (e) Ignition timing over advanced or late. (f) Faulty carburetion and/or faulty ignition. (g) Prop hub slips. (h) Scored cylinders or rings stuck.
17. Cranks over extremely easy on one or more cylinders.	(a) Low compression. (i) Worn rings. (ii) Scored cylinder or pistons. (iii) Blown head gasket. (iv) Loose spark plugs. (v) Loose head bolts. (vi) Crankcase halves improperly sealed.

A. ENGINE REACTION	B. CHECK POINTS
18. Engine won't crank over.	(a) Manual start lock improperly adjusted. (b) Pistons rusted to cylinder wall. (c) Lower unit gears, prop shaft rusted or broken. (d) Broken connecting rod, crankshaft or driveshaft. (e) Coil heels binding on flywheel. (f) Engine improperly assembled after repair.
19. Motor overheats.	(a) Motor not deep enough in water. (b) Not enough oil in gas or improperly mixed. (c) Faulty water pump parts. (d) Seals, gaskets or castings - burned cracked or broken, allowing exhaust gases to enter cooling system. (e) Impeller key not in place or broken. (f) Plugged water inlet, outlet or cavity. (g) Obstruction in water passages. (h) Broken, pinched or leaking water lines.

A. ENGINE REACTION	B. CHECK POINTS
19. Motor overheats. (continued)	(i) Advanced ignition timing.
	(j) Motor not assembled properly during repair.
	(k) Shorted heat light wiring.
	(l) Bad impeller, plate or housing.
	" DO NOT TEST MOTOR OUT OF WATER "
20. Motor stops suddenly, freezes up.	(a) No oil in gas, or no gas.
	(b) Insufficient cooling water.
	(c) No lubricant in gearcase.
	(d) Rusted cylinder or crankshaft.
	(e) Bent or broken rod, crankshaft, driveshaft, prop shaft, stuck piston.
	(f) Gas tank air vent not open.
	(g) Bad water pump or plugged water passages.
	(h) Bad fuel connector.

A. ENGINE REACTION	B. CHECK POINTS
21. Motor knocks excessively.	(a) Too much or not enough oil in gas. (b) Worn or loose bearings, pistons, rods or wrist pins. (c) Advanced ignition timing. (d) Carbon in combustion chambers and exhaust ports. (e) Manual starter not centred. (f) Flywheel nut loose. (g) Bent shift rod (vibrating against exhaust tube). (h) Flywheel hitting coil heels. (i) Loose assemblies, bolts or screws.
22. D.C. Generator will not charge.	(a) Battery condition. (b) Connections loose. (c) Connections dirty. (d) Faulty regulator. (e) Field fuse blown. (f) Generator not polarized. (g) Faulty generator.

A. ENGINE REACTION	B. CHECK POINTS
23. A.C. Generator will not charge.	(a) Battery condition. (b) Connections loose. (c) Connections dirty. (d) 60 amp fuse blown. (e) Faulty regulator. (f) Faulty rectifier diodes. (g) Faulty generator.
24. Excess fuel consumption.	(a) Hole in fuel pump diaphragm. (b) Deteriorated carburetor gaskets. (c) Altered or wrong fixed jets. (d) Jets improperly adjusted. (e) Carburetor coating porous. (f) Float level too high.
25. Shifter dog jumps.	(a) Worn shifter dog or worn gear dogs. (b) Worn linkage. (c) Remote control adjustment. (d) Gearcase loose. (e) Exhaust housing bent. (f) Gearcase bent.

A. ENGINE REACTION	B. CHECK POINTS
26. Electramatic slips.	(a) Improper remote control installation.
	(b) Faulty coils.
	(c) Faulty springs.
	(d) Faulty clutch and gear.
	(e) Faulty bearings.
	(f) Wrong lubricant.
	(g) Loose gearcase.
	(h) Shorted wiring.
	(i) Sprung gearcase.

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WOODWORK

Introduction

Woodwork is probably the subject most often taught in schools which offer shop programs. There are many reasons for this choice. They include the utility of the material, its relative softness which results in ease of working, the fact that most teachers have had some training or familiarity in woodworking and the availability of suitable tools in most communities. The following projects have been collected from teachers and other sources throughout the north and are not arranged in order of difficulty.

Equipment and Supplies

Procedure for requisitioning is outlined in the first selection of this booklet, however in certain cases special supplies and equipment beyond the regular dollar allotment may be requisitioned. Such requisitions will be reviewed by the Superintendent of Vocational Education and should be accompanied by a detailed account of the use to which the equipment or supplies will be put.

Course Outline

If the teacher or instructor feels that a formal course outline might help him to arrange more meaningful learning experiences for the pupils, he should refer to the course outline prepared for use in junior high schools in the Northwest Territories and Teaching Industrial Arts and select suitable sections of it for use in his local setting.

PLAY EQUIPMENT

For permission to reproduce the drawings of play equipment included in the text, we are grateful to the Department of National Health and Welfare.

These projects should prove challenging enough for pupils of any age and be of value to the general school population. Some of the equipment could probably best be built as a group project in the shop and the pupils may become interested in proper use and maintenance of it in the school yard or kindergarten rooms.

Objectives

1. To introduce the pupils to woodworking skills commensurate with their maturity and ability.
2. To introduce the use and care of tools.
3. To encourage the development of a sense of responsibility to improve the environment, and the initiative to act on this responsibility.
4. To encourage the pupil to recognize the versatility and use of different kinds of wood in various forms.
5. To encourage pupils to build useful articles which will tend to improve their standard of living.

SAFETY

Every shop must have an effective safety program. This does not mean merely that the promulgation of a set of rules and regulations will satisfy this end. Pupils must be taught, in each and every subject studied within the industrial arts framework, the *"how's"* and *"why's"* inherent in the safety program. Dress and deportment play an important part in the operation of a safe shop program. Pupils and instructor should be neatly dressed at all times and the instructor should take care to ensure that no loose and dangerous clothing is worn. Safety aprons, goggles and gloves should be used wherever necessary. It is the responsibility of the instructor to supply continuous and vigilant supervision and to ensure that all pupils engage in safe shop practices. A good safety program includes:

1. Regular and thorough instruction and revision of the program.
2. Constant vigilance.
3. Checks and evaluation by the instructor.
4. Complete first aid equipment kept in first-class condition.
5. Non-skid paint and clearly marked working areas around all machinery.
6. Proper clothing with particular attention to eye protection.
7. Machines and tools in good working condition.

8. Routine reporting of all accidents and an adequate system of record keeping. This record of accidents, cause and treatment given, is extremely important for two reasons:
   (a) To indicate recurrent accident patterns so that they can be remedied.
   (b) In case of suit for liability.
9. Good housekeeping.

The following is a sample of safety regulations:

1. No power machines shall be used by any pupil until specific instruction has been given with regard to safe operation and safety precautions.
2. No power machine shall be used by any pupil without the specific permission of the instructor each time the machine is used.
3. No power machine shall be used while the instructor is absent from the shop.
4. Safety guards must be in place on all power machinery.
5. Approved eye protection must be worn for certain operations.

Note: A good safety slogan at all times -

"A place for everything and everything in its place."

There are five basic steps in safety education:

1. Set a good safety example for pupils.
2. Instruct each pupil thoroughly in the safety precautions of his job. Check lists for power machinery.
3. Keep all tools sharp and in good condition, older pupils will assist in maintenance of tools.
4. Keep all safety devices in proper use.
5. Follow up safety instructions constantly. The shop will be as safe as the instructor makes it.

It should be pointed out that failure to comply with every reasonable safety precaution, may jeopardize the instructor's position in any claim for compensation. Each school should receive the excellent publications and bulletins dealing with accident prevention and safety procedures distributed by the Workman's Compensation Board.

PLANNING SHEET

Name _____ Grade _____ Teacher's Approval _____

Project _____ Date Started _____ Date Finished _____

Bill of Material - Finished Size

Part	Pieces	T	W	L	Material	Cost

Steps	Tools and Equipment
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

TOTAL

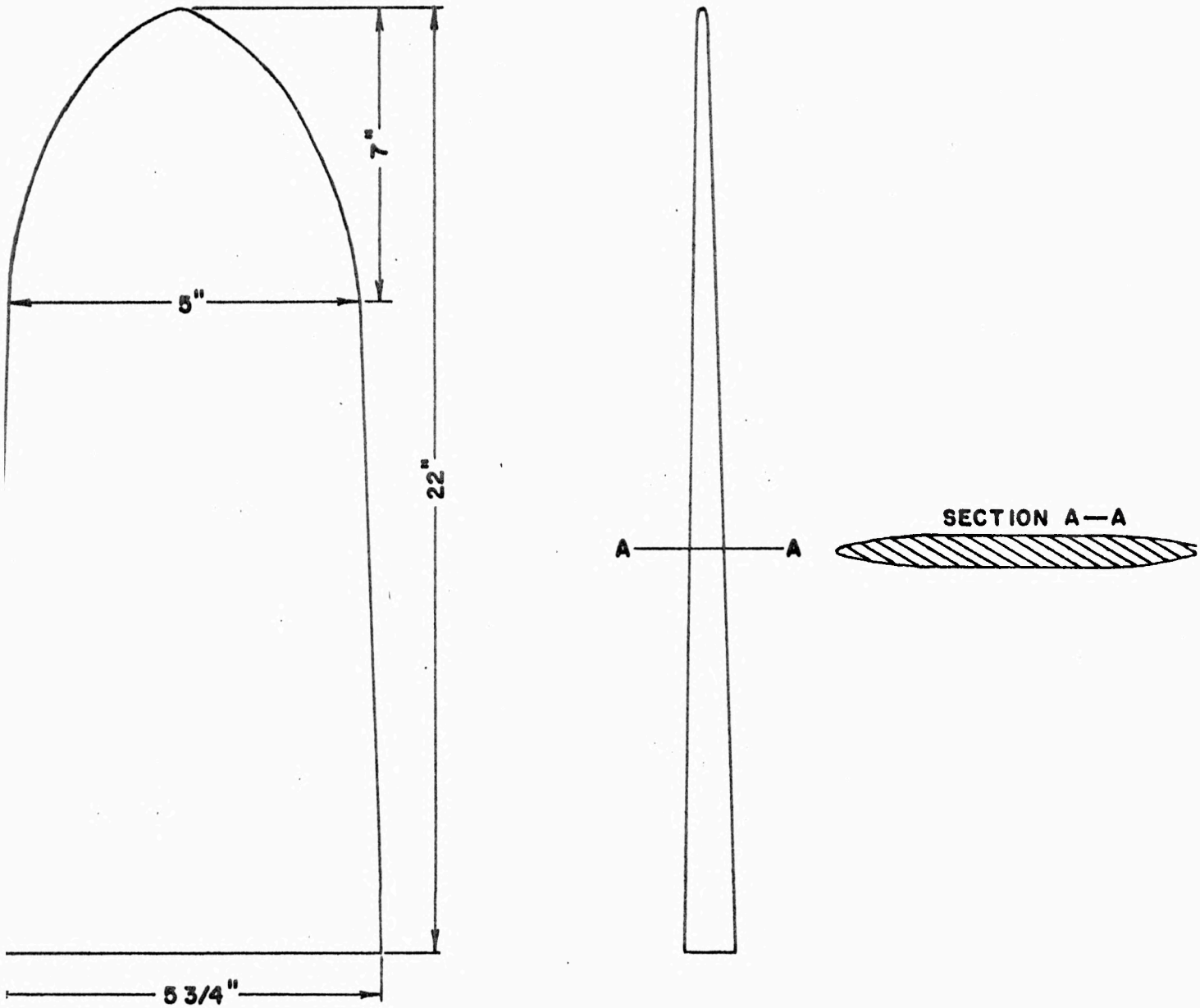
Planning _____ Surface Preparation _____ Finishing _____

Accuracy _____ Tool Operation _____ Shop Efficiency _____ _____

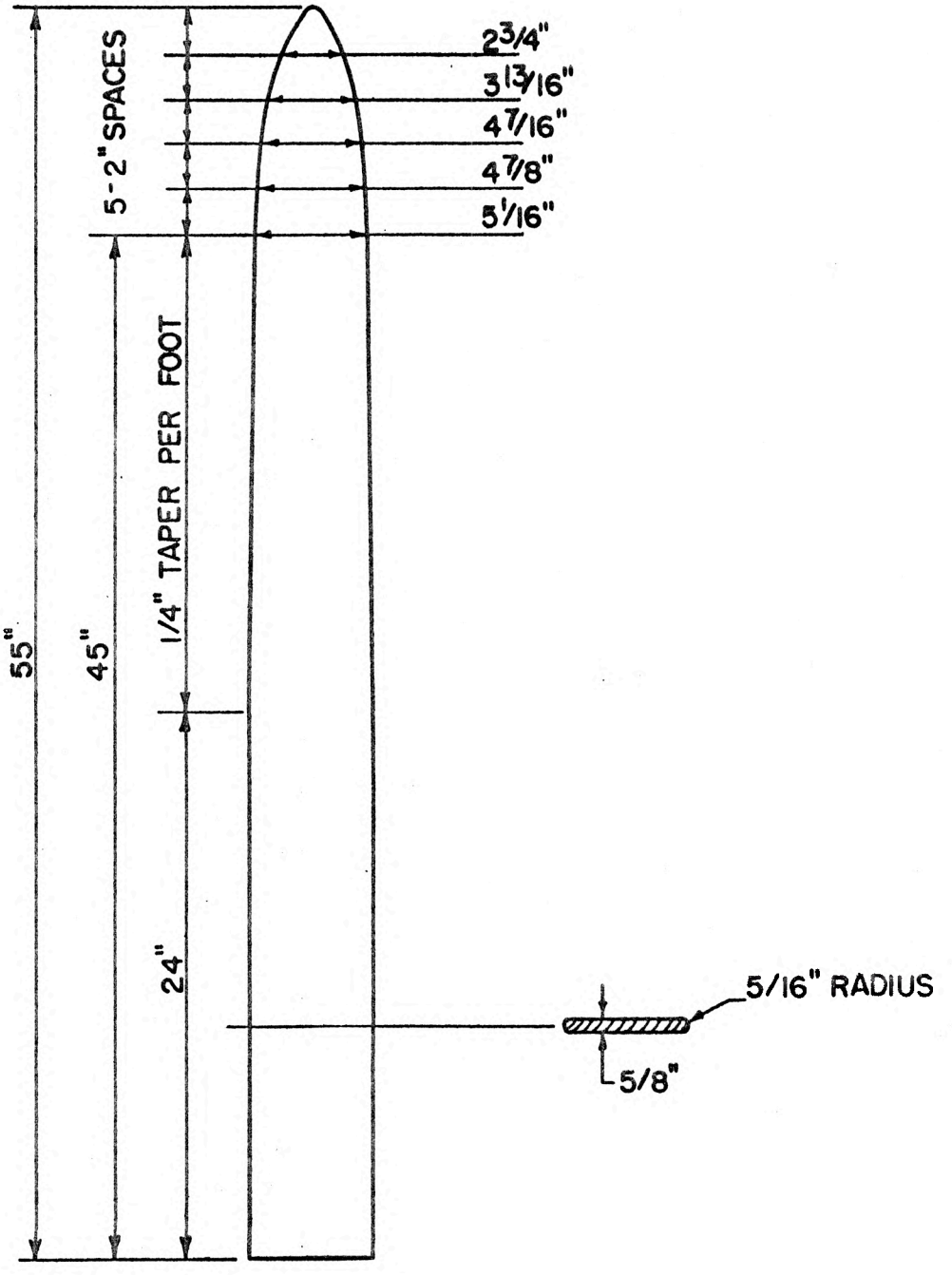
One of the most important facets of trapping is the preparation of the furs. It is extremely important that the furs be stretched uniformly and symmetrically on a standard size skin stretcher. If this is well done, furs will sell for a maximum price. If the stretcher is misshapen, the furs are automatically reduced in value.

In many communities trappers do not take sufficient time to make accurate skin stretchers. Here then is a project eminently suitable for construction in the school shops. The attached drawings show stretchers for fox and different sizes of muskrat - materials 5/8 inch plywood. It is not necessary to finish the project but a coat of shellac will help to preserve it.

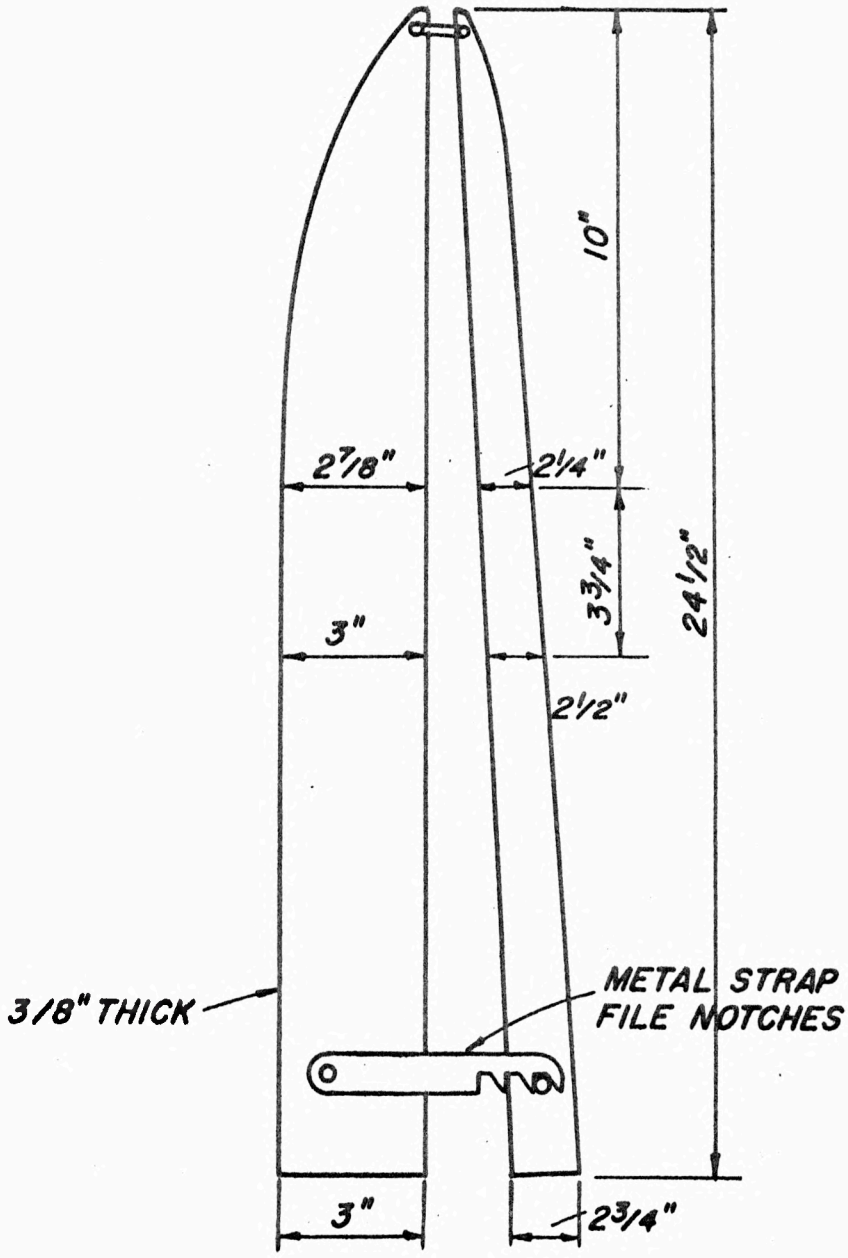
FORT McPHERSON SHOP-1962
MUSKRAT STRETCHERS



FOX STRETCHER

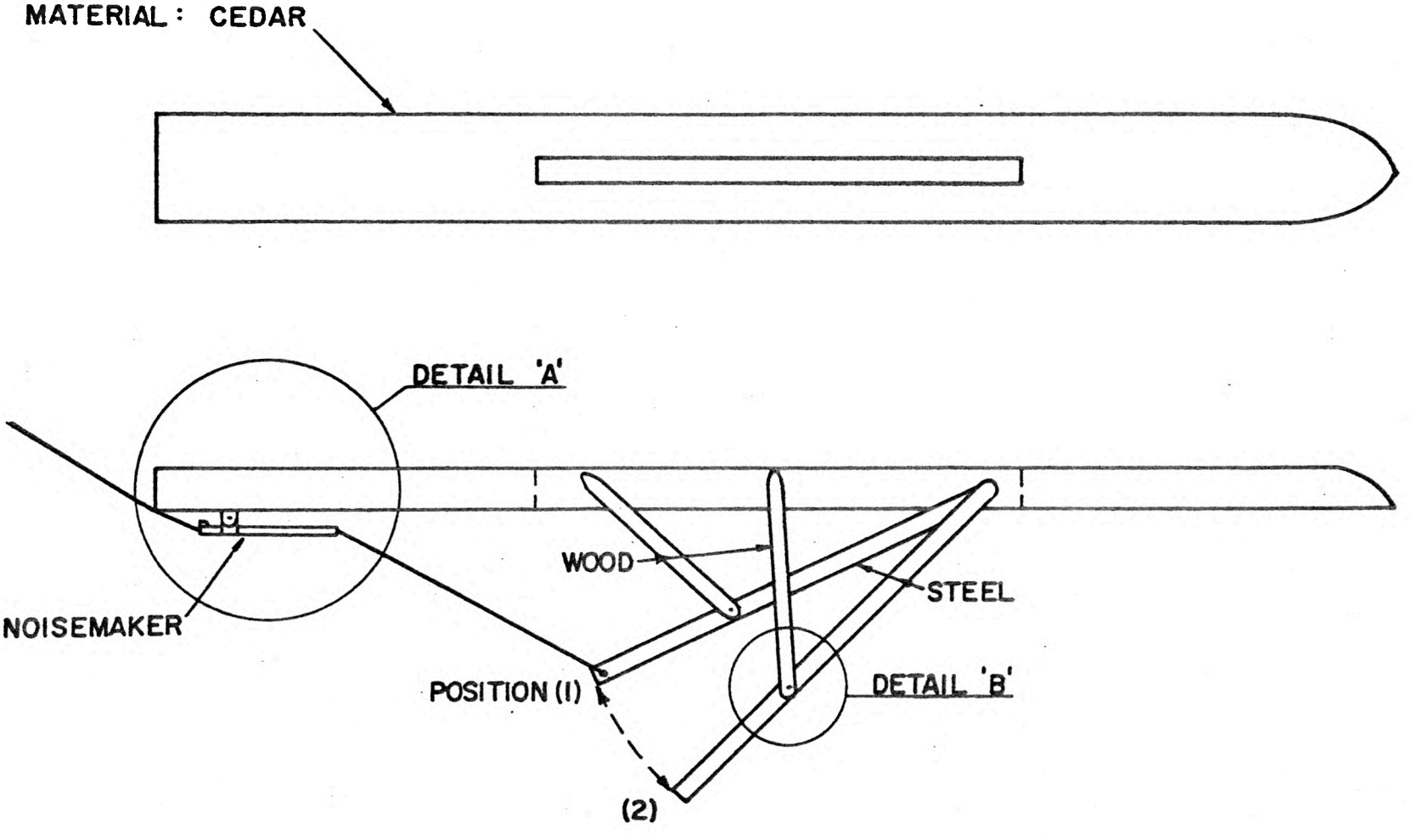


STRETCHER


10"
24 1/2"
2 7/8"
2 1/4"
3 3/4"
3"
2 1/2"
3/8" THICK
METAL STRAP
FILE NOTCHES
3"
2 3/4"

In communities where fishing is part of the economy, an ice jigger makes a very useful and challenging project. While materials suggested are suitable, others may be substituted. It should always be the teachers aim to use material which is available in the community even if adaptations in the basic design are required. The jigger shown in the drawing can be made in three different sizes. It can be used to introduce the students to a variety of different tools and techniques if this is the objective of the teacher or it can be made with very simple tools.

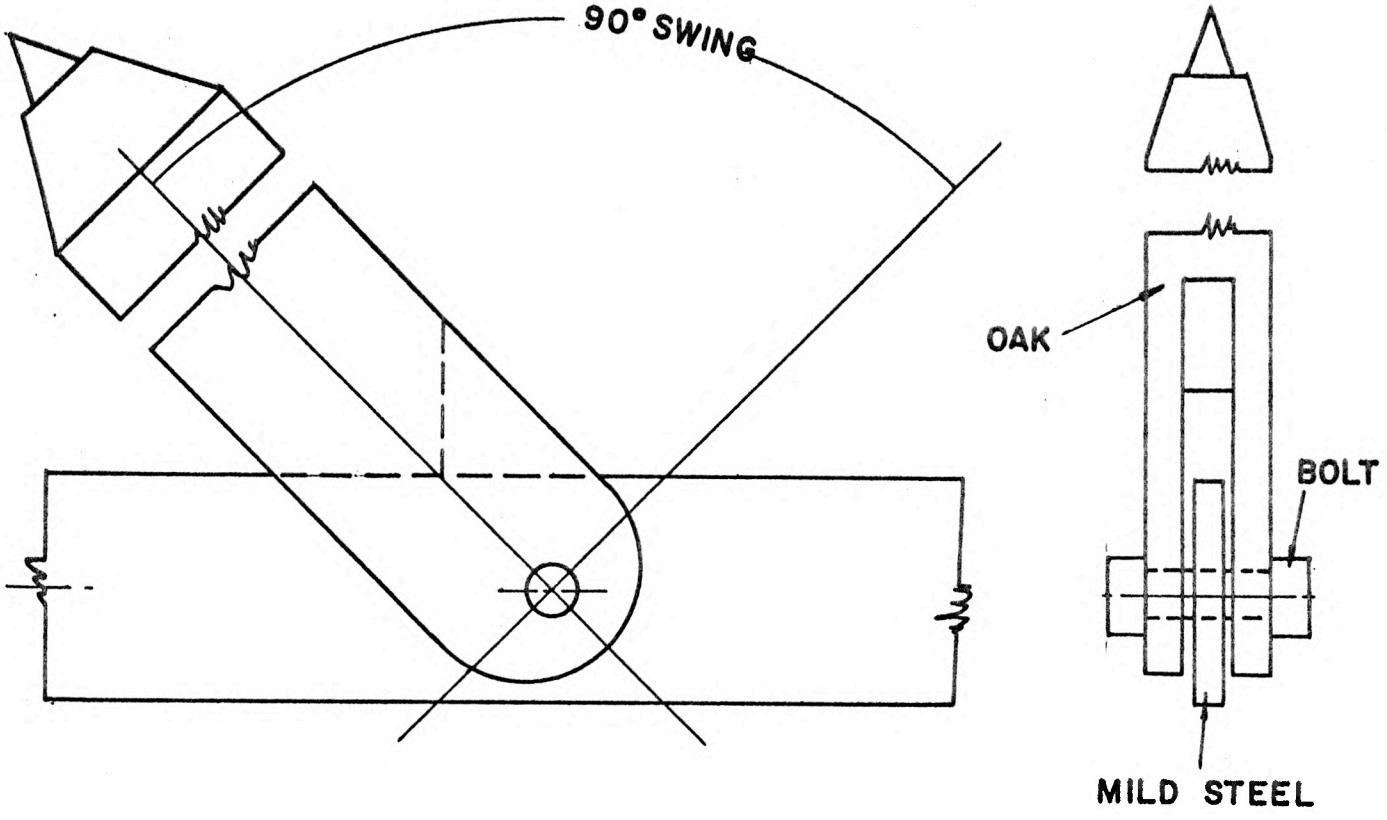
ICE JIGGER



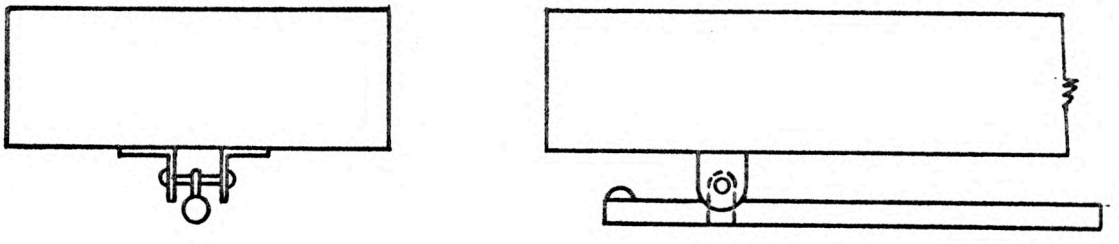
SCALE : 1" = 1'-0"

ICE JIGGER

DETAILS

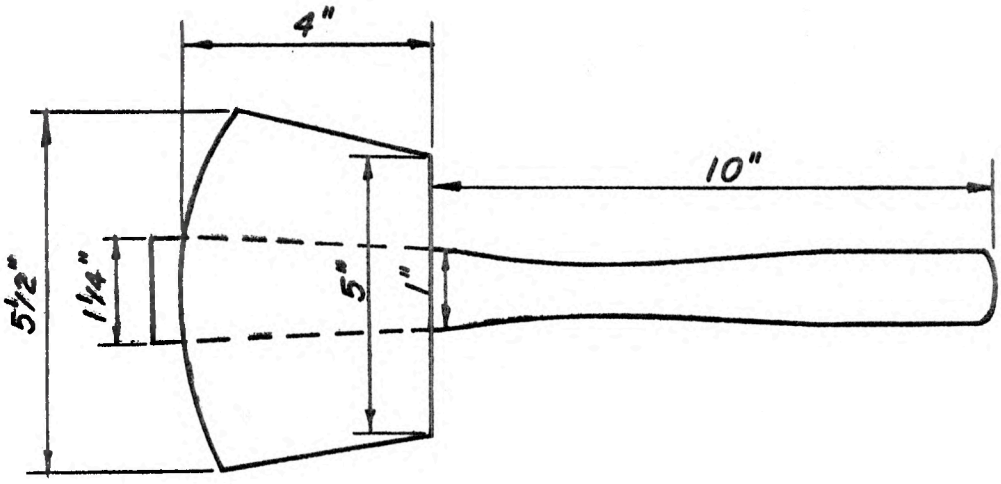


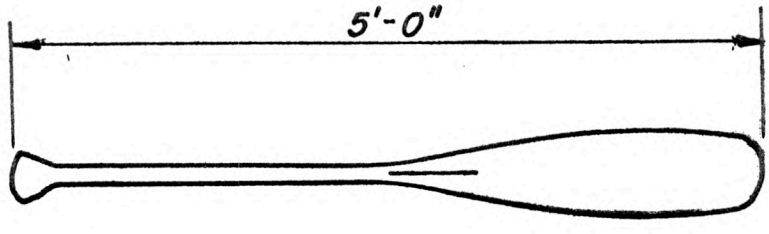
DETAIL 'B'
SCALE FULL SIZE



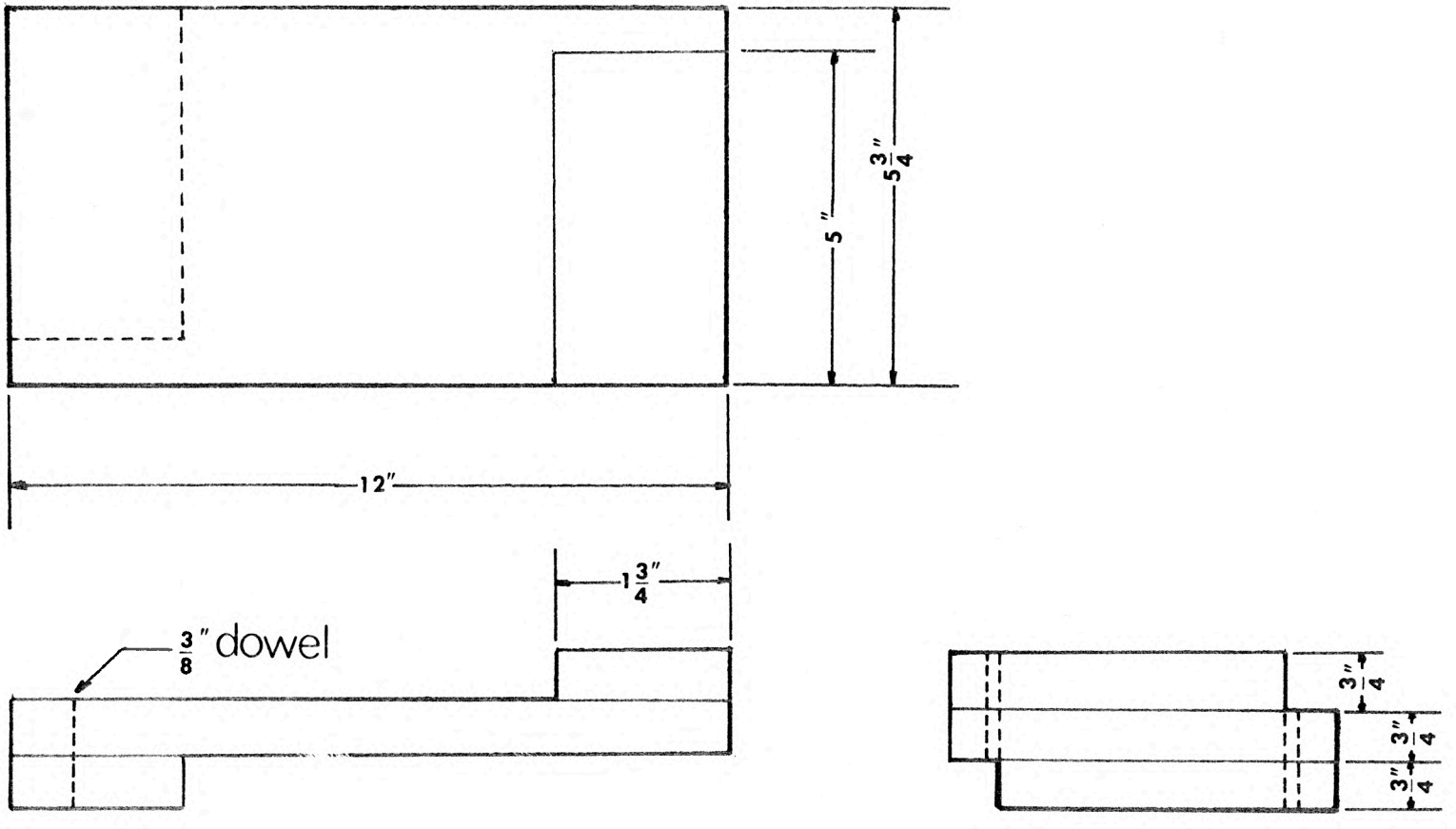
DETAIL 'A'
SCALE : 1/4" = 1"

MALLET





WOOD PADDLE



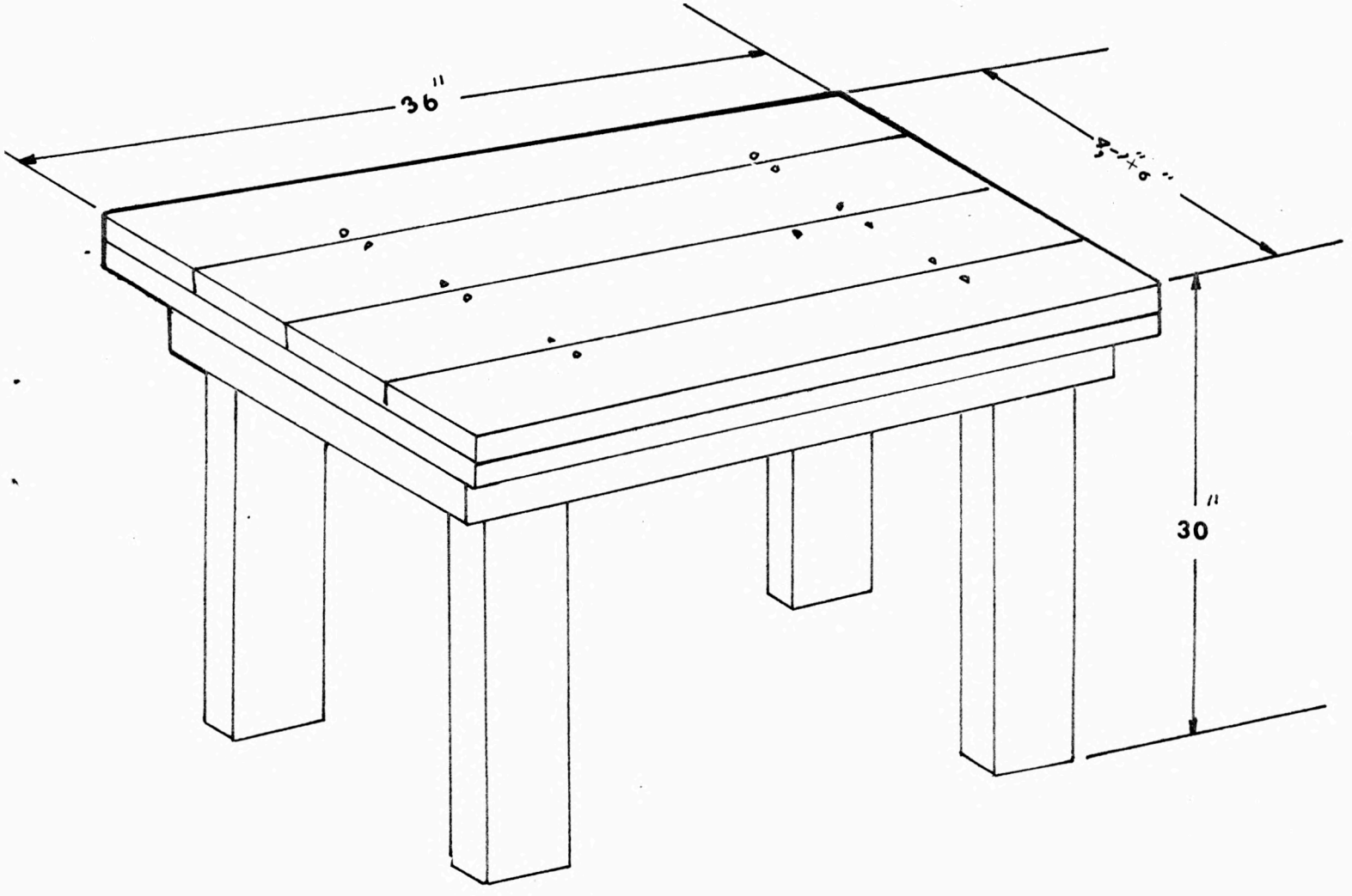
BENCH HOOK

WORK BENCH

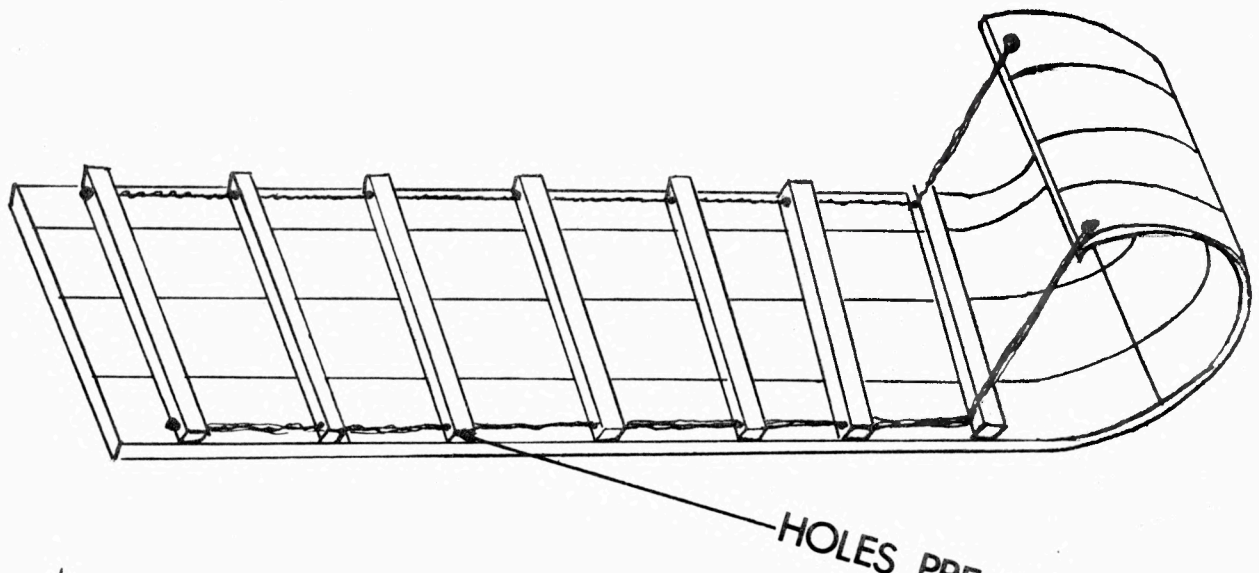
Small children like to hammer just for hammering sake but by the time they reach school age they want to make things. A bench like this may be useful in the primary or kindergarten rooms in the school.

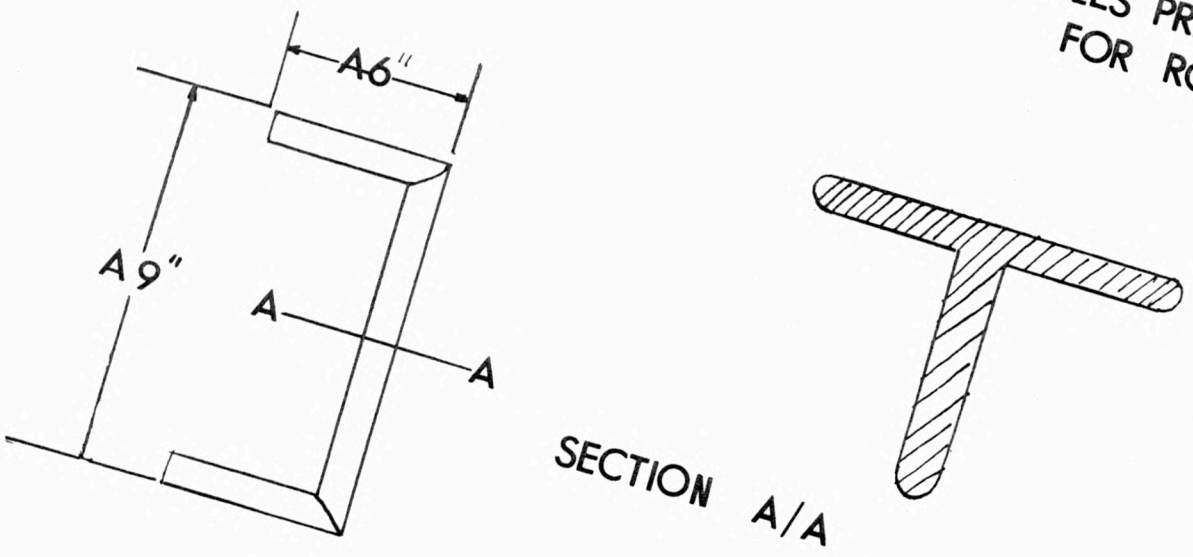
Perhaps as industrial arts teachers or people with a particular interest in this area, we may be able to encourage work of this type in the primary grades.

WORK BENCH



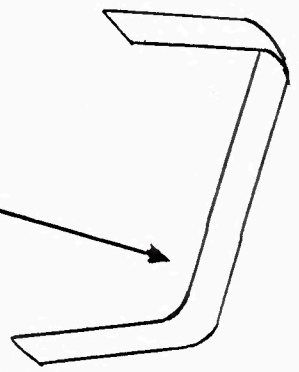
REHAB.I NORTHERN SLED
INUVIK
2 OF 5





SECTION A/A

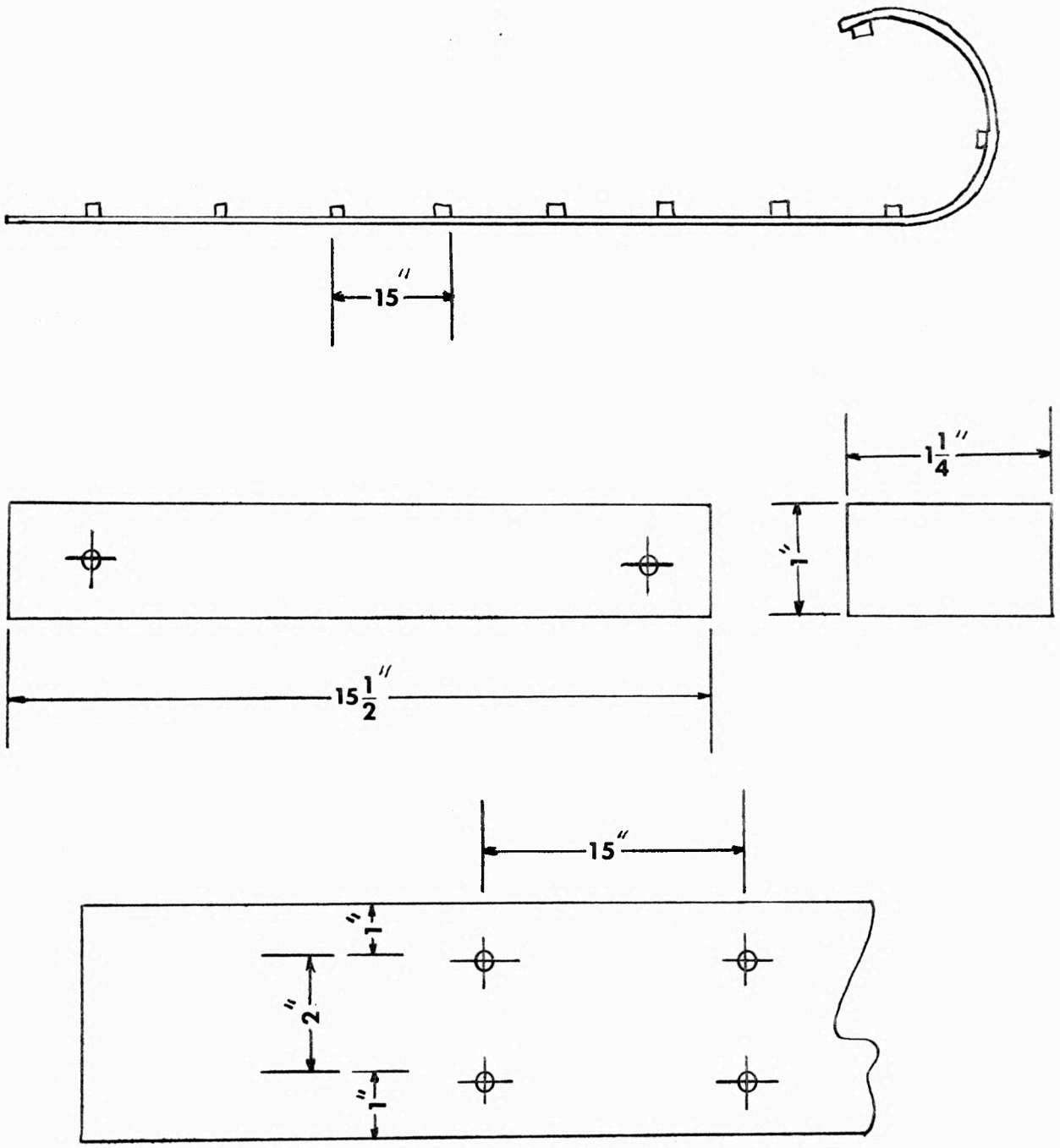
CLAMPING JIG FOR HEAD (2 REQD)
STRAP IRON MAY BE USED



REHAB.I NORTHERN SLED

INUVIK 3 OF 5

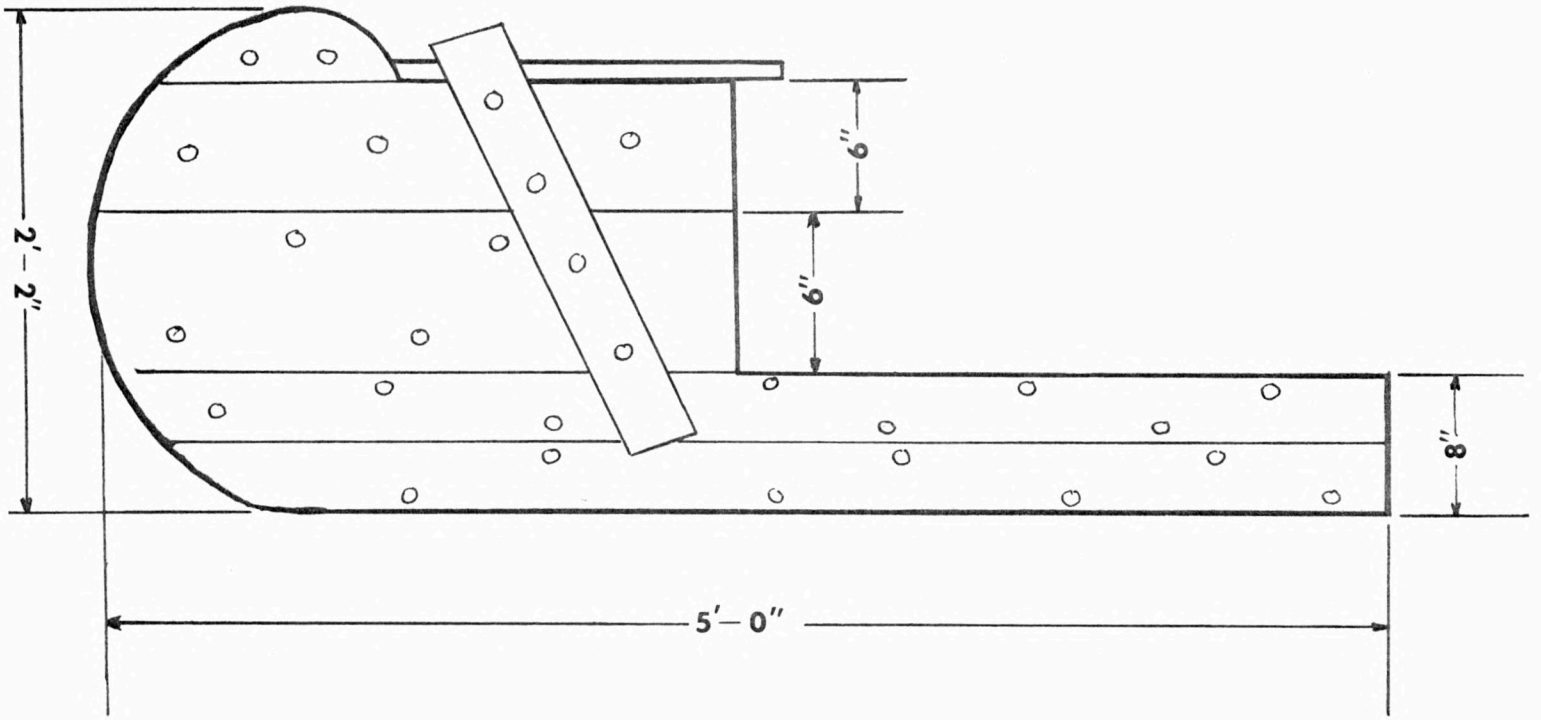
When drilling countersunk bolt holes in crosspieces, care must be taken so that the horizontal rope holes do not coincide

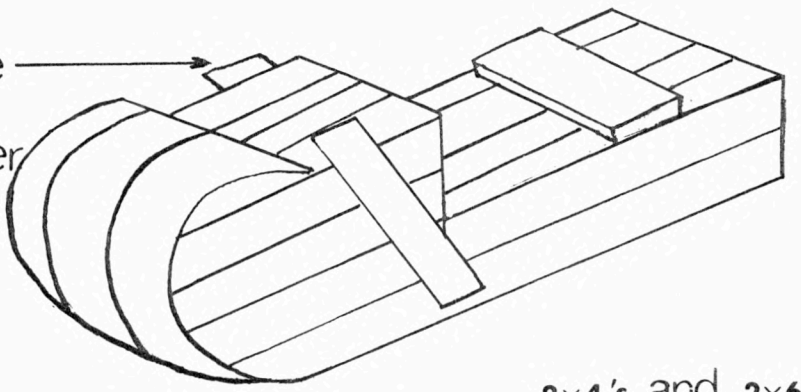


pre-drilled bolt holes in slats – countersunk

REHAB I NORTHERN SLED

INUVIK 5 OF 5

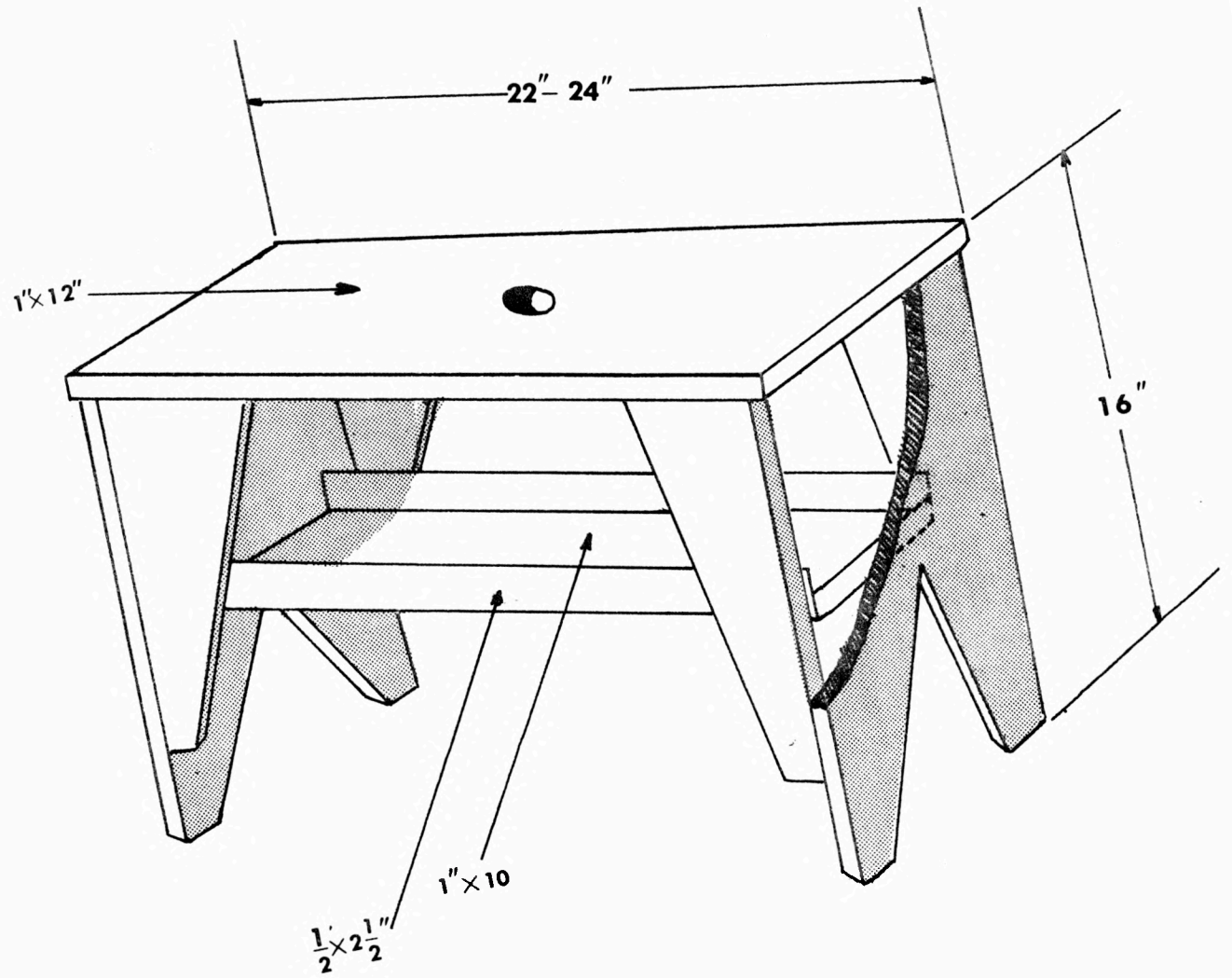




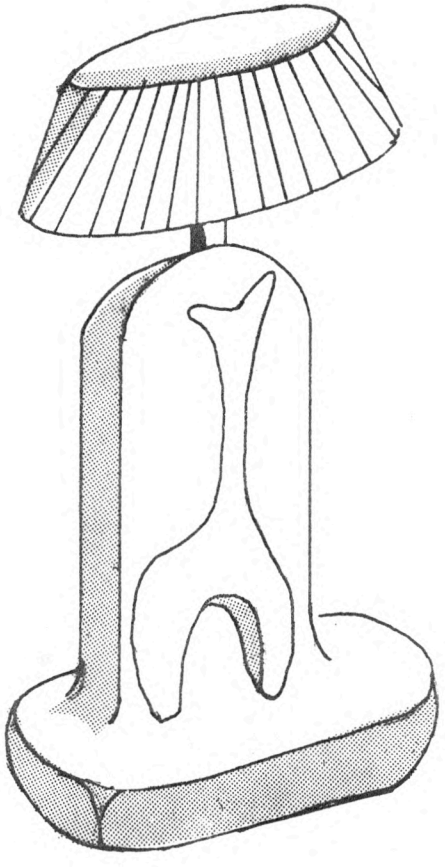
2×4's and 2×6's are used in construction

A SUITABLE BENDING JIG

SAW BENCH OR STOOL

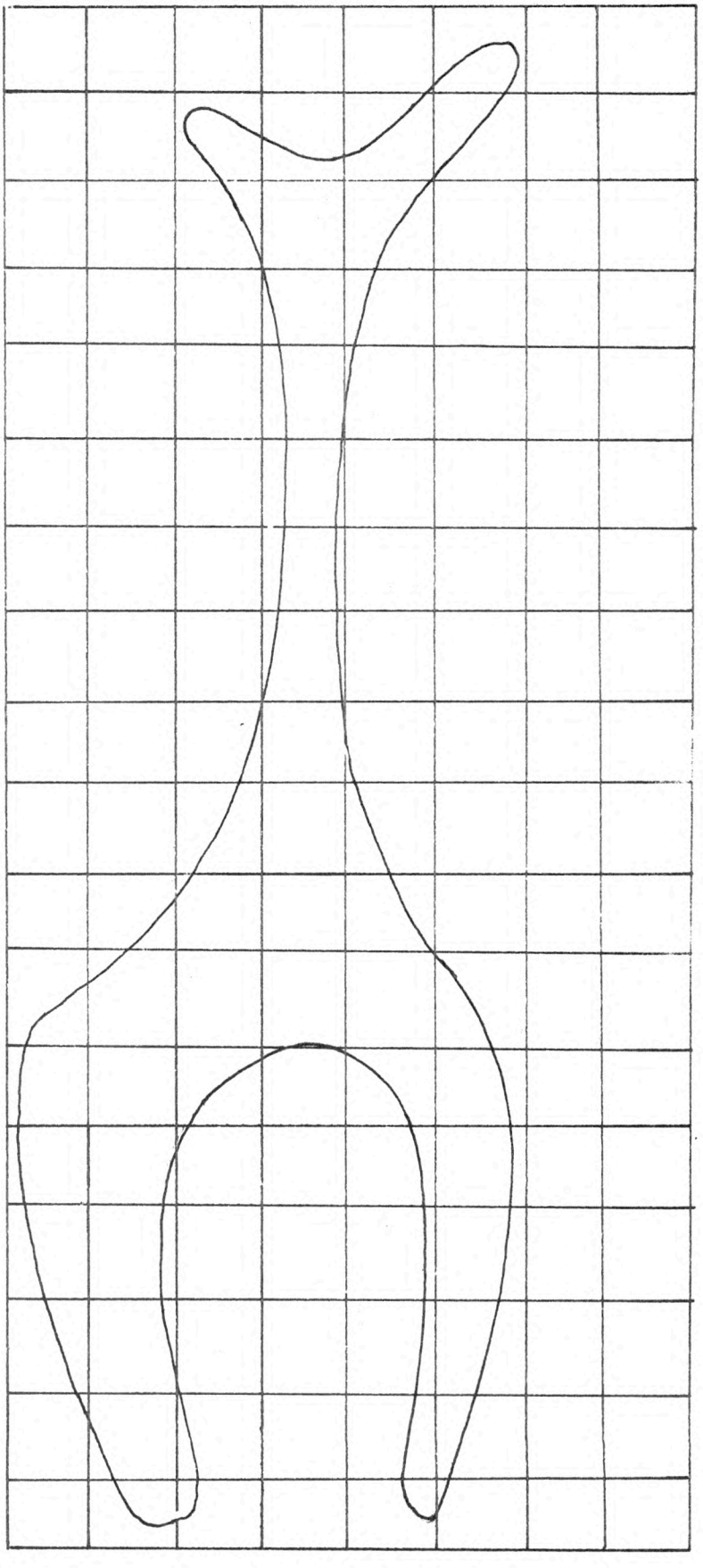


FREE FORM FIGURE LAMP

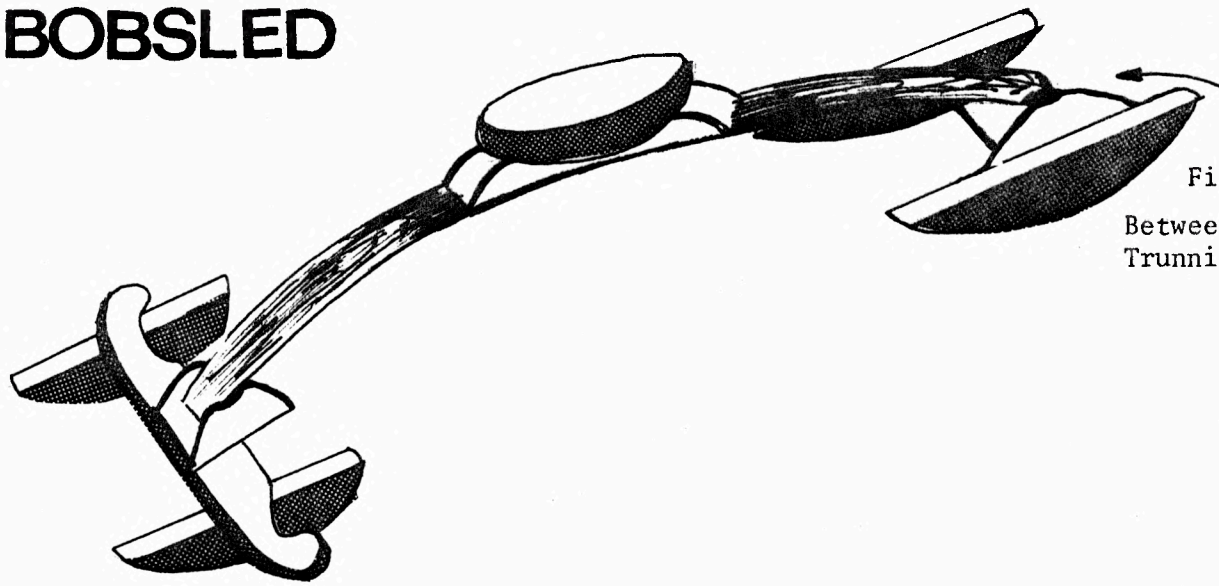


Material - Walnut or
Mahogany and Sycamore

Finish - Shellac and wax polish

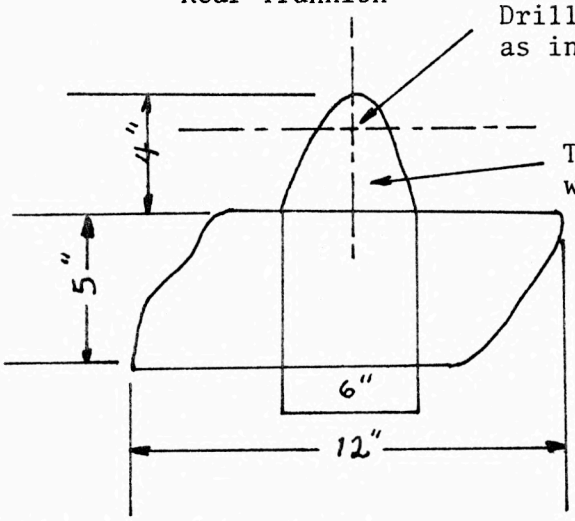


BOBSLED

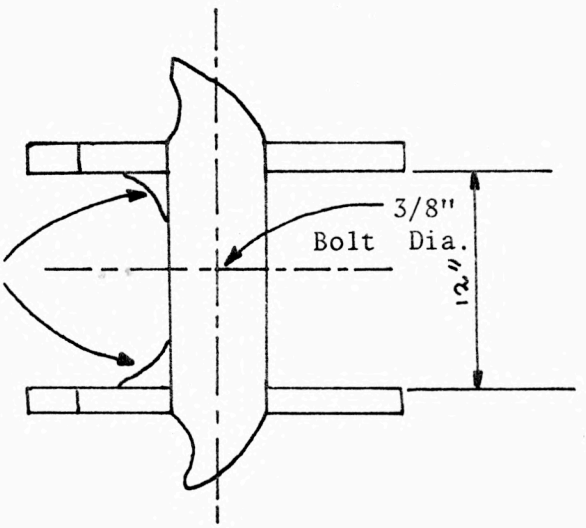


Fire Spacers
Between Spring and
Trunnion

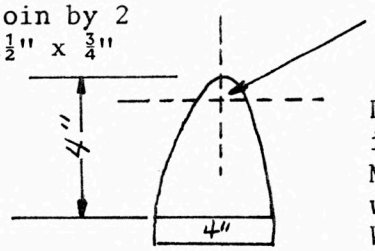
Rear Trunnion



Front Trunnion



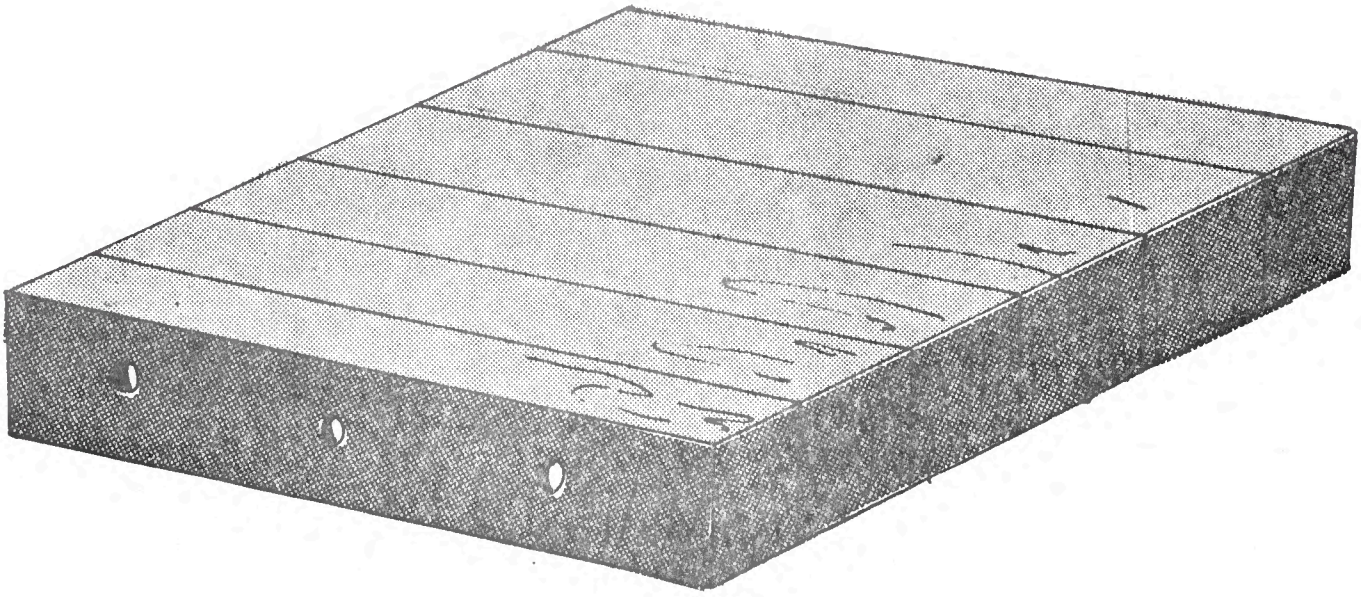
Make two and join by 2
pieces 14" x $1\frac{1}{2}$" x $\frac{3}{4}$"



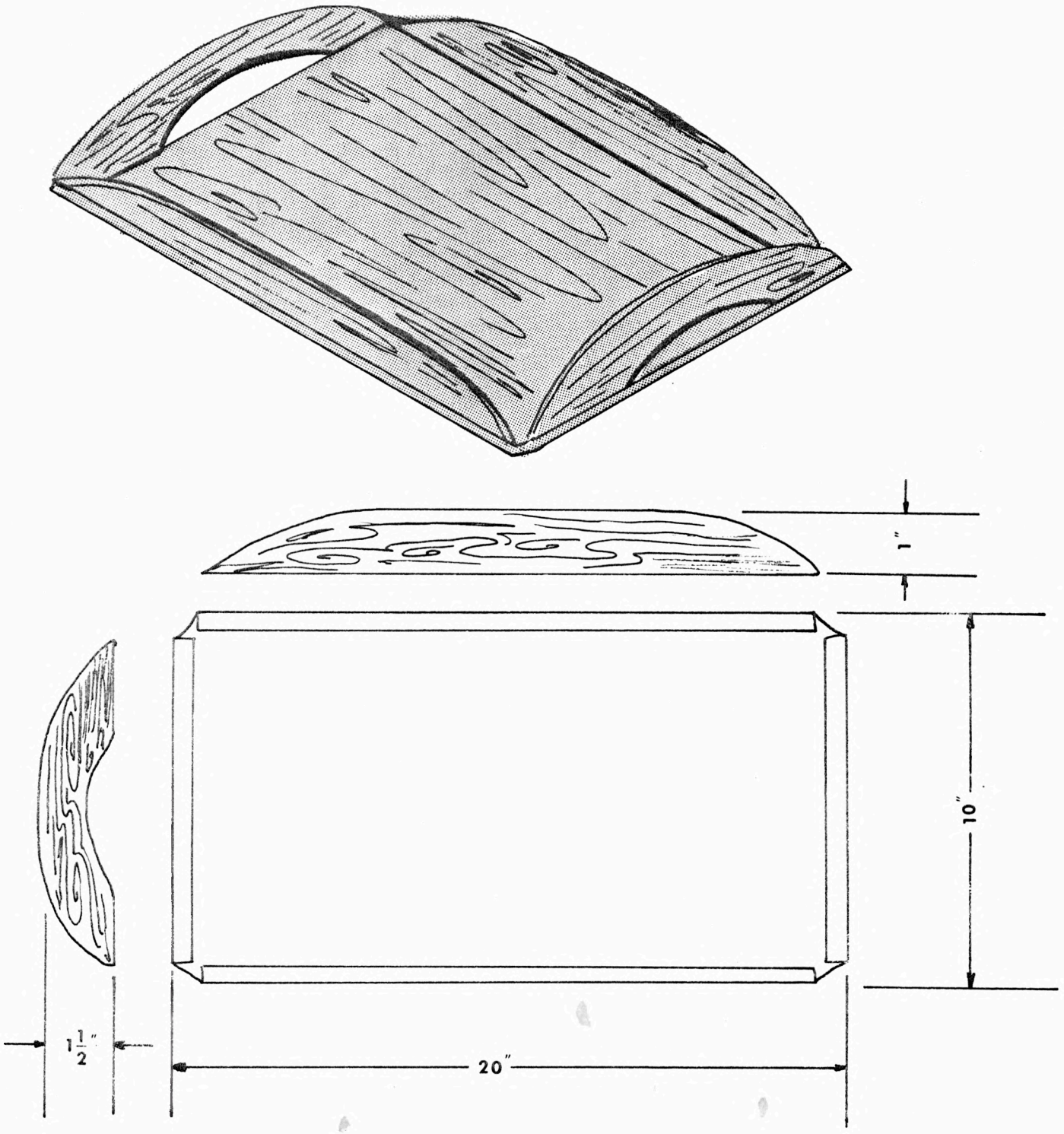
Drill hole same as
in spring
Make two and join
with 4 x $\frac{3}{4}$" stock.
Width depends on spring.
Then bolt to front
Trunnion.

Seat shop is optional
then bolt to spring.

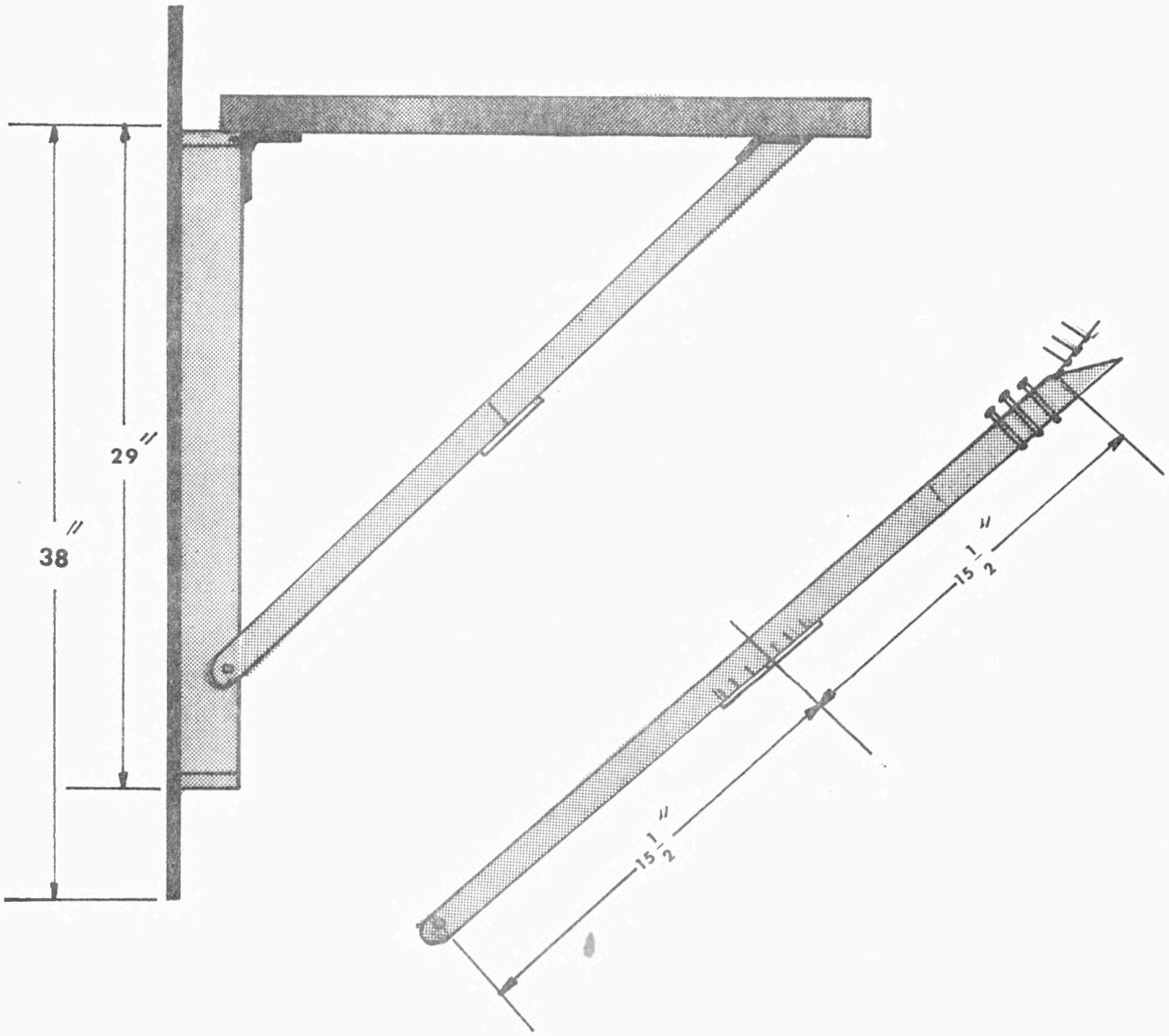
CUTTING BOARD



TRAY



FOLDING TABLE



FOLDING SEAT
F
E
A
B
B
A
D
C
C.F.
Deckchair Canvass Tacked Under Rails
Joints Used
D.E.
A
A

PROJECT IDEAS

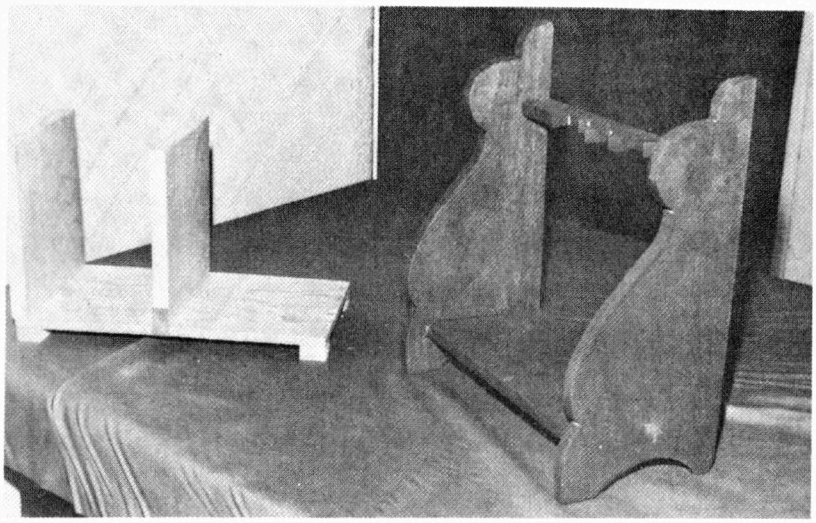


Fig. W. W. 1

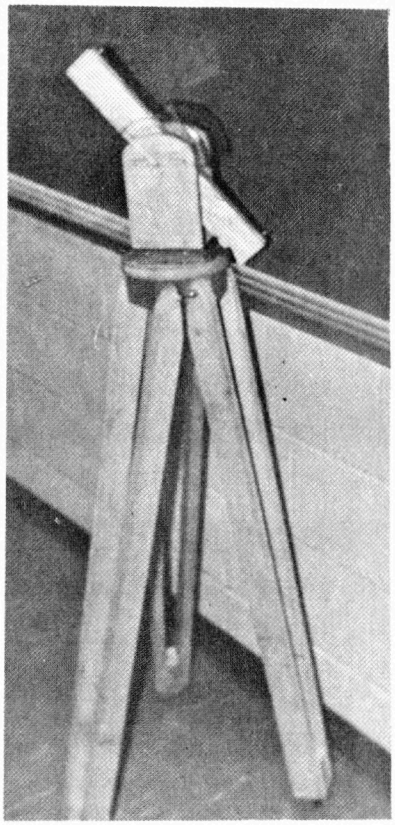


Fig. W. W. 3

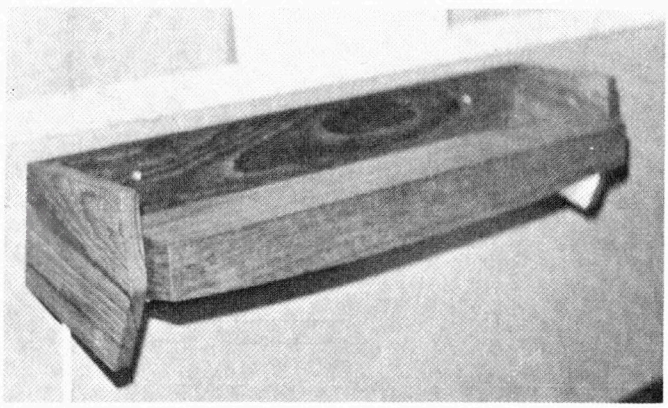


Fig. W. W. 2

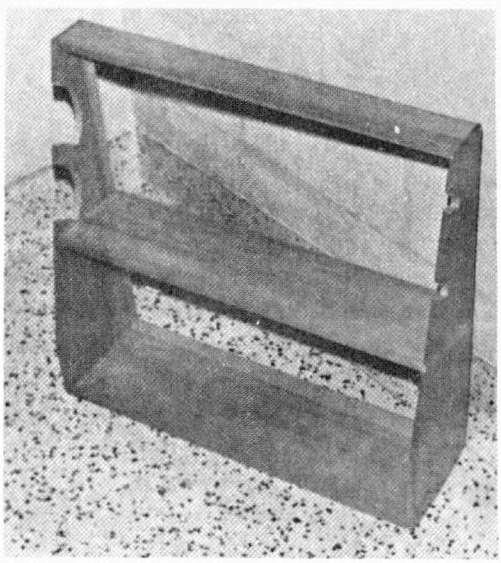


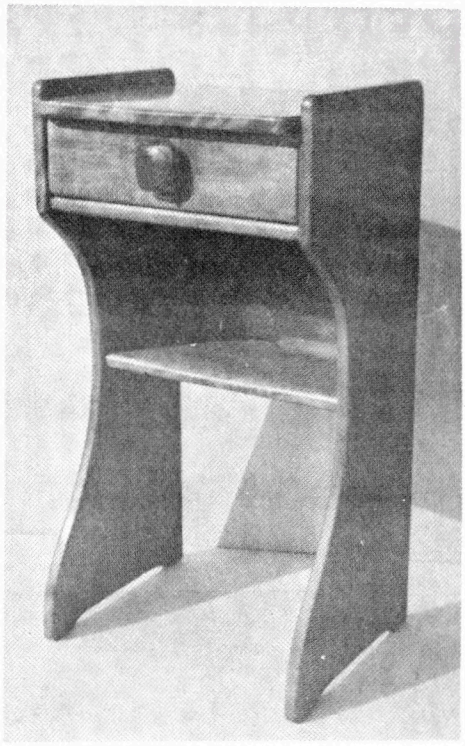
Fig. W. W. 4

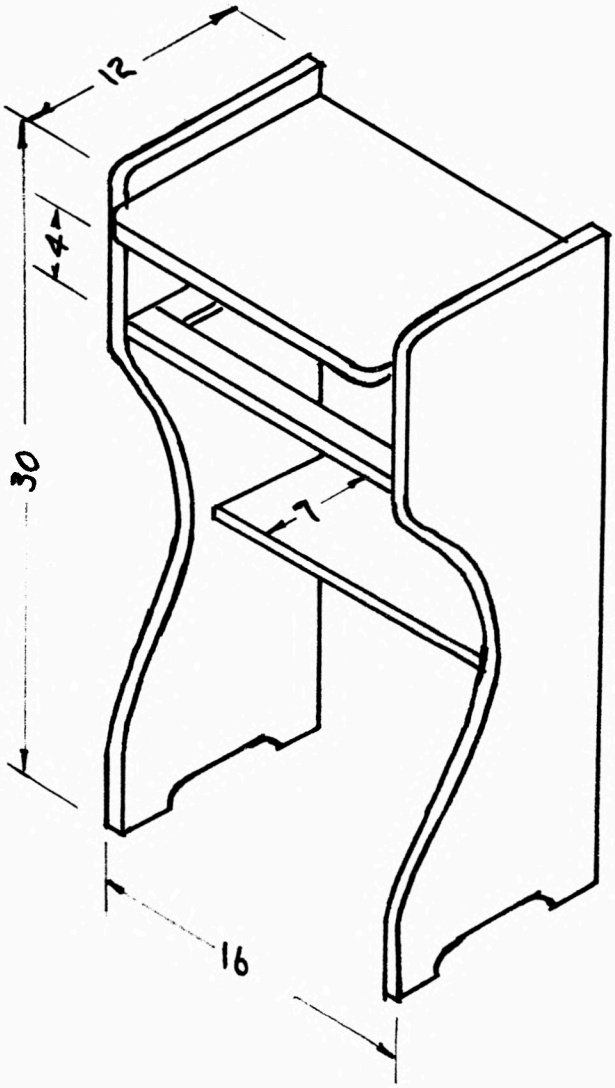
Dimensions and Construction to be solved by the student.

DESIGN PROBLEM

COLONIAL

BEDSIDE TABLE





SUGGESTED DIMENSIONS

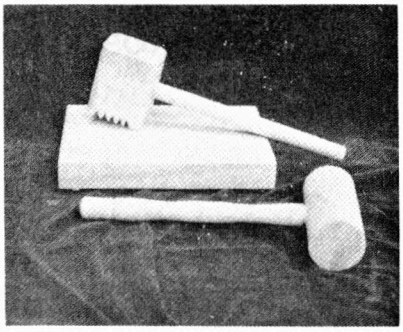
CONSTRUCTION HINTS

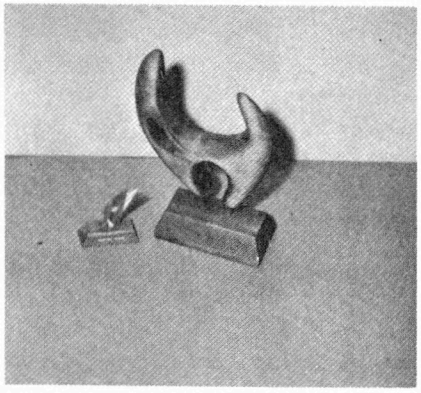
Butt joints used throughout.

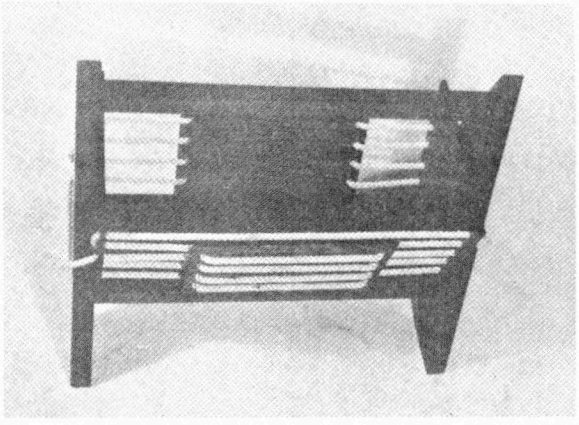
1 3/4" No. 10 F.H. Wood Screws, counter-bored with matching wood plugs, hold the frame together.

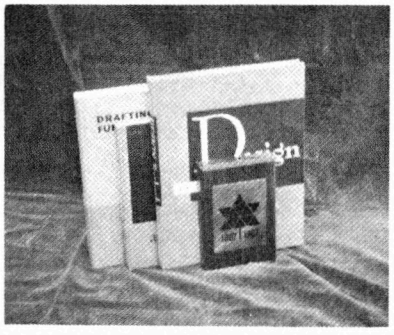
1/4" plywood back.

PROJECT IDEAS

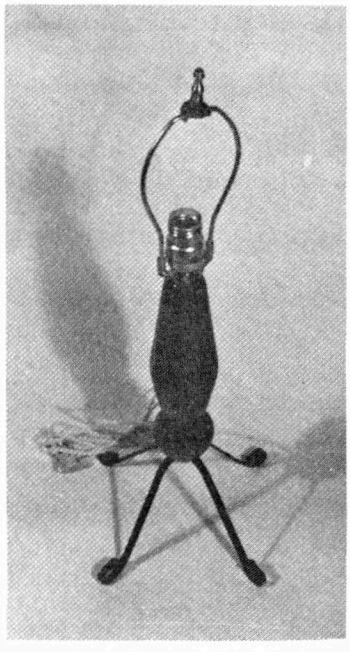


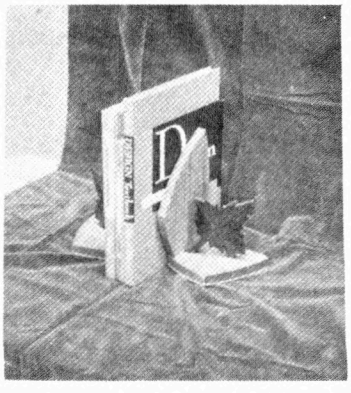




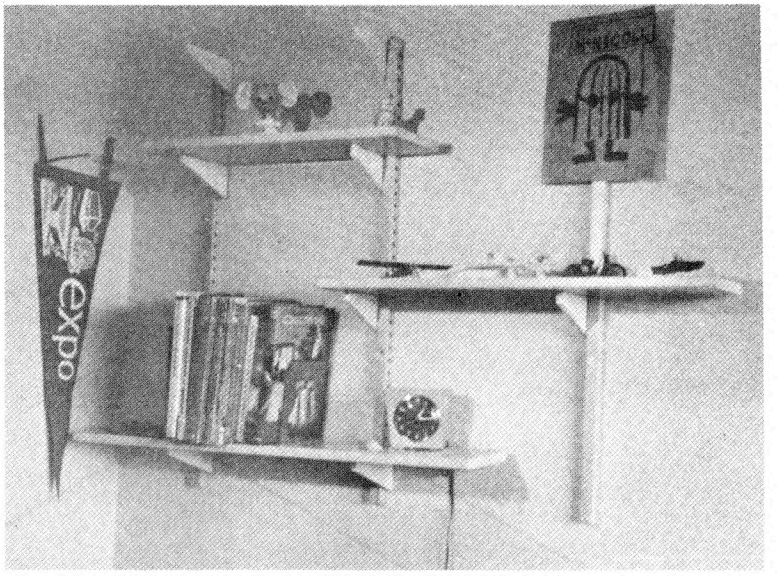


Dimensions and Construction to be solved by the student.





DESIGN PROBLEM ADJUSTABLE SHELVES



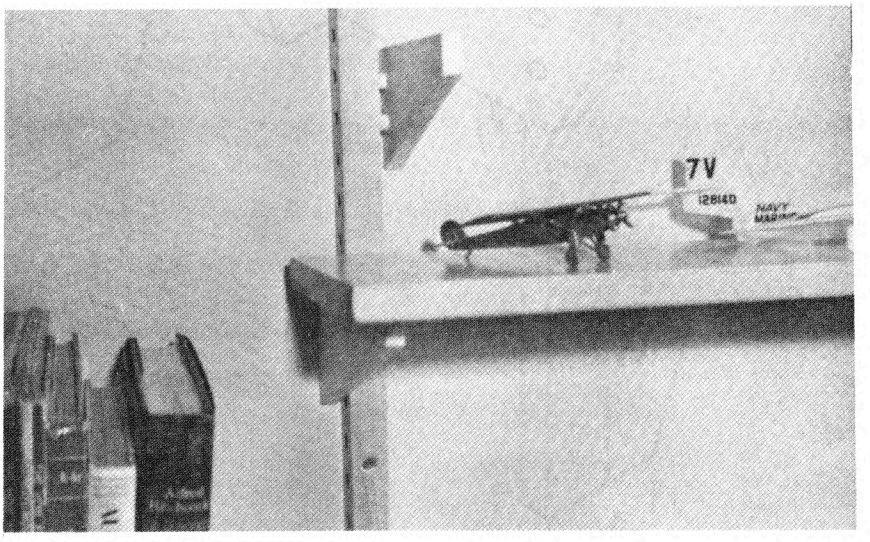
SUGGESTED DIMENSIONS

(a) shelves 3/4 x 6 x desired length (natural or stain finish)
(b) shelf supports 1/2 plywood (painted white)
(c) uprights 3/4 x 1" maple (painted white)

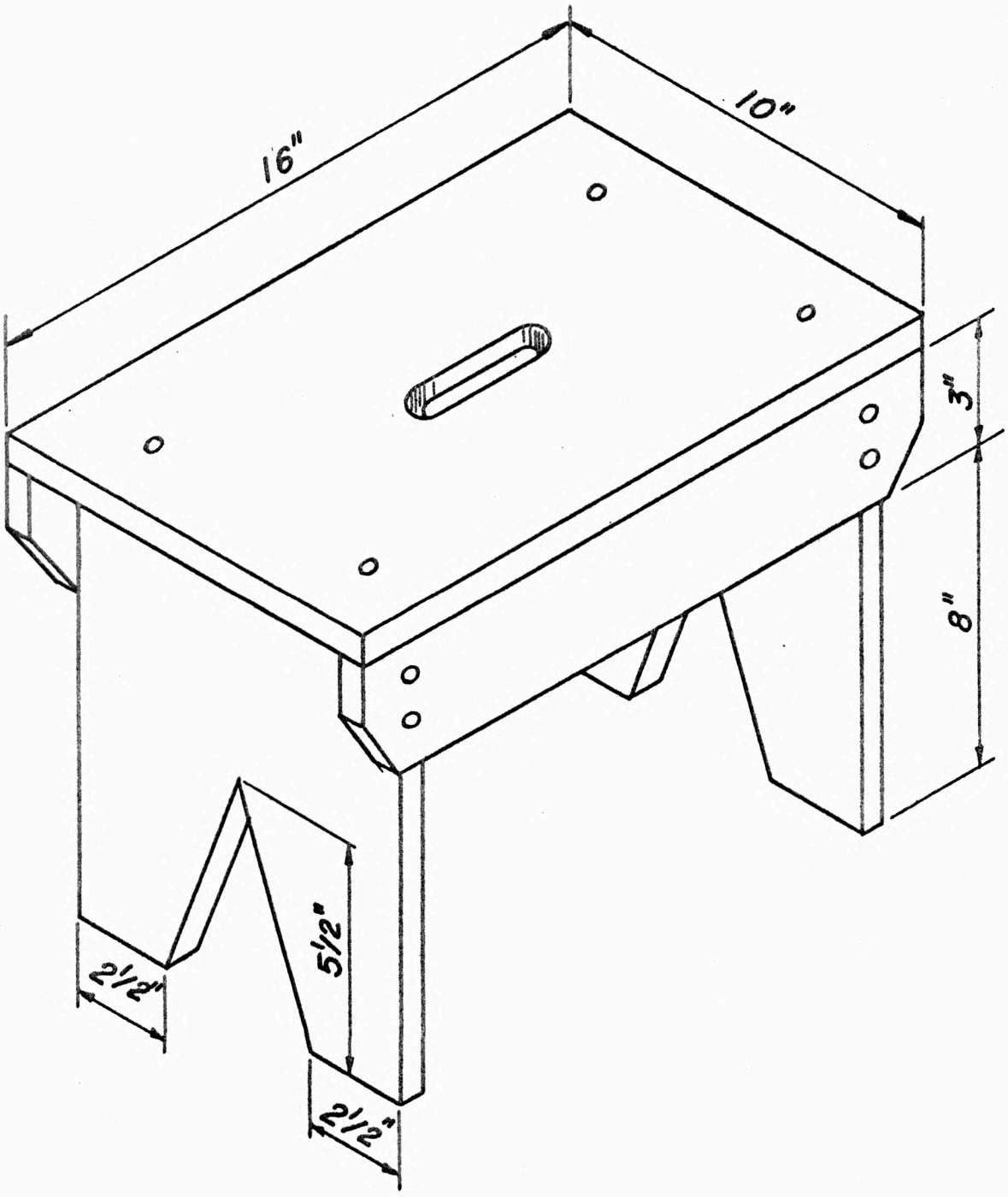
CONSTRUCTION HINTS

3/8" holes spaced 1" apart

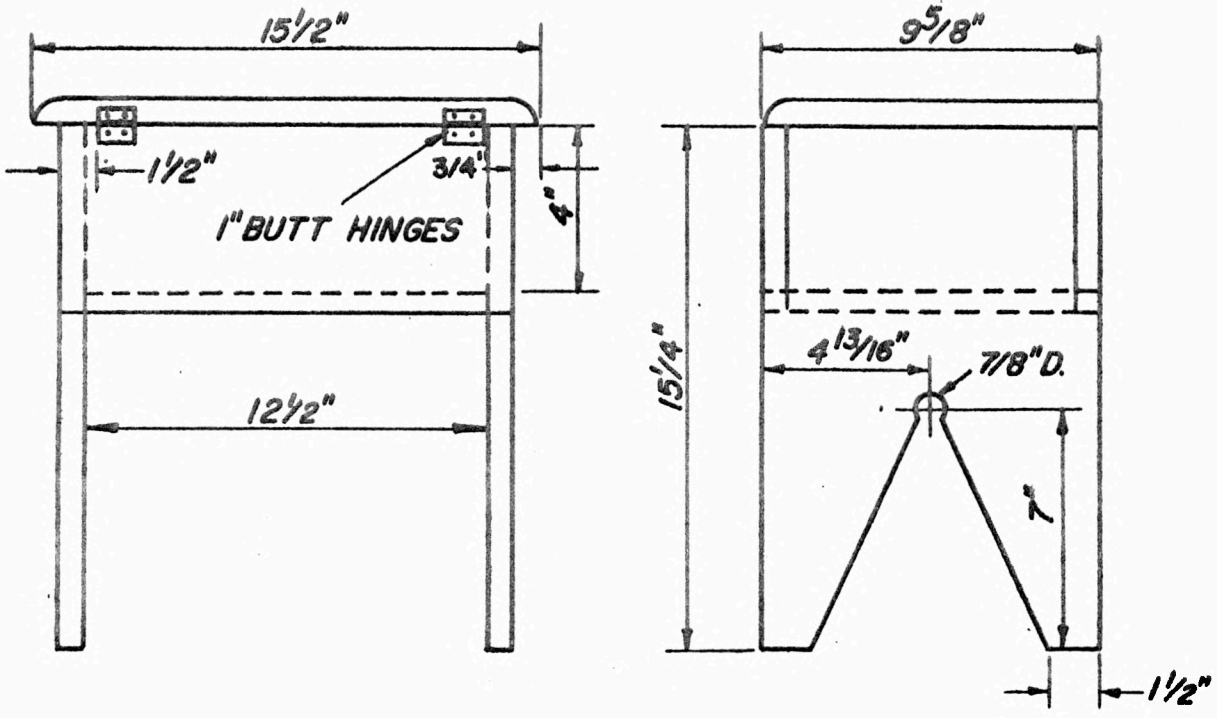
Note - use a jig on the drill press for accurate spacing of holes.



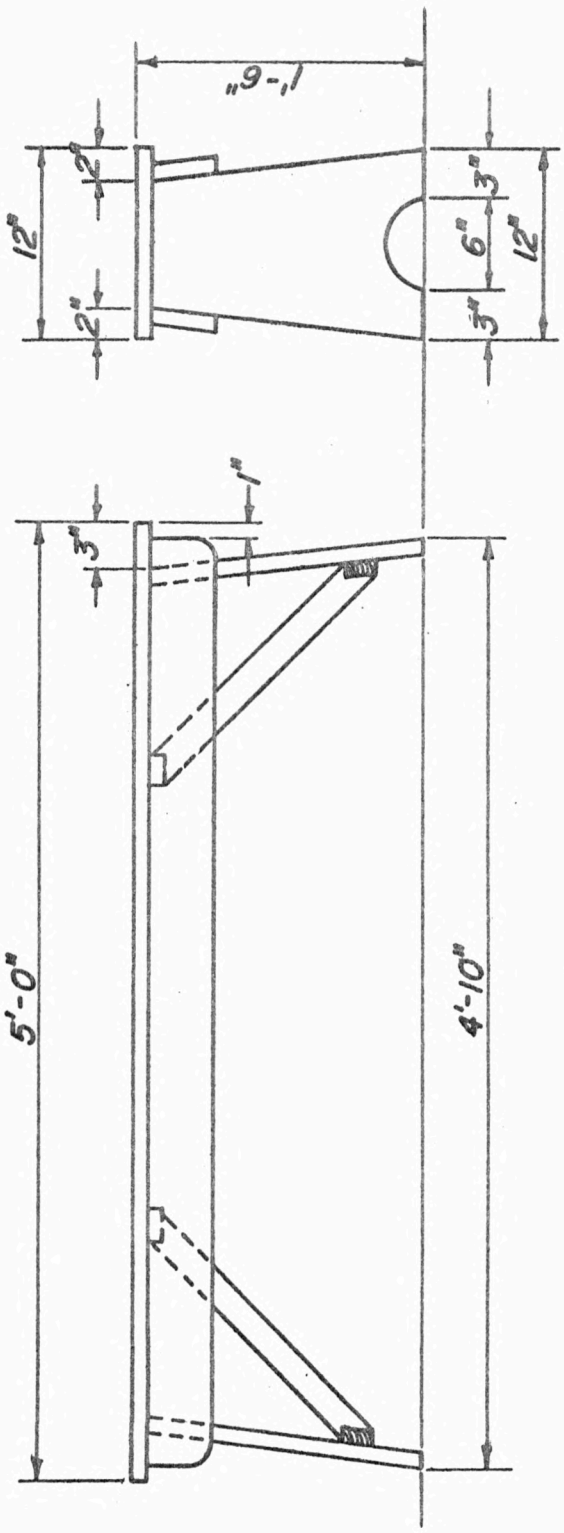
STOOL



WORK STOOL



BENCH

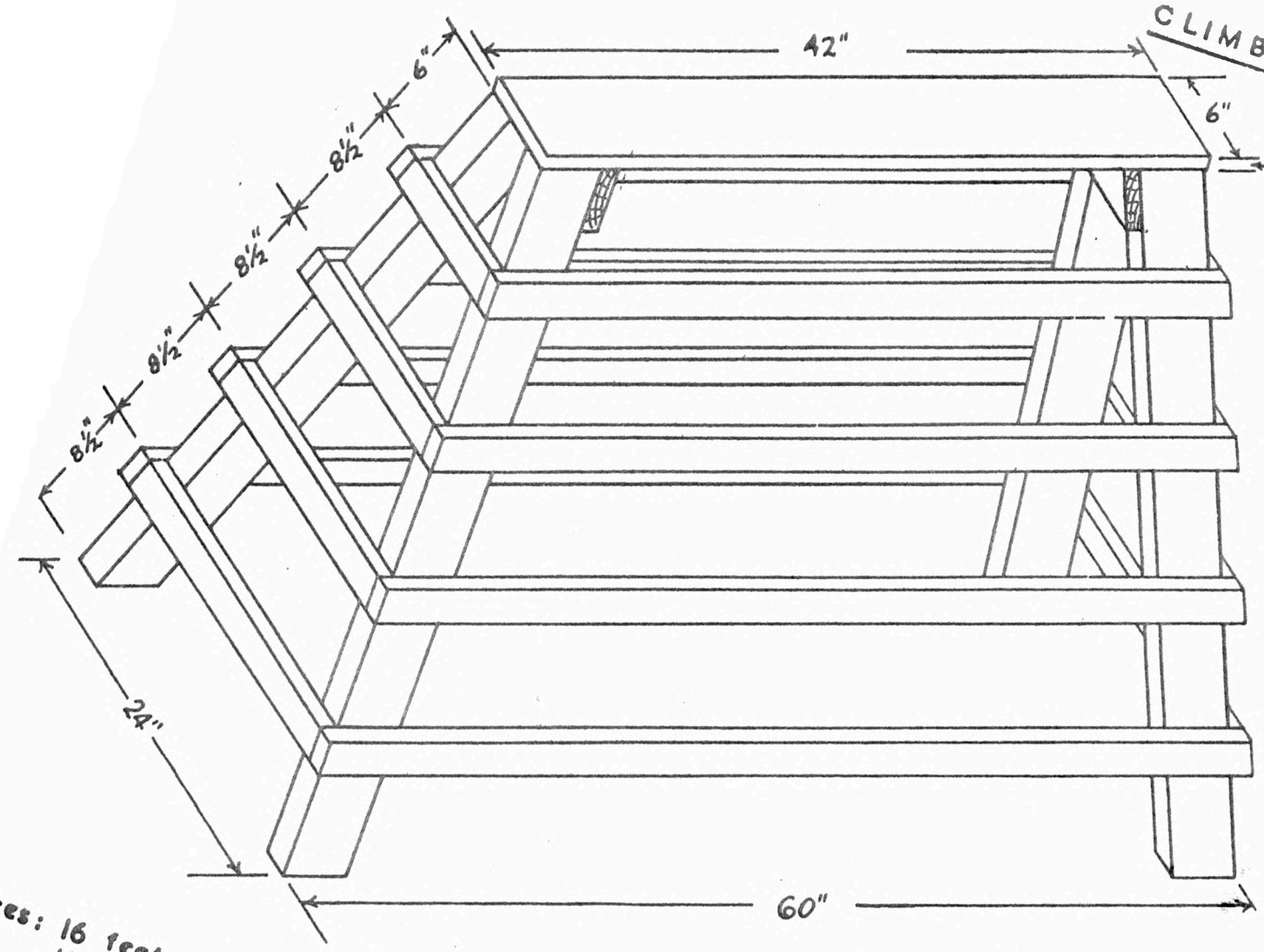


SCALE: 1" = 1'-0"

CLIMBING HORSE

Children love to climb and balance. This climbing horse is a simple form of apparatus which can create opportunities for exercise.

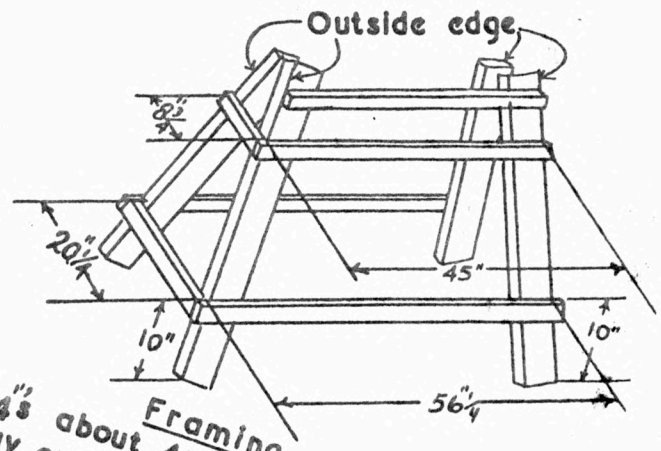
CLIMBING HORSE



Requires: 16 feet of 2"x4"dressed
1½ feet of 1"x4"dressed
54 feet of 1"x2"dressed
(1"x2") should be hardwood)
4 feet of 1"x6"dressed

Use flathead screws or roundhead. If flathead screws are used holes must be countersunk.

Round all corners and edges.

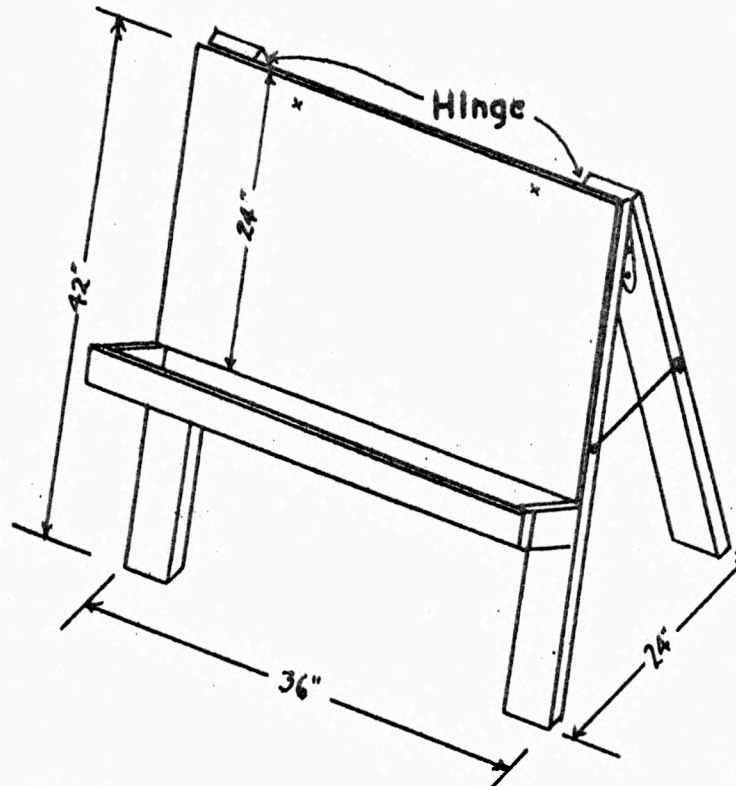


Framing

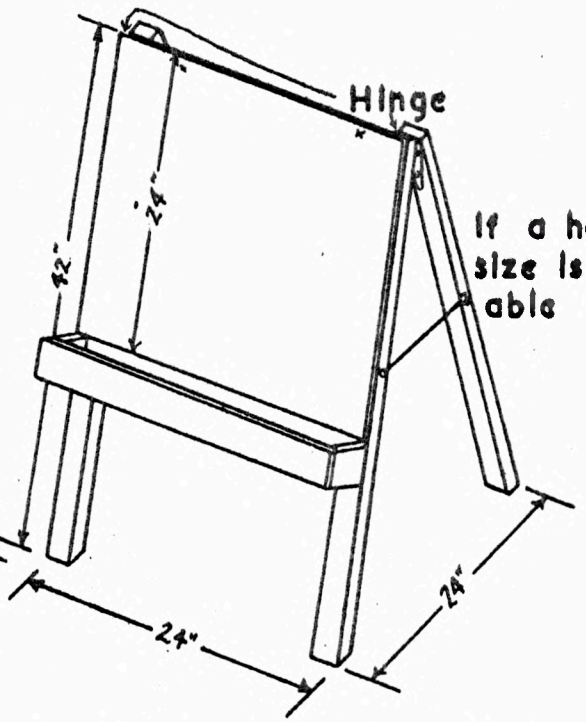
Lay out 4 2"x4"s about 48 inches long. On outside edge lay out a 10" measurement as above. Frame up with top and bottom rungs. Temporarily fasten a batten as above in correct position for top line (measured up outside edge). Top line can now be pencilled for sawing. Follow around and do bottom of legs. Correct angles can be sawn.

from CHILDREN'S CENTERS

EASEL

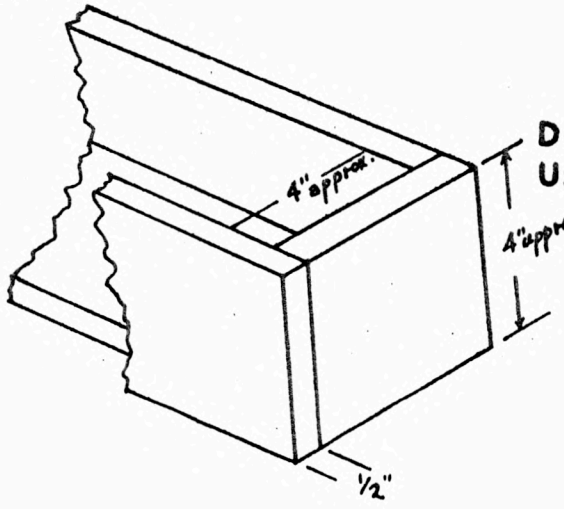


Use 1"x4" dressed for uprights
6 inch strap hinge



If a hook this size is unobtainable use chain

Use 1"x2" dressed for uprights
4 inch strap hinge



Detail of paint bottle rack
Use 1½ x 4" dressed

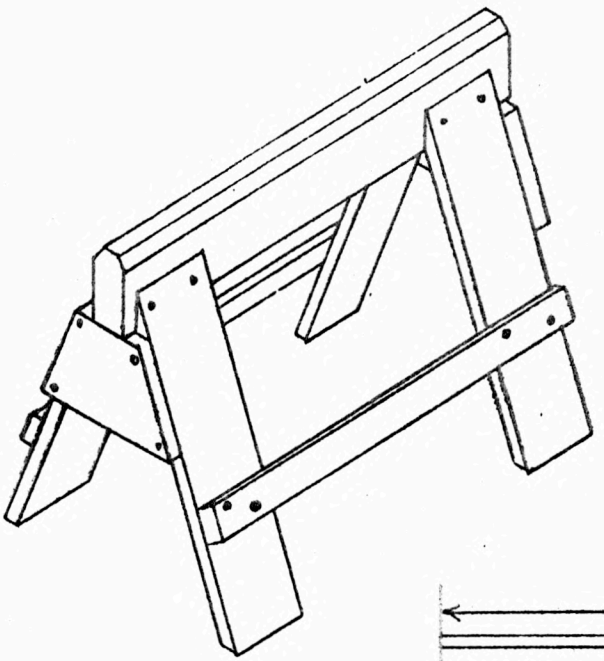
Finger painting is becoming very popular and easles will be welcomed in the primary grades and, in fact, in all grades. This project could be attempted on a mass-production basis.

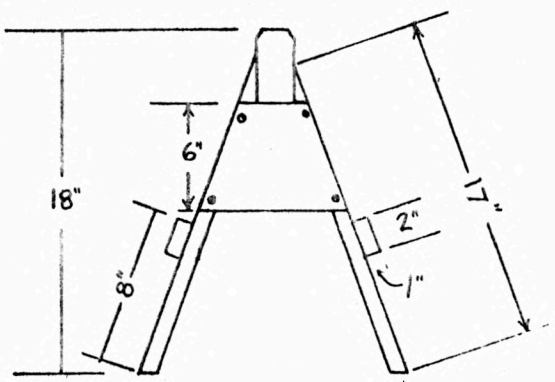
¼ inch plywood for painting surface
Small xes indicate brads for holding paper.

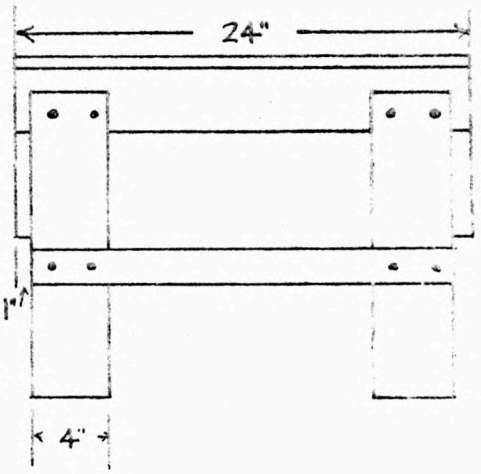
from CHILDREN'S CENTERS

SAWHORSE

While not necessarily play equipment a sawhorse is a very useful project and can be converted to a teetertotter.



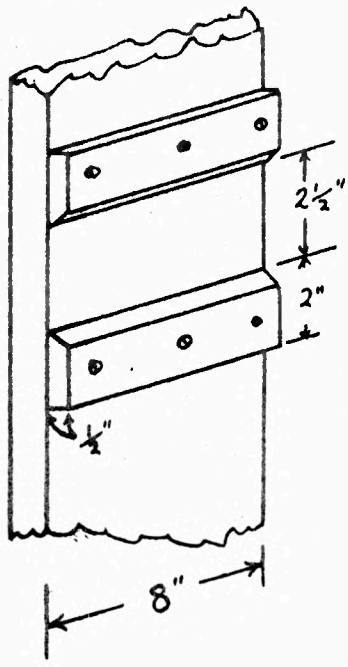


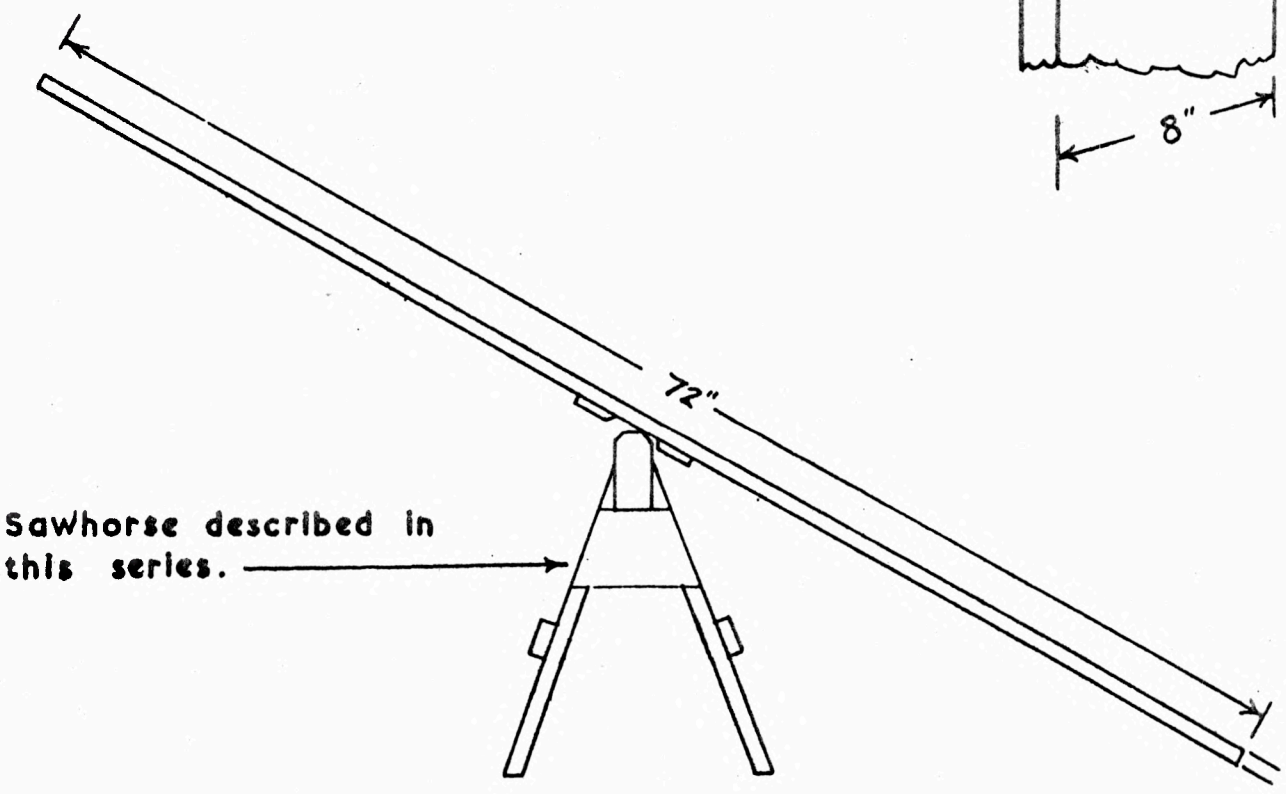


Requires:
- 4 feet 1"x2" dressed
- 6 feet 1"x4" dressed
- 1½ feet 1"x6" dressed
- 2 feet 2"x4" dressed

Sand all corners and edges round.

SEESAW





This seesaw requires only a board with two cleats as shown and one sawhorse as described in this series.

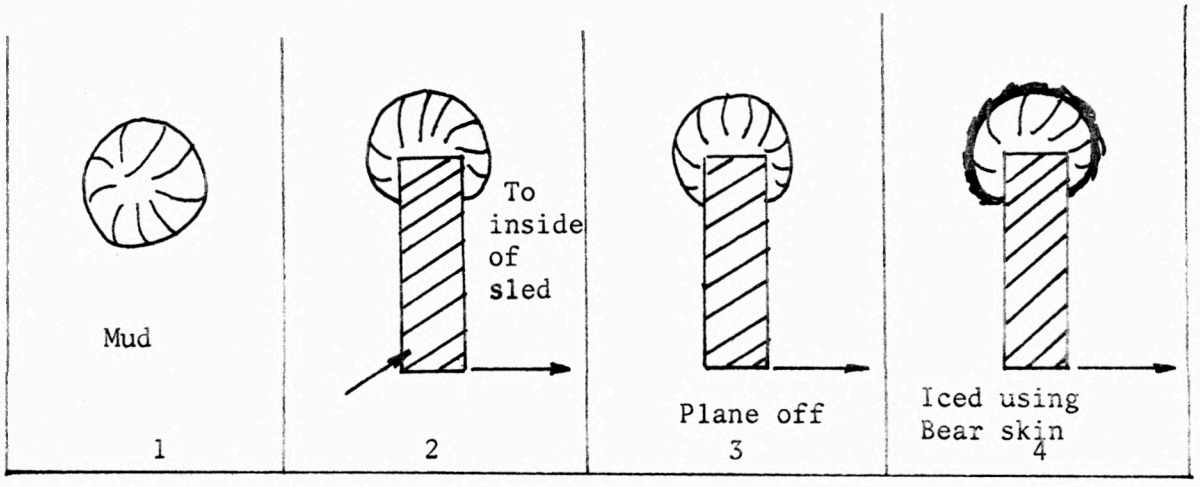
APPLICATIONS OF MUD ON SLED RUNNERS

G. Bossé,
Rankin Inlet.

Mud for sled runners is generally found around lakes or on hill tops. The mud is dark in colour and should be free from gravel or roots. Importance should be placed in the choosing of the mud in order to prevent easy breakage after hardening due to different grades of mud.

The mud is placed in a large container and mixed with an amount of water usually equal to about half the amount of mud. The sled is then placed with the bottom of the runners facing up. A fly screen may be nailed first under the runner before the mud is applied. The latter step is of great importance if the sled is being pulled but by a device other than a team of dogs where the mud is vigorously shaken.

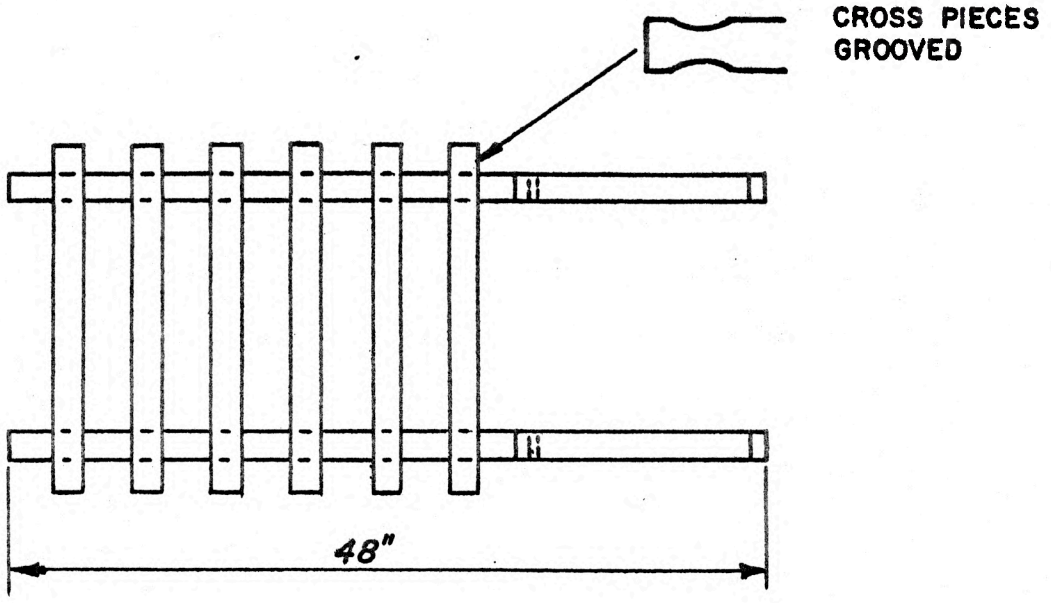
Start applying the mud from the front of the sled by taking a handful of mud, rounding it into a ball and fitting it onto the runner as illustrated.

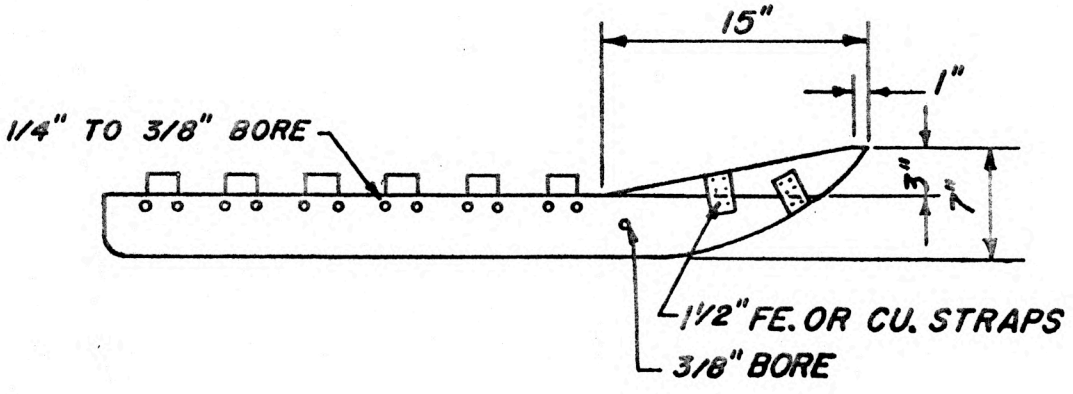


The mud is then left to dry outside for approximately two or three hours. The mud may be applied to the runners either inside or outside of a building but the drying has to be done outside in the cold. The mud is then planed to the shape as shown on the previous page, Ref. No. 3. A little more mud is planed off the inside of the runner than the outside in that the sled follows a straight trail. Water is then applied with a polar bear fur on top of the mud in order to make the mud more slippery. The mud should be watered every time the sled is used for any length of time.

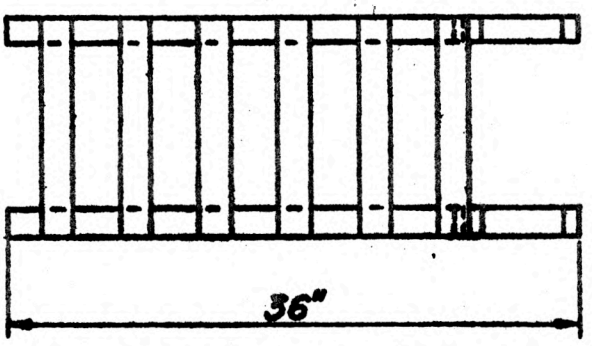
ROPE TYPE SLED

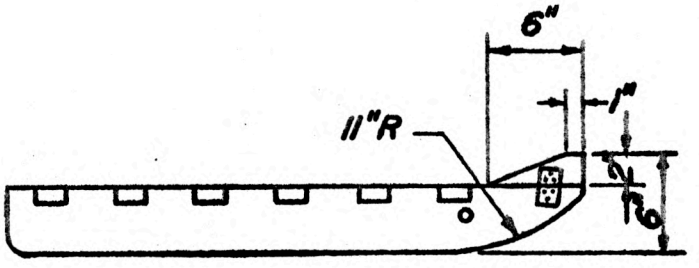
RUNNERS : 2x4x48
CROSS PIECES 1x2x22.
RADIUS OF RUNNER - 22"





SOLID SLED



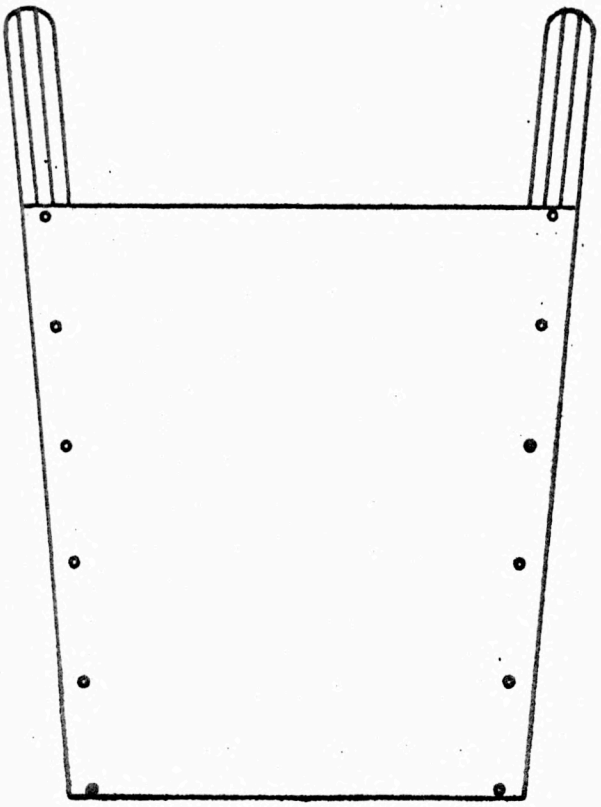


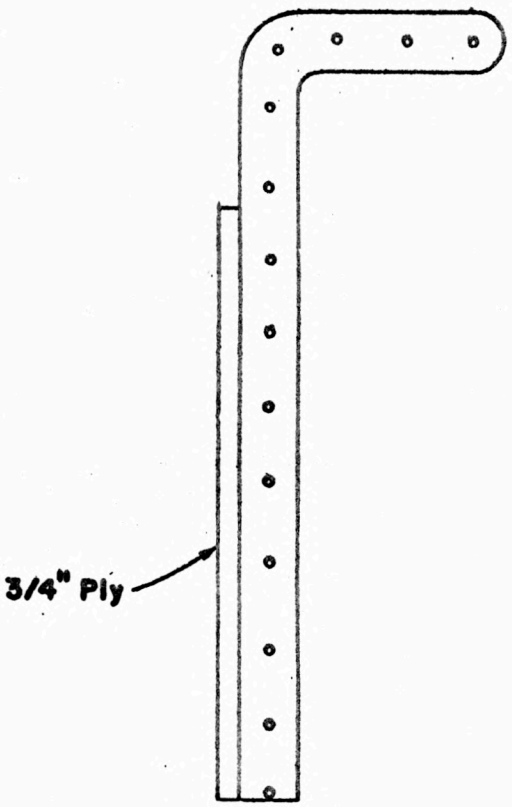
RUNNERS: 2x4x36

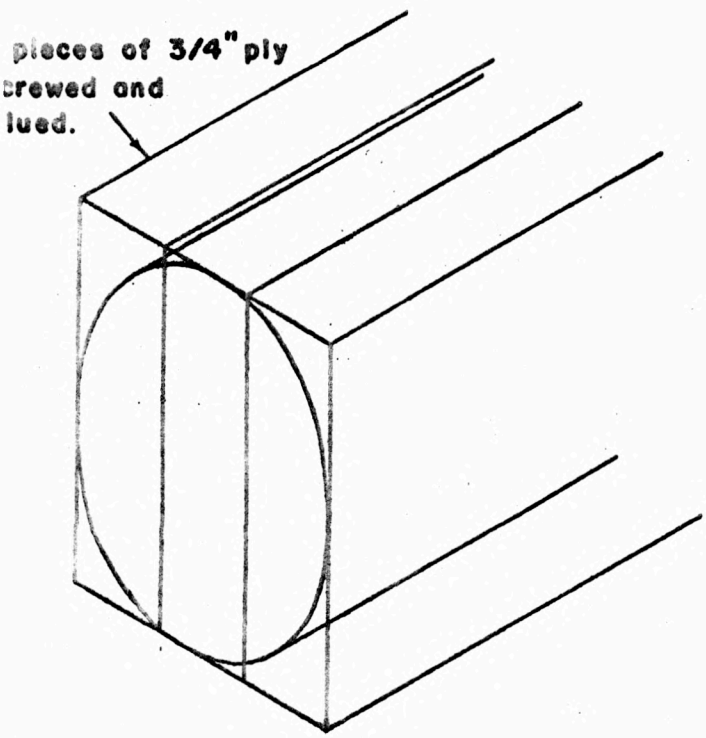
CROSS PIECES: 1x2x16

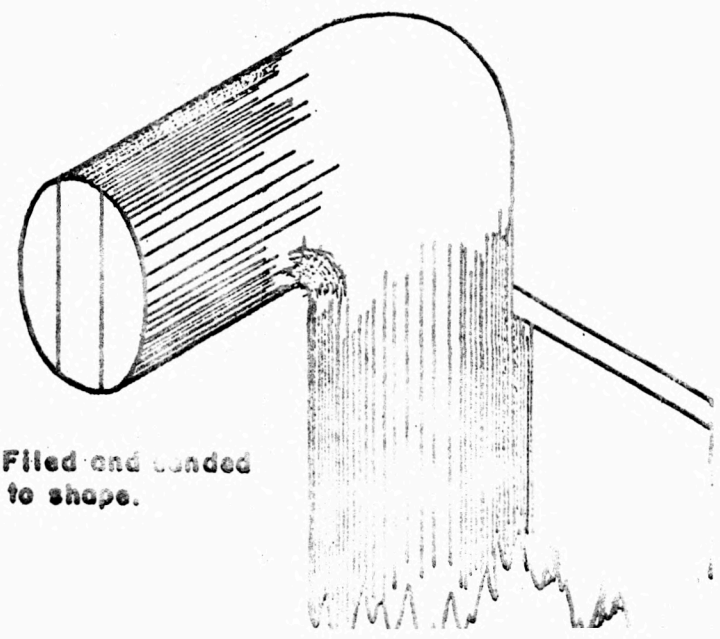
RADIUS OF RUNNER APPROX. 11"

FORT McPHERSON
SLED HANDLES–LOUCHEUX PATTERN









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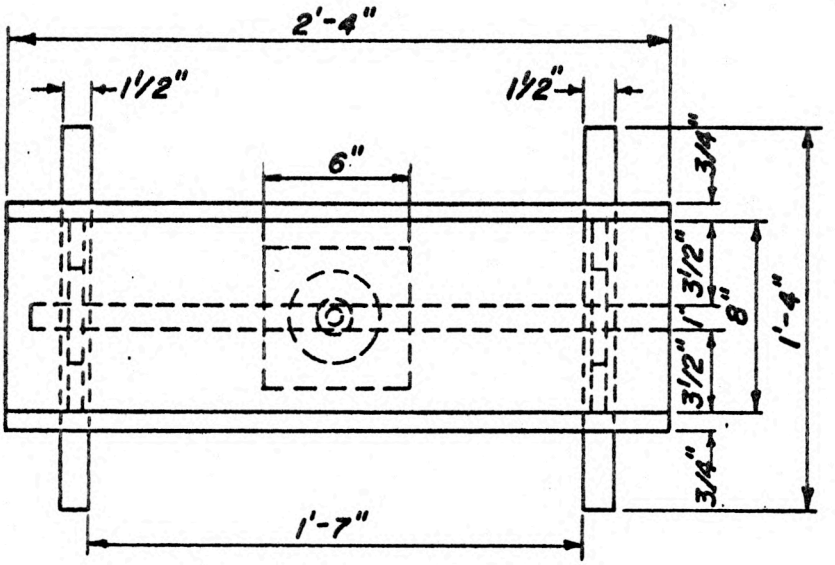
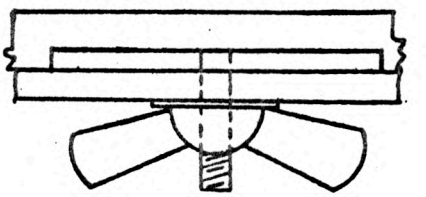
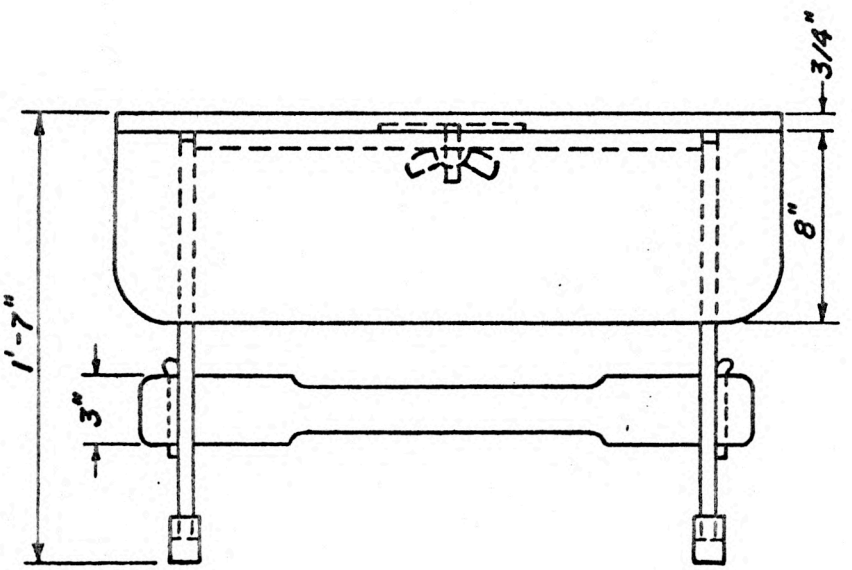


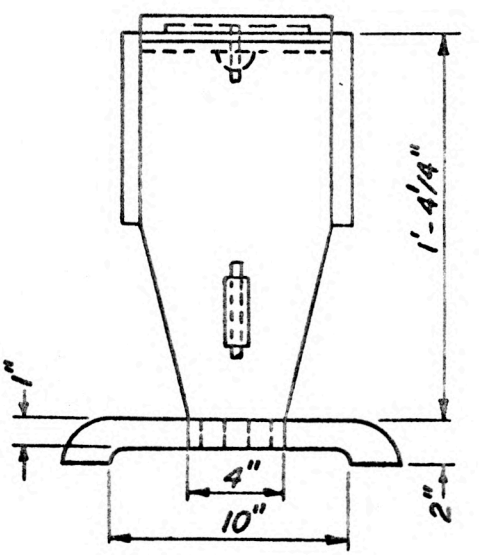
PLAN



WING NUT - DETAIL

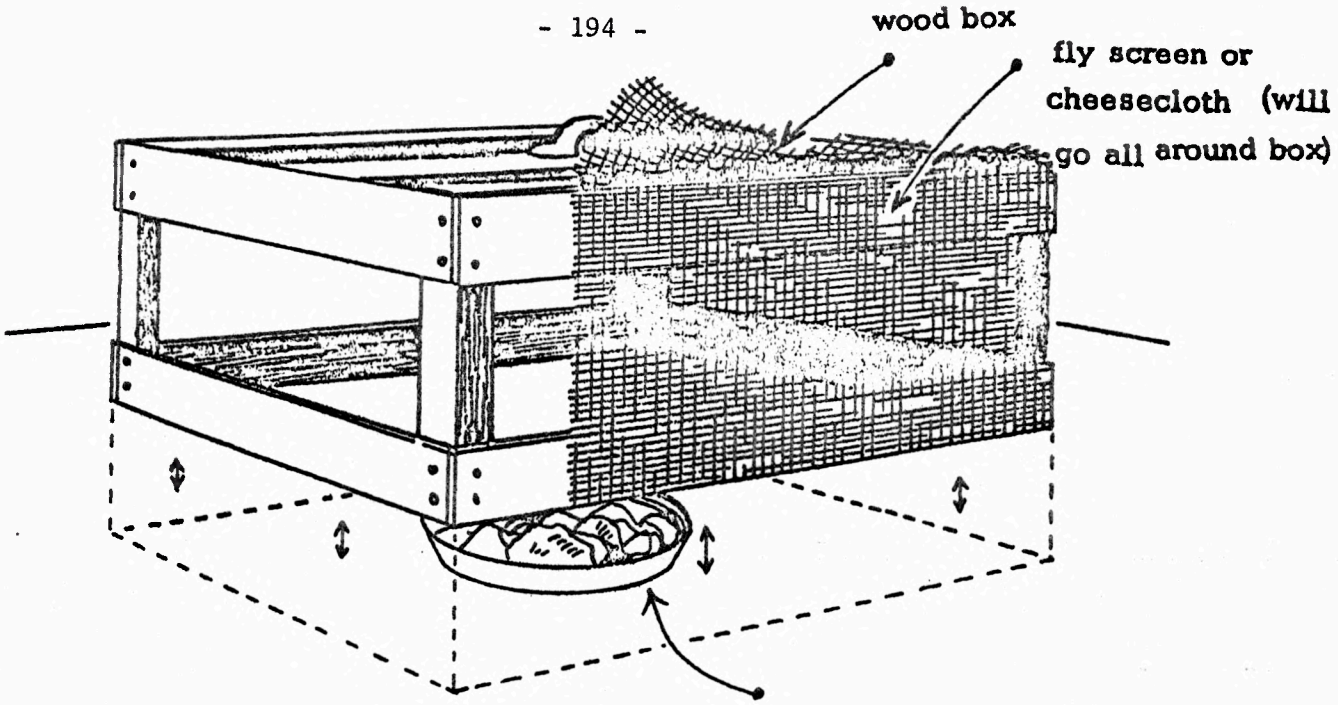


SIDE ELEVATION



END ELEVATION

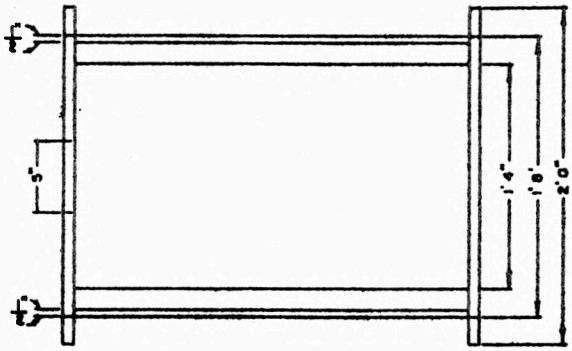
SCALE : 1½" = 1'-0"



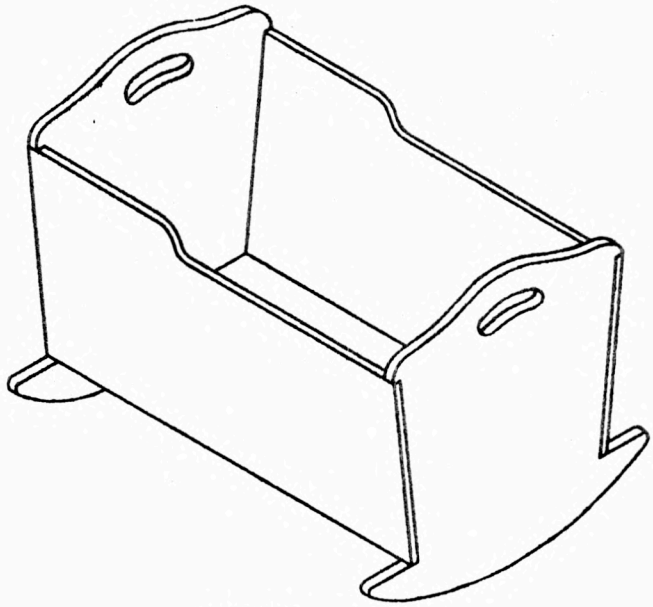
PORTABLE FOOD COVER - wood and screen type

- 141 -

BABY CRIB

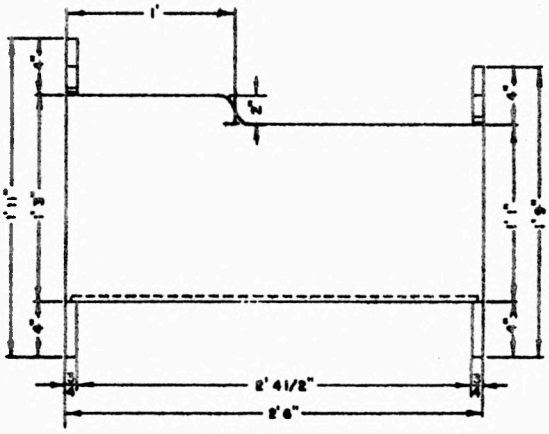


PLAN

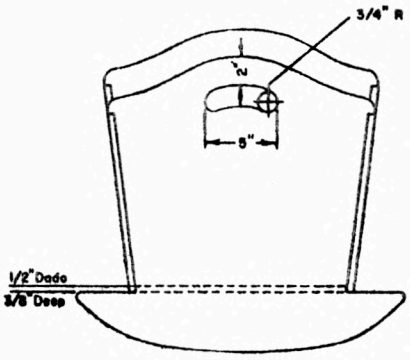


ISOMETRIC

SPECIFICATIONS
2 Ends - 3/4" Plywood
2 Sides - 1/2" Plywood
Bottom - 1/2" Plywood



SIDE ELEVATION



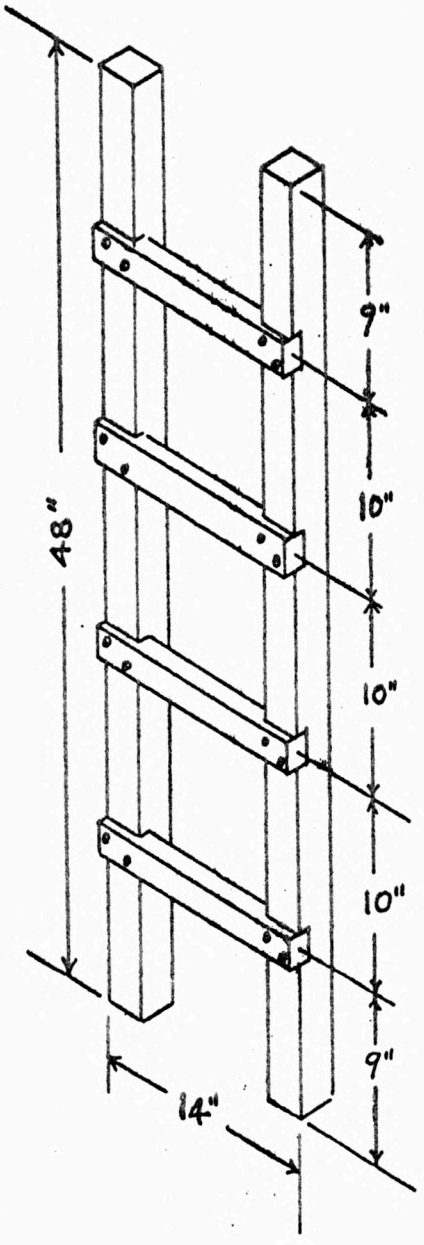
END ELEVATION

Scale - 1 1/2" = 1'-0"

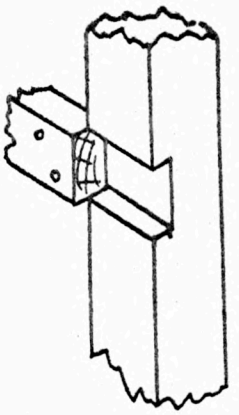
Small Ladder

A small ladder is intriguing to children and may be useful in the home. The length may vary with the ages of the children.

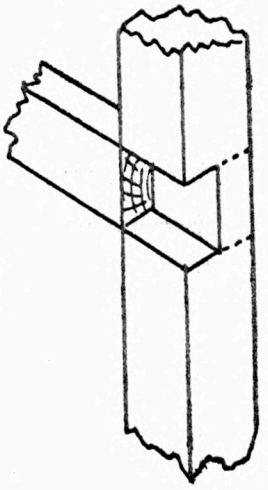
SMALL LADDER



DO cut posts like this 1/2 inch only.



DON'T cut posts for rungs like this. Posts will break on dotted lines.

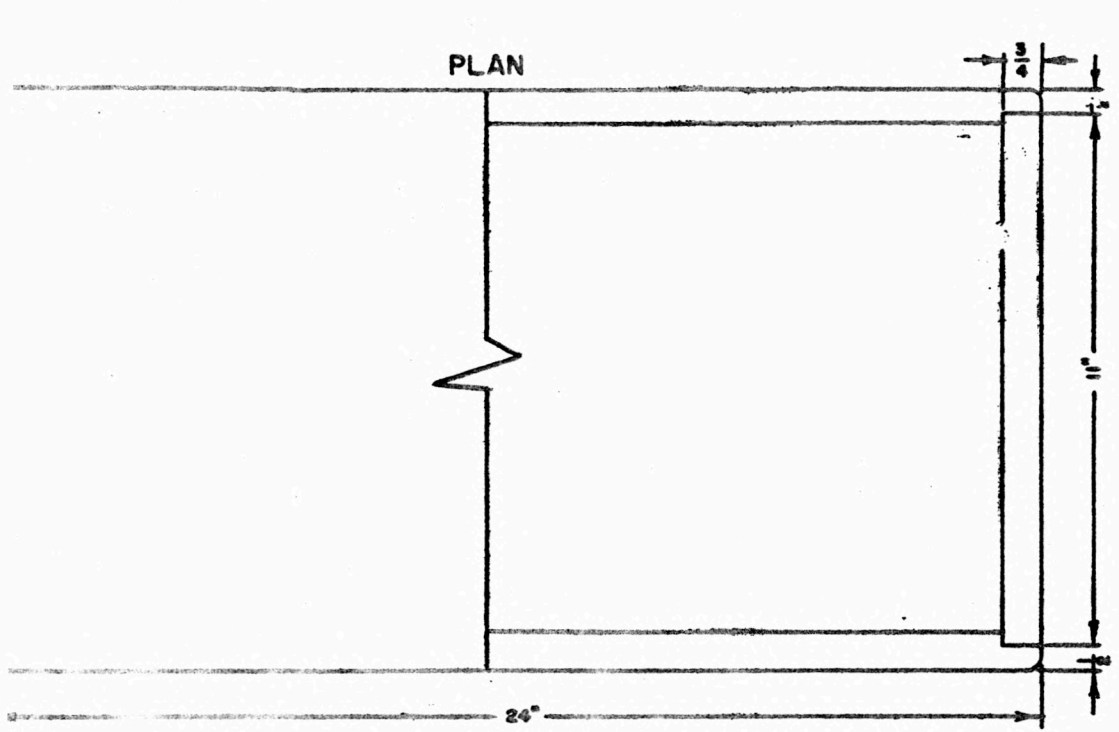


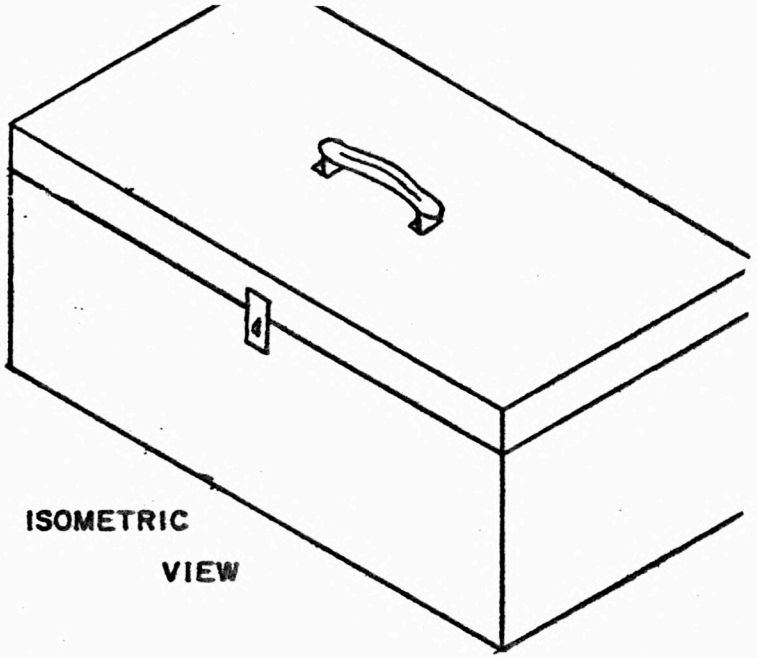
Use 2"x 2" dressed for posts (8 feet)
Use 1"x 2" dressed for rungs (6 feet)
Use flat-head screws drilling and countersinking holes in rungs. If you haven't a countersink use round-head screws. (16 screws. 2 inch)

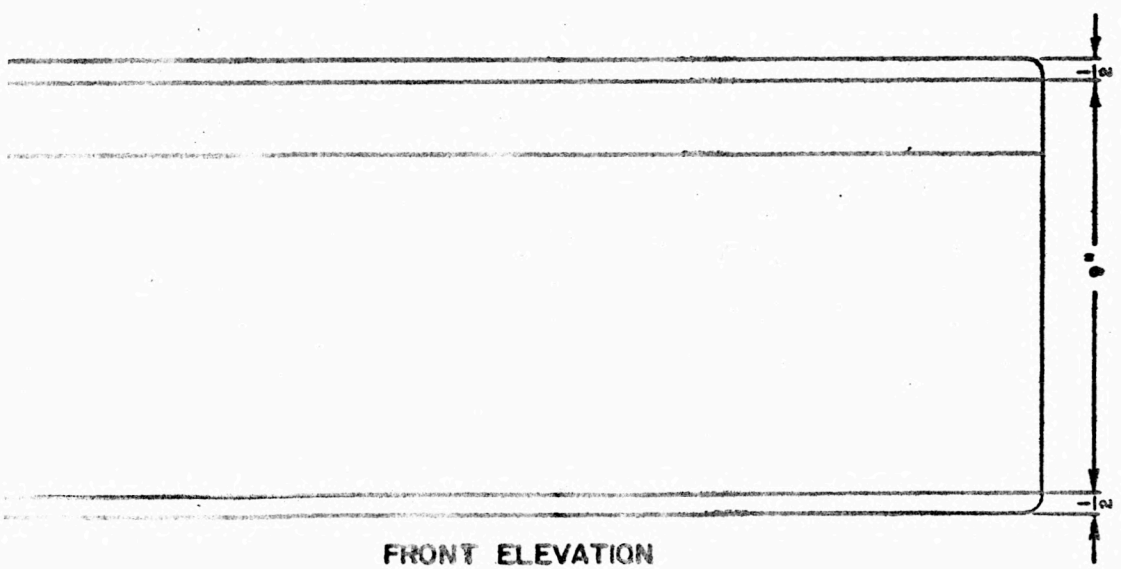
NOTE: 2 inch wood dressed is not 2 inches wide. Base cuts on actual size.

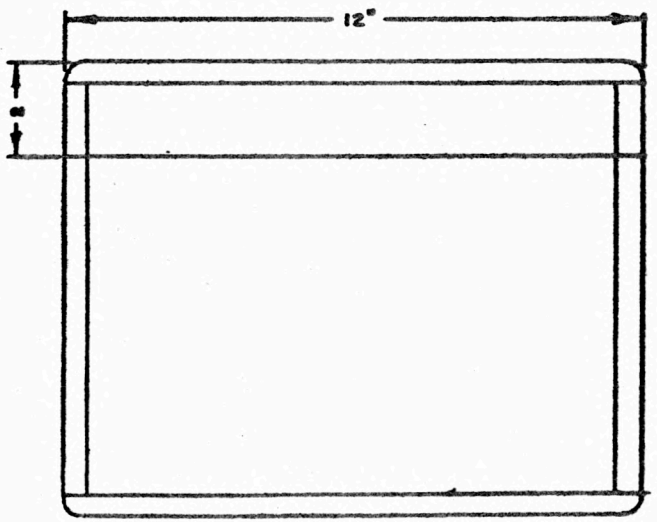
Sandpaper all edges and corners round

from CHILDREN'S CENTERS





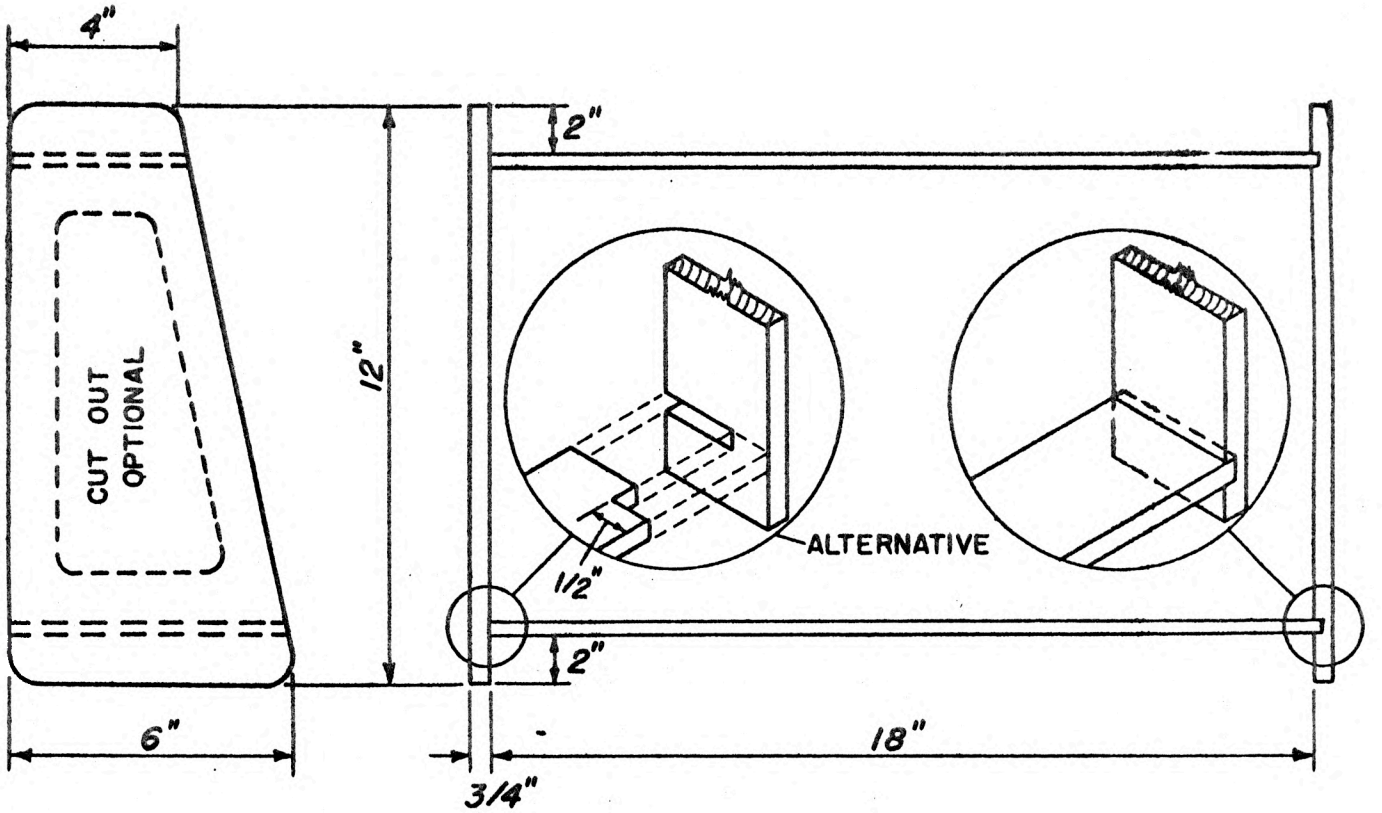




GRUB BOX
INUVIK

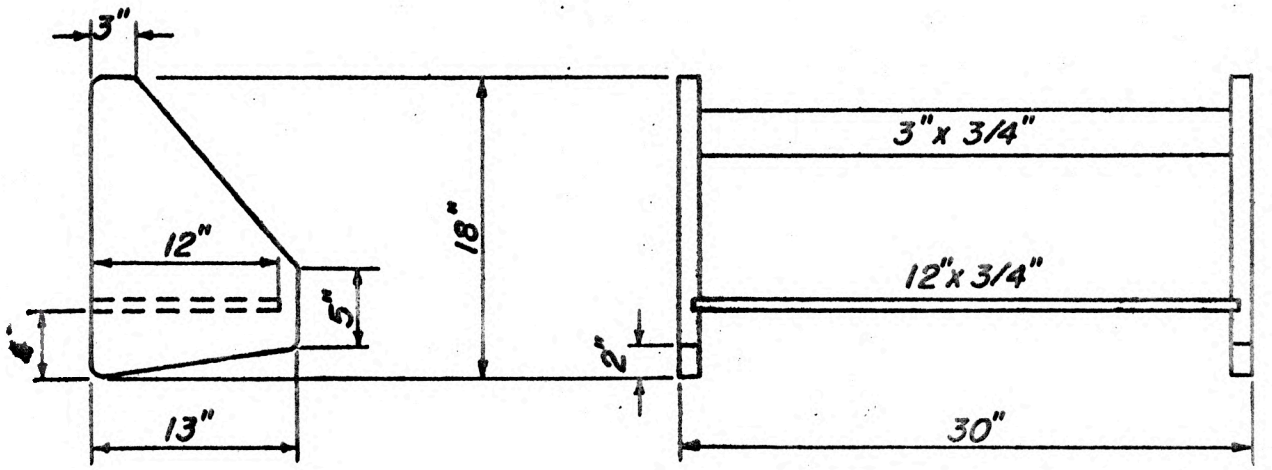
SCALE: 3"=1'-0"

WALL SHELF



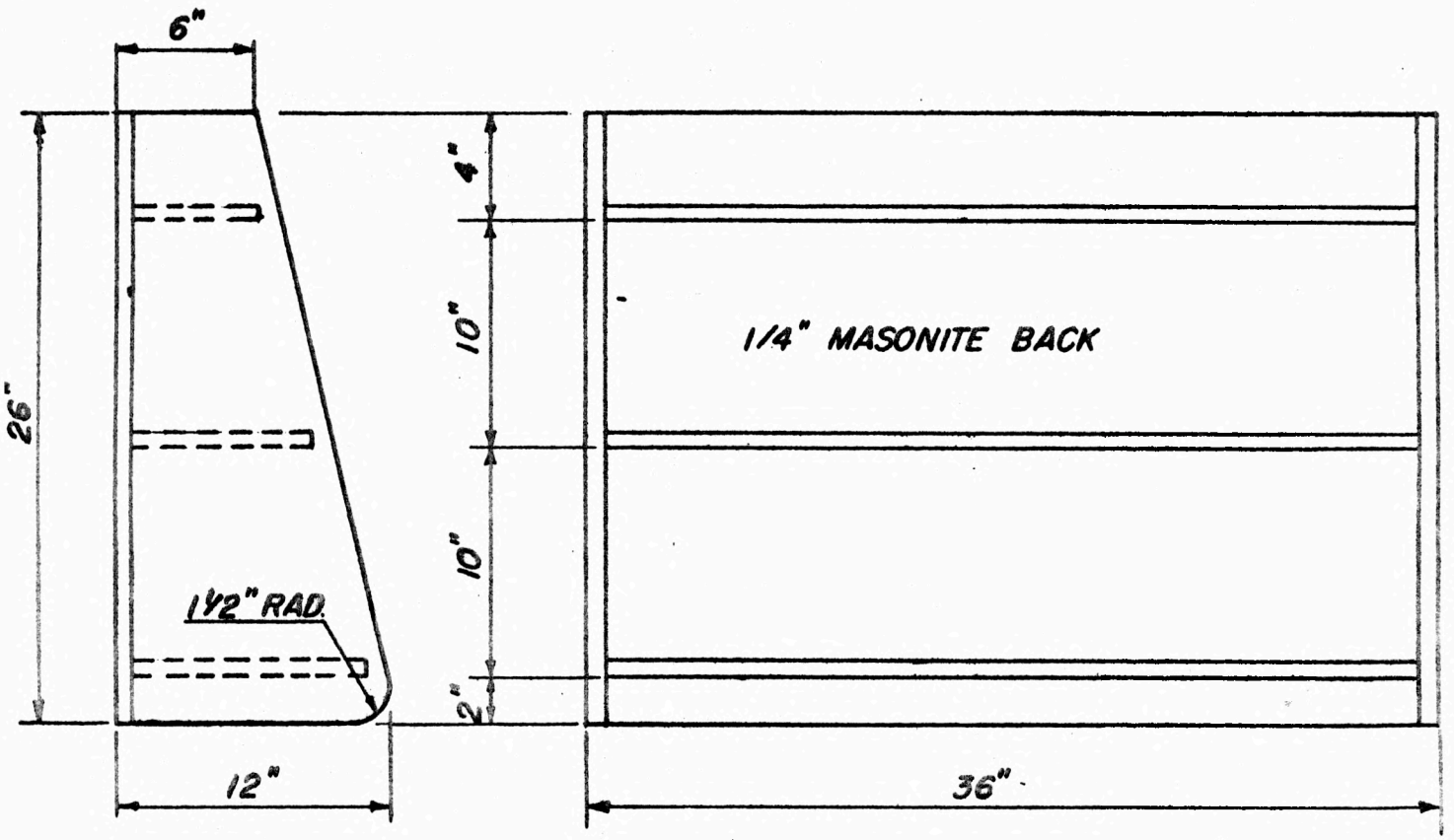
SCALE: 3" = 1'-0"

ALTERNATIVE



SCALE: 1" = 1'-0"

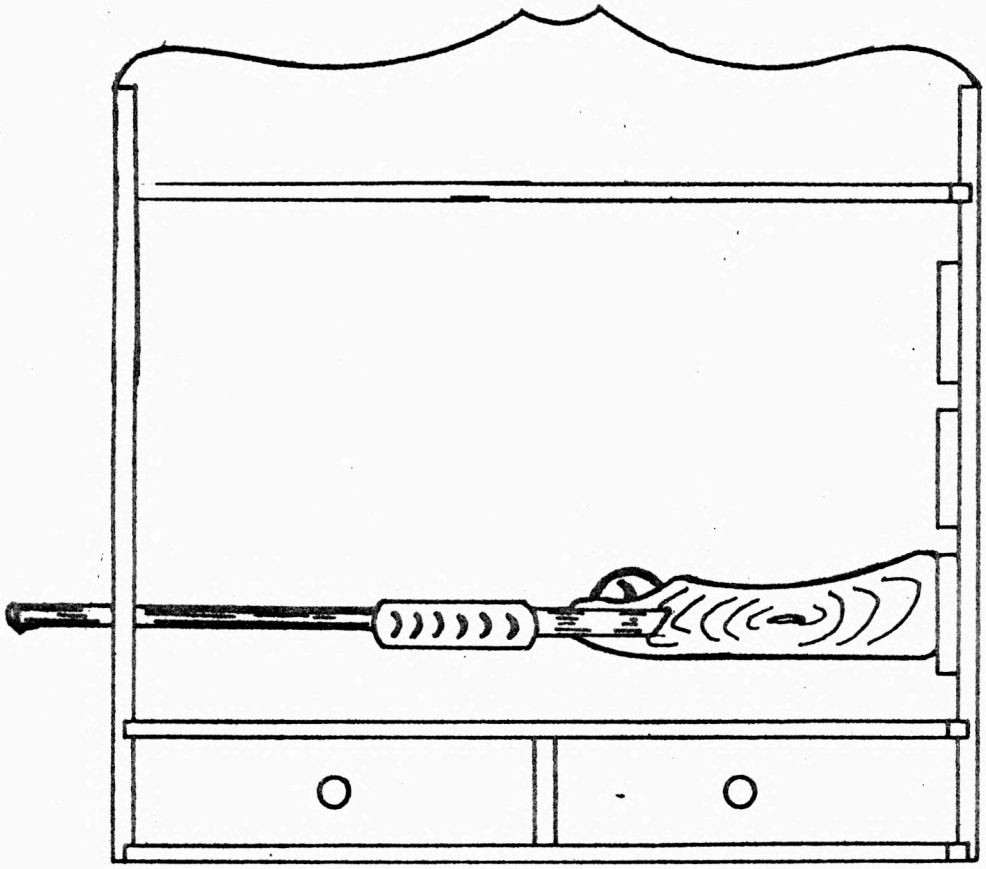
WALL HUNG BOOKSHELF



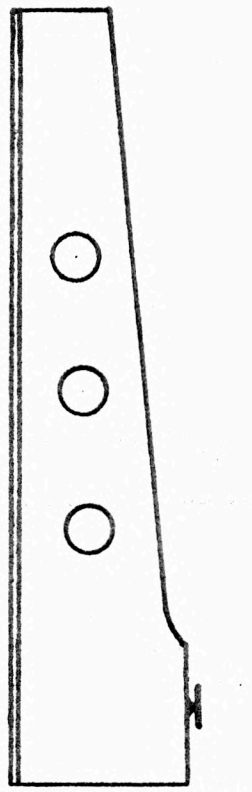
SCALE : 1½" = 1'-0"

PROJECT VIID FORT McPHERSON
GUN RACK ··· SCALE = 1/8

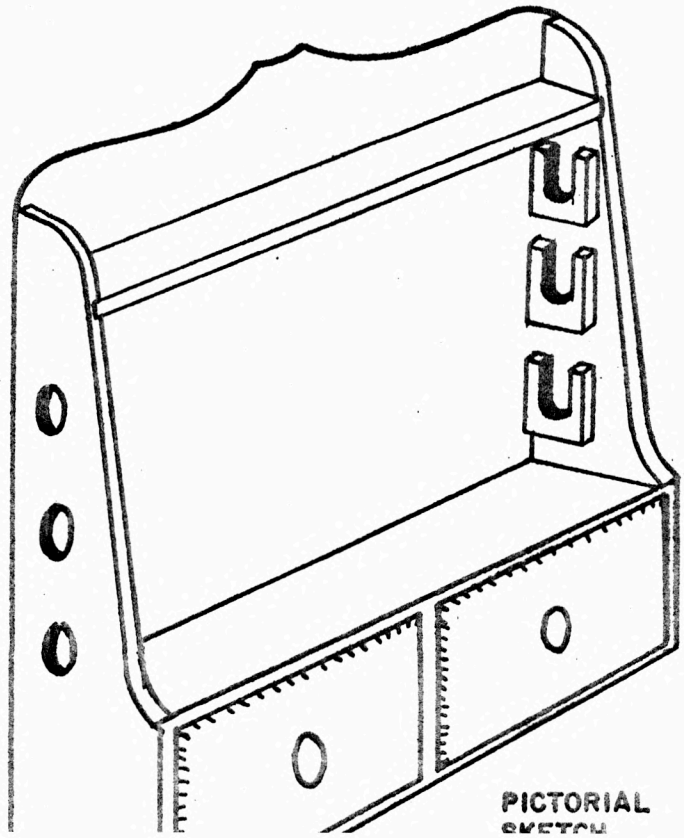
J. MORGAN. 1963



ELEVATION



END ELEVATION



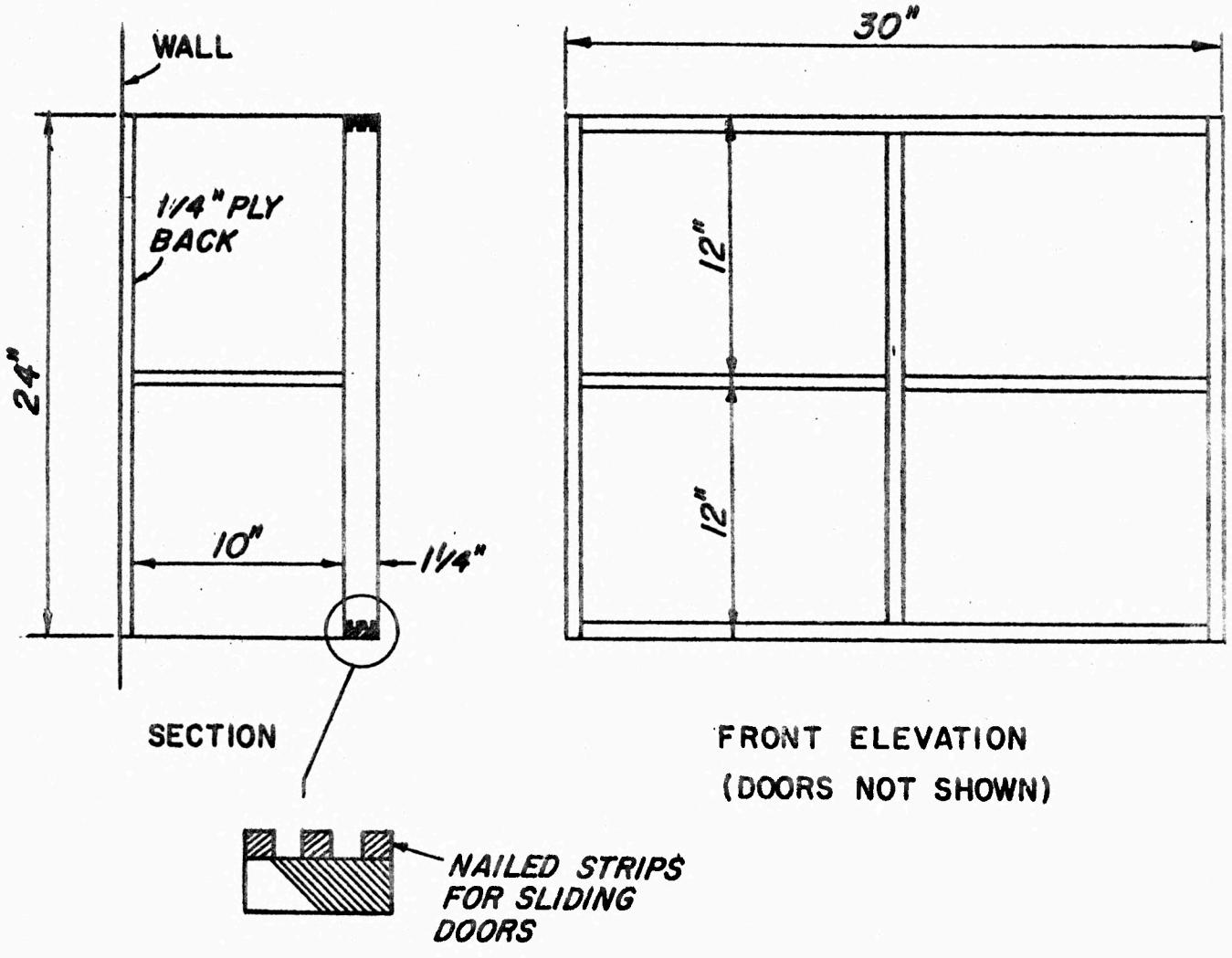
1/4" PLYWOOD BACK

PICTORIAL SKETCH

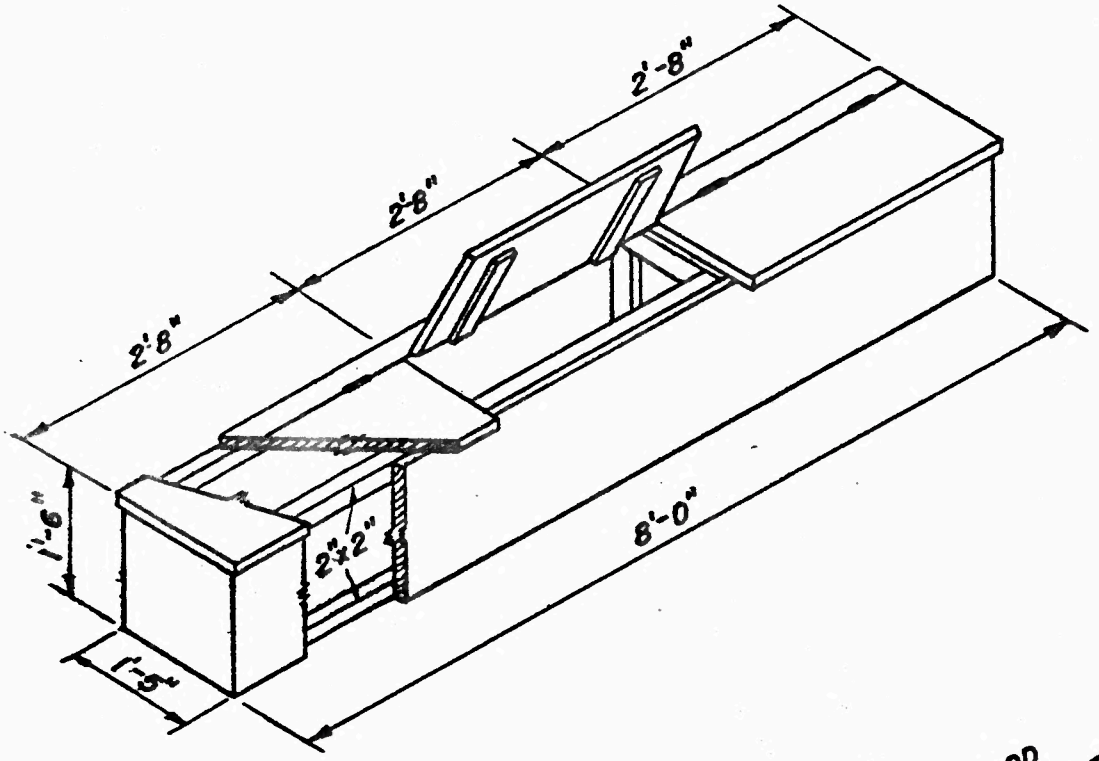
Drawer Detail May Be Formulated According To Ability. Mass Production Ideas Used In Construction Of Dado Joints And Rebates.

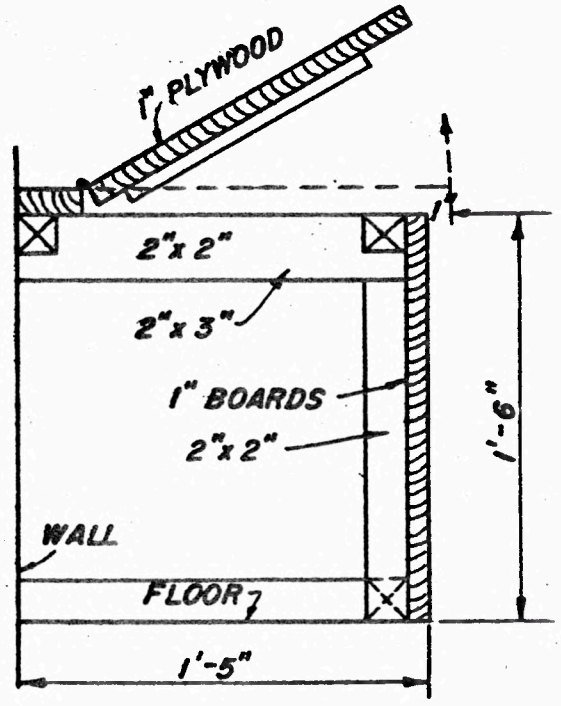
MACHINE TOOLS : Table Saw + Dado Head Jig Saw, Drill Press Belt Sander.

WALL CUPBOARD



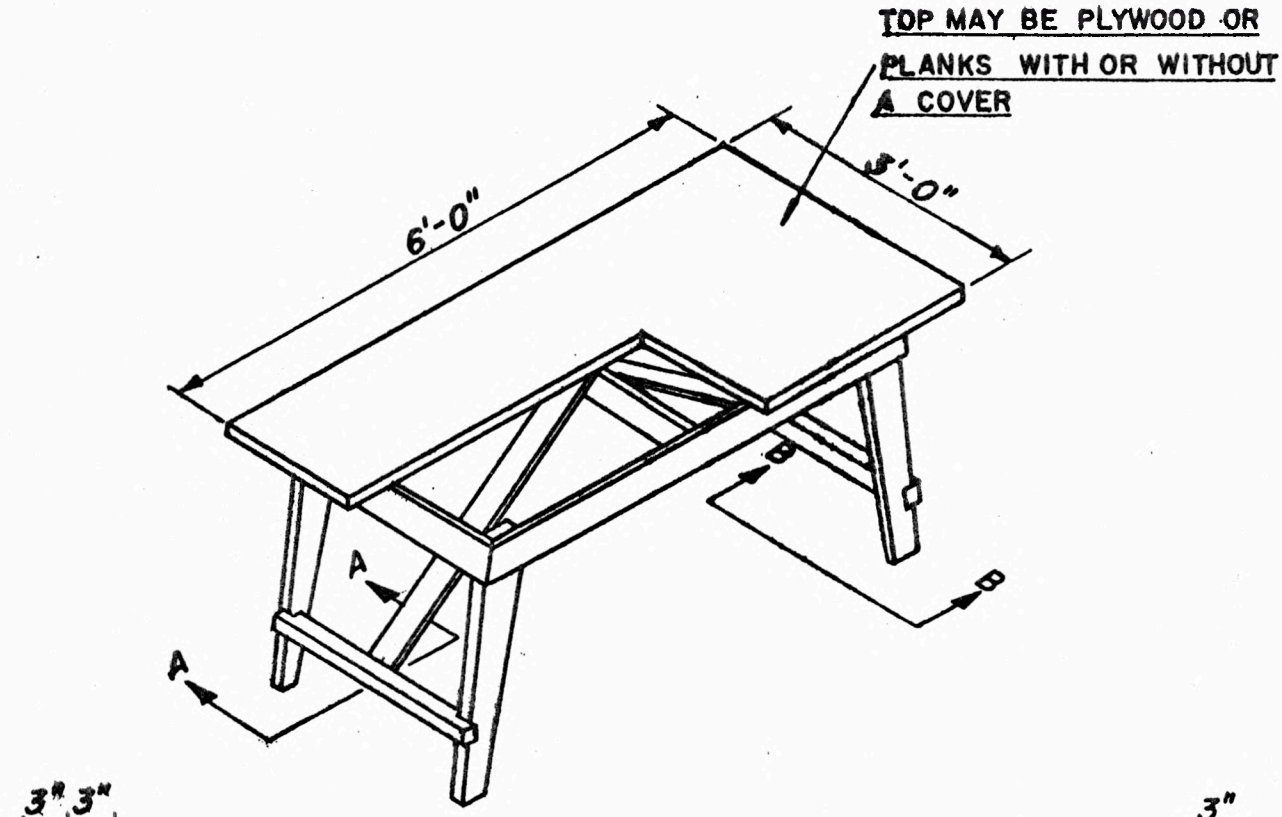
SCALE : 1½" = 1'-0"

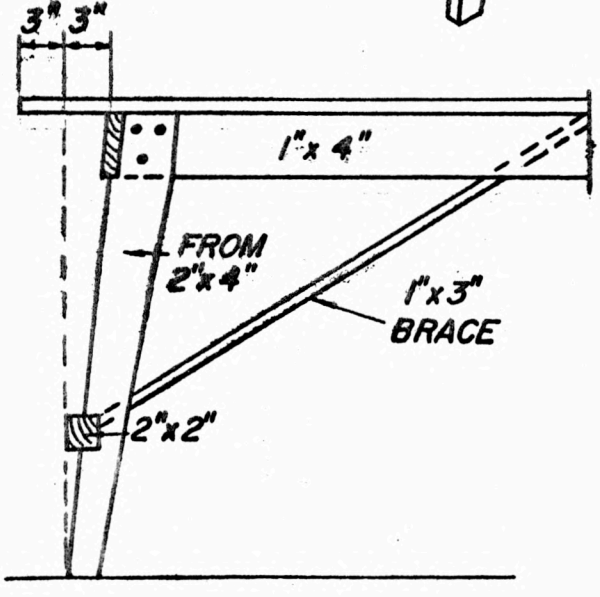




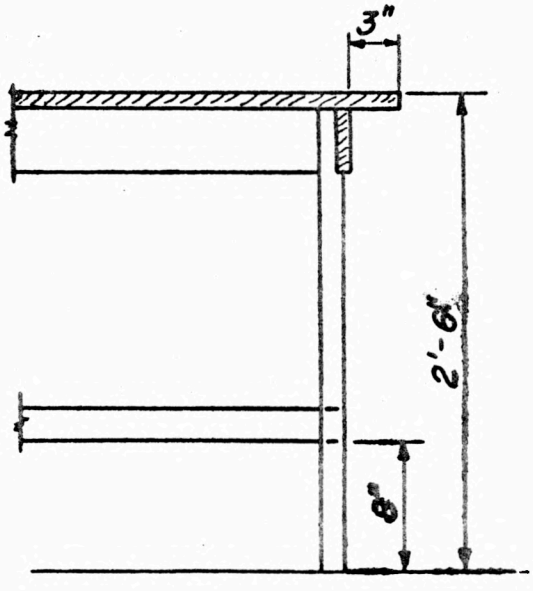
WALL BENCH & STORAGE

SOLID TABLE





SECTION A-A

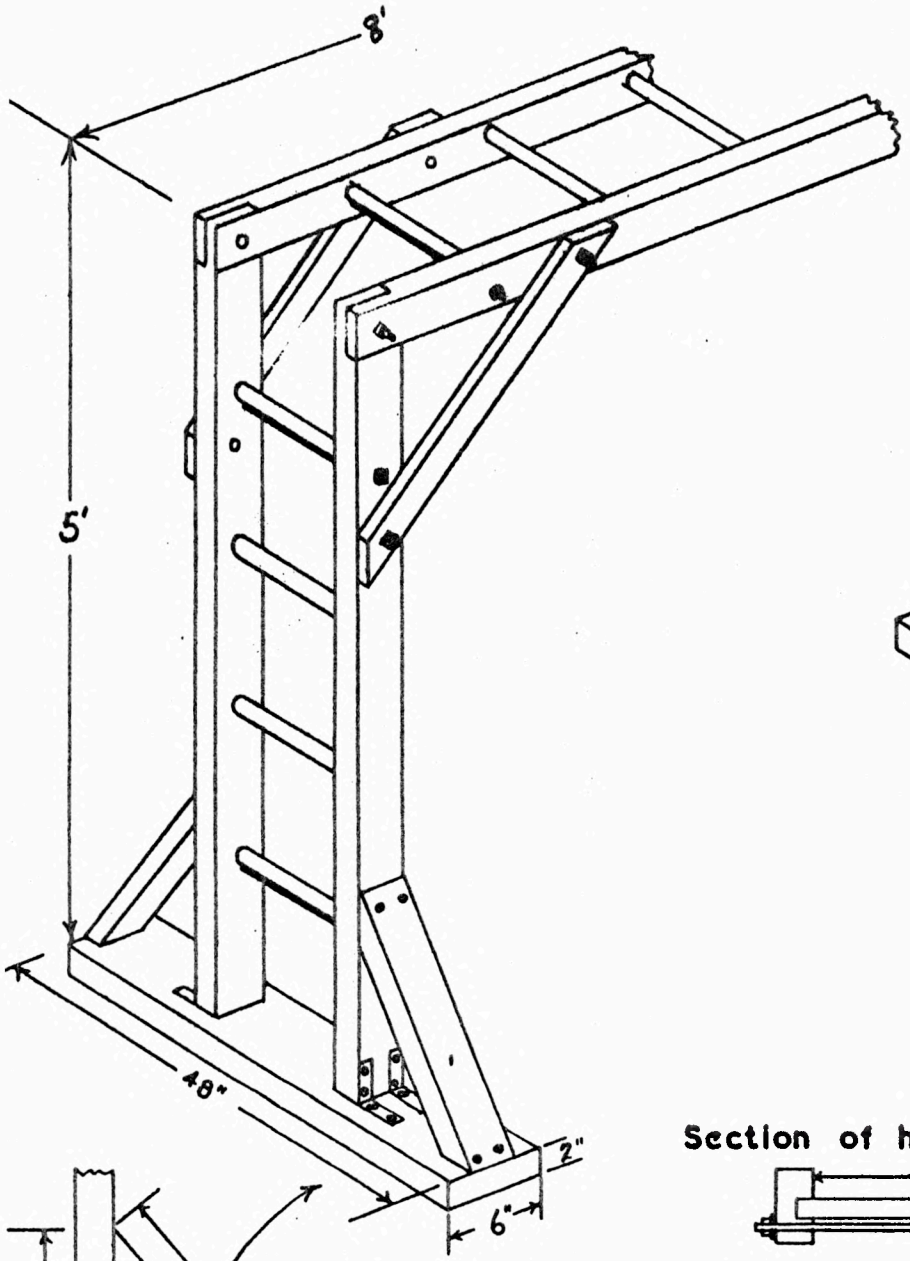


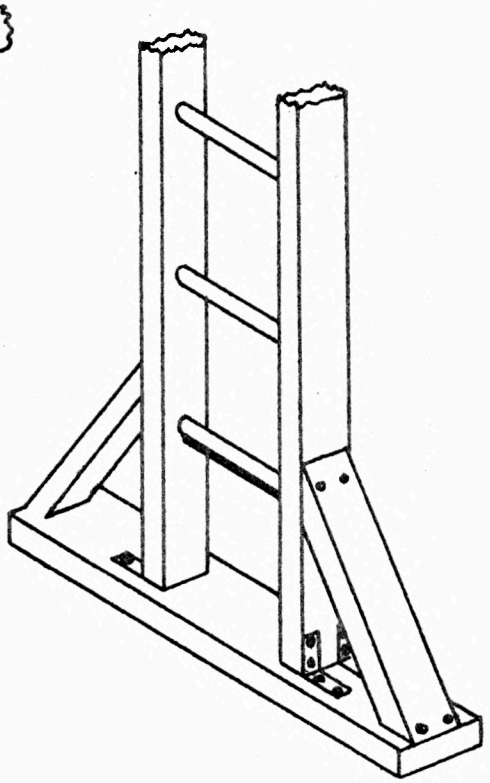
SECTION B-B

Climbing Arch

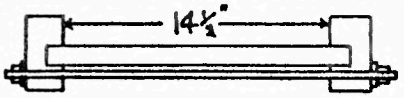
The climbing arch can be used indoors and outdoors. It is designed primarily for very young children but children of all ages will use it for make believe play. A swing may be hung from the cross bar or a plank placed on top of the rungs on the cross bar to make a platform.

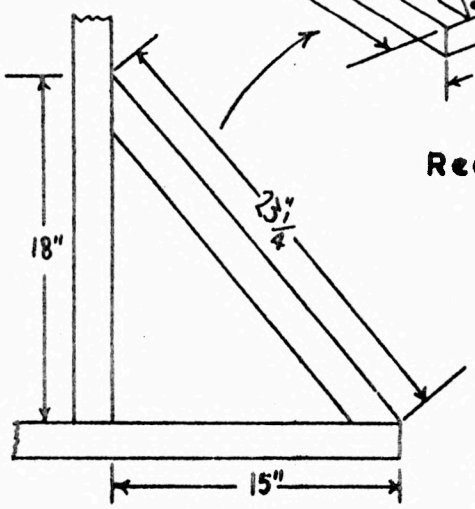
CLIMBING ARCH





Section of horizontal ladder





Requires: 10 feet 1"x2" dressed
44 feet 2"x4" dressed
20 feet 1" round hardwood
8 feet 2"x6" dressed
8 4" brackets
7 pieces iron rod 1/4" diameter threaded both ends. with nuts and washers. (tie rods)

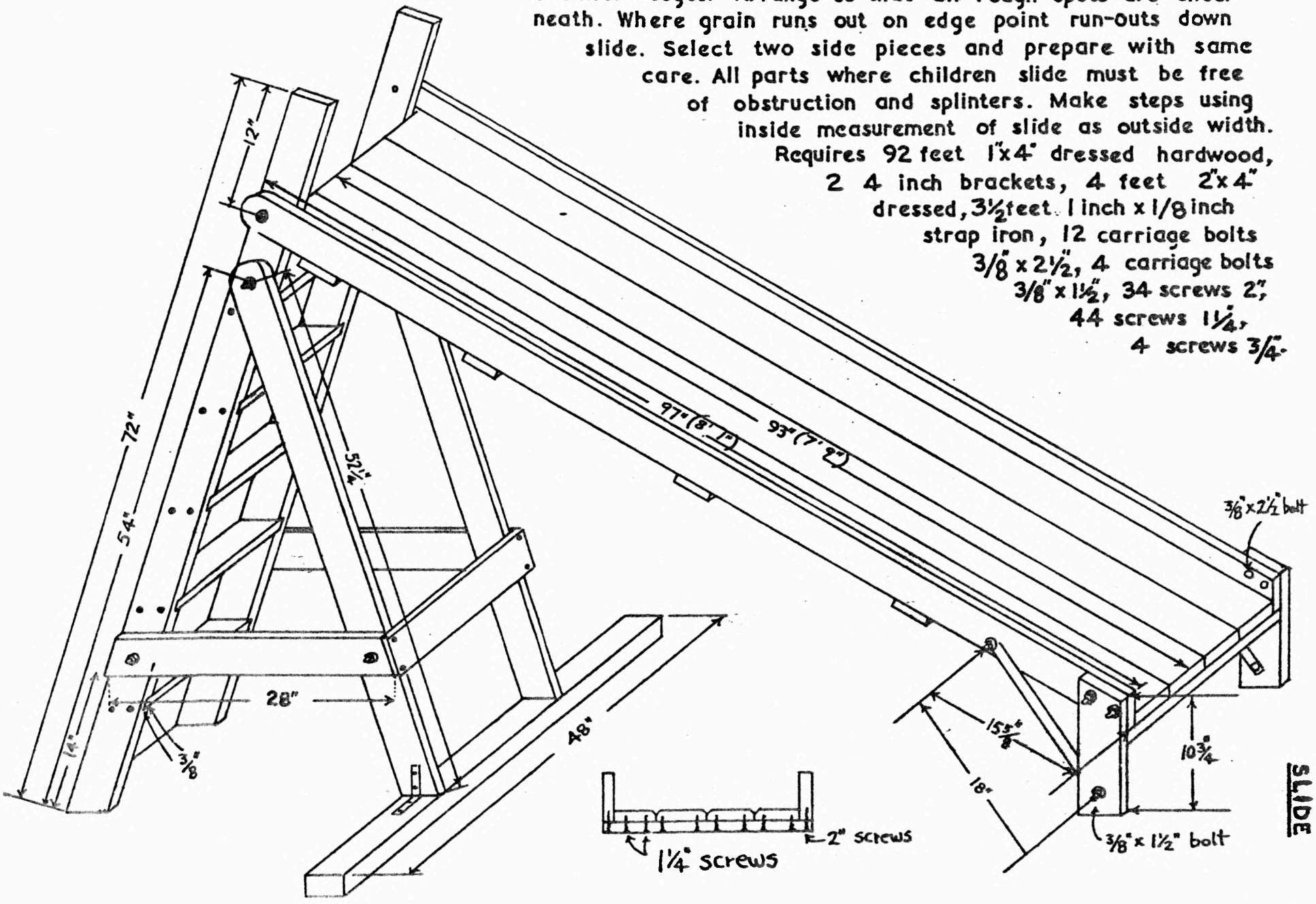
Use tie rod under each end rung of ladders and one in centre of horizal ladder.

Sand all corners and edges round.

SLIDE

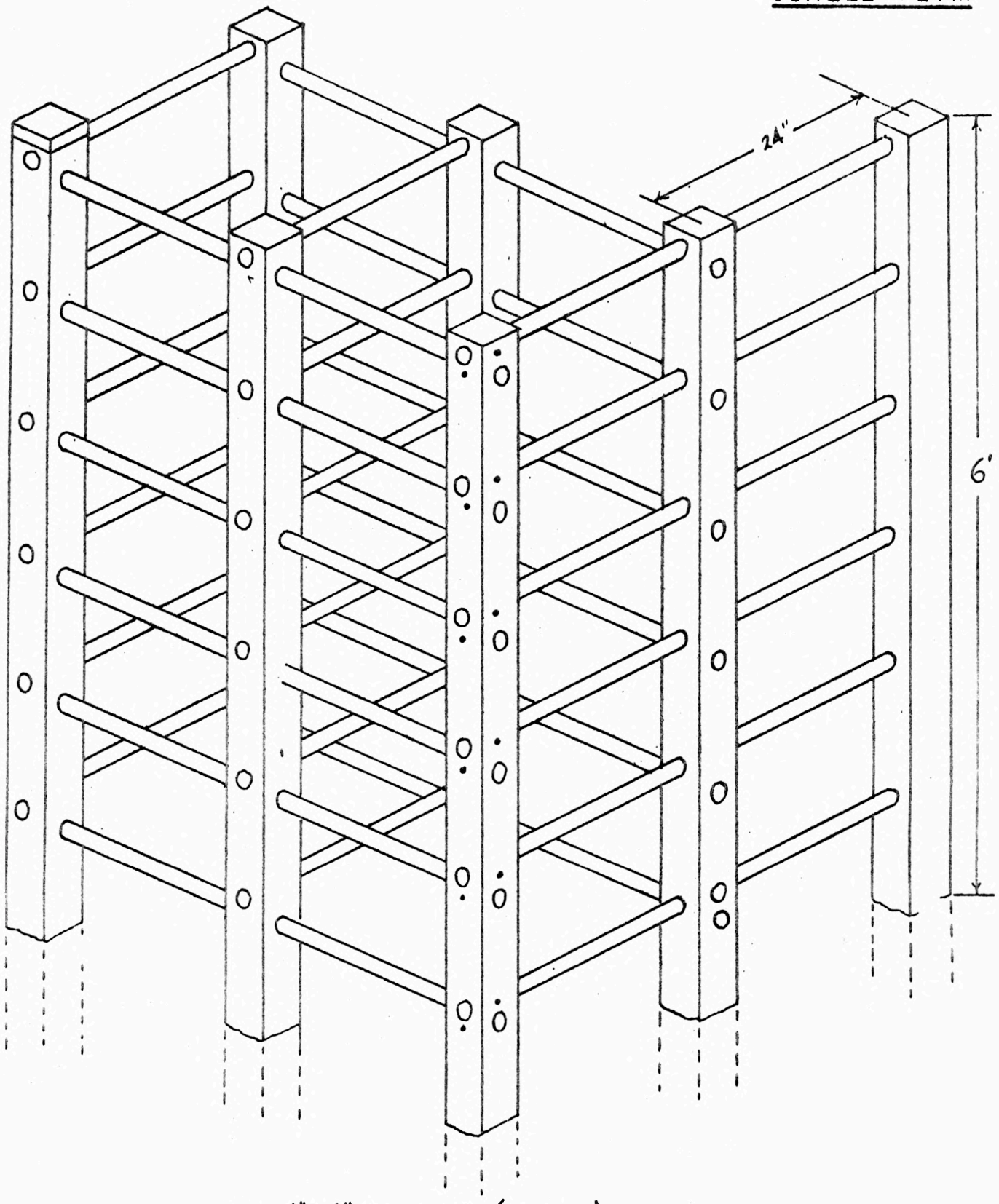
This slide could be used outdoors or indoors. It is sturdy but not very high. However, it will supply an outlet for high spirits and an opportunity to teach some elementary safety rules.

Except for 48 inch steadying bar (2"x4") all wood is 1"x4" dressed
All 1"x 4" should be hardwood. Select four 8 foot lengths.
Chamfer edges. Arrange so that all rough spots are under-
neath. Where grain runs out on edge point run-outs down
slide. Select two side pieces and prepare with same
care. All parts where children slide must be free
of obstruction and splinters. Make steps using
inside measurement of slide as outside width.
Requires 92 feet 1"x4" dressed hardwood,
2 4 inch brackets, 4 feet 2"x4"
dressed, 3½ feet 1 inch x 1/8 inch
strap iron, 12 carriage bolts
3/8" x 2½", 4 carriage bolts
3/8" x 1½", 34 screws 2",
44 screws 1¼",
4 screws ¾".



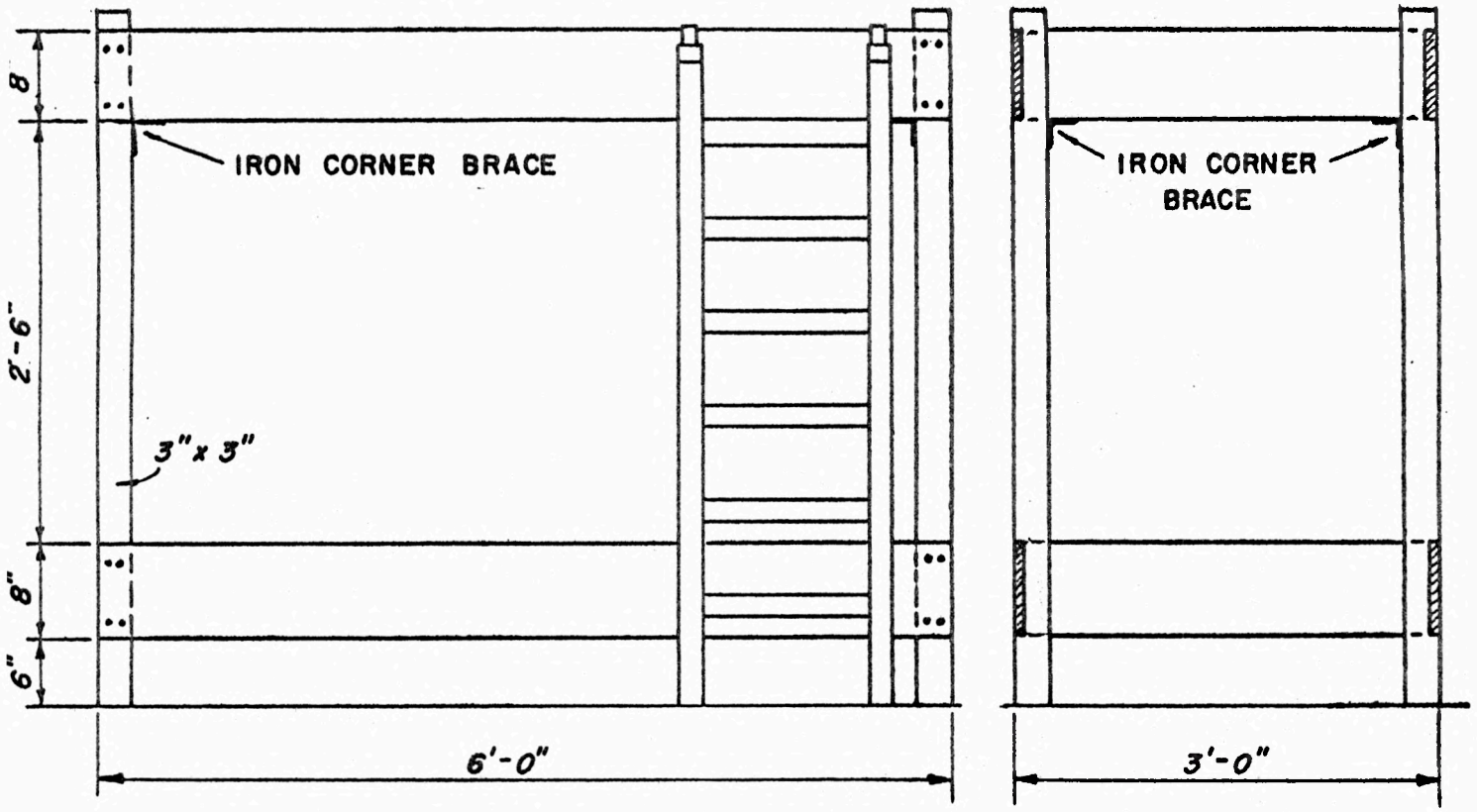
SLIDE

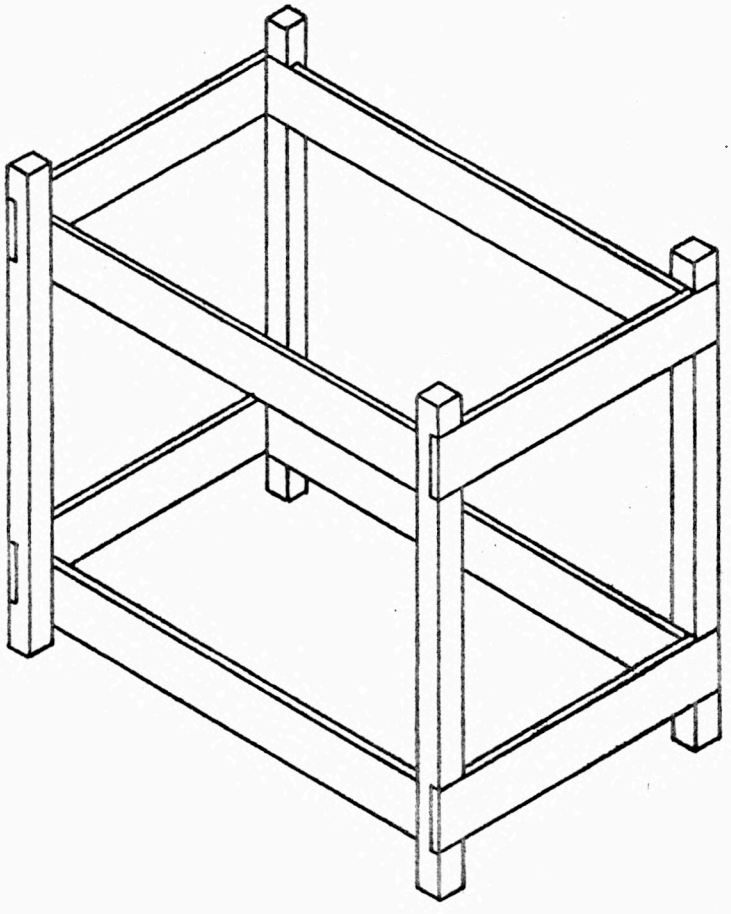
JUNGLE GYM



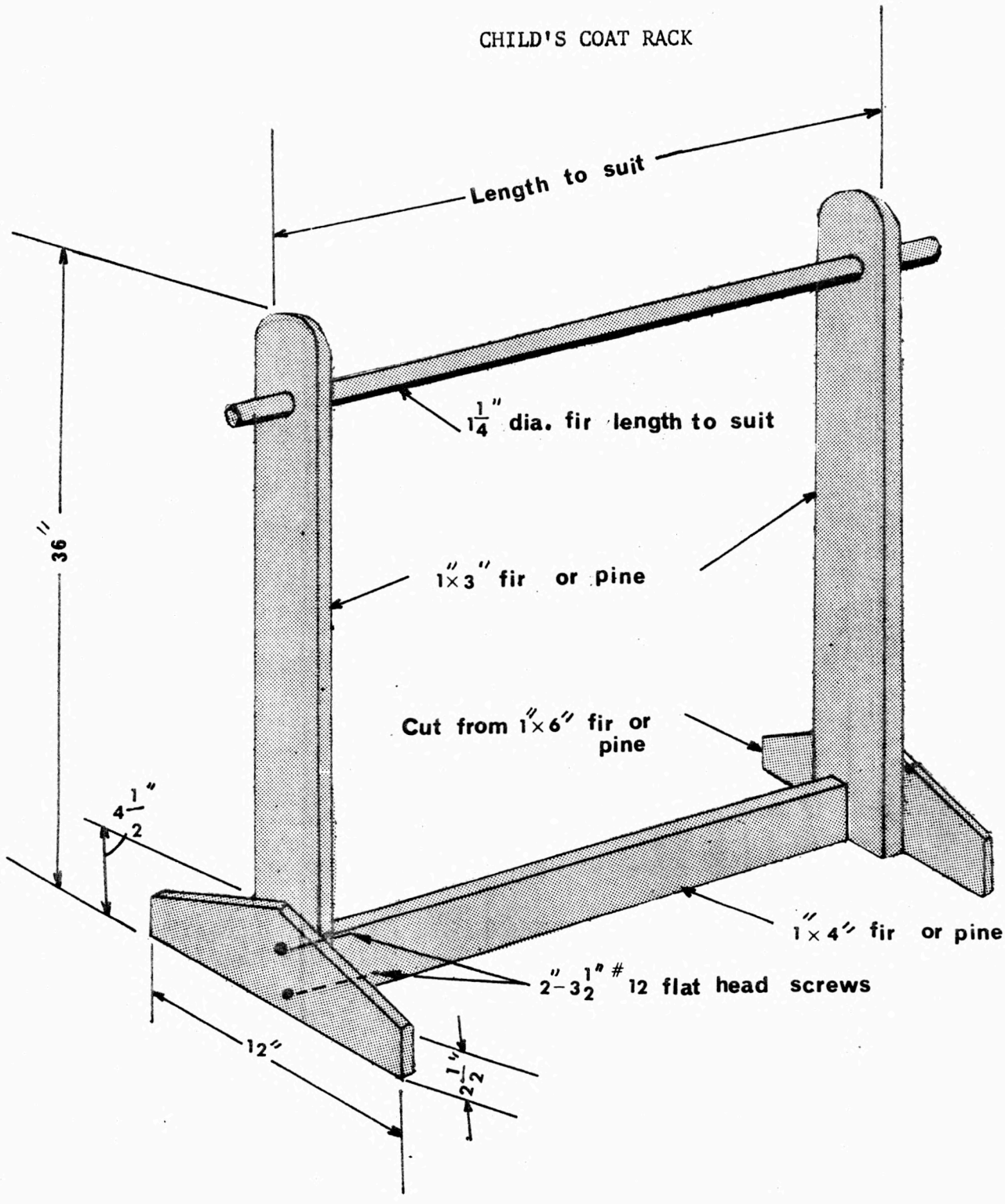
Use 4"x4" for posts (dressed)
1¼" hardwood dowelling for rungs.
Cap each post with 1"x4"
Any number of units can be made.
Bury ends 2 feet in ground.

BUNK BED





CHILD'S COAT RACK



Carving

Carving is a craft which requires little in the way of equipment and materials but gives a pupil an appreciation of the structure and beauty of the wood. The carver may learn to work at his leisure, producing interesting objects, without spending large sums for materials or equipment.

The basic tool is a pocketknife with one or more blades and is often preferred to a heavier solid handled knife.

Procedure

Subject: Choose something that can be portrayed successfully in wood. Birds and animals which are native to the locale are always popular with pupils. A small carving will be easier to manipulate. A decorative pin such as the leaf design will allow a student an opportunity to learn the handling of a knife and grain of the wood and yet will produce an article that is appealing.

Materials: Softwoods such as Pine, Basswood, Cedar and Spruce are excellent for beginners as these woods can be easily carved and have straight grain. Hardwoods are more difficult to work with but finish very well.

Tracing: Trace the subject on wood using carbon paper or templates of metal or cardboard. Try and have the gain following the direction as indicated.

Cutting Out: Small objects may be cut out with a coping or jig saw but larger carvings may require a band saw. A great deal of time may be saved by cutting the carving in profile and top view as shown on page (220) of large solid objects. Cut out the profile first and then reassemble using nails or spots of glue. The block can then be cut safely from any direction to eliminate a great deal of hand work.

Safety: Because of the smallness of the work piece and the irregular cuts to be made, the above is a fairly complex operating procedure. Each student should have individual instruction on the safe use of any of the machines and also require permission to operate a machine before using it.

Carving:
1. Hold the knife in as comfortable position as possible. If doing carving for long periods tape may be necessary on the first finger.
2. Do not try and remove too much material at one stroke.
3. Try and cut with the grain.
4. Use care in carving and avoid placing fingers or other parts of the body in front of the blade.

5. Keep the knife sharp ALWAYS.
6. Do not carve one section of the project until it is finished and then move on to another section. Take a little wood off all over. In this way a better idea of the form results.
7. Keep referring to pictures and photographs of the subject being carved to get the correct form and proportion.
8. Take as much wood as possible off with the knife before attempting to sandpaper.

Finishing: Begin sanding when you have completed using all sharp edged tools.

Back a piece of sandpaper with a pencil or flat ruler. This produces good results for rough sanding. Complete using fine paper and sand in the direction of the grain of the wood. Never paint over beautiful grain wood. Finish with paste wax or for dark wood boiled linseed oil rubbed in by hand.

Mounting: Most animal carvings do not need a stand but bird carvings do. Contrasting pieces of hardwood can be used. Make these fairly thin and cut them out in suitable shapes. Small pieces of draftwood make excellent mounts for animals and birds. Legs for birds can be made from thin wire wrapped with thread and then covered with glue. This gives them a lifelike appearance.

Soapstone

Problem

(1) To produce an article from soapstone.

(2) To experiment with soapstone and record:

(a) characteristics of material

(b) tools with which material may be readily worked

(c) limitations of material

(d) possible uses of soapstone

1. Articles Made From Soapstone

(a) List any articles which you have seen made of soapstone.

(b) List some articles which you consider can be made of soapstone.

2. Characteristics of the Material

(a) Appearance: When the material is picked up it is found to be reasonably heavy and fairly soft. The stone itself has a waxy, soap feeling. It is usually a greyish white colour becoming black when rubbed with oil.

Impurities found in the material alter its colour: for example, pyrite crystals impart their own gold colour. Quartz gives it a white colour, while carbonate tends to produce a brownish colour.

Soapstone has a grain and can break along that grain.

(a) Workability

The material can be easily worked with most hand tools. Impurities, however, will dull cutting edges of tools and cause fracturing along the grain. The material withstands heat well. Dust produced from the material when working can irritate the eyes and nasal passages. The material can be repaired by using pollyfilla and resin glue.

(b) Limitations of the Material

Impurities cause the material to fracture making light delicate pointed objects difficult to carve. This accounts for many Eskimo carvings appearing bulky if made of soapstone. Finer more delicate objects are made of bone or ivory.

Due to the heavy weight the material is expensive to transport.

Soapstone varies in colour from light green to a dark black and is not always the right colour for the object in mind.

(c) Possible use of Soapstone

Soapstone may be split or slabbed into tilelike parts and can be used to decorate table tops.

Soapstone is fairly easy to carve and therefore may be used to form animal figures, masks, paperweights, bookends, pen and pencil holders, fruit bowls, lamp boxes, ash trays and trivets.

Additional Information

1. Roughing Out

   One side is usually made level by means of hacksaws, files and woodrasps. The other surfaces are shaped by using hacksaws, coping saws, metal cutting bandsaw, cold chisels and knives. The material may be clamped loosely in a vise.

2. Bringing to Size

   The material may be shaped and sized by using hacksaws, woodrasps, coping saws, files (various sizes and degrees of coarseness) and by a power sander (using coarse sandpaper).

3. Adding Details

   The stage of adding details may be done with files and chisels (wood chisels, gouges and fine files). Repairs may also be done with pollyfilla and glue. Pollyfilla may be dyed when being mixed so that it can blend in with the natural colour of the stone or contrast with it. Sanding operations are then done.

4. Final Finish

A wood rasp or wire brush can be used to produce a rough, texture effect.

Additional features may be scratched in next, using a sharp object, i.e., scribers or knife. If the article desired is to be a beaver the rough appearance will give it the look of real fur.

For a very smooth finish, coarse, medium and fine sandpaper can be used completing by the use of wet sandpaper.

Vaseline or mineral oil may then be added to bring out the natural features and colour of the rock.

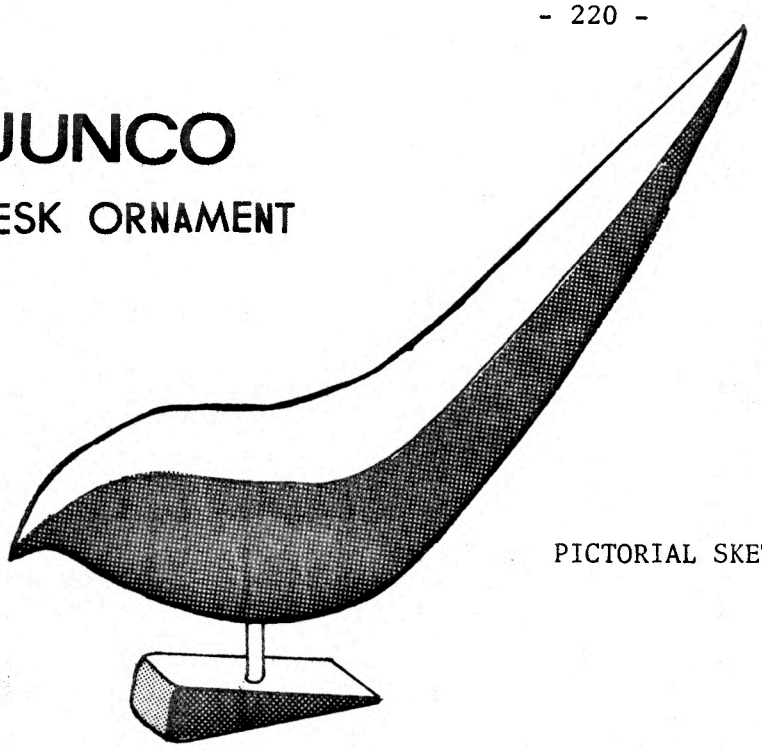
Any glueing or adding pollyfilla should be done before oiling.

LEAF DESIGN

1. Obtain a piece of material 1/4" to 3/8" thick and 2" x 2½".
2. Trace design on material.
3. Remove waste material using a coping saw to saw outside of line.
4. Round edges by whittling cutting in direction of grain.
5. Cut in details using knife point.
6. Smooth the entire job with 4/0 sandpaper.
7. Cement pin to the back.
8. Finish with two coats white shellac rubbing lightly with fine steel wool after each coat.

JUNCO

DESK ORNAMENT

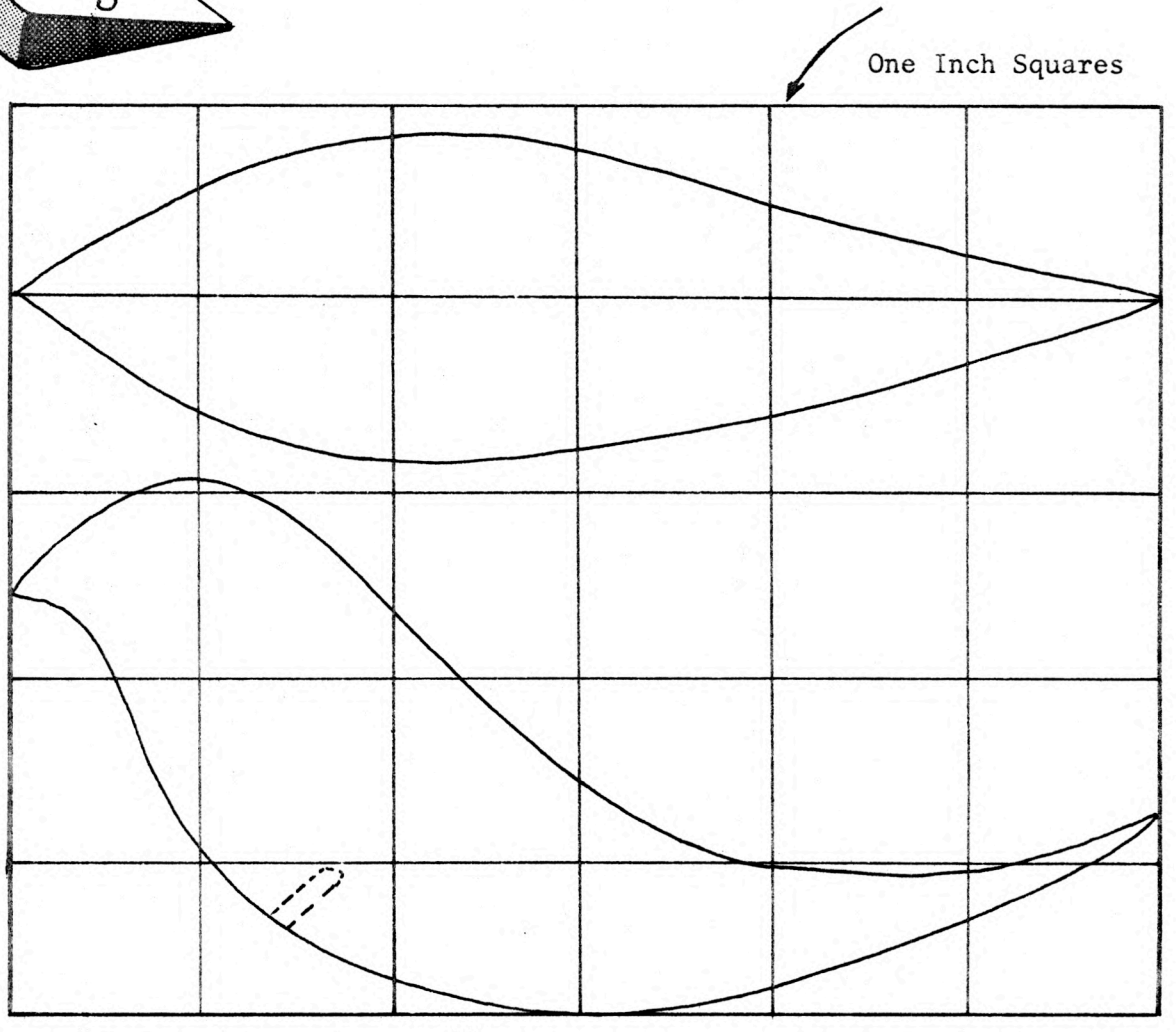


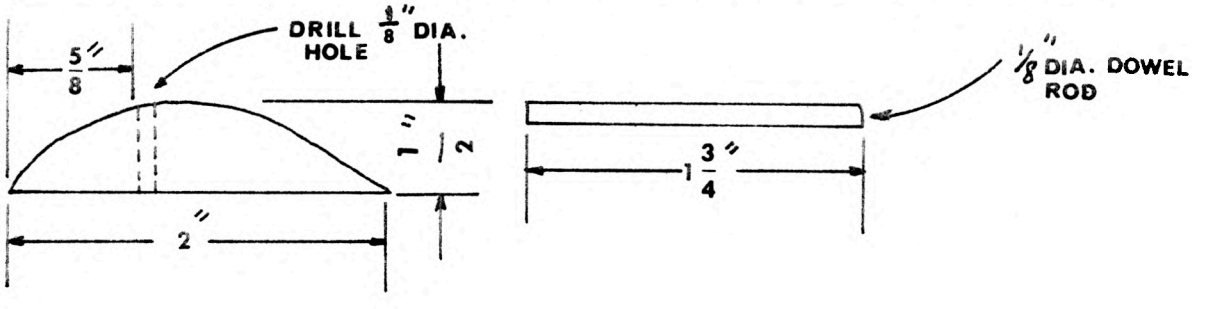
Wood WALNUT or CHERRY

Finish White Shellac

and Wax Polish

PICTORIAL SKETCH



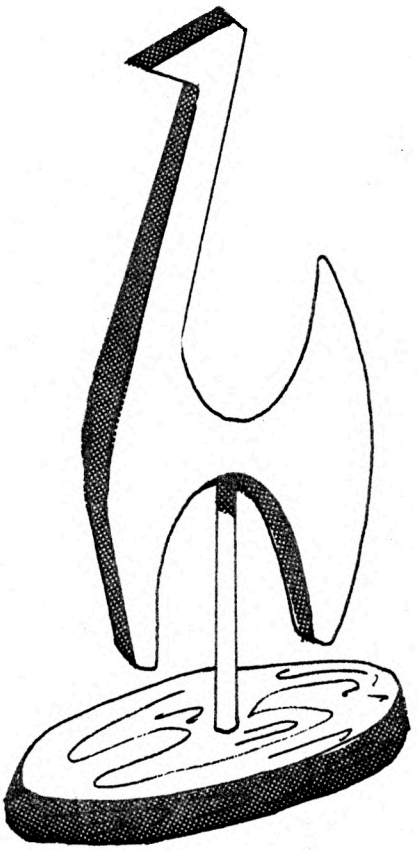


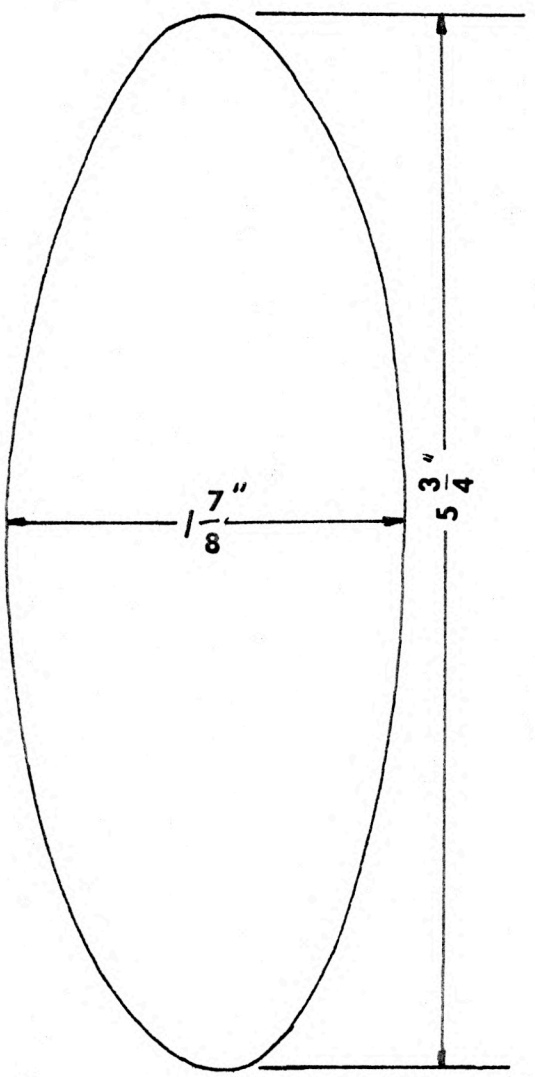
DUNCO

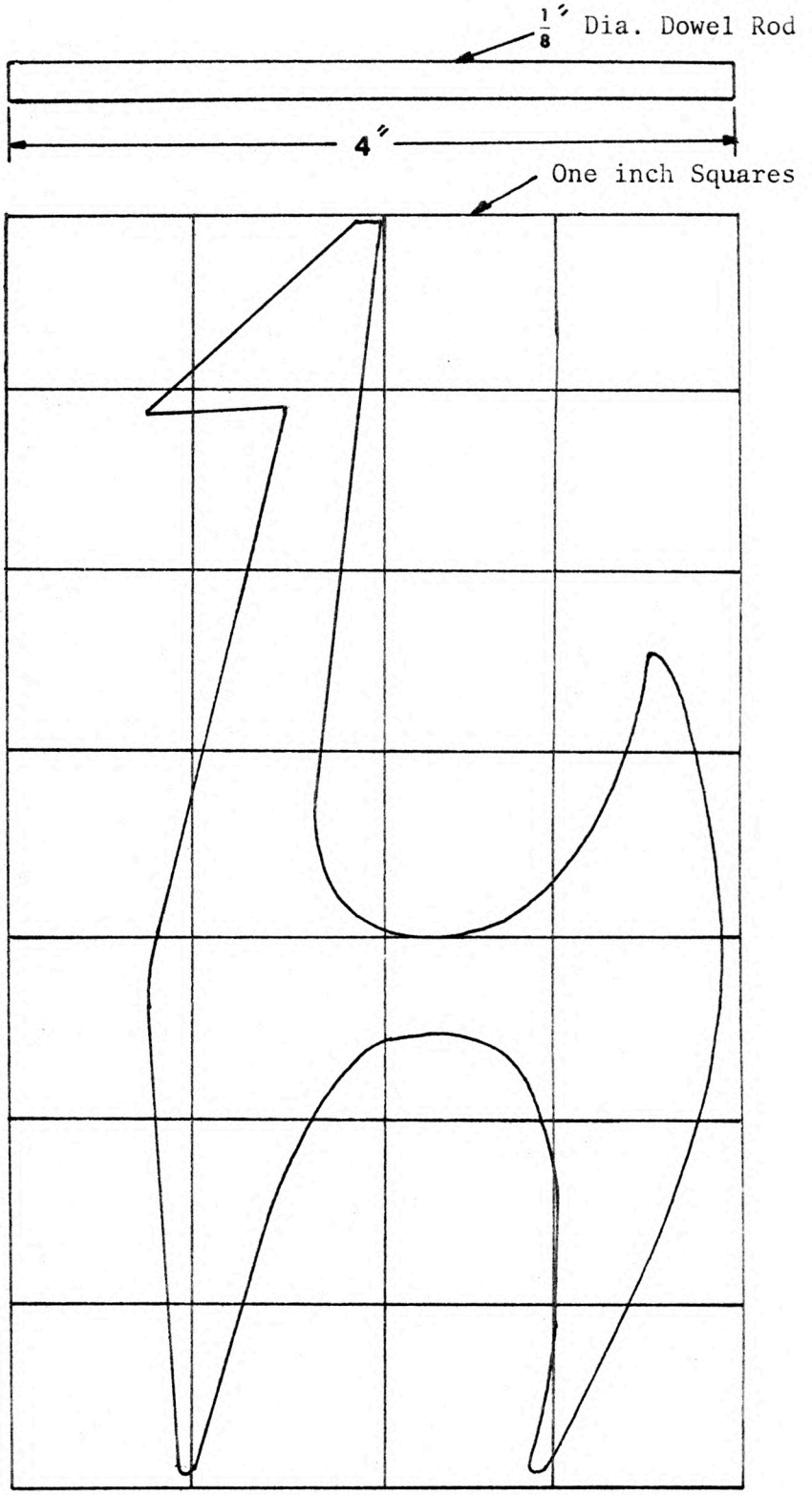
DESK ORNAMENT

Material - $\frac{1}{2}$" Mahogany

Finish - White Shellac and Wax Polish

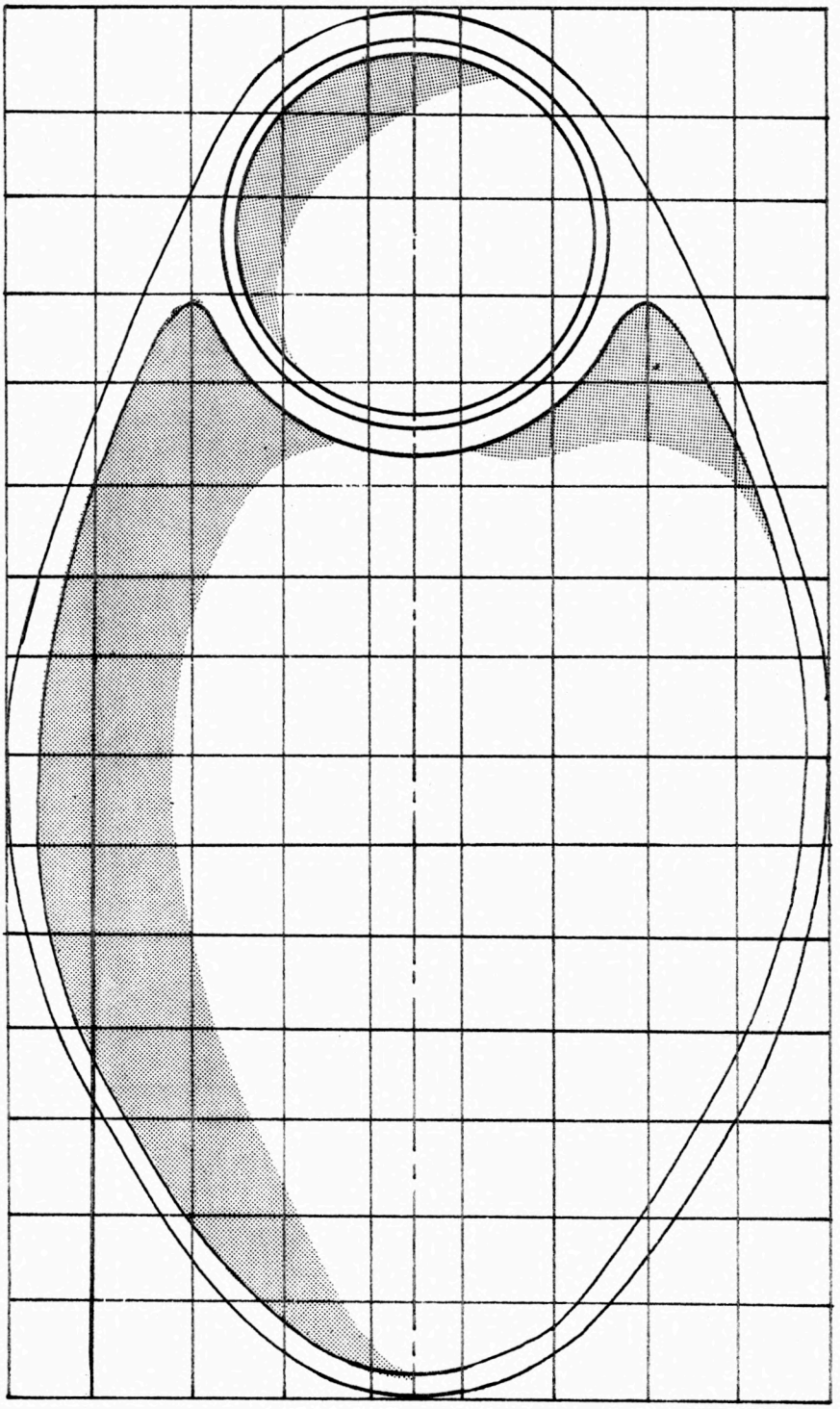






CHIP AND DIP TRAYS

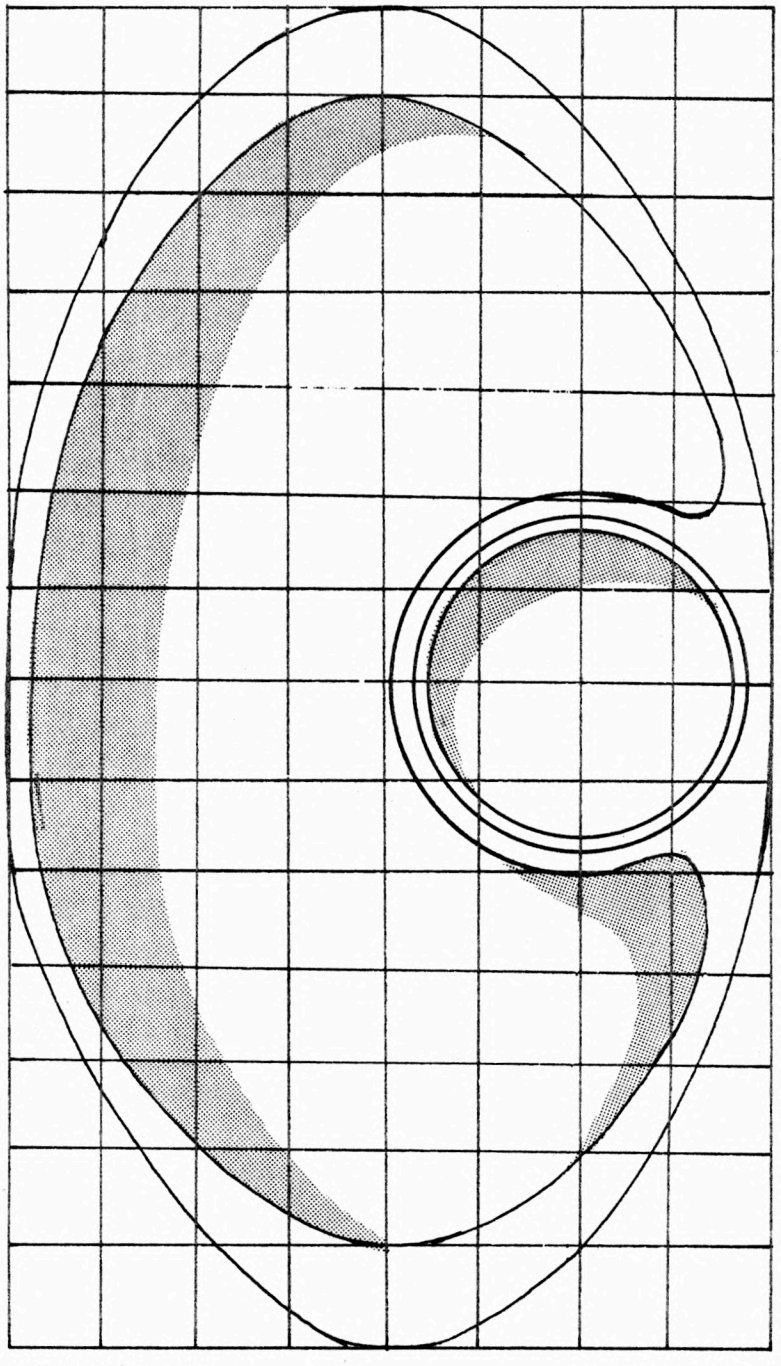
Lip Rounded



Dish 3¼" Deep

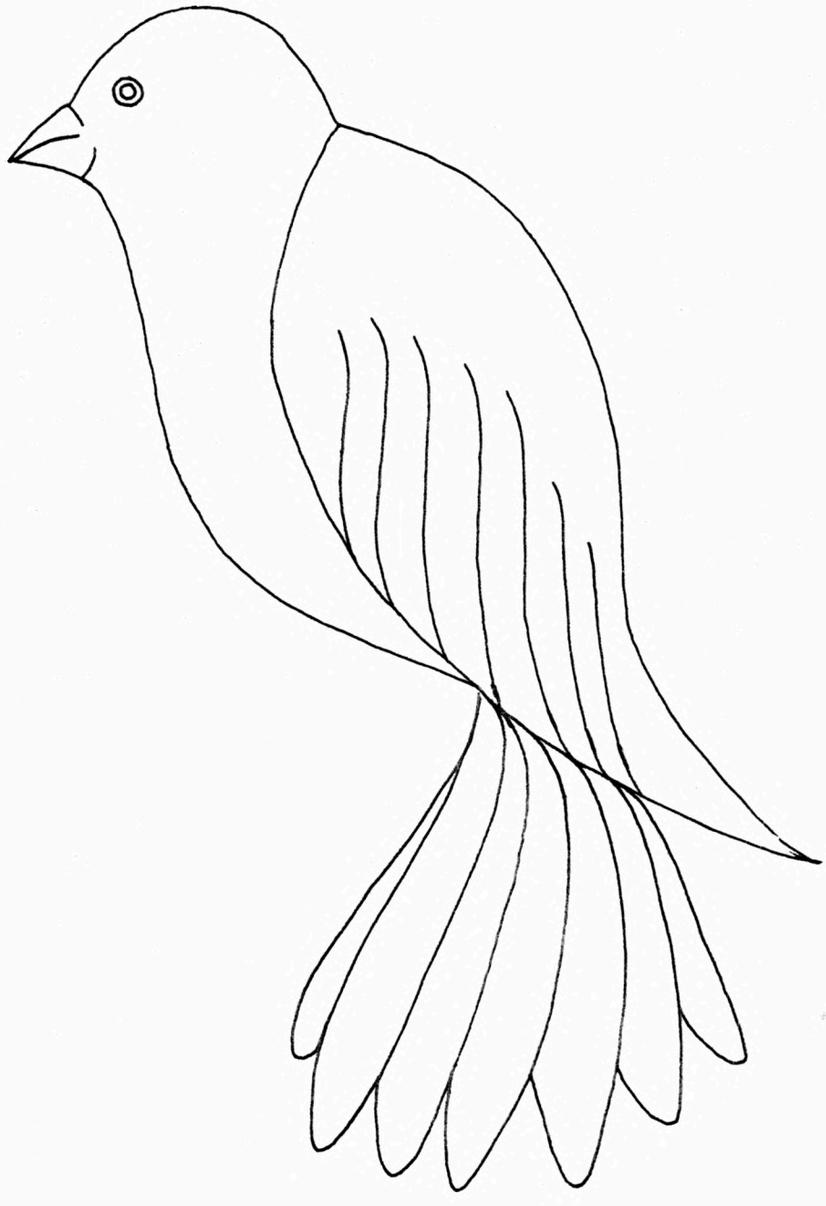
1" Squares

CHIP AND DIP TRAYS

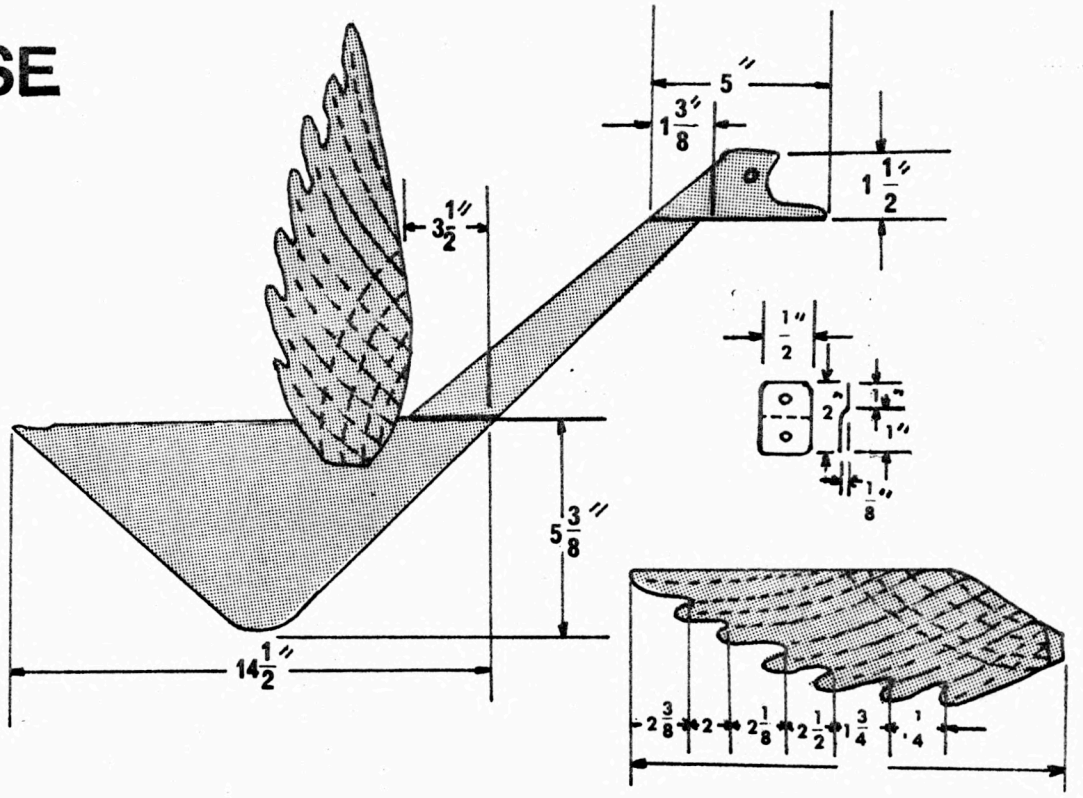


Dish $3\frac{1}{2}$" High

1" Squares



GEESE

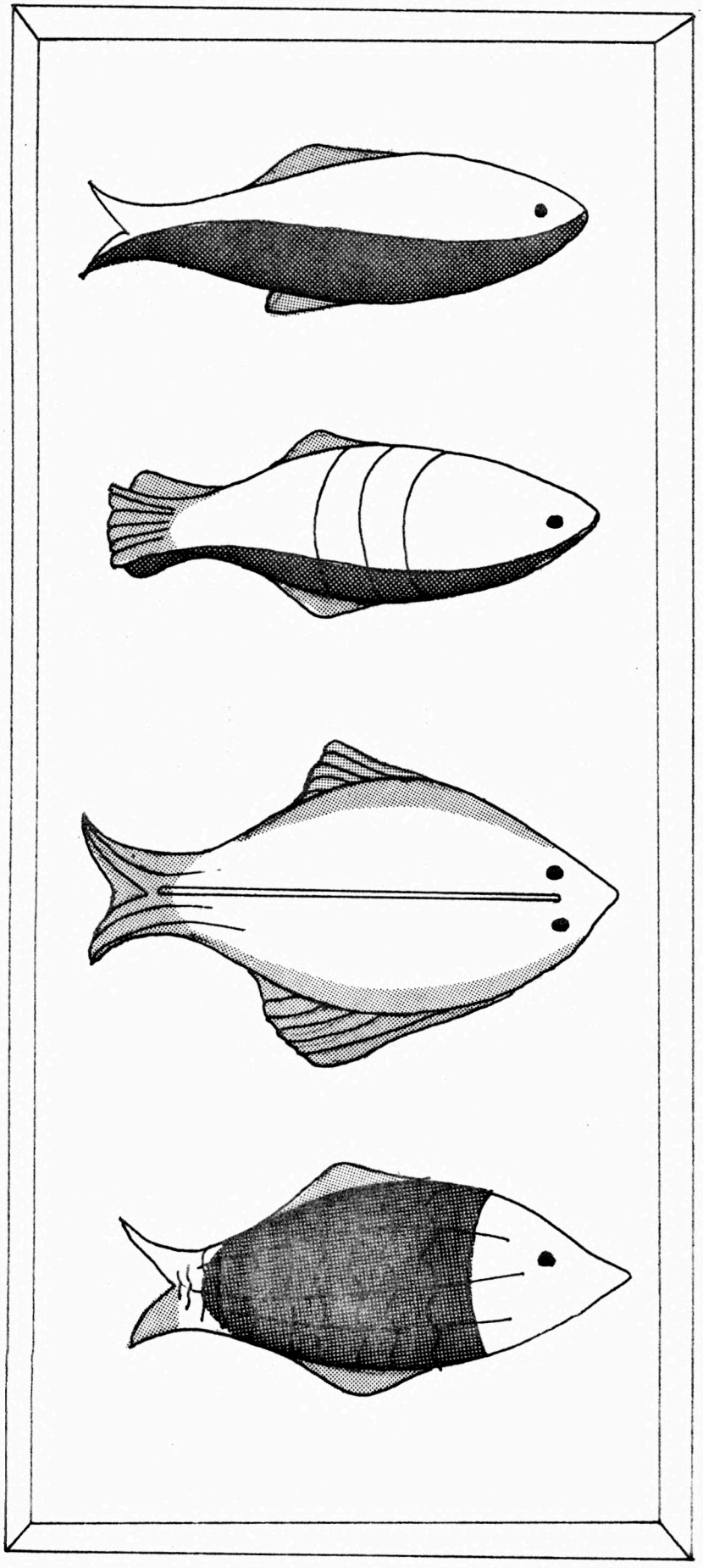


Bill of Materials

Quan.	Part	Material	Size
2	Body	Hardwood	14½ by 5 5/8 in.
2	Neck	Hardwood	10¾ by 3½ in.
2	Head	Hardwood	5 by 1½ in.
4		Half-hard aluminum	20-ga. 14 by 3¾ in.
2		Half-hard aluminum	20-ga. 2 by ½ in.
2	Rivets	Aluminum	¼ by 1/8 D.
8	Screws	Panhead	No. 4 by ¼ in.

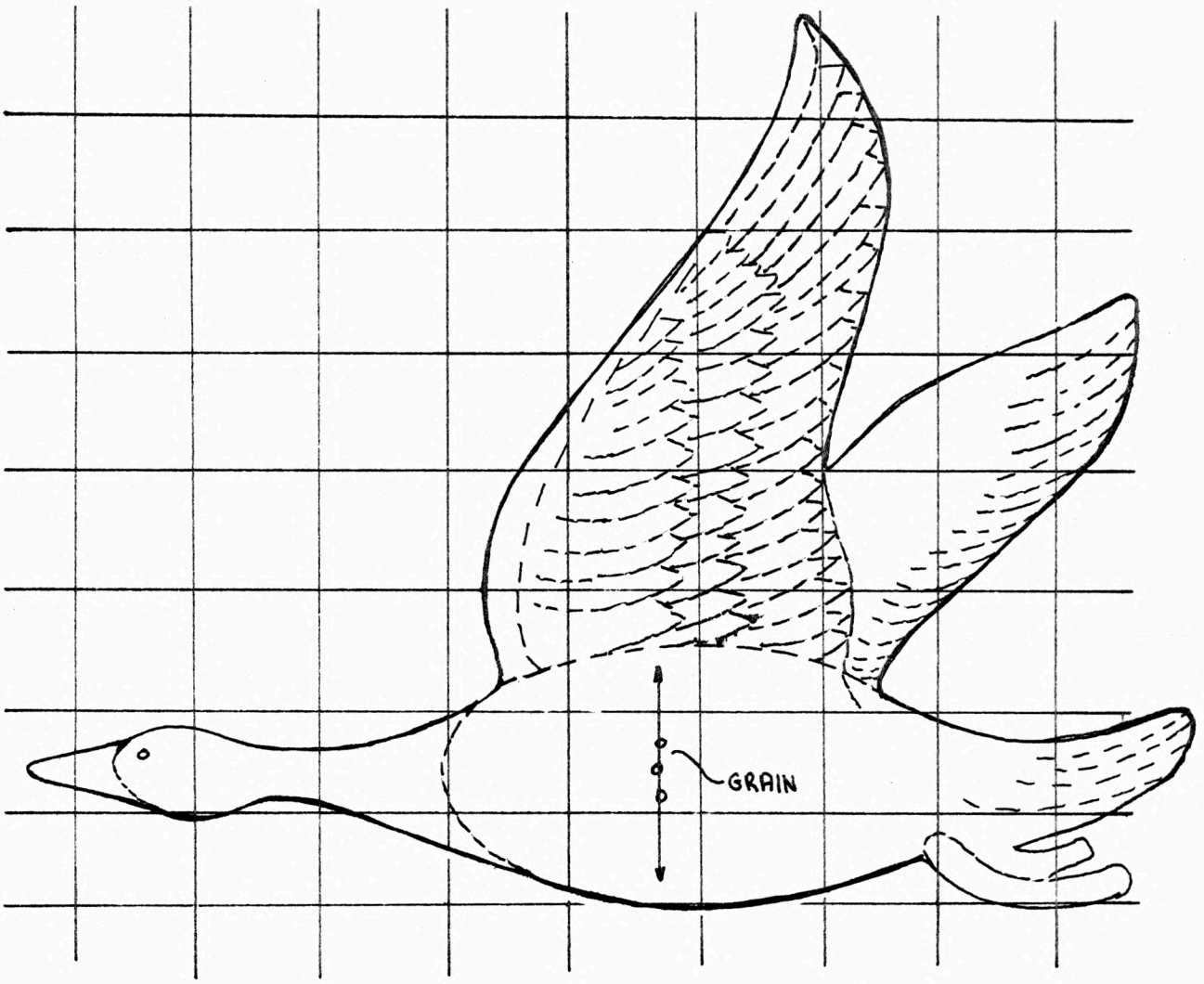
(Overall size of wood after gluing - 22½ by 14 in.)

MOUNTED FIGURES



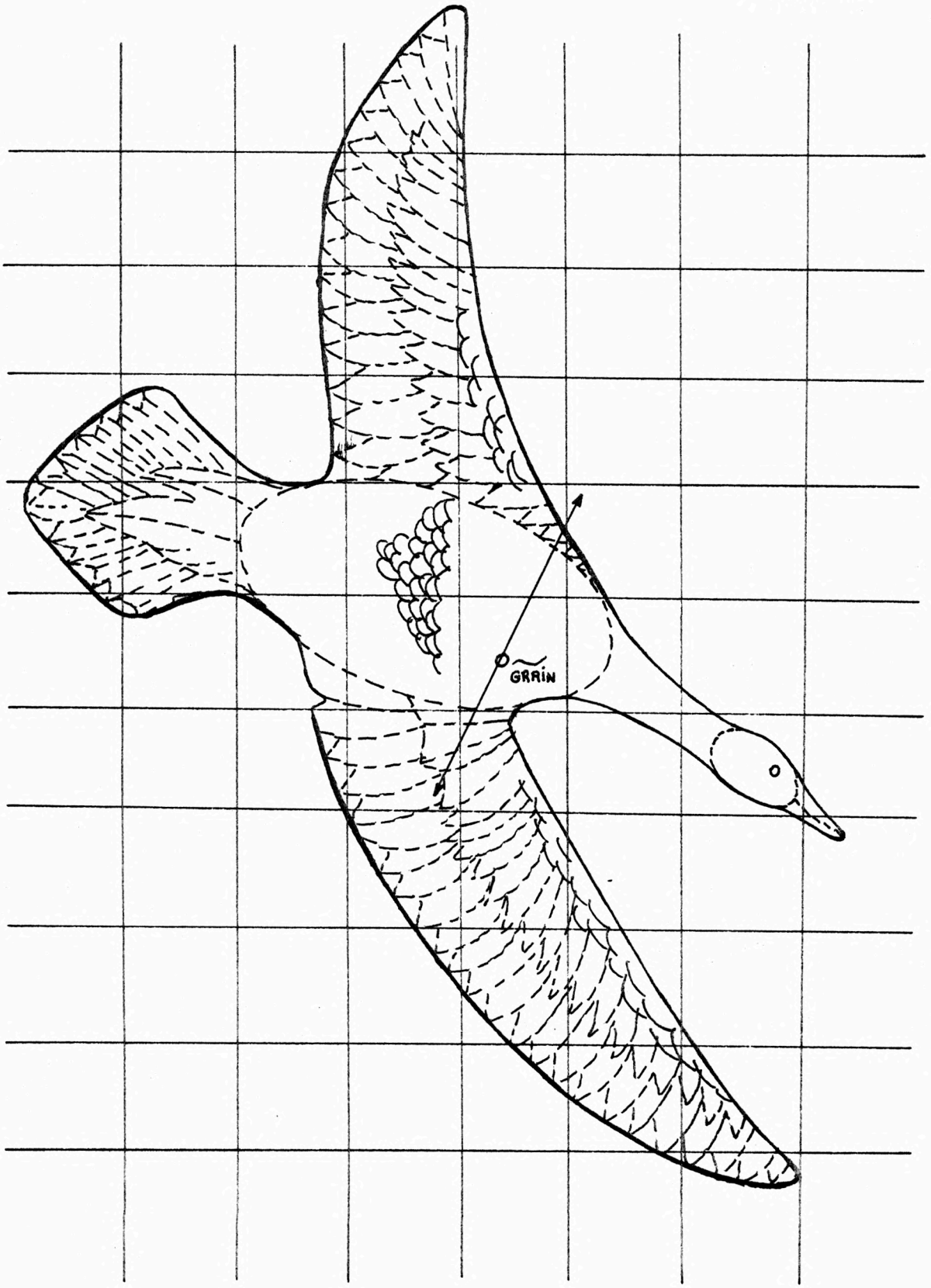
Carved wood figures grouped together and used as a Plaque for Wall Decoration.

1" Squares



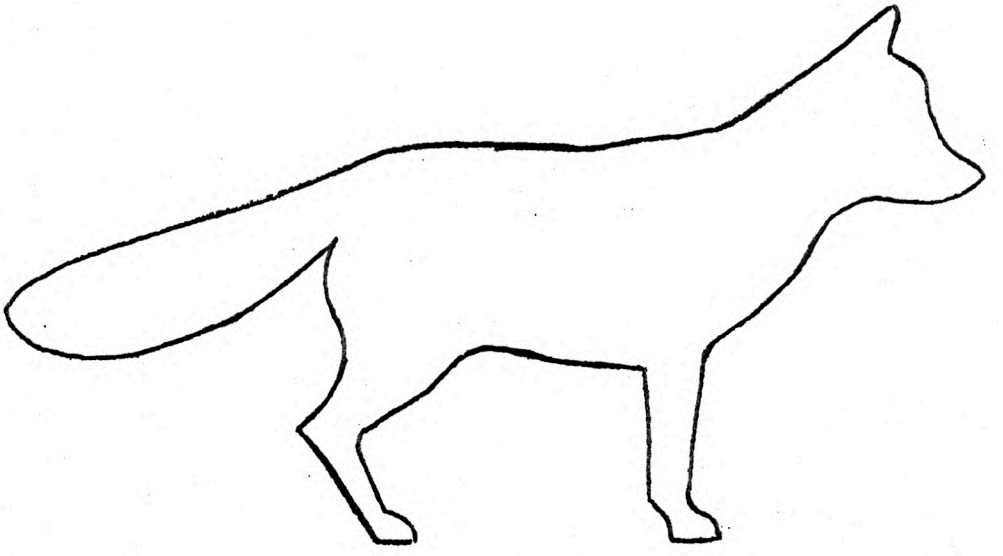
Blank $\frac{1}{2}$" Thick - Wood Pine

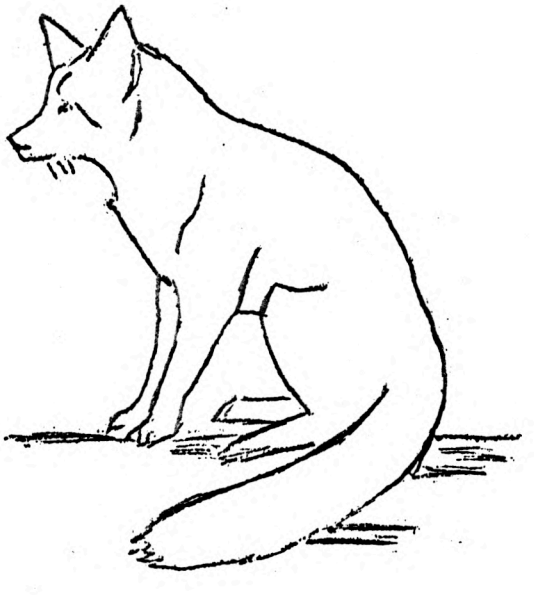
1" Squares

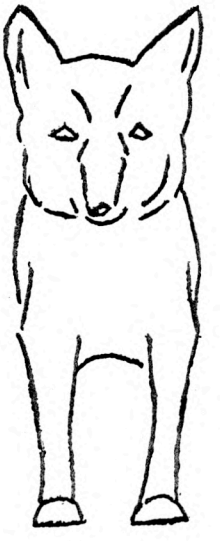


Blank, $\frac{1}{2}$" Thick - Wood, Pine

FOX

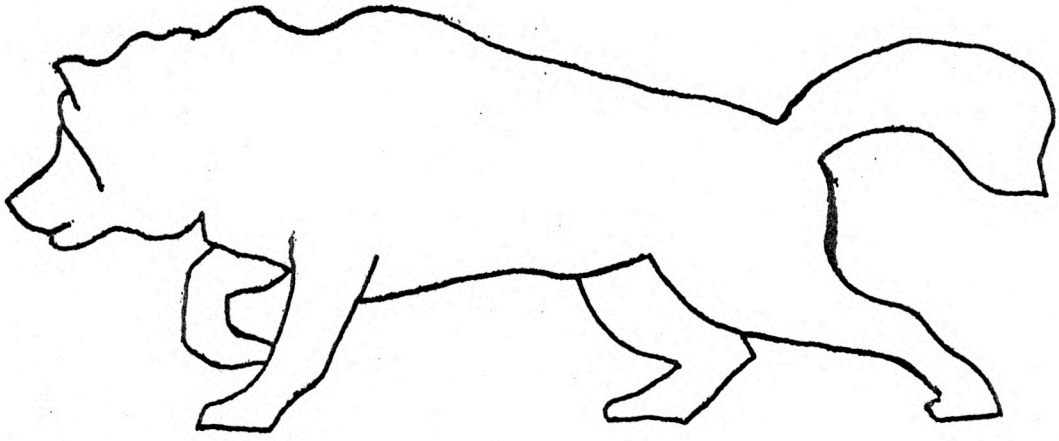


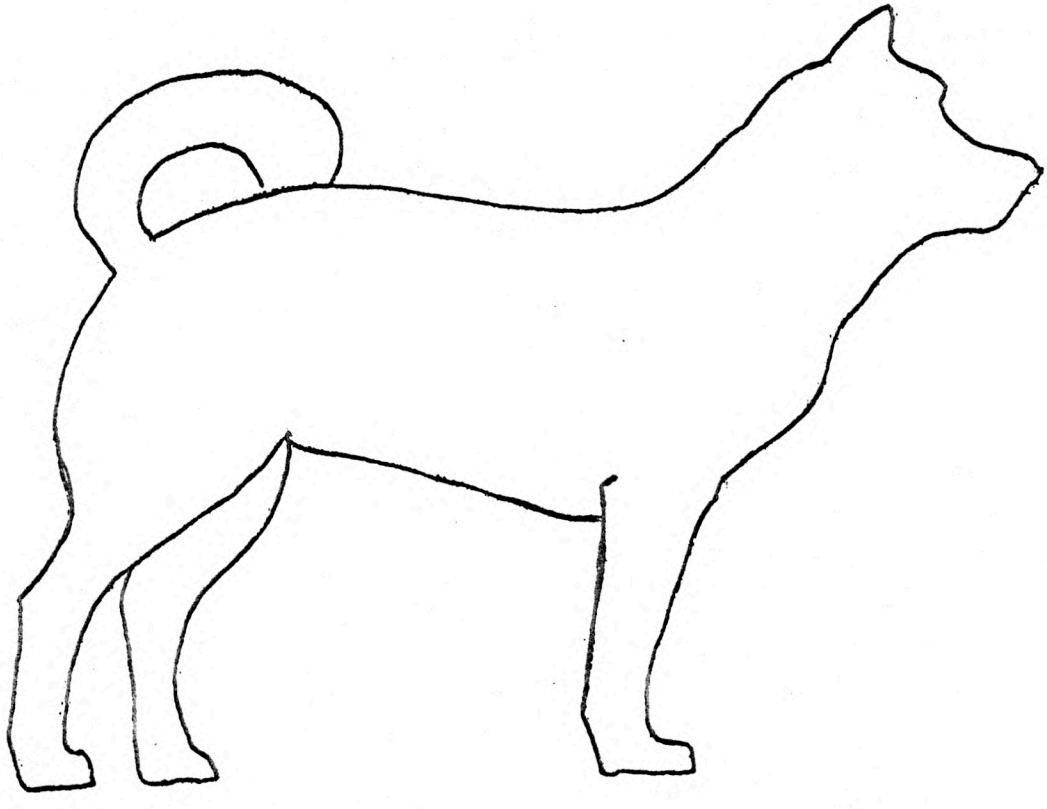




Material: $1\frac{1}{2}$" softwood

HUSKIES

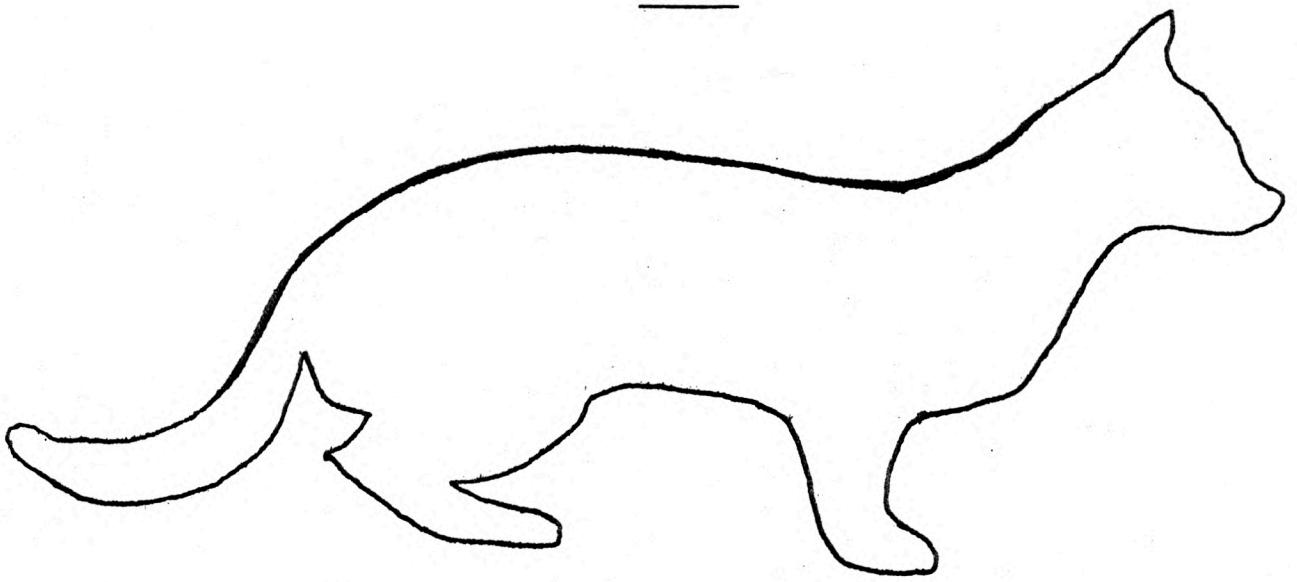




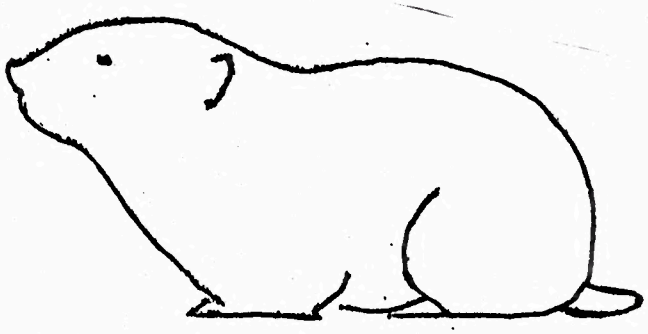
Material: 2" thick.

Material: 1½" thick.

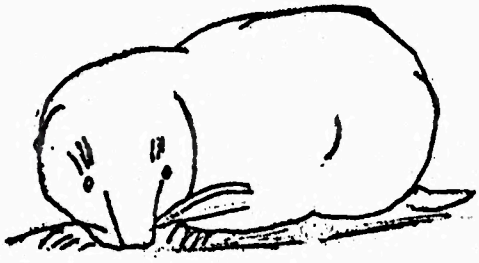
MARTEN

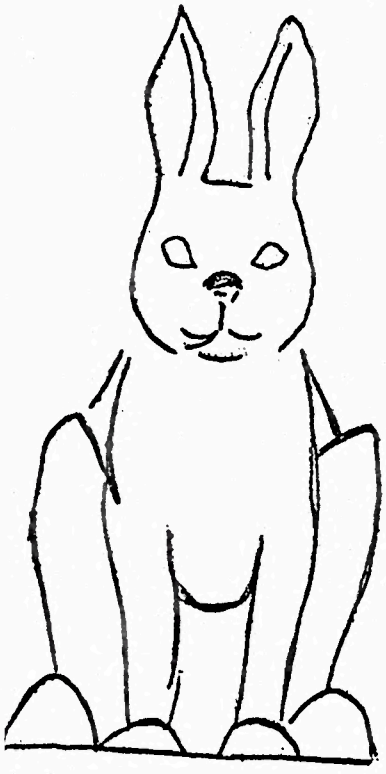


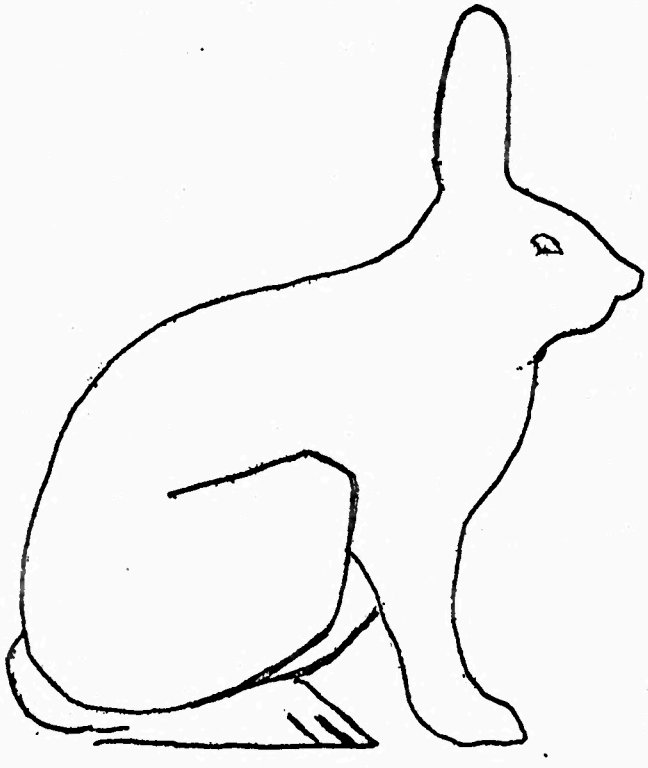
Material: 2" Pine, Basswood



LEMMING

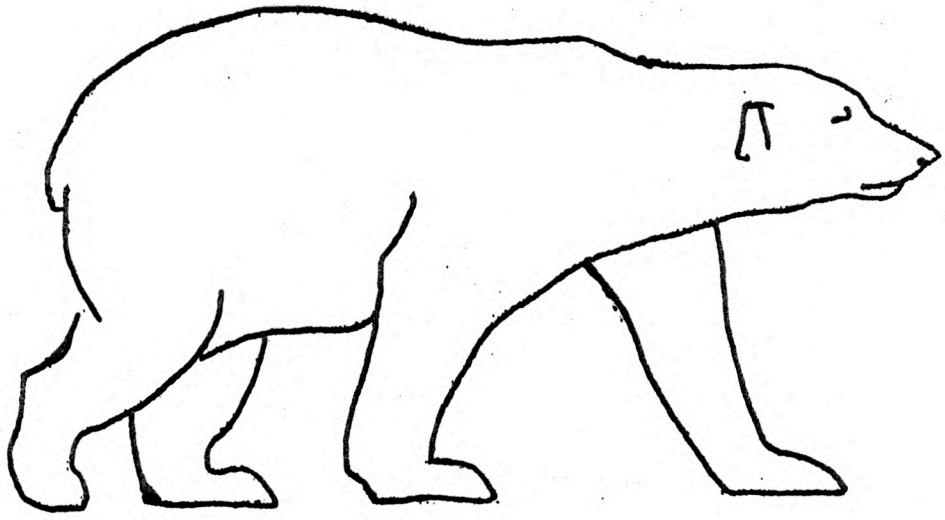


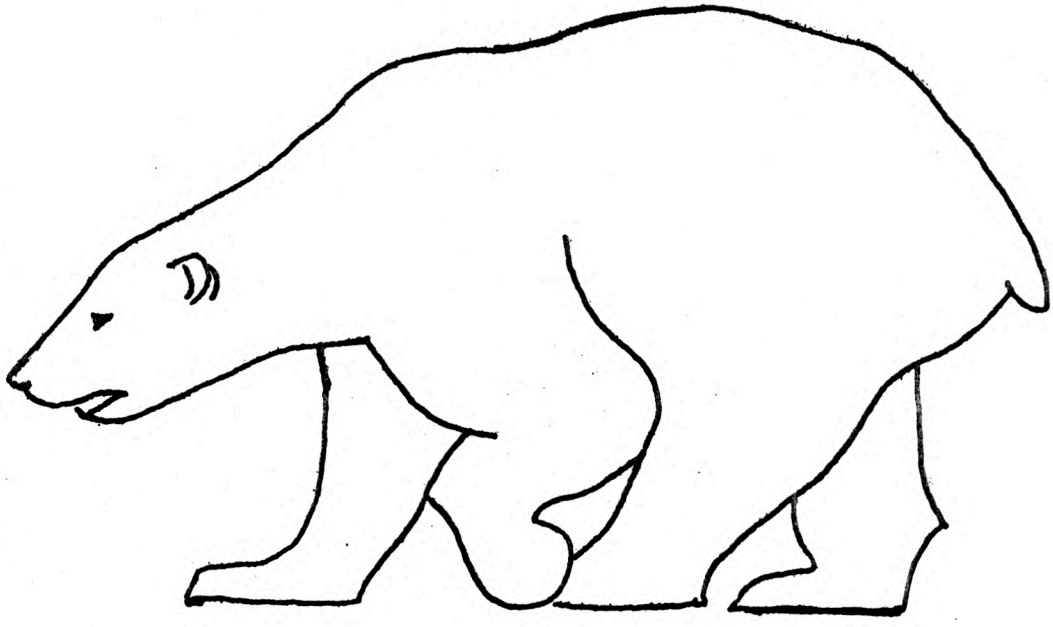




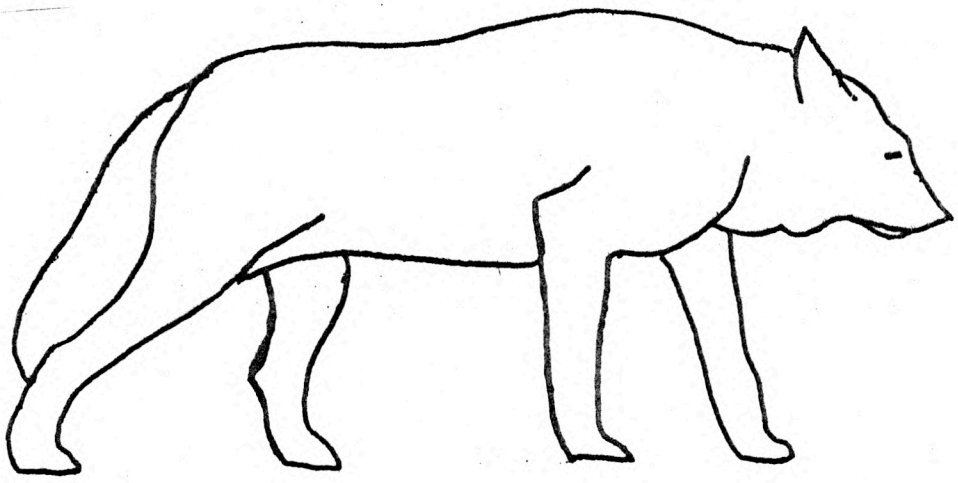
ARCTIC HARE

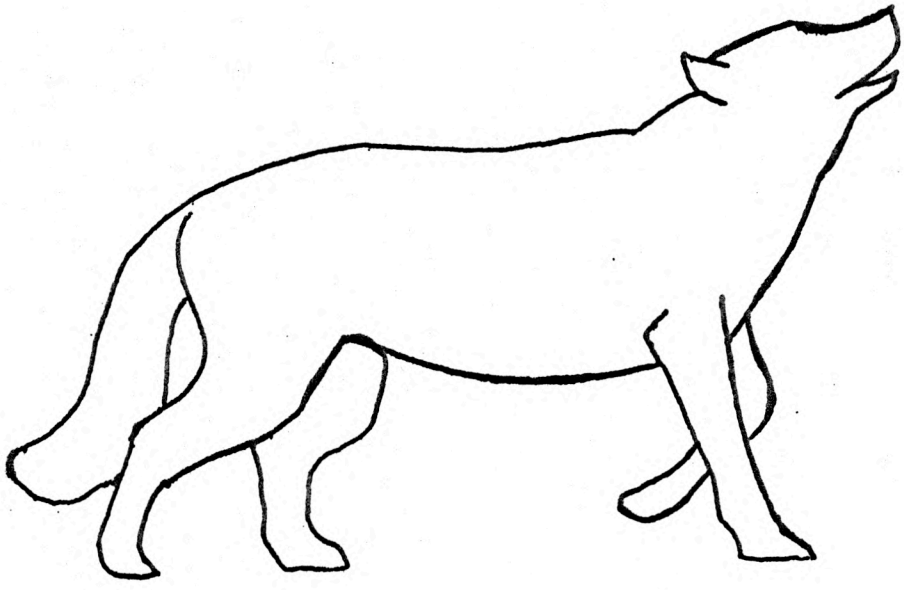
POLAR BEAR

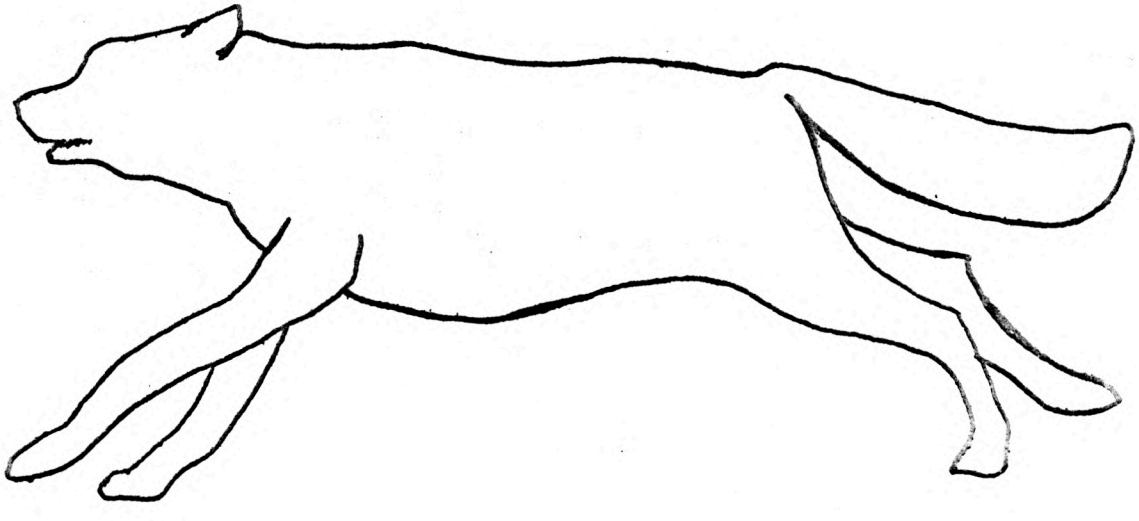




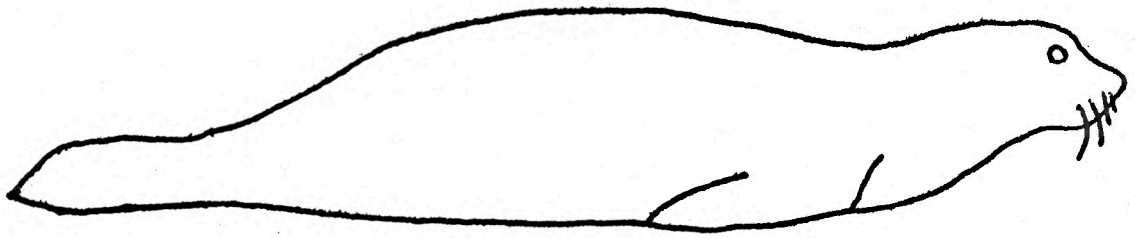
WOLVES

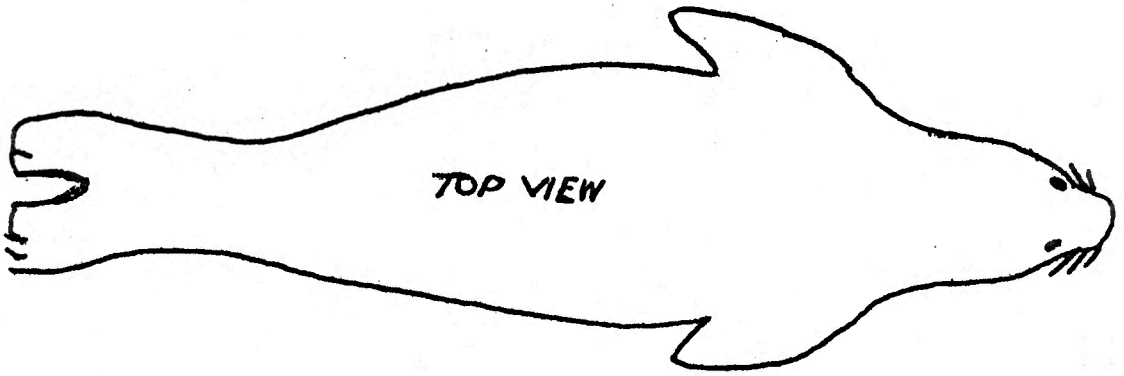


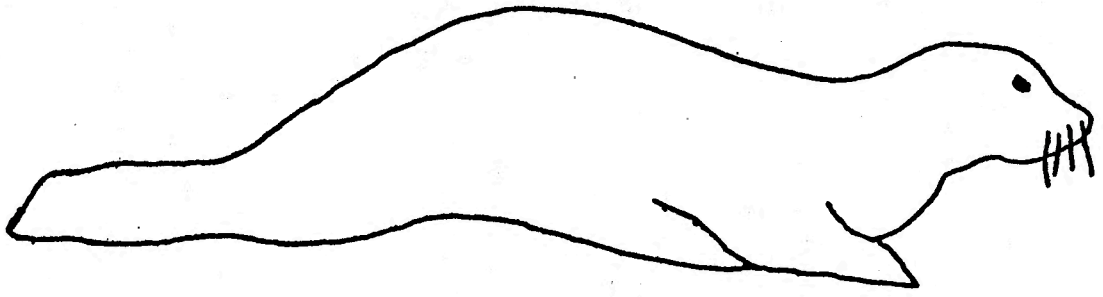




SEALS







Metalwork

Wherever tools, materials and an instructor are available, a course in the correct handling of tools for metalworking can be of great value to pupils in any locality. The variety of projects possible is limited only by the physical facilities and the ingenuity, skill and initiative of the teacher and the resource people in the community.

Equipment and supplies should be requisitioned as for other programs. Tin cans ranging from soup tins to fruit juice tins may be useful until other material is available.

Course Outline

Sheet Metal Work

1. Planning and layout
   - Use of rule, square and templates
   - Use of tinsnips
2. Folding
   - Use of folding equipment and hardwood blocks
3. Soldering
   - Use of propane torch
   - Use of soldering irons
   - Using soft solder in bar and core form

4. Flux

5. Punching and drilling metal

6. Riveting

7. Painting

    Preparation

    Application

Bench Metalwork

1. Layout

    Use of rule, square, scriber, center punch, calipers

2. Use of hacksaw

3. Use of file

    Selection and care of files

4. Drilling holes

    Locating, hand drilling, machine drilling

5. Riveting

6. Forming

    Use of jigs in cold and hot bending

Welding

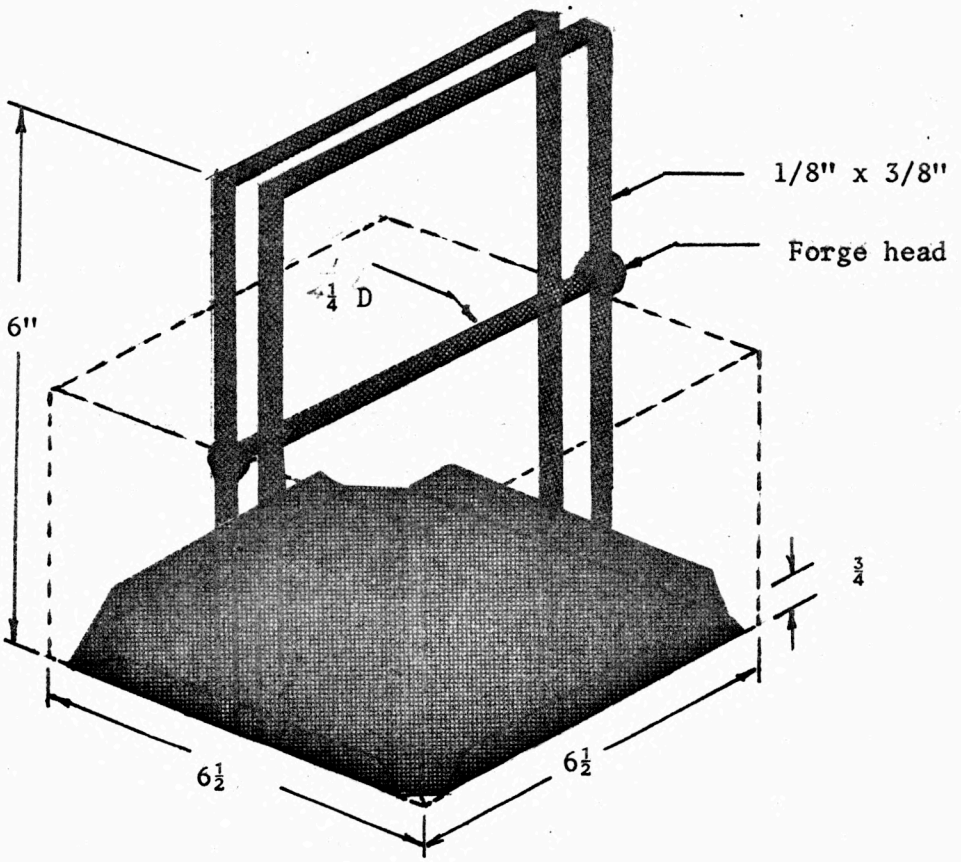
See welding section.

Project Suggestions

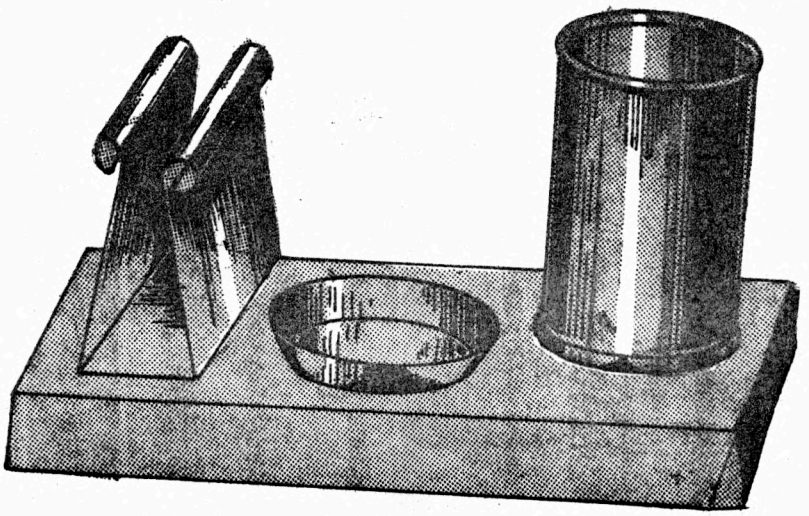
Fish lure, shelf bracket, gaff, small boxes, cookie sheet.

See additional suggestions.

SERVIETTE TRAY



DESK CADDY

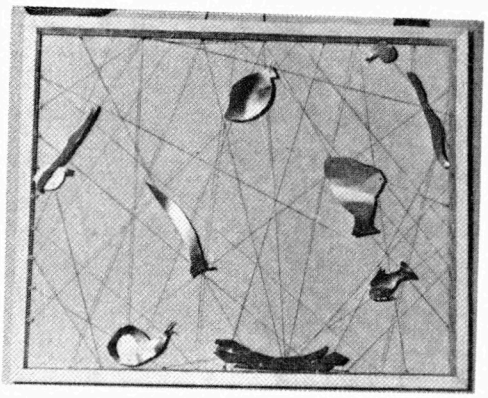


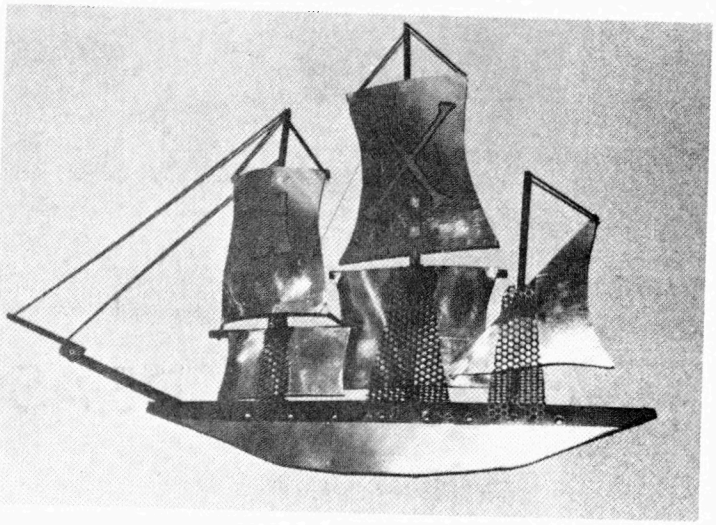
Bill of Materials

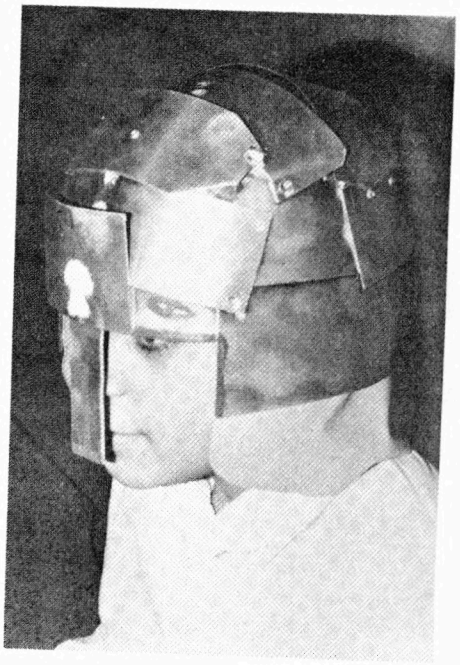
Quan.	Part	Material	Size
1	Base	28-ga. Galvanized steel, steel, or .0149 aluminum	10½" x 6-5/16"
1	Pencil tube	28-ga. Galvanized steel, steel, or .0149 aluminum	4" x 7-11/16"
1	Letter holder	28-ga. Galvanized steel, steel, or .0149 aluminum	10½" x 3½"
1	Paper clip dish	.040 Deadsoft aluminum	3¼" x 3¼"
3	Pop rivets		1/8"

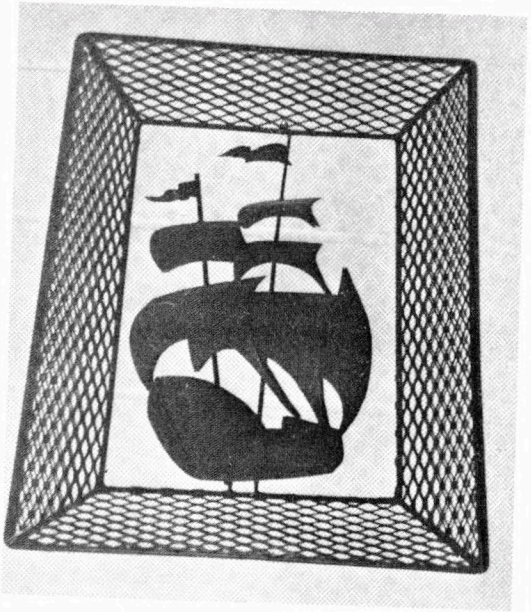
PROJECT IDEAS

DEPARTMENT EDITOR
HARVEY ELLER

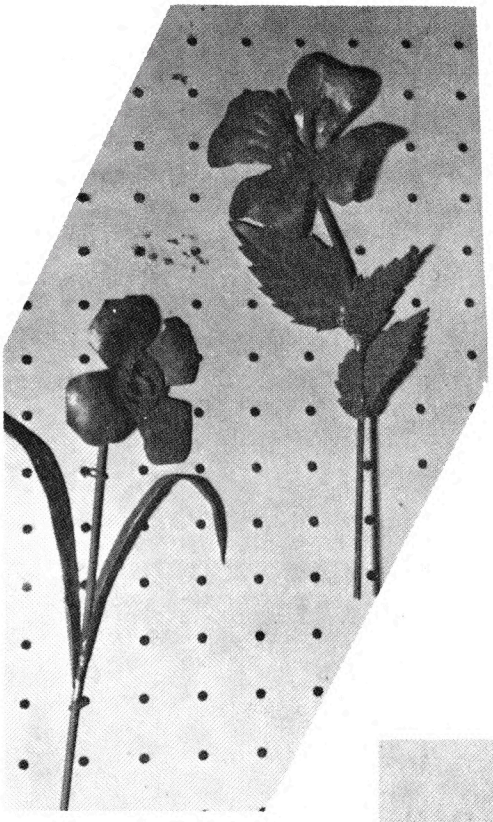


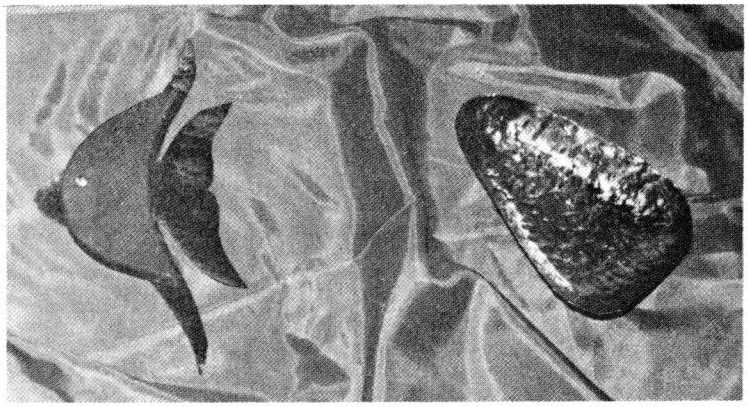




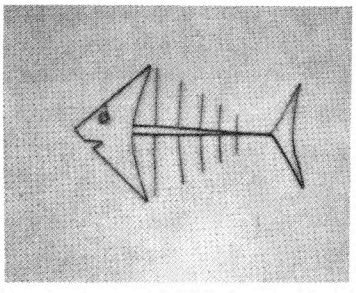


Dimensions and Construction to be solved by the student.

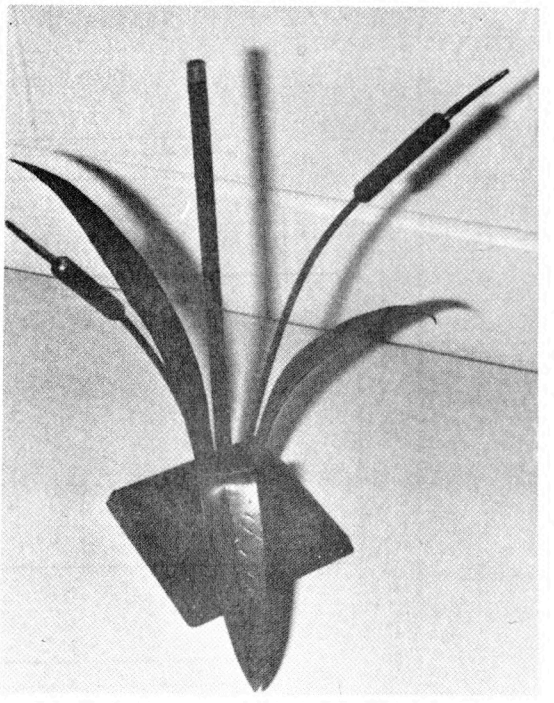


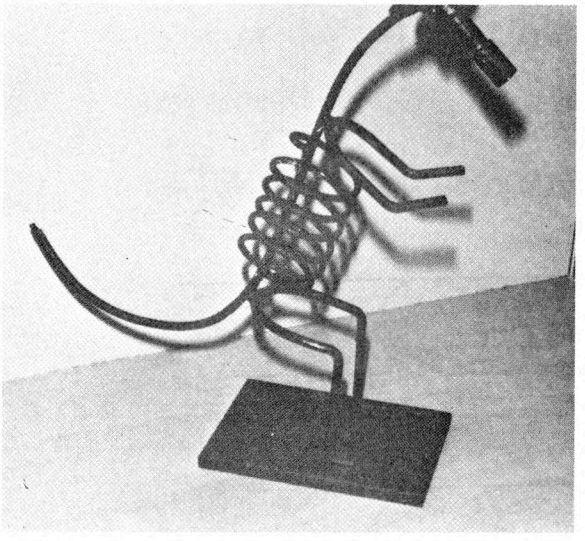


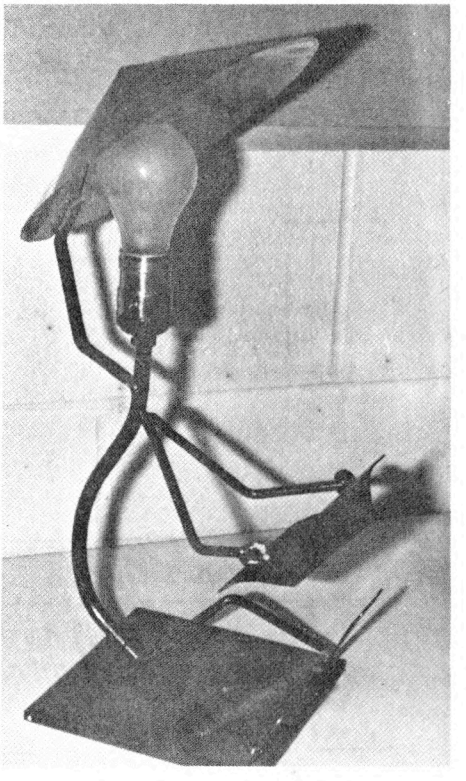
PROJECT IDEAS



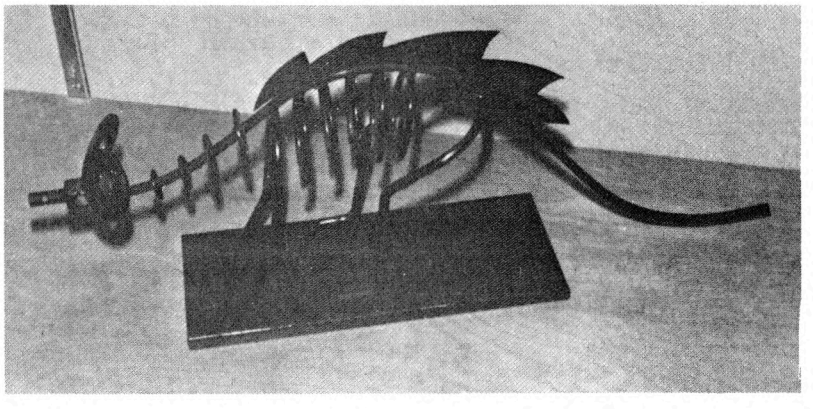
PROJECT IDEAS



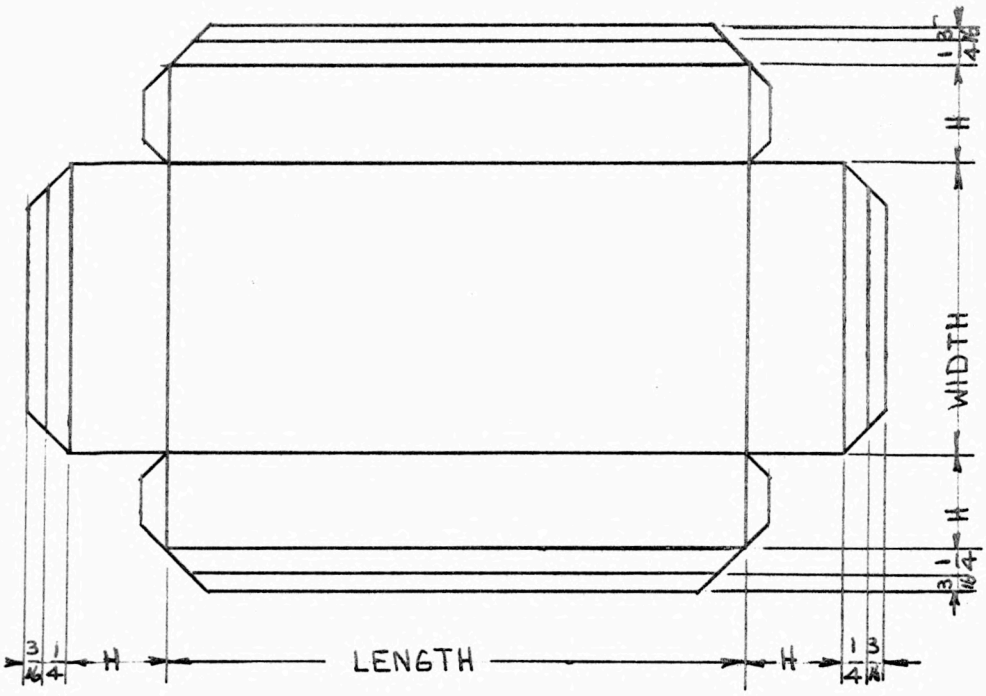




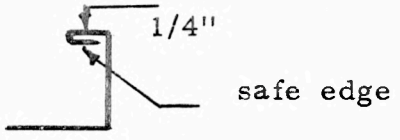
Dimensions and Construction to be solved by the student.

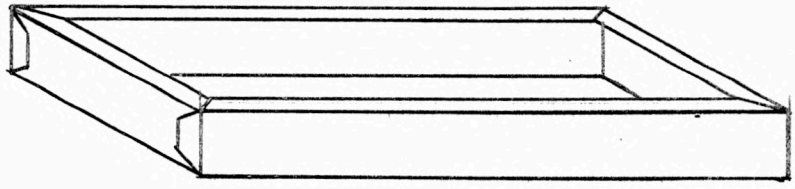


BOX WITH LID

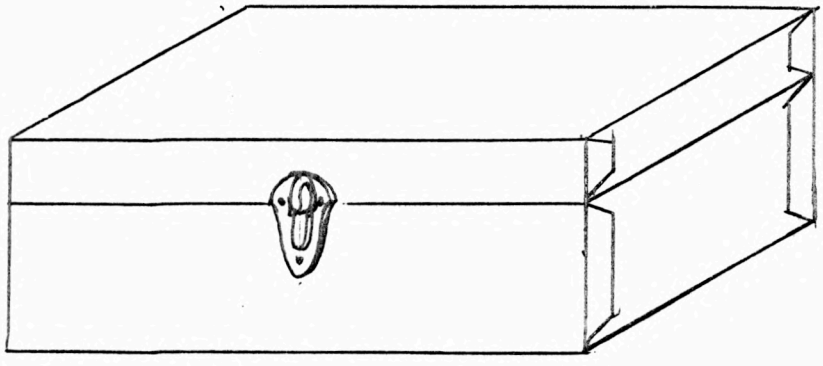


Add to the basic box dimensions 3/8. Bend your material so that your 1/4" is standing at right angles to the sides. e.g.





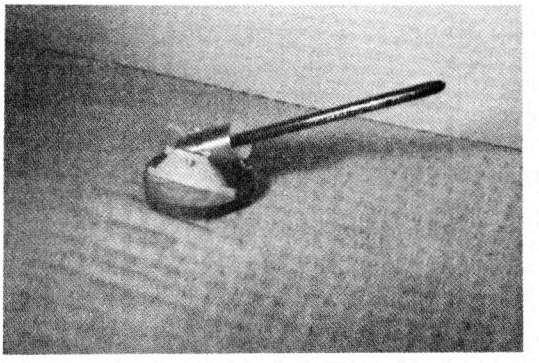
Make 2 pieces the same or of different height.

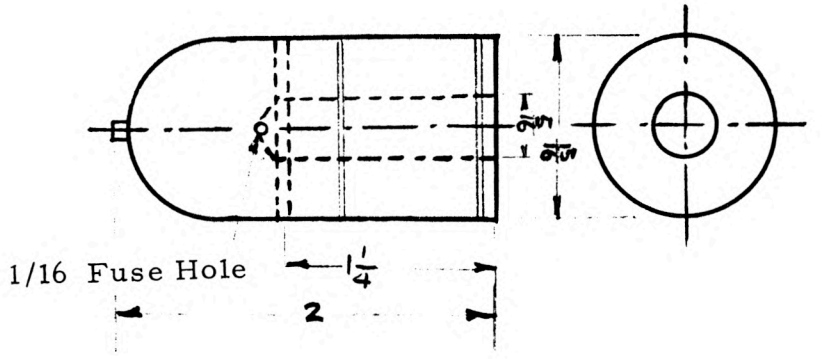


Add a handle of your choosing.

Use butt hinges and rivets as well as suitcase hinges

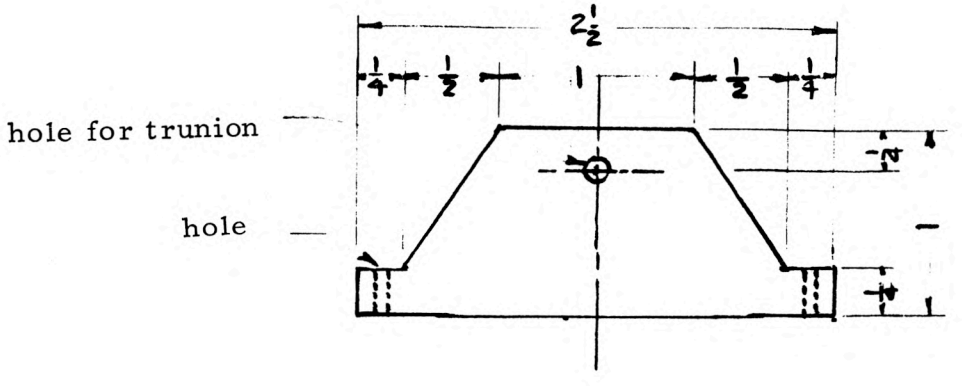
MORTAR CANNON PEN HOLDER





BARREL

1" aluminum rod



MOUNTS

Base Optional

Dark Wood 3"x3"

2 required Made from aluminum 1/8"xl" wide

WELDING

Introduction

Welding is an extremely useful skill. It has great application with repair of equipment and is a good source of income in all parts of Canada. Welding is a skill which can be taught on several levels, from that of the *"jobber"* to that of the highly skilled technologist. The level attempted under the auspices of any school should depend upon the availability of space and equipment and a suitable skilled instructor. Where the teacher is not skilled in this particular skill, every attempt should be made to utilize other resource persons of the community to give the pupils instruction.

Safety

Particular care must be taken in this field to ensure the safety of the pupils. Safety goggles and other equipment must be worn at all times. It is also imperative that adequate fire precautions be maintained.

Many excellent publications on safety are available from manufacturers of welding equipment and from the Department of Labour.

Equipment

Necessary equipment and a suitable building should be available before this course is offered. However, additional supplies (for example, welding rods, metal, safety equipment) should be requisitioned in the usual way and will be processed by the Superintendent.

WELDING

Welding is a method of joining metals by heating to a suitable temperature to cause them to melt and fuse together. This may be done with or without the application of pressure and with or without the use of filler material of a similar composition and melting point.

Gas Welding

Gas welding makes use of burning gases such as acetylene or hydrogen mixed with oxygen to produce heat as required to cause the metal to melt and flow together.

Acetylene and oxygen mixed in the proper proportions burn with an extremely hot flame and produce little carbon are the most common gases used in shops.

Equipment

Oxyacetylene welding equipment consists of:

1. A supply of the two gases (gas cylinders).
2. A device for reducing the pressure and controlling the gases as they come from the cylinders (oxygen regulator, and acetylene regulator).
3. A method to transfer the gases from the cylinders to the point of use (oxygen hose and acetylene hose, for easy identification; the oxygen hose is green and the acetylene hose is red).

4. A device to mix and control the gases in proper proportion for welding (welding torch).
5. Goggles must be worn to protect the eyes from flying sparks and metal particles when welding heating or observing. Goggles protect the eyes from heat which dries the surface of the eyes. They also increase confidence because the student is not tense and afraid to get close to the work. Lenses are available in different shades, light, medium and dark.

Torch tips are manufactured in a wide range of tip sizes. For general use 0, 1 and 2 will take care of most welding jobs. It is impossible to attach hoses incorrectly to the regulators or torches since oxygen connections have right hand threads and acetylene connections have left hand threads. Also, acetylene nuts on hoses and regulators are identified by a machine groove on the outside surface of the nuts.

Other items are a welding table with a top covered with fire brick, a spark lighter to light the torch, an apparatus wrench to fit the various connections on regulators, cylinders and torches, and asbestos gloves.

Safety

In welding, never guess, experiment or assume anything. Make certain you know how to operate the equipment before starting. The following are some safety rules:

1. Never use oil or grease on or around a welding outfit. Grease or oil can cause a fire when it comes in contact with oxygen.

2. Always use a spark lighter to light the torch, but never matches.
3. Never attempt to light the torch with both valves open.
4. Always wear goggles when welding.
5. Never allow anyone to watch while you are welding without goggles.
6. Always hang the torches in the correct place. Never lay them on the welding table.
7. Always turn off the torch when you have completed your weld.
8. Test any connections with soapsuds for leaks.

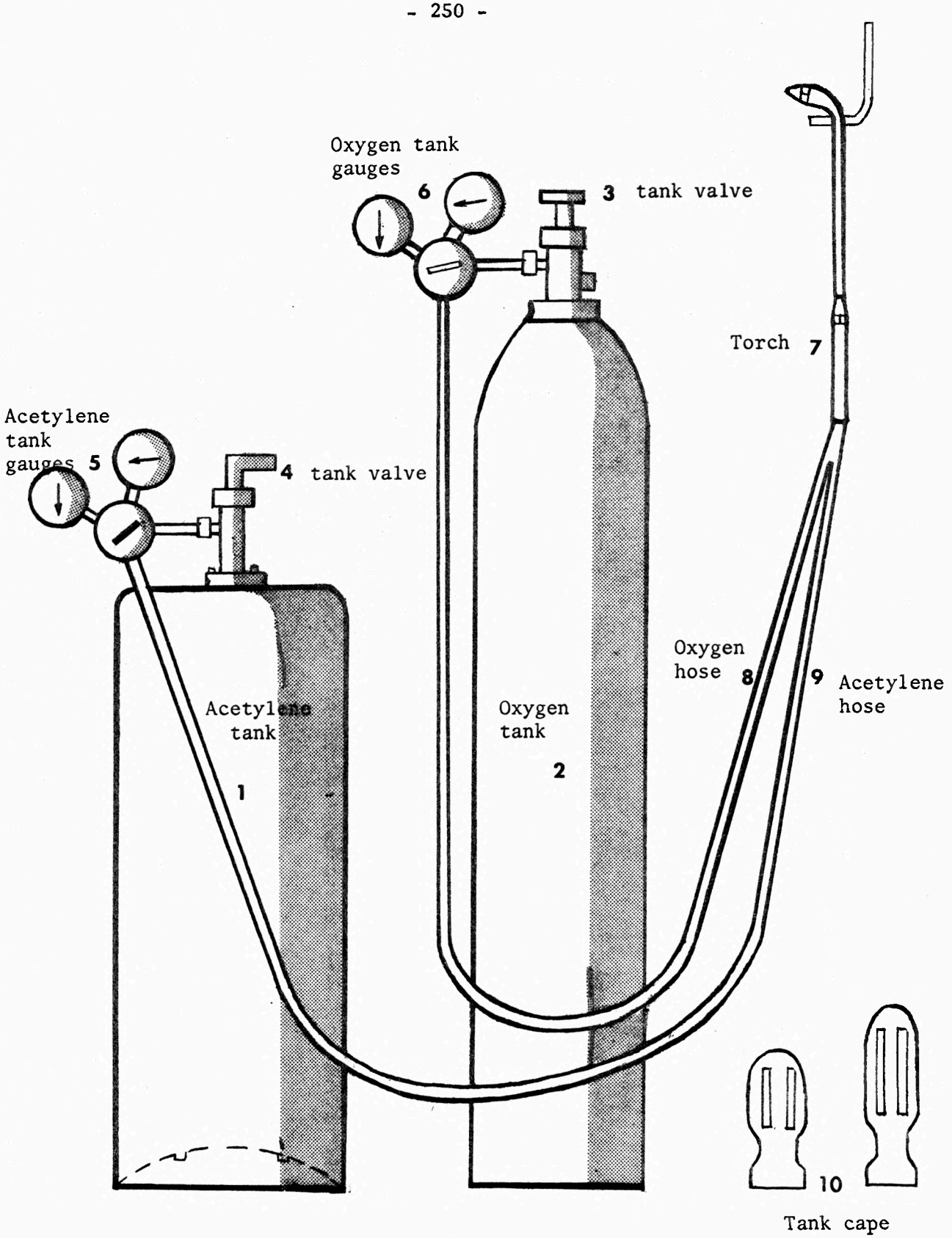
Welding Rods and Fluxes

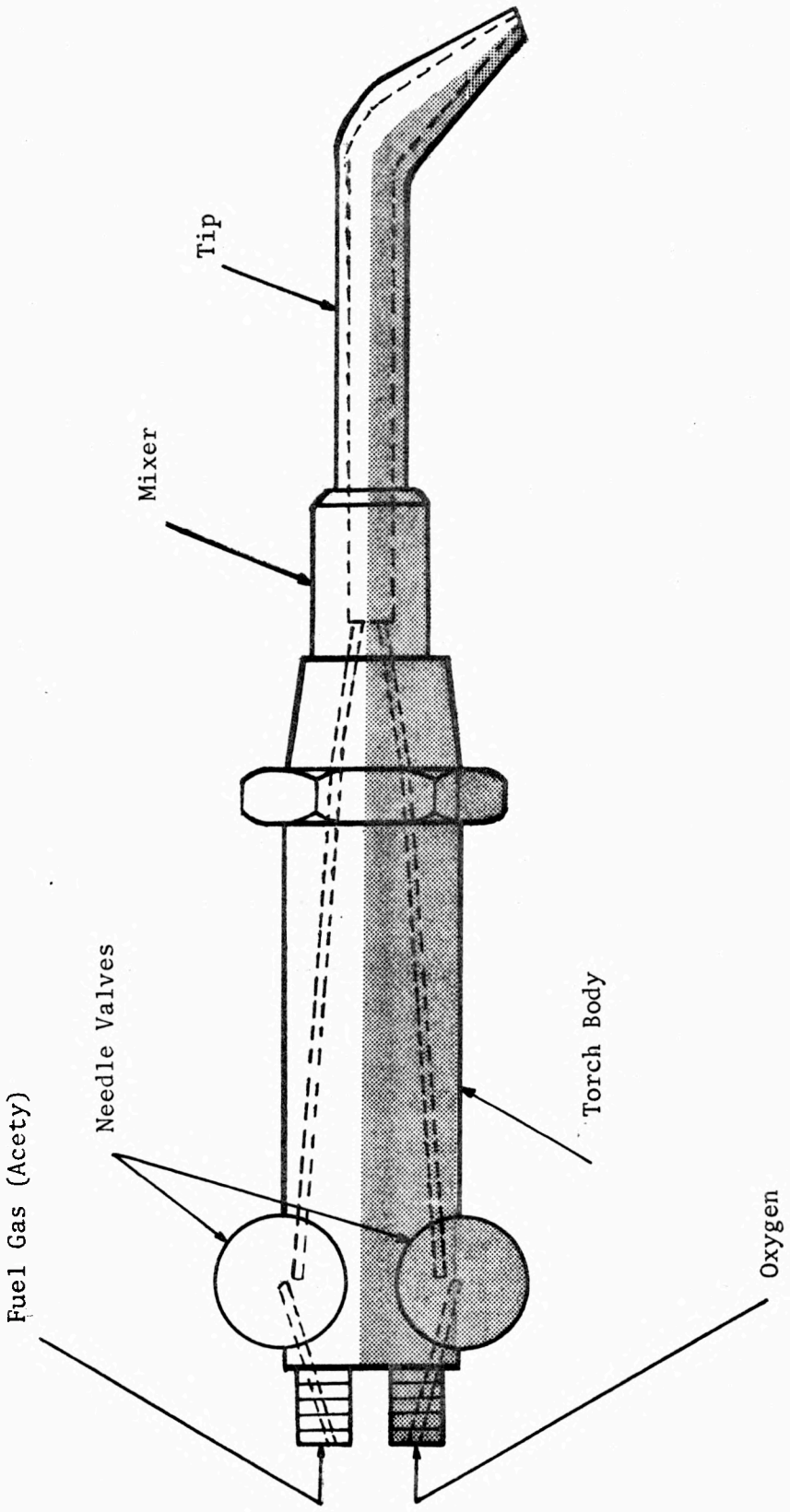
As a beginner you will likely use two types of rods:

1. A mild-steel welding rod that is usually coated with copper to prevent rusting. It is customary to use a small rod for thin material and a larger rod for thick material.
2. Brazing rod or bronze rod, is used for bronze welding or brazing. It is a yellow gold in colour and may be purchased with a coating of flux. Flux is needed in brazing. Borax is good but a brazing compound is better making the weld flow more easily and keeping an oxide from forming.

Recommended Rod Sizes

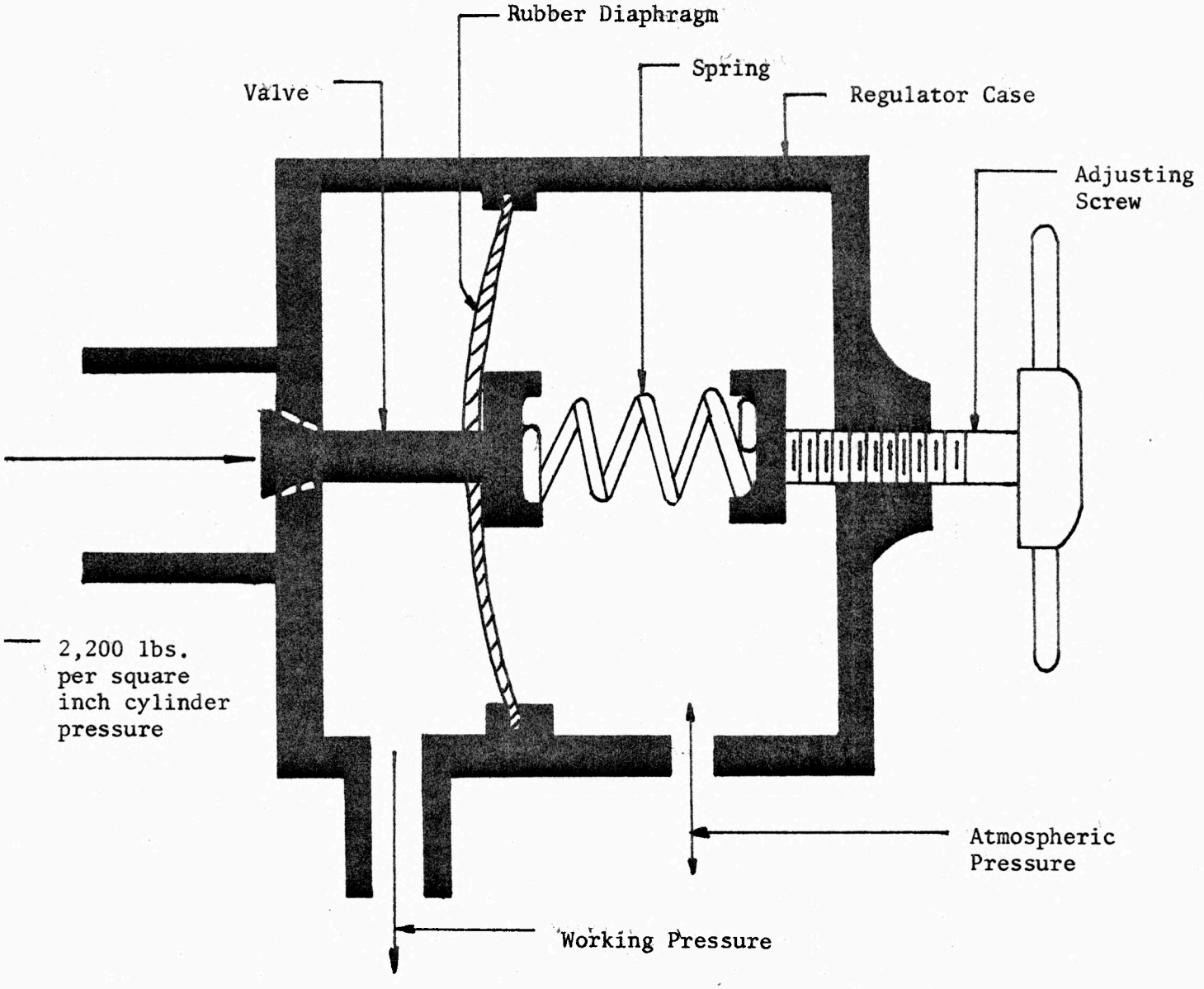
16 gauge	1/16" diameter rod
18 to 16 gauge	1/16" to 3/32" rod
16 to 10 gauge	3/32" to 1/8" rod
10 gauge to 3/16 gauge	1/8" to 5/32" rod
1/4" or heavier	3/16" to 1/4" rod


Oxygen tank gauges
6
3 tank valve
Torch 7
Acetylene tank gauges 5
4 tank valve
Oxygen hose 8
9 Acetylene hose
Acetylene tank
1
Oxygen tank
2
10
Tank cape



Basic Elements of a Gas Torch

OXYGEN AND ACETYLENE REGULATORS



Oxygen and Acetylene Regulators

The primary purpose of oxygen and acetylene regulators is to reduce the high cylinder pressures, safely and efficiently, to useable working pressures and to maintain these pressures within very close limits under varying conditions of demand.

The diagram will help to show the relatively simple operation of the regulator.

Essentially the pressure in the hoses is controlled by applying pressure to the spring through the adjusting screw. The spring in turn applies pressure to the flexible diaphgram which is connected to the high pressure valve. When the pressure from the adjusting screw is greater than that within the tank the valve opens allowing the gas to escape through the valve to the torch.

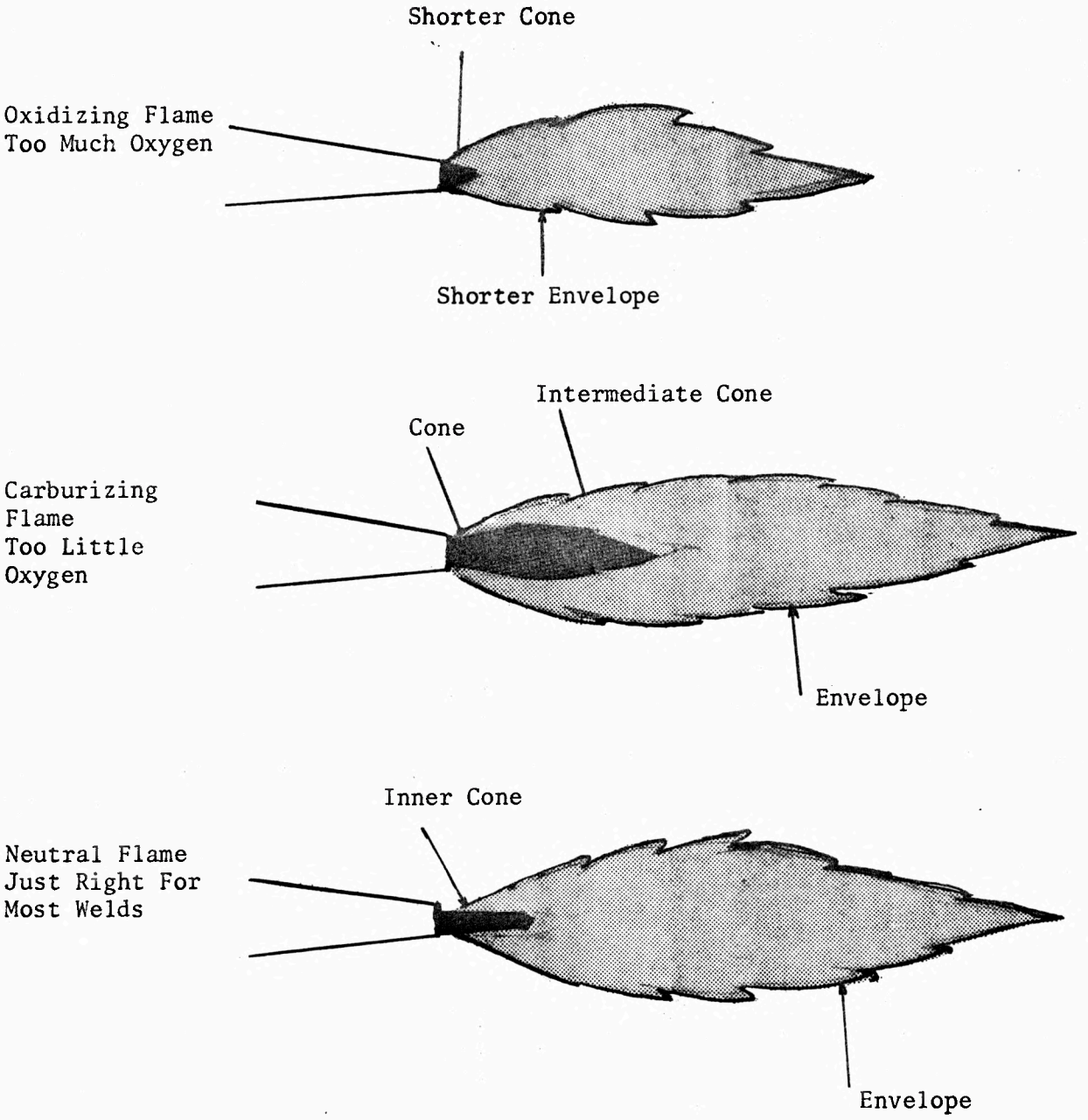
The valve closes when the pressure is released from the valve.

Procedure for Setting Up

1. Chain cylinders together to a cart, post or wall.
2. Remove cylinder caps and store.
3. Remove, dirt, oil or grease from cylinder threads using a clean dry cloth.
4. Standing to one side open each cylinder valve for a second or two, then close. This blows foreign material out of valve.
5. Attach regulator to cylinder valve with wrench.
6. Turn adjusting screw counter-clockwise to *"Out"* position.
7. Standing to one side of gauges slowly open oxygen cylinder valve to wide open position. Then open acetylene valve $1\frac{1}{2}$ turns.
8. Purge regulators for a few seconds, then close.
9. Attach welding hose to regulators.
10. Attach torch body to welding hose.
11. Set regulator pressures on oxygen and acetylene gas regulators according to data charts. Check hose connection fittings and regulator inlets for leaks.
12. Purge lines.
13. Insert welding tip into body and tighten with wrench.

How to Light and Adjust to Neutral Flame

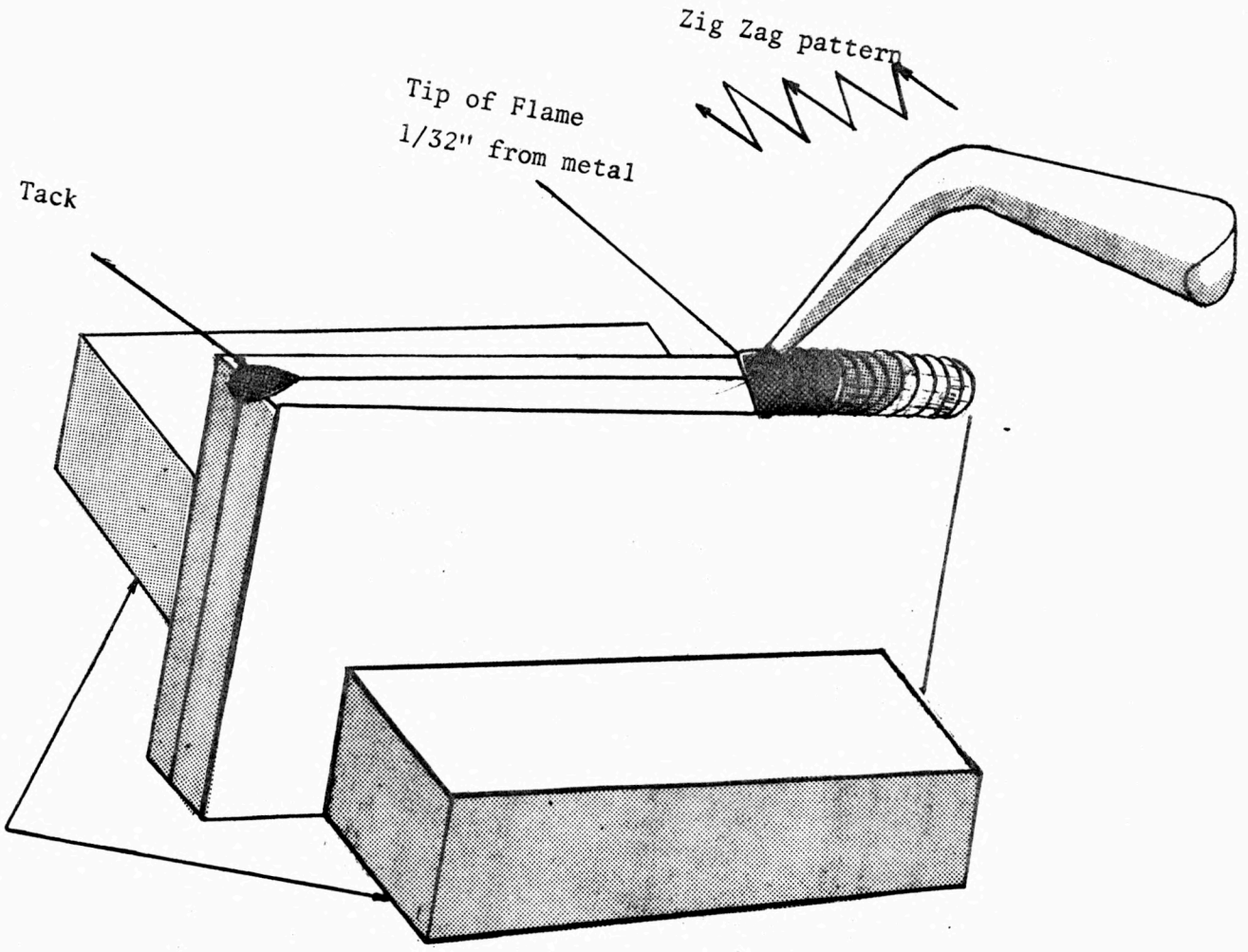
1. Place goggles over forehead.
2. Open oxygen cylinder valve completely.
3. Open acetylene cylinder valve $1\frac{1}{2}$ turns.


Shorter Cone
Oxidizing Flame
Too Much Oxygen
Shorter Envelope
Intermediate Cone
Cone
Carburizing
Flame
Too Little
Oxygen
Envelope
Inner Cone
Neutral Flame
Just Right For
Most Welds
Envelope

4. Turn regulator handle on oxygen and acetylene until pressure is 1 lb. more than the tip number.
5. Open acetylene valve on torch ¼ turn and light torch. Adjust valve until flame is on the tip. If too little a black smoke will flow in the air.
6. Pull goggles over eyes.
7. Open oxygen valve on torch to neutralize the flame. (The intermediate cone becomes even with the innter cone.)

To Close Down Equipment

1. Shut off the acetylene torch valve.
2. Shut off the oxygen torch valve.
3. Close the acetylene tank valve.
4. Close the oxygen tank valve.
5. Loosen the pressure regulators.
6. Bleed oxygen and acetylene lines by opening oxygen and acetylene torch valves.
7. Close torch valves.
8. Remove and clean tip.


Zig Zag pattern
Tip of Flame
1/32" from metal
Tack
Fire Brick

Making Practice Welds

1. An Edge Weld Without Rod.

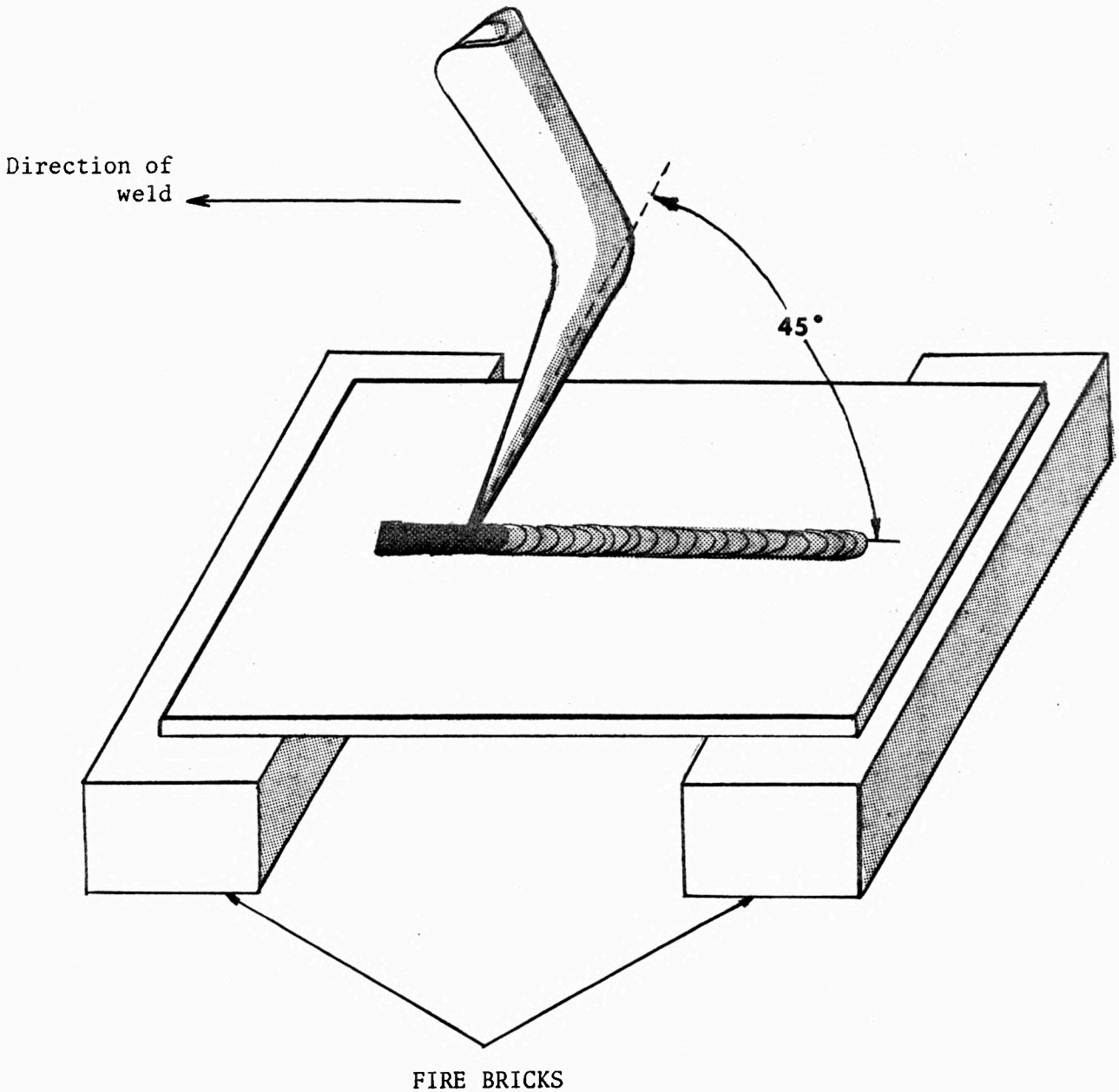
   (a) Use 2 pieces of 1/16" or 16 gauge scrap sheet steel about 1" wide and 3 to 4 inches long.

   (b) Place the two pieces together and hold upright with bricks.

   (c) Light and adjust torch covering your eyes with goggles.

   (d) Hold the torch in your right hand with the inner cone about 1/32" from the metal. Zigzag it back and forth to tack the pieces of metal at one end.

   (e) Now start at the other end, working along the edge with a zigzag torch movement and holding the torch at a slight angle with the tip aiming towards the left. If you burn through the metal change to a smaller tip, change angle, move the torch more readily or cut down on flame by adjusting both acetylene and oxygen.


Direction of
weld
45°
FIRE BRICKS

(f) Move the flame from one section of metal to the next, forming a puddle. Move the torch along from one side to the other as you move along. Practice until you can join two pieces together with a weld that has smooth, uniform ripples.

2. Running a Bead Without a Filler

(a) Select a piece of metal 1/8" x 2" x 4" and place on fire-brick.

(b) Use a tip #1 and adjust to a neutral flame.

(c) Hold the tip at an angle of about 45^{o} to the metal with the tip of inner cone about 1/32" to 1/16" away from surface.

(d) Form a puddle, and then move the torch slowly forward in a weaving or semicircular motion.

(e) Make certain that the forward motion and weaving motion are even to make the bead smooth and regular. If the torch is held too long in one place a hole will be burned through the material. If the torch is held too close to the metal the flame may go out or a backfire will take place.

3. Making a Butt Weld Without Rod

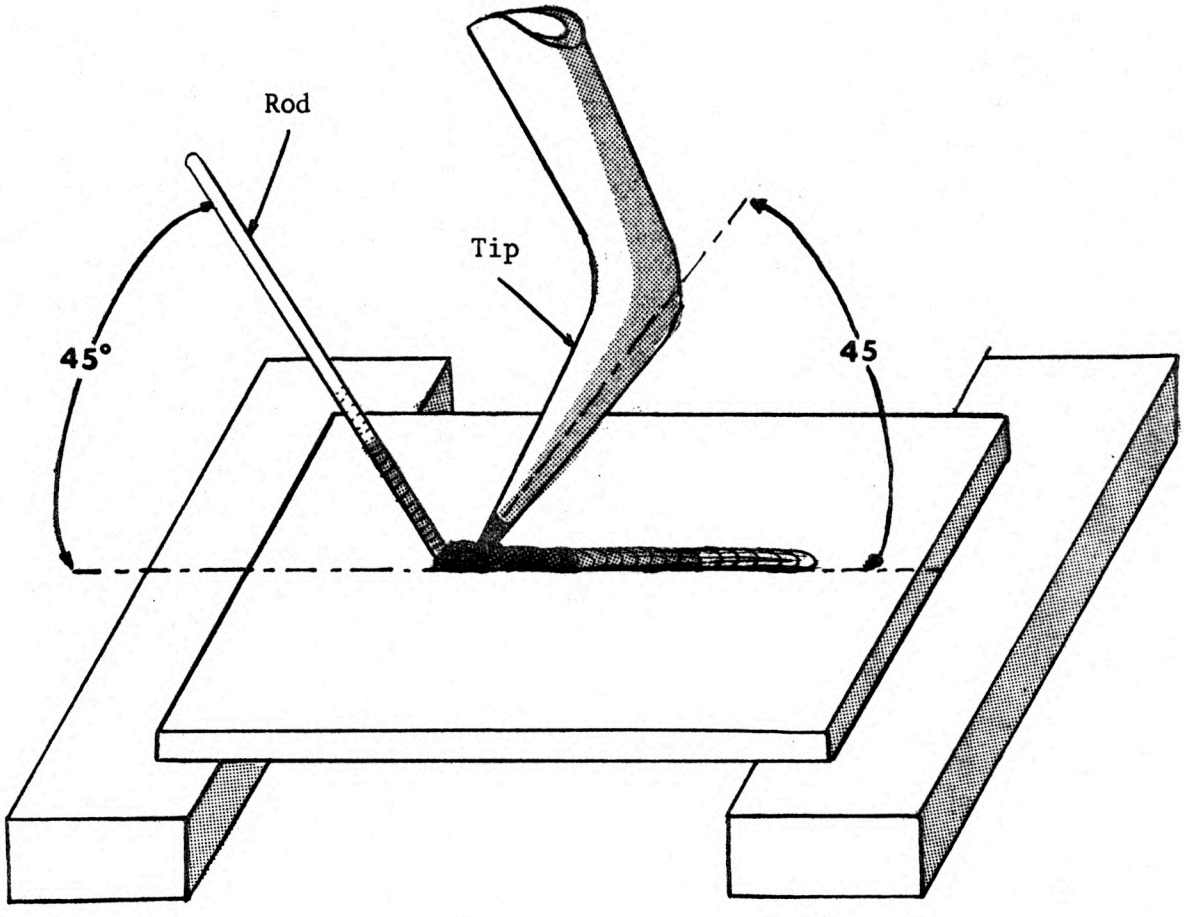
(a) Cut two pieces of scrap steel 1/16" x 1" x 5".

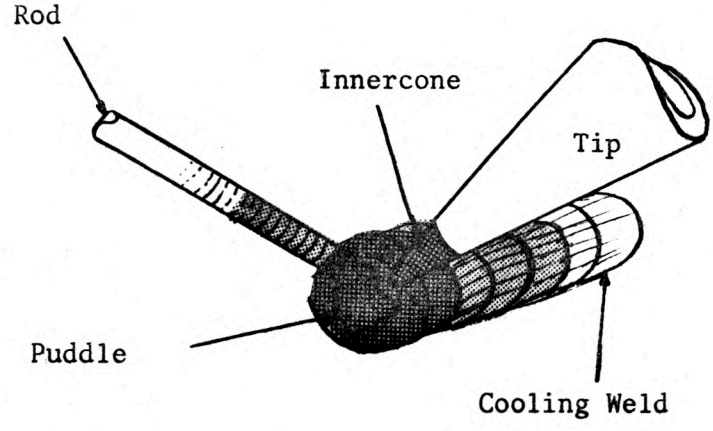
(b) Turn 1/16" flange on edge of each piece.

(c) Place the pieces with the flange edges facing up about 1/32" apart on welding table.

(d) Tack left end.

(e) Starting at other end melt flange to form a bead keeping the molten puddle of metal running to form an even smooth bead.


Rod
Tip
45°
45


Rod
Innercone
Tip
Puddle
Cooling Weld

4. Running a Bead with added Filler

   (a) Choose a piece of scrap stock about 1/8" by 2" x 4".

   (b) Select an 1/8" mild-steel welding rod.

   (c) Start forming a puddle and continue heating in one place to form a pool without putting a hole in the metal. Use a semicircular or weaving motion.

   (d) When puddle is formed add the welding rod to the middle of it. The rod should add about 25% more material. Keep the rod in the puddle, and direct the flame on the metal and not the rod.

   (e) Continue to form bead the length of the material.

5. Making a Butt Weld

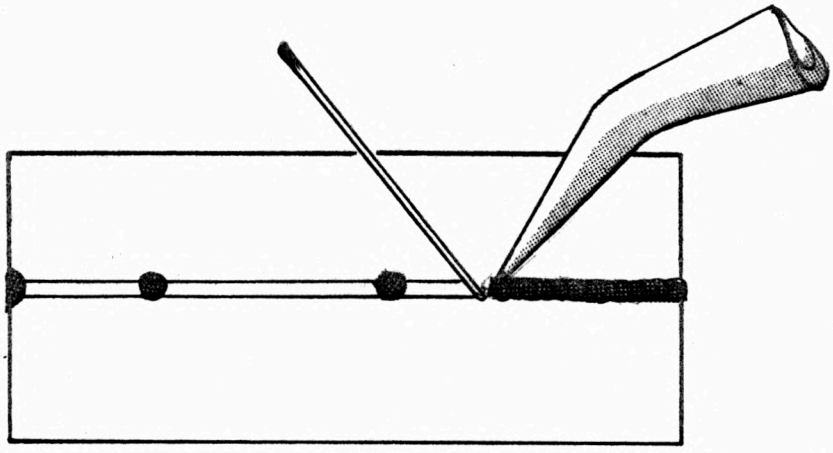
   (a) Use 2 pieces of material 1/8" x 2" x 4" and place them on bricks 1/16" apart at one end and 1/8" at the other.

   (b) Tack the two ends together.

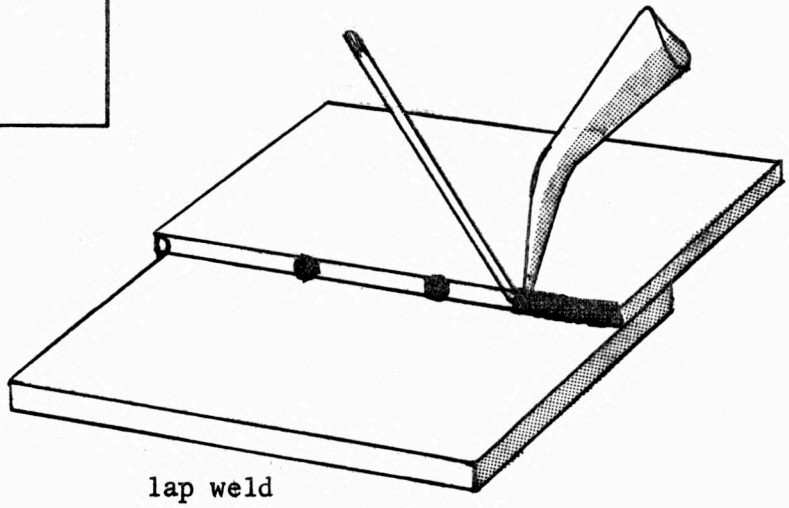
   (c) Select 1/8" mild steel welding rod.

   (d) Begin at the narrow end and form a puddle to build up the weld about 25%.

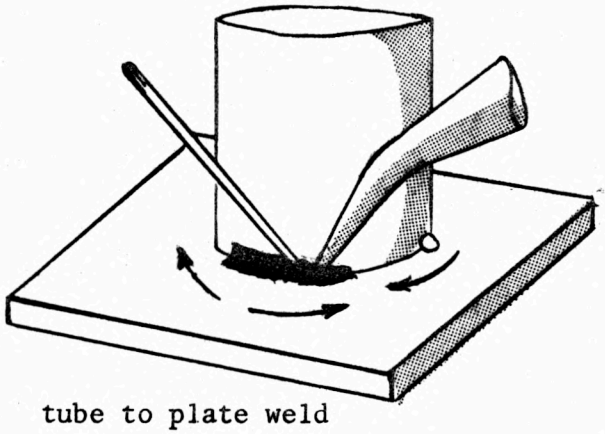
   (e) Weave the torch back and forth moving the rod with the opposite movement.



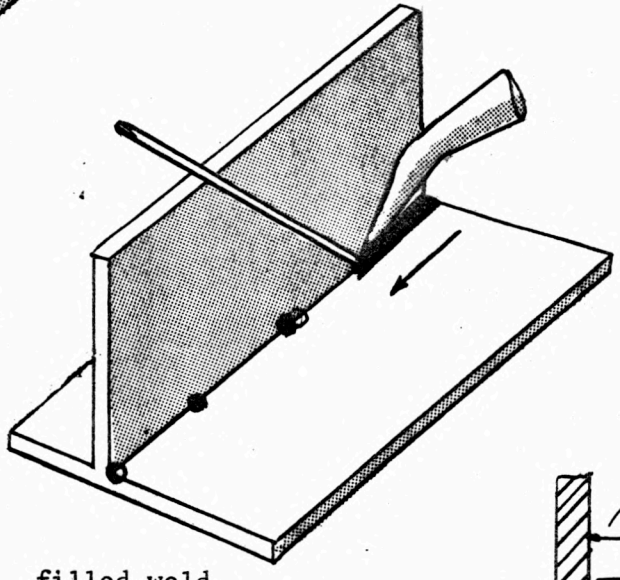
butt weld



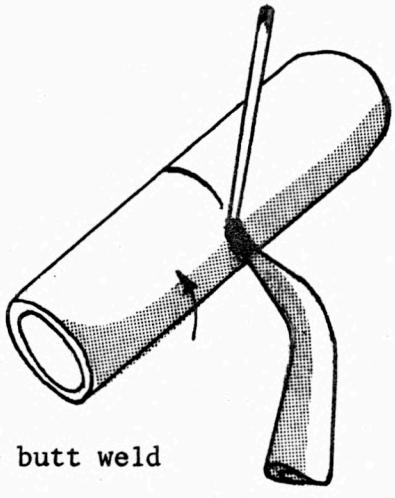
lap weld



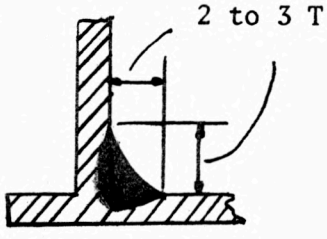
tube to plate weld



filled weld



tube butt weld



Enlarged section of weld.

Brazing or Bronze Welding

Brazing or bronze welding is used to make joints almost as strong as welded joints, without actually melting the metal. Bronze welding rod coated with flux may be used or if used without the coating a commercial flux is needed.

1. Clean the oxide from the parts to be joined by grinding, filing or using emery cloth.
2. Place the pieces to be joined on the welding table. Hold in position by clamps, wires, etc.
3. Preheat the two parts evenly. If one piece is larger than the other apply additional heat to it.
4. Heat the metal at the point where the braze weld is to start. Play the torch over this part in a circular motion.
5. When the metal is at red heat - heat the rod slightly and stick it into the flux. The flux cleans the oxide from the brazing area and dissolves the oxides formed.
6. Hold the end of the flux rod just ahead of the torch. Then apply more heat to the metal until the flux and rod start to flow.

Remember: (1) Never melt the rod directly.

(2) Avoid overheating the metal. The finished joint should be bright and clean.

Aluminum Welding

The welding of aluminum and aluminum alloys, which are classified as non-ferrons metal, presents certain considerations of design and technique which are considerably different in some aspects from those of steel and other ferrous metals. One will find, however, that after a little practice, the oxy-acetylene welding of aluminum is relatively simple.

Welding Properties of Aluminum

Aluminum has three properties which the student must bear in mind as he begins practice on this metal: Aluminum does not give warning by a noticeable change in colour that it is approaching the welding heat, as steel does, but it appears to collapse suddenly upon reaching the melting point. Aluminum and many of its alloys are weak when hot, or in other words are *"hot short"*. This means that during the welding of aluminum parts all areas which have their temperature raised appreciately should be adequately supported. In this connection it is well to remember that the thermal or heat conductivity of aluminum is high, so that when heat is applied to the edges to be welded, it spreads rapidly through the mass of metal.

The corrosion resistance of aluminum is derived from an oxide of aluminum which forms rapidly on all exposed surfaces. In order to make a sound weld, this oxide has a higher melting point than the base metal, a suitable flux that combines chemically with the aluminum oxide to form a fusible slag is used. This slag then rises to the surface of the puddle during the welding action and may be readily removed.

Types of Aluminum Alloys

Only 25" and 35" will be used in this insert. The commercially pure, wrought aluminum (25) is specified as containing a minimum of 99 per cent aluminum. This 25 aluminum is available in practically all forms used in the metal industry, possesses high resistance to corrosion, and excellent workability.

The wrought aluminum alloy (Manganese), (35) containing about 1.2 per cent manganese and a minum of 97 per cent aluminum is somewhat stronger and consequently less workable than 25.

Joint Design for Aluminum Welds

Although the essential principles of joint design for aluminum are the same as those of welding steel, there are special considerations which make it worthwhile to present a discussion on the preparation of the edges for aluminum welding.

Butt-Type Joints: Aluminum sheet which is 16 gauge or thinner can be welded with a plain butt type weld. The only requirement for this type of joint design is that the edge be straight and square.

Flange-Type Joints: The flange type joint is also recommended for welding aluminum sheet which is 16 gauge or thinner. The flange height should be about the same height as the thickness or slightly higher.

Notched Built-Type Joints: This type of joint design possesses particular merit, especially for sheet aluminum for 15 to 5 gauge in thickness. The edges of the sheet are notched through their entire thickness to a depth of about 1/16 inch. The notches should be about 3/16 inch apart. The best way to make these notches is with a hammer and cold chisel.

Lap-Type Joints: The lap-type is not recommended.

Preparation for Welding

After the edges have been prepared in accordance with the joint design, there are a number of other steps which must be performed before actual welding starts.

Cleaning: Any grease, oil or dirt which may be on the surface to be welded must be removed. In addition, the oxide with which the aluminum becomes coated, must be removed before welding to insure a good weld.

Jigs: It is preferable to do all aluminum welding in jigs that will support the work adequately.

Use of Flux: In welding aluminum, the use of a specially prepared flux is necessary to remove the aluminum oxide which forms rapidly on molten weld metal. Aluminum flux (Oxweld Aluminum Flux) is sold as a powder and is best prepared for application by mixing with a specified amount of water to form a paste of free-flowing consistency. It is then applied to the welding rod by means of a brush. Do not mix in a steel container as it contaminates the flux, use glass or porcelain.

Selection of Welding Rod: Use commercially pure welding rod (Oxweld No. 14 or Oxweld No. 23). Oxweld No. 23 welds are somewhat darker in colour than 25 or 35 aluminum and should not be used where a colour match is desired.

Welding Practice on Sheet Aluminum

In adjusting the flame it is well to begin with an excessive acetylene feather ($1\frac{1}{2}$ X). This excess acetylene flame adjustment makes it absolutely certain that the flame does not become oxidizing at any time during the welding.

Place a small piece of aluminum sheet on the welding table, light and adjust the flame. With the tip help perpendicular bring the inner cone almost in contact with the surface. Observe that without warning the metal suddenly melts and runs leaving a hole in the metal. Repeat the same operation with the blowpipe held at an angle of about 30 degrees. A student will soon notice that the surface may be heated without melting a hole.

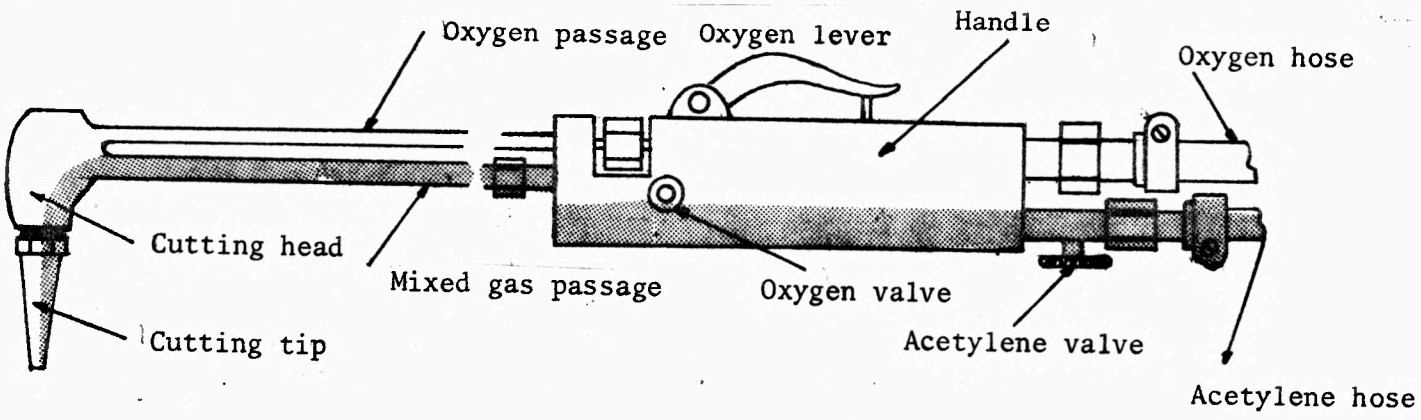
Cutting Steel and Cast Iron

Oxy-acetylene cutting is much faster than any other method of cutting metal. Depending on the size of the cutting blowpipe and nozzle, you can cut steel from 1/16" to 4' thick.

This operation is done by preheating a small area with an oxy-acetylene flame until it is bright red and then directing a jot of oxygen against the preheated area. A narrow slit or kerf is quickly burned through the steel.

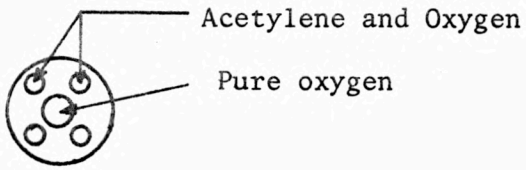
Oxygen does the cutting. It makes a liquid iron oxide as it joins with hot steel. This flows out or is blown away exposing more metal for the oxygen jet. By moving the blowpipe, you can guide the oxygen jet to cut straight, curved or irregular lines.

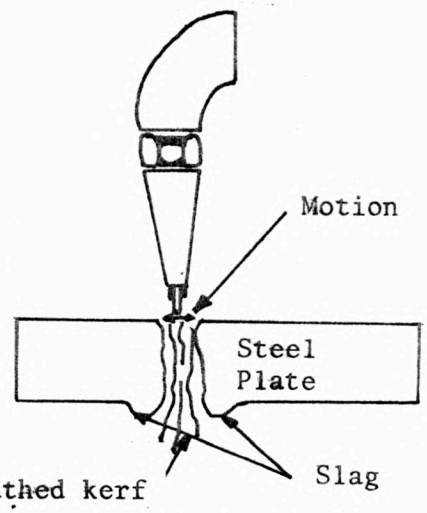
CUTTING TORCH



Set-up for Cutting

1. Remove welding head and connect cutting attachment. Tighten all connections with open-end wrench.
2. Open fully oxygen torch valve and make certain the preheated oxygen valve is closed.
3. Adjust acetylene regulator for the thickness of the metal.
4. Adjust oxygen regulator for 5 lb. pressure.
5. Place goggles on forehead.
6. Open acetylene torch valve and ignite the gas, and adjust flame.
7. Pull goggles over eyes and open pre-heat oxygen valve on full turn. Press down cutting oxygen lever and adjust preheat flame to neutral.



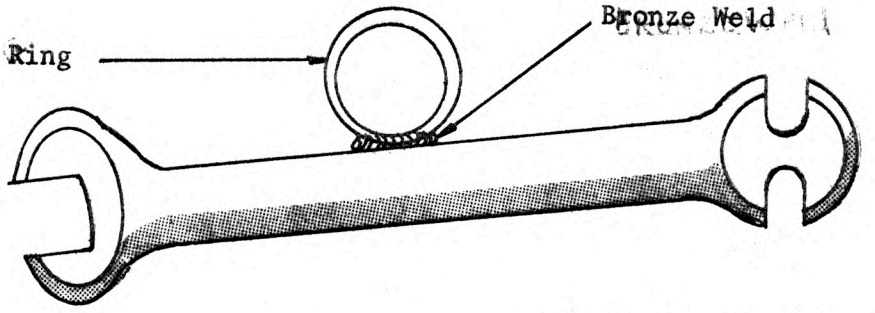


Cutting

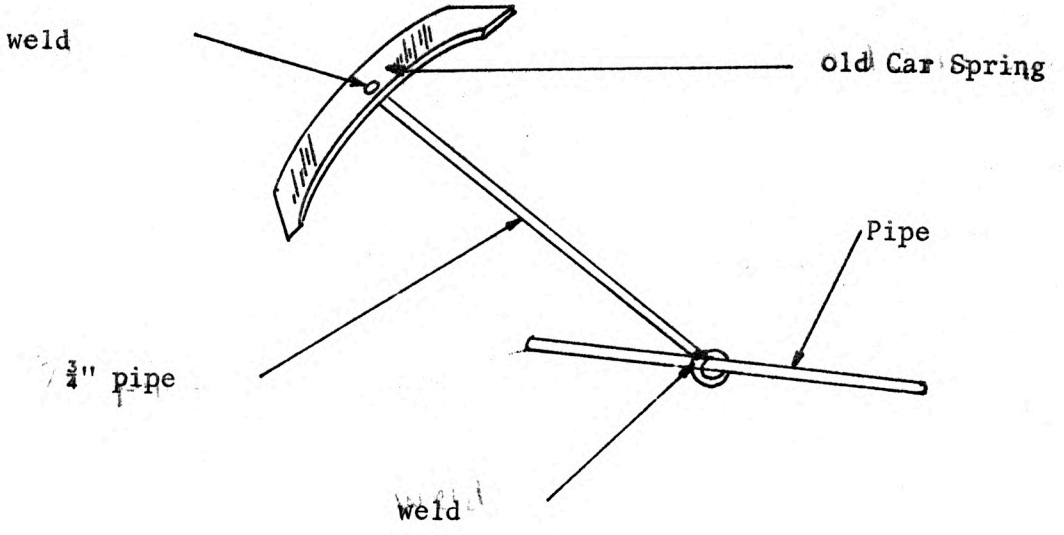
1. Mark the metal to be cut using center punch marks and soapstone. If the metal has a heavy scale a wire brush may be used to remove this oxide.
2. Practice rolling action until you can move the nozzle steadily. Then put on gloves.

3. Light and adjust the flame.
4. Keep the ends of the pale blue core of the preheating flame about 1/16" away from metal.
5. Keep the nozzle straight up and down over the plate until a spot under the flame starts to melt.
6. Then tilt the nozzle so that the flame points toward the edge of the plate. Slowly open the cutting-oxygen valve by pressing down on the lever.
7. As soon as cutting starts, (there will be a shower of sparks) slowly straighten up the nozzle, and again press the lever all the way down.
8. If you move the blowpipe too fast the cutting will stop. If this happens release the oxygen lever and start the cut as you did at the edge of the plate.

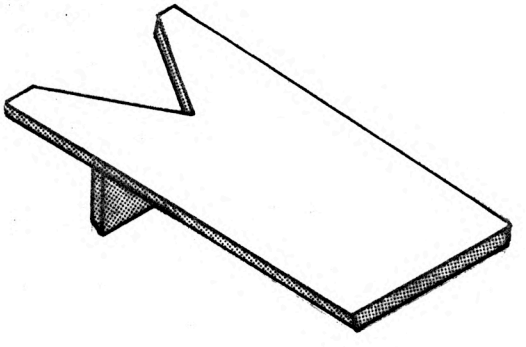
REGULATOR WRENCH



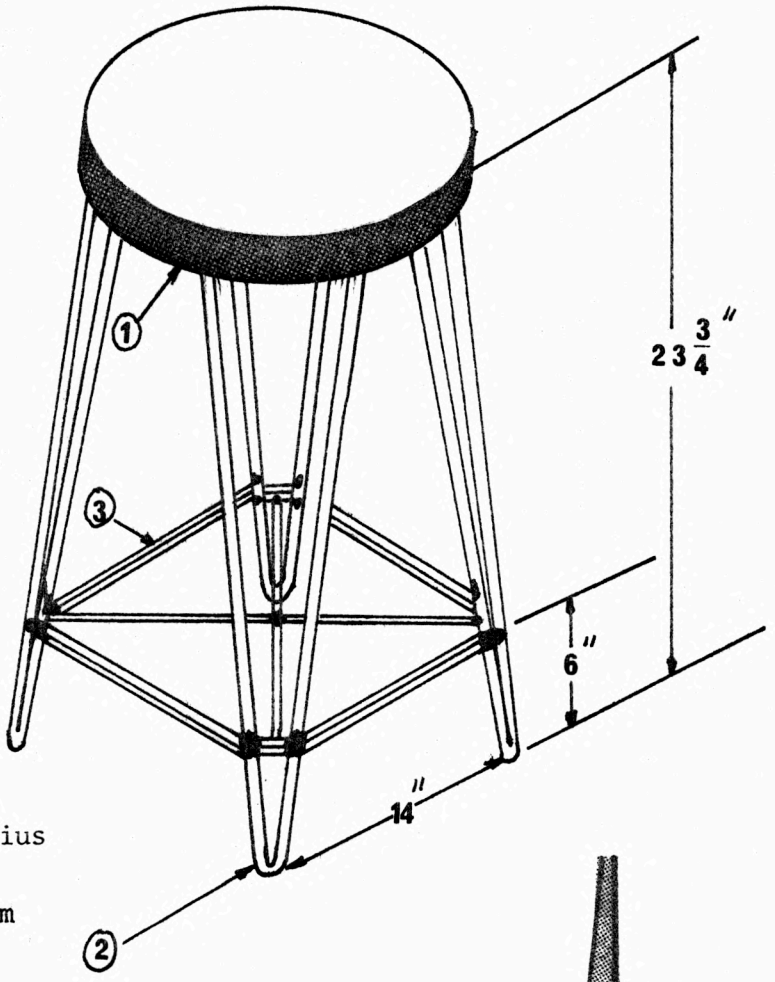
BOAT ANCHOR

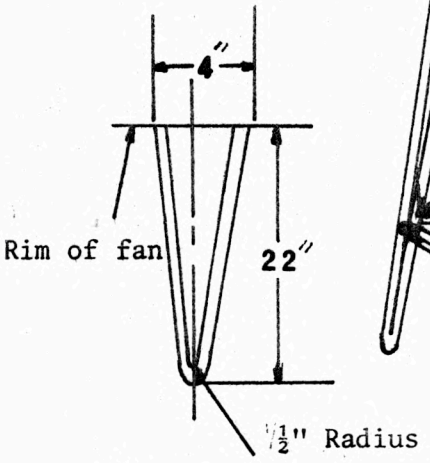


BOOT JACK

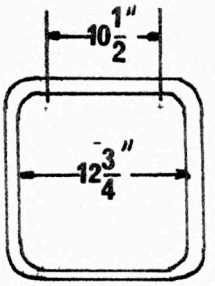


STOOL



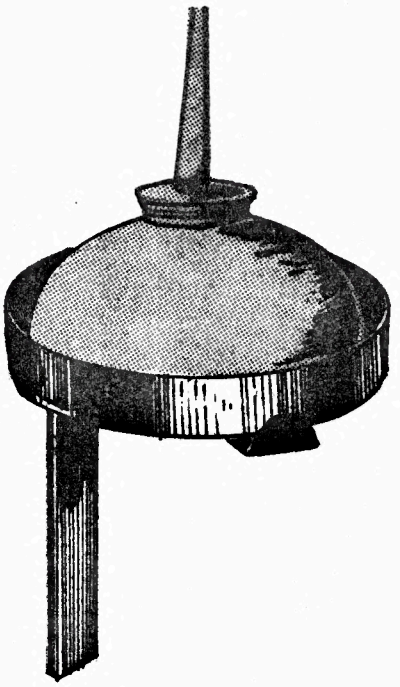


(2) Layout Diagram of Legs

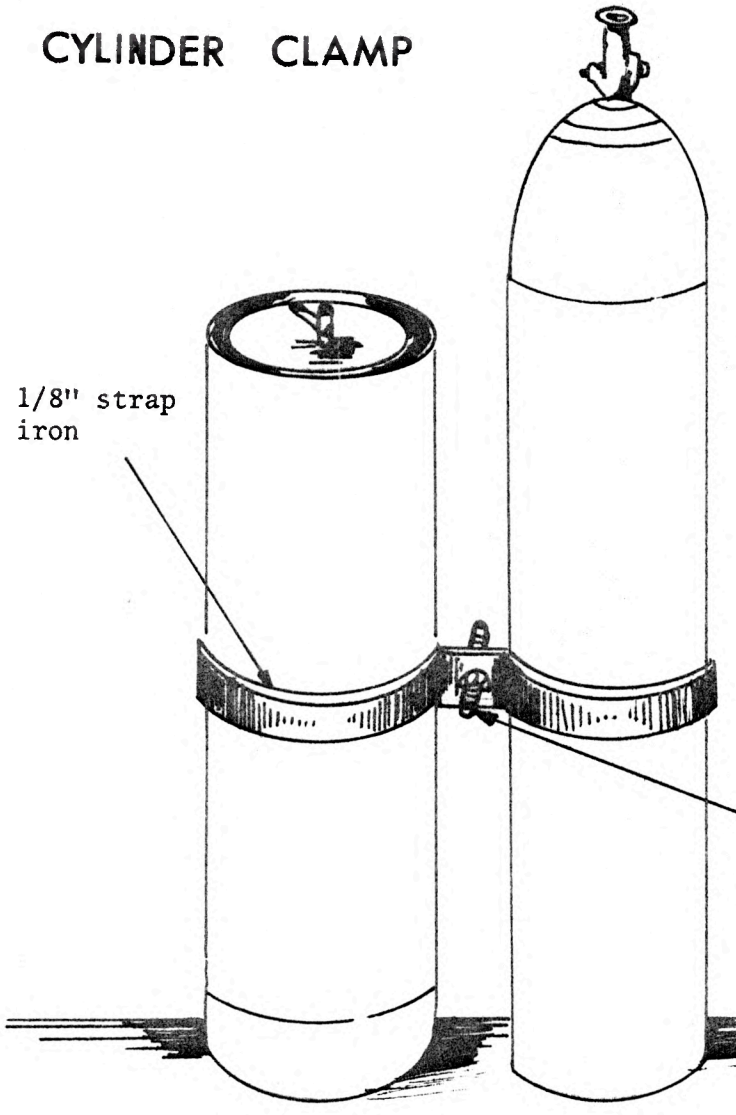


(3) Layout Diagram of Braces

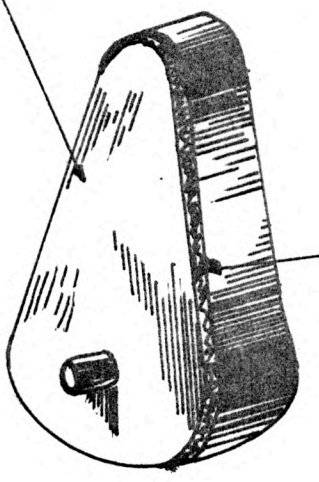
OIL CAN HOLDER



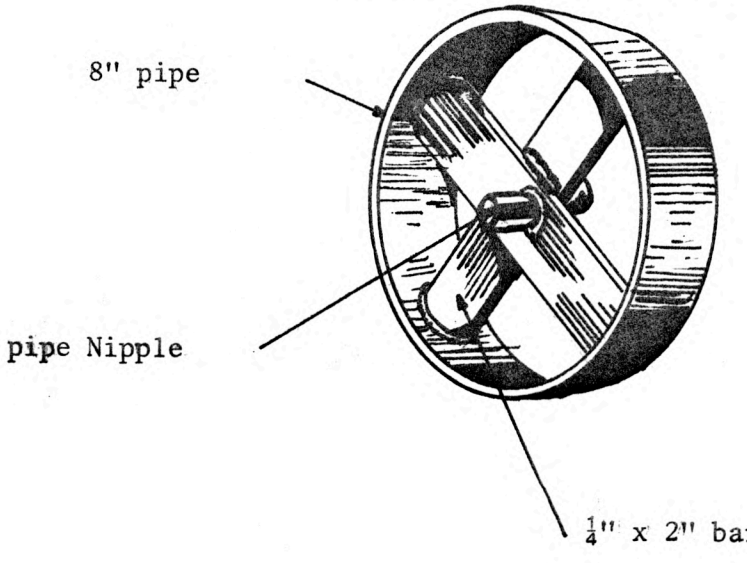
CYLINDER CLAMP



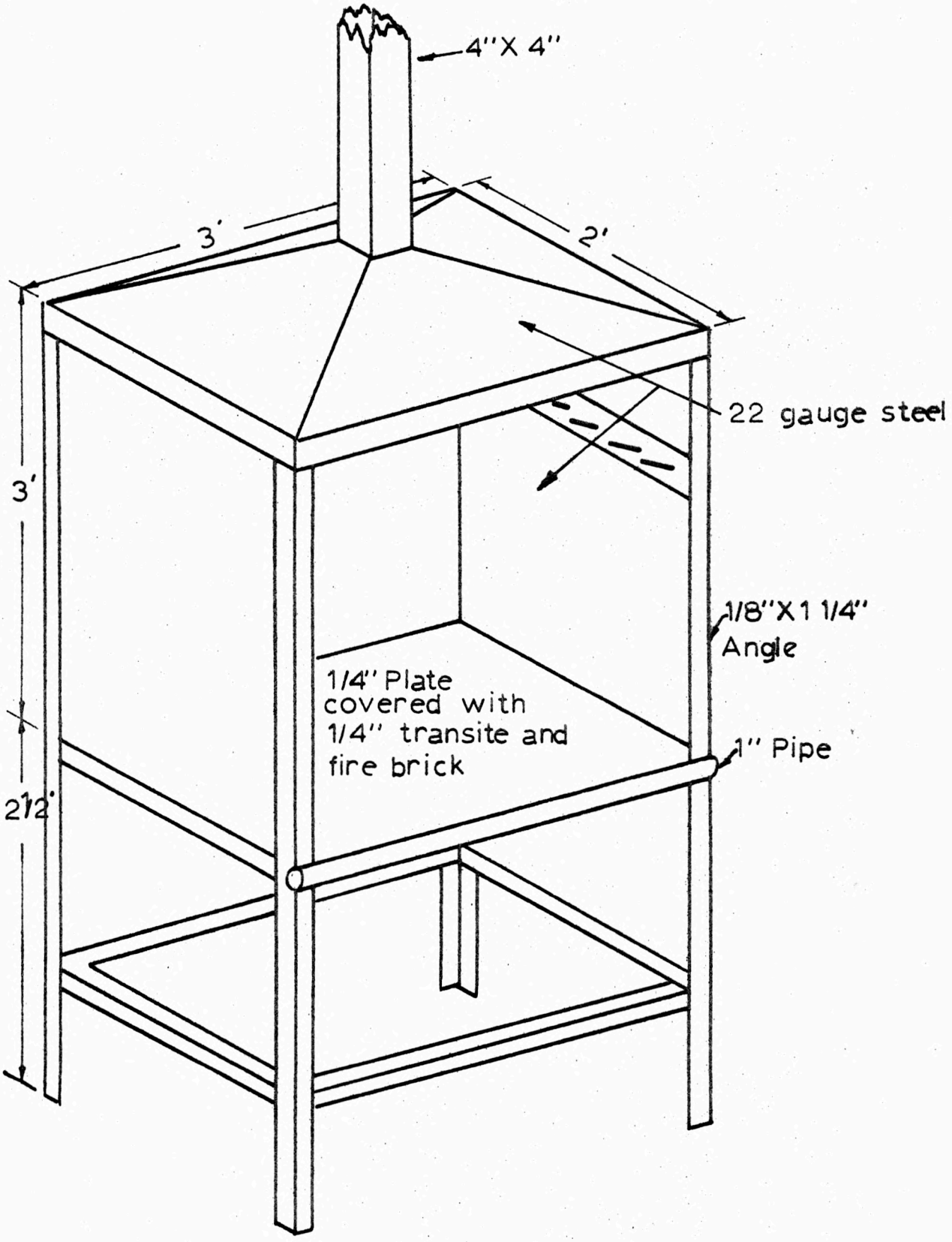
SAFTEY GUARDS



HAND—TRUCK WHEELS



WELDING BENCH



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Wolansky, Courtman, McCrea and Wheeler
Industrial Arts
McGraw-Hill Company of Canada, Toronto, Ontario.
$7.50

Visual Aids

The Fort Smith District Office which has been the Regional and Area Headquarters has an excellent selection of 16 mm. films and strip films on safety and tool and machine operations. Your principal will have a list of these films which are available on loan.

Delta Wall Charts

The Rockwell Manufacturing Company have a set of wall charts on their power tools such as: Wood Lathe, Metal Lathe, Scroll Saw, Power Grinder, Drill Press, and Circular Saw. These are available from: School Aids Department, Power Tools Division, Delta Rockwell Manufacturing Company, 544 Lexington Avenue, Pittsburgh 8, Pa.

General Motors of Canada

The General Motors of Canada, Oshawa, Ontario have a number of charts dealing with diesel motors, power, electricity and transportation. These are free from the Public Relations Department.

The Technological Developments Section,
Technical Information Service Division,
The National Research Council,
Ottawa 7, Ontario.

These are reprints of national research.

Metallizing Ceramics for Soldering and Brazing	EK B7529
Systems approach in Die Casting Metals	EK B7544
Forming, Fabricating, Fastening Pre-Painted Metals	EK B7548
Methods for Vacuum Coating Plastics with Metals	JEC B75996

See also *"Teaching Industrial Arts"*.

THE STORAGE AND USE OF OVERHEAD TRANSPARENCIES

A vertical file box made of heavy cardboard may be used to store your overhead transparencies. The box shown is available from any office supply store.

The transparencies in current use may be stored on the projector stand for ease of handling. As they are filed vertically, the titles are easily read and a selection made quickly. No shuffling through a pile of frames.

If you have a large selection of titles, each activity or information area may be filed in separate boxes and stored on shelving as shown at the left. This is a very quick way to make a selection of titles for current use.