THE BOYS' OUTDOOR VACATION BOOK

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A Complete Handbook for Every Boy Fond of
Life and Recreation in the Open

BY

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With over 300 Diagrams by the Author

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INTRODUCTION

Every boy longs to make the most of his vacation and to have just as much real fun as he possibly can. Unfortunately many boys find their vacations, either in summer or winter, very dull indeed, merely through a lack of knowledge of what to do and how to do it.

This book has been written with the aim of showing healthy-minded, red-blooded boys just how to enjoy their vacations, the various things they can do and how they can employ their time profitably and pleasurably by making their own camps, traps, boats, weapons, toys and appliances; how they can cure and dress the skins of the animals they kill or trap and how they can lead an enjoyable out-of-doors life, and while enjoying themselves, at the same time acquire a vast deal of practical knowledge.

For the boy who spends his vacation in the country, or near the woods, camps and camping offer great possibilities. Every boy loves to camp, to play Indian or pioneer, to trap and to live as near to Nature as possible. It is not necessary to go far into the wilderness to camp-out, nor to be provided with elaborate and expensive camp-equipments, tents, guides, etc., in order to enjoy a summer in the woods. Any two or three boys can build tight, comfortable camps in any patch of woodland, can hunt and cook their own game, make their fires in true savage style, tan the skins of their game, make their own moccasins and clothing and their own weapons and enjoy all the excitement of following trails and making "Injun signs" that most boys long for.

It is a bare and poor country, indeed, that does not abound in enough fish, small animals and other creatures to make fishing, trapping or hunting of some sort possible, and there certainly can be no sentimental objection to boy campers taking wild life when it is necessary for food.

The boy who spends his vacation where there are no opportunities for camping out can find a great deal of entertainment in occupying his time and displaying his ingenuity in building bridges, making charts and maps, flying model aeroplanes, throwing boomerangs, or even constructing a boy-carrying glider in which to enjoy all the pleasure and exhilaration of aviation without any of its risks or dangers.

The boy who spends his summers at the

seaside, on lake, or river, will naturally turn to the water as a source of entertainment. Here he can swim, dive, sail, row or paddle, and if he builds his own craft, constructs his own spring-boards or diving-floats and learns to rig and handle his own boats his pleasure will be greatly enhanced and a great deal of valuable and practical knowledge will be obtained.

Even in mid-winter a vacation may be spent largely out-of-doors, for with toboggans, skis, snowshoes, skates and ice-yachts there are abundant sources of sport and entertainment. All these things are easy to make and many dull evenings and rainy days may be transformed to profitable and pleasurable epochs if they are spent in constructing such objects.

The woods, in winter, are a wonderful revelation to any boy who has not visited them, and a tramp on snowshoes or skis over hill and dale will disclose a world that most boys have never dreamed of. The boy that is fond of Nature and her wild creatures will find a great interest in tracking the various wild animals by the trails they leave in the snow, while in many places a considerable amount of pocket money may be earned by trapping animals for their furs. Fishing through the ice is a sport familiar to many country boys, but comparatively unknown to most city boys, and yet easy of accomplishment wherever winter covers ponds, lakes or streams with a coating of ice. Even camping in winter is most enjoyable and it will be a surprise to many boy-campers to find how warm, comfortable and cozy a boy-made winter camp can be.

All these things and many more are fully described in the pages of this book, and all are practical, simple and within the province of every boy who can use his hands, feet and eyes. The author has camped, tramped, hunted and sailed from earliest boyhood and has personally performed every feat and accomplished everything described in these pages, and hence the volume is in reality a record of actual experiences.

The illustrations are prepared with special reference to simplicity, accuracy and detail, and each and every step in the construction of every object or appliance described, is fully illustrated.

The author has confined himself to the descriptions of only the simplest, cheapest and most practical things and every objectionable, dangerous or impractical matter has been omitted.

The book is intended as a guide, companion and helpmate for boys during their spare hours, holidays and vacations, and if it leads to a greater enjoyment of outdoor life, a better knowledge of Nature, a greater confidence in the boys' own resources and adds to the practical knowledge and training of its readers, the mission of the work will be accomplished.

PART I

SUMMER

CHAPTER I

CAMPING OUT

Choosing Companions

It is hard work for a boy to have a good time by himself, no matter how or where he spends his time; but it is far better to be alone than to have the wrong sort of companions. If you are going to camp out the matter of choosing the proper boys to accompany you is of the utmost importance, for a camp to be pleasant and successful depends upon each of the campers doing his share of work and helping out willingly and pleasantly. Although this is absolutely essential to an enjoyable outing of any sort, yet it is given but little thought by most boys, and as a result many trips or vacations are ruined and the boys' outings spoiled when everything would have gone smoothly and everyone would have had a bully time if care had been taken in choosing the right boys for the trip.

In the first place, be sure and do not take any boys who are shiftless, hot-tempered, impatient or inclined to shirk. In every camp there will be trials and disappointments, bad weather and hard work. If these are taken good-naturedly and smilingly and are overcome they will prove but an added zest to camp life. Make the best of everything and do your share is the first and invariable rule of life in the woods. When your companions are selected, the next step is to choose a leader, for without someone to direct, your trip will be a failure. The leader should be the boy who has had the most experience in woodcraft or outdoor life, and if no member of the party excels in these matters, select the one who has the most practical knowledge, the calmest and best judgment, and to whom you would look for leadership if you were choosing a captain of a ball-nine or any other club or team.

Having once selected your leader you should follow his directions implicitly unless he shows himself incompetent, ignorant or overbearing. It is a good plan, however, to always hold a council or meeting of the members of the party where there is any question as to matters concerning the outing, and if the majority do not agree with the leader, he should be manly enough to waive his authority and accede to their wishes, unless he feels that there is some good and sufficient reason for not doing so.

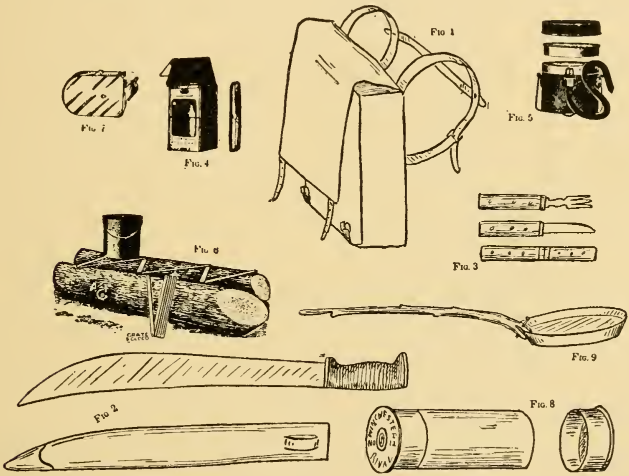
From the other members of the party the cook, hunter and others should be selected, for if each boy has certain duties and sticks to them, it will save a lot of delay, trouble and friction. When everyone is tired and hungry and camp is to be made it is very vexatious to try and decide who is to cook, who is to chop wood, and so on, when each one longs to put the work on the other fellow's shoulders.

Of course each boy selected for a certain duty should have an occasional change in his work, for even the simplest duties of camp life become tiresome if they are carried on day after day until they seem like work. Any decent set of boys will be able and willing to adjust such simple matters, however, and to exchange places and duties now and then, while everyone should help in every duty whenever possible.

Camp Outfits

The question of an outfit depends a great deal upon the tastes of the boys, the locality where you are to camp, the sort of camping you intend to do, the amount you can carry, and last but by no means least, the amount you can afford to spend. There are so many different kinds of outings ordinarily classed as "camping out" that it is almost impossible to make hard and fast rules as to an outfit. Of course if you intend to camp within easy reach of a road or on the borders of a lake or river, and are to use tents or have a permanent camp, almost any amount of luxuries and conveniences may be taken along; but the best fun is in camping here and there, tramping from place to place, stopping in the woods as fancy suits and carrying bed, board and everything else upon your backs. A good woodsman or an experienced camper can get along pretty well with only a knife and an ax for tools, a tin plate for cooking and eating utensils, a box of matches and the clothing he wears; but to get on with such an outfit is beyond the powers of most boys and requires years of practice and life in the wilds.

For a trip, where temporary camps are to be made, I do not advise more than four boys, and it is far better for each member to carry his own individual outfit than to have one outfit for the crowd and try to divide it up for transportation. In such cases each boy usually feels that he is carrying more than his share and there will always be dissatisfaction in packing up and distributing the outfit evenly, especially towards the end of the trip. The first and most important part of a camp outfit is the pack. There are a great many styles and makes of packs on the market and each section of the country



has its favourite, but I have tried nearly all of them and have found the simple canvas pack, with shoulder and breast straps, by far the most satisfactory for all-around use,—especially for summer camping and for boys' purposes. These packs (Fig. 1) may be purchased ready-made from dealers in camping and sporting goods and cost about $3.00 each; but they may be easily made at home from strong cotton drill, khaki, or light canvas. Such a pack for boys' use should be about 14 x 20 inches square and 6 inches thick. It will easily hold everything you require for a camping trip and will weigh as much, when filled, as you can conveniently carry on a day's tramp.

Now for the goods to fill the pack. A first-class ax weighing about two pounds and with a 14-inch handle is perhaps the most important item. A machete—the long, heavy-bladed knife of tropical America (Fig. 2)—is very handy and will often prove more useful than an ax, especially for chopping brush and small trees, blazing trails, splitting firewood and for various other purposes. A machete, in the hands of one accustomed to its use, can be made to serve almost any purpose from that of a toothpick to an ax, and even large trees may be easily felled with a machete when you learn how to use it skilfully. If more than two boys are going camping I advise only two axes, and machetes for the others. They are cheap—costing with leather sheath about $2.00—and are lighter and easier to carry than axes, for they can be hung to a belt like a sword or from a strap or sash over the right shoulder and under the left arm. For the rest of your outfit you will need the following articles for each boy:

A waterproof cylindrical match-safe.

A combination fork and knife or a common steel knife and fork (Fig. 3).

A teaspoon and a tablespoon.

A good ax-stone, preferably a carborundum stone.

A bag containing thread, needles, wax, buttons, shoelaces, pins, etc.

A roll or hank of good strong linen, or braided cotton, twine.

About one hundred feet of light, strong, rope (braided is the best). This is only required for the party as a whole and is not needed for each boy.

Fish hooks, lines and sinkers.

A reliable pocket-compass.

A good sheath-knife (a sailor's knife is the best).

A pocket knife.

A folding rubber or collapsible drinking cup.

A tin cup and deep tin pie plate.

Half a dozen candles.

Some assorted or mixed wire nails, from 3 to 12 penny.

All of these are important articles and will be found almost essential to enjoyable camping.

The rope should be strong enough to bear the weight of any boy in the party and should invariably be kept neatly coiled and ready for use, as it may save your life more than once, and will prove useful in a hundred places and a thousand ways.

In addition to the above list you will, of course, provide your hairbrush and combs, toothbrush, etc., but don't clutter up your pack with a lot of useless toilet articles and similar things. A small pocket mirror will be handy, for if you get something in your eye you will find a mirror very useful; it is also valuable for signalling and it is more convenient for a looking-glass than a pool of quiet water, although the last will answer very well. Every party of boy campers should carry a medicine-case containing simple remedies, such as quinine, rhubarb, bicarbonate of soda, bismuth-subnitrate, chlorate of potash, Warburg's tincture, Sun cholera tablets, etc. There should also be a roll or two of antiseptic bandages, a box of zinc-ointment, vaseline and some permanganate of potash, and if you are going into a wild country or more than a few hours' tramp from a settlement or house, be sure and have some sort of a stimulant along. This need not be alcoholic and I advise any boy who is going camping to have his family physician select and label the various medicines and furnish written directions for their use. The most convenient form to carry them is in the little pocket leather medicine-cases that cost from $1.00 to $1.50 each.

You may camp, tramp and hunt for years and never require medicines, stimulants or bandages; but accidents will happen now and then and if you are almost drowned or faint from loss of blood or a sprained ankle or other cause, a stimulant may save a life. The permanganate of potash, if dissolved in water, will relieve the pain from insect bites and ivy poison and in a country where poisonous snakes are found it is the best and safest remedy known for their bites. Antiseptic tablets are also good things to have along on any trip, for a very simple cut, sprain, bruise or scratch may result seriously if neglected, and an ounce of prevention is worth many tons of cure in the woods. Old campers and woodsmen may poke fun at you for carrying your medicine-kit; but it takes up little space, it is little trouble and if occasion does arise for the use of the medicine it will prove more valuable than all the other things put together. I should never have written this book if I had not carried these simple articles on my trips, for on more than one occasion my life has depended upon them and more than one old woodsman, who pooh-poohed the outfit, has had occasion to thank God that I carried it along.

Always have one boy, and one only, carry the emergency outfit both day and night, unless every member of the party is supplied with his own kit, and allow no one to administer or fool with the medicines unless in case of real necessity. This will result in your always knowing where the things are when you want them, and when you do want them, you'll want them quick.

There are numerous other simple, light and inexpensive articles that will make camp-life more enjoyable and which you may or may not take as you see fit. Among these are folding lanterns (Fig. 4), of mica and aluminum, costing $1.50 each and which weigh but a few ounces and fold into a flat, square package and are very useful; Japanese mess-kits (Fig. 5), which cost $1.75, and being made of aluminum and folding into very small compass, are most convenient; campfire grates (Fig. 6), which cost $1.00 and save many a spilled cup of coffee or burned pancake and various other handy inventions.

A very useful and inexpensive article which I always carry is a pocket mechanical lighter

(Fig. 7). If matches are wet or lost you can light your fire with this and it will prove of great value many times over, for while a boy can light a fire with a simple flint and steel or even by means of two sticks, as will be described later, such methods take time and patience.

The rubber, cylindrical match-boxes are the best form, as they are waterproof and float if dropped overboard; but if you do not care to buy one of these you can make a very good substitute from an old paper shot-gun shell. Cut the metal end from one shell and burn out the paper lining in a fire. This brass cap will fit snugly over another shell and will make a first-rate waterproof box; but it has the disadvantage of not holding many matches (Fig. 8).

The pie-plate and cup are all the cooking utensils really needed, for coffee can be made in the cup or eggs may be boiled in it, while by splitting the end of a stick, slipping it over the edge of the plate and driving a nail through it, a first-class stew- and frying-pan can be rigged up in a few moments (Fig. 9).

Provisions

The amount and kind of provisions that you take on a camping trip depend largely upon where you are going, whether you will depend upon hunting or fishing or buying from farmers, or whether you intend to carry everything you will need. It is, therefore, impossible to furnish any really complete and hard and fast list of what will be required; but among the following you will find a number of good things that are readily carried and cooked, while such things as coffee, sugar, salt, lard or cottolene, pepper, bacon, salt pork, etc., are, of course, essential to every camper.

Erbswurst—This is a compound of pea-meal, meat and vegetables compressed into a sausage-shaped roll and adopted by nearly all European armies as the nearest approach to a perfect food. It costs $0.32 per pound and may be eaten raw or may be cooked in a great variety of ways.

Soup Tablets come in various styles and are very handy and useful, for by simply dissolving them in hot water, a steaming cup of delicious soup may be prepared in a few moments.

Dried Vegetables are the best quality of vegetables evaporated and compressed. They are equal to ten or twelve times their weight of fresh vegetables, are easily prepared and may be purchased at $0.20 per package and are furnished in the following varieties: potatoes, sliced beans, spinach, cabbage, celery, onions, leeks, carrots, turnips, etc.

Crystalose is more compact and better than sugar, as one ounce equals in sweetening power one ton of cane sugar. It costs $0.25 per vial or $1.00 an ounce.

Dried Eggs, called "Truegg," is a delicious and convenient article. It is made of perfectly fresh eggs, beaten and evaporated, and simply has to be dissolved in water before using. It makes perfect omelettes, scrambled eggs and other dishes, and will keep in any climate. One pound is equal to four dozen fresh eggs and is far more convenient to carry. It costs $0.75 for a half-pound tin.

Army Bread, or "Hardtack," is the best form of wheat food, while ordinary canned goods, corned beef, braised beef, veal-loaf, tongue and boneless chicken are all good things to have in camp.

Condensed Milk, or Evaporated milk, is good, but the dried milk known as "Truemilk" is better and easier to carry about.

The following has been decided upon by many prominent campers as the quantity of food required for one person for two weeks. Of course boys do not consume quite so much as grown people; but it is better to have too much, rather than too little.

Flour (or equivalents), 6 lbs.; corn meal, 2 lbs.; beans, 1½ lbs.; Erbswurst, ¼ lb.; soup tablets, ½lb.; sugar, 2 lbs.; baking powder, ¼ lb.; coffee, ½ lb.; butter, 1 lb.; salt pork, 2½ lbs.; evaporated milk, 1½ lbs.; dried fruits, 1 lb.; salt, ¼ lb.; chocolate or cocoa, ¼ lb.; tea, ¼ lb.; bacon, 1½ lbs.; dried potatoes, 1 lb.; other dried vegetables, ½ lb.; dried eggs, 1¼ lbs.; shelled nuts, ½ lb.

Sweet, or milk, chocolate is one of the best of foods and should always be carried. A small piece of this will keep one from hunger and fatigue in a remarkable way, and I have frequently tramped from daylight until dark with no other food than a cake of milk chocolate. Nuts are also very sustaining and peanut butter or "Peanolia" is excellent. Flour and other dry groceries should be carried in waterproof bags as tins are cumbersome and heavy and pack badly. Bags of this sort can be easily made from waterproof canvas which can be purchased at almost any store.

Clothing

For clothing you should provide the stoutest, most comfortable things possible; but even in midsummer the underclothing should be of wool, for in the woods one is often wet and dry by turns, and cotton undergarments are very bad under such conditions. Stout, easy shoes should be worn and moccasins will be found very comfortable about camp. Have hob-nails in your boots if you are going to a mountainous district or intend to ford streams and carry along at least one extra change of undergarments and several extra pairs of socks or stockings. Don't forget boot grease, it will save blisters and cracked shoes and will keep your feet dry. Blankets are not essential, although very comfortable and useful; but I have always found that a bed of springy hemlock or fir boughs and a well-built "lean-to" at the end of a day's tramp were comfortable and warm enough without bed clothing. A light, all-wool blanket and a very light rubber blanket are excellent to carry along, however, and they do not add much to the weight of your load. If the rubber blanket has a slit in the centre, —with the edges of the slit bound with tape, —it will serve as a waterproof cape or poncho by slipping your head through the opening.

When I first went camping in northern New Hampshire, a boy of sixteen was supposed to carry a pack weighing fifty pounds;

but I think that for real fun that is too heavy and that thirty-five pounds is about the limit, while, if it is even less, your shoulders will be saved many an ache and you will enjoy your trip far more.

In those days of which I speak, none of the modern conveniences of camping were to be had at any price, and we were obliged to carry eggs, vegetables and other food in bulk, which added a great deal of weight to our packs. If you intend to carry guns and ammunition you will do well to carry a pack as light as possible, for a gun weighs a great deal at the end of a day's long tramp,—especially if no game has been seen,—while in any decent sort of camping country you should be able to help out your larder quite a little by shooting and therefore you will not require so many ready-made provisions.

Of course I am taking it for granted that my readers are ignorant of camping and camp life, and must learn how to build their camps and fires, blaze their trails and wrest a living and the necessities of life, as well as many of its luxuries and comforts, from the woods themselves; but I will leave these matters for other chapters.

CHAPTER II

MAKING CAMP

After your camping trip is planned, and you have secured the necessary outfit and chosen your companions the next most important step is to decide upon the site for your camp and the sort of shelter you intend to use. Of course you may use tents and if you are planning to camp out near home, or in a permanent place for the entire vacation, a tent will do very well,—there is no denying they are acceptable and convenient in bad weather,—but to enjoy camping out to the limit the campers should make their own shelters. Moreover, even the smallest and lightest tents are clumsy and heavy to carry, and every ounce added to your pack will feel like so many pounds at the end of a day's hike.

It is so easy and so much fun to build your own shelters that tents are only a nuisance and I advise every boy-camper to make his own camps. Any two boys can put up a "lean-to" or similar shack in a short time, and if well-constructed, such a shelter will keep you as dry and warm, save in the heaviest rains, as any tent. If you are to have a permanent camp to use season after season or are even to spend an entire vacation in one camp, a log-camp is good; but even if you decide to build such a hut, a lean-to will be found very useful to live in while you are building the more substantial cabin.

If you are going on a canoe trip, or can ship your outfit by train or wagon to your camping site, and do decide to take a tent along, choose the lightest and smallest that will accommodate your party. Personally, I prefer a wall-tent. One of this type, 7½ feet square, will easily sleep four boys and will weigh less than 15 pounds. In waterproof duck such a tent will cost from $7 to $8 when new. Plain duck will cost almost as much, but will leak badly in rainy weather, unless used with a fly, which is a great nuisance.

Many boys might like the tepee or Indian wigwam; but it is a heavy tent for the amount of room inside. Owing to its circular, conical form, there is a great deal of waste space and there is often considerable difficulty in getting enough long, straight poles with which to erect it. For a permanent camp, or for pure fun, wigwams are excellent and will be described in a subsequent chapter.

Selecting a Camp Site

The selection of a proper spot for a camp is a most important matter. Many a camp is a failure owing to improper surroundings, and any old or experienced camper will select the most favourable spot by intuition. It is not expected that boys can do this until they have had a good deal of experience, however, and it is far wiser to spend an hour or two looking about and choosing a really suitable spot than to build a camp wherever you happen to stop, without regard to its surroundings. A spot may seem very favourable while the weather is pleasant; but a sudden shower in the night may flood the camp, unless you have provided for such a contingency beforehand.

Select your camp-site with reference to wood, water and drainage, as well as in a locality where there is plenty of material for building your shelter. Choose a dry, level place a few feet higher than the surrounding ground. Usually a good location may be found near some lake, pond, river or stream, where the woods are fairly open and the trees of good size, and where the earth slopes enough to insure the water running away from your camp in case of a rain. A small bluff, overlooking a lake or river, is a good location and there should be dead or fallen timber close at hand, which will save much weary work at chopping and attempting to burn green wood. Evergreens are an important factor in building a lean-to, for they furnish both roof and beds. If birch-bark is abundant, it will prove a very useful article for making roofs, starting fires and for constructing various dishes and utensils,—tea or coffee may even be made in a birch-bark utensil or water may be boiled in an extemporised birch-bark pot.

Building a Lean-to

To build a lean-to is one of the first and most important things to learn when going camping, for this is the simplest, most practical and quickest shelter known for a temporary one-night camp. If well and substantially built a lean-to will do for a permanent camp; but this type of shelter is particularly adapted to night shelters where a new camp is built at the close of each day's tramp.

Although it is not at all difficult to make this popular shelter yet I advise you to practice in woods near home until you are expert, before starting off on your camping trip. This will save lots of time and trouble and you will know just the sort of materials to use, where to find them and how to use them and every camp you make will be an improvement on the last.

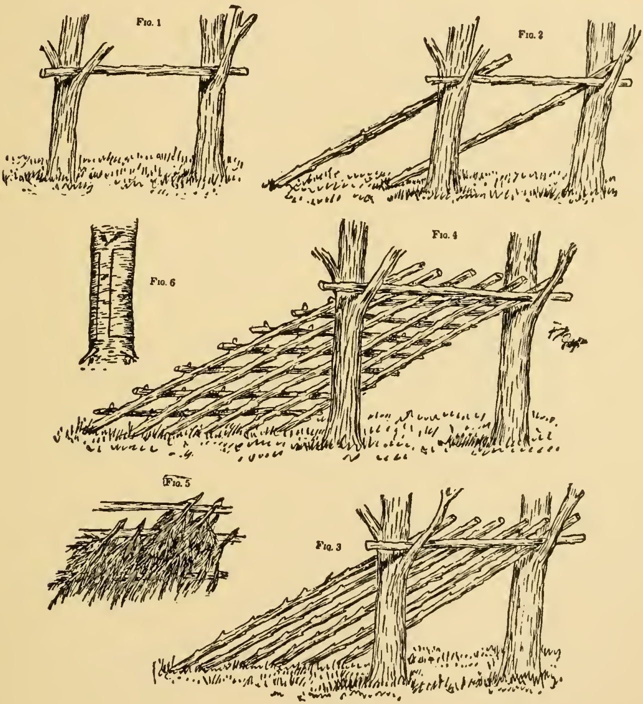
After you have selected your camp-site, look about for a couple of strong trees standing from eight to ten feet apart with branches from six to eight feet above the ground. Having found these, clear the ground between them and for some distance on each side. By bending over the bushes and young saplings with one hand and chopping through the strained fibres, even good-sized trees may be easily cut off with a few sharp blows of the ax or machete. As soon as the ground is cleared, cut three or four poles about twelve feet long and at least three inches in diameter at the large ends. Place one of these across the two trees, resting the ends in crotches of the limbs where they join the trunks (if your trees do not have any suitable limbs, the poles may be lashed on with ropes or withes), (Fig. 1). Next place two other poles against this cross-piece with the butt-ends resting on the ground about eight feet behind the two trees (Fig. 2). Be sure that these two poles are level and parallel, and place a number of smaller poles between them and parallel with them (Fig. 3). All of these poles should have the branches trimmed off in such a way as to leave stubs two or three inches long. Across these poles, and resting against the stubs, a number of lighter poles should be laid. The lean-to will now appear in skeleton-form as shown in Fig. 4, and the next step is to thatch it.

While one or two boys are getting up the framework, another should be gathering fire-wood and preparing meals, while another should be cutting and bringing in soft, thick tips of hemlock or balsam boughs.

Select the largest and flattest of these "fans" and beginning at the back of the framework, hook the hemlock boughs over the cross-pieces in layers, with each layer overlapping the one below it (Fig. 5).

Continue this process until the entire roof is covered, and if it looks like rain, thatch a second layer over the first. If windy or stormy, place additional poles on top of all, and if necessary, bind them in position with hemlock roots or withes. These will keep the thatch firmly in place, even in severe storms. If you wish, and have plenty of time, the sides of the shelter may also be thatched in a similar manner to the roof, and you will then have a very cozy little house.

Sometimes two lean-tos are built facing each other, about six feet apart, and this



arrangement makes a very comfortable camp, as the fire may be built between the two, thus lighting and warming both.

If you cannot find evergreen trees, peel the bark from birches and use these sheets of bark-like shingles, holding them in place by light poles laid across them from side to side. Sometimes hemlock bark will peel readily and the large slabs of this strong bark make excellent roofs, especially for a permanent camp. To peel the bark of a birch, hemlock or other tree, make two cuts almost completely around the tree, one as high as you can reach, the other near the ground; connect these cuts by perpendicular incisions, joining the others at their ends (Fig. 6), and by starting the edge of the bark the whole piece will come off easily. The narrow strip of bark left on the tree will serve to carry the sap and prevent the tree from dying. If there are stubs, branches or twigs on the space you are to strip off, they should be cut down flush with the tree before peeling. This will prevent the bark from tearing at the projections and will merely leave small holes in the piece you take off.

After your lean-to is built, the ground inside should be smoothed and softened. Pull up all small twigs and roots, remove the dead leaves and with the back of your ax,—used like an adze by swinging it between your legs,—knock down any knobs or small hummocks of the earth. These may seem trivial, but if you lie upon two or three of the little projections all night you will feel as if you had been stretched upon a rack by morning.

Making the Beds

When the ground is thoroughly level and soft you can proceed to make your beds. To do this, chop down a young hemlock, balsam or other evergreen tree and pull off the soft "fans" or flattened tips of the branches. Those that are too tough to pull off by hand are too large and too coarse for your use. Lay these criss-cross against the handle of your ax or along a light pole and in this way you can carry a great amount of twigs at one time.

On the floor of your lean-to, place a thick layer of the fans, with the convex sides up and the butts of the stems toward the foot of the bed. Now thatch this over with more fans by thrusting the butt ends through the first layer at a slight angle toward the head of the bed, so that the soft tips will curve toward the foot of the bed, and be sure to make the head of the bed away from the opening of the shack with the foot toward the opening. Over this bed spread your blankets, if you have them; but even without a covering of any sort you will find this a surprisingly soft, springy and fragrant bed.

Building the Fire

The camp now being completed and ready for the night you may turn your attention to the fire, for no doubt the cook,—if he is a novice,—is having plenty of troubles of his own, especially if the woods are heavy and damp or if there has been a recent rain. To build a good fire in the woods is not so easy as the story-books would have us believe and requires quite a little skill and knowledge. Indians always build a small fire and tend it constantly, but the white trappers and hunters usually make a roaring fire and trust to the coals keeping up enough heat to warm the camp over night and to start a new fire in the morning, with perhaps an occasional log thrown on in the night, if the campers happen to wake up. Personally I prefer to follow a middle course; I do not like to spend most of the night huddling over and nursing a tiny blaze like the Indian, nor do I approve of wasting a vast amount of fuel—to say nothing of alternately freezing and roasting—like the white woodsman.

With a medium-sized fire the heat is under better control, and you will soon learn to wake up and replenish the blaze at regular intervals.

To start a campfire, first gather a number of light, dry chips and twigs. If there are birches and evergreens, gather a lot of birch bark (this will burn even if green), and some dry, resinous branches of the evergreens, such as are always to be found sticking out from these trees, whether living or dead. Make a little crisscross pile of your driest and most inflammable kindlings and shreds of bark, and lighting a piece of birch bark, thrust it underneath the kindlings and nurse and protect the little flame until it catches and burns briskly. Do not smother it with too much fuel, and do not let it die down too far, but add bark and twigs, little by little, and gradually increase the size of the twigs until a good lively fire is going. When the blaze is well started, place two stout, green, hardwood logs on either side. These should be of oak, maple or hickory, and should be about eight feet long and at least eight inches in diameter, and they should be placed near together at one end so as to support various sized pots and pans. By having these backlogs long, and double, they can be pushed up as the fire eats them away. If you are building a fire for warmth and cheer, do not try to cook over the main fire, but when a good mass of coals has accumulated, rake out a heap and cook over these, adding fresh ones and now and then a few pieces of wood as required. The fire should burn sticks several inches in diameter and three or four feet long, if for warmth, and if placed six or eight feet in front of the lean-to it will throw enough heat inside to warm it up in first-class shape.

When ready to turn in for the night, place two or three heavy hardwood logs on the fire, and these will smoulder and give out quite a little heat all night, and if you should wake up and stir the fire now and then, you will sleep as warmly and soundly, and far more refreshingly, than in your own bed at home.

The best firewoods are birch, beech, maple, oak, ash, chestnut and hickory, and each is good for a special purpose. Chestnut gives good coals and heat but does not last long; oak burns slowly with good heat; hickory makes a fine bed of coals but does not blaze readily, it has good lasting qualities but is apt to smoulder out, unless mixed with lighter wood; beech and maple are good heating woods, but the best of all for heat, blaze and all-around use, is birch. This will burn when green or wet and will give a bright, cheerful blaze and lasts well, but it should be mixed with harder woods for the night fire.

You will sometimes find great difficulty in lighting your fire in wet weather or in the rain. An Indian can do it more readily than a white man, but his success lies in always carrying some dry twigs or bark with him, or in knowing just where to find them in the woods. I advise every boy camper to carry dry birch bark and resinous twigs in his pack at all times, in readiness for the rainy day that will surely come sooner or later.

In wet weather, it is a good plan also to build a good-sized fire on the spot where you intend to place your camp. This will dry out and warm the ground, and after the coals and cinders are raked and swept away will leave a nice spot on which to make your beds.

Camping with a Tent

If you intend to use a tent you will proceed to go into camp quite differently. Find a spot where there are two trees ten or twelve feet apart and clear up the ground between and around them as already described. Make a number of tent pegs by placing a young maple, or birch sapling, about an inch in diameter, across a log, and by two sharp blows at an angle cut off sections at least eighteen inches long. These long pegs will keep the ropes from slipping off and will grip the ground better than short ones. When you have enough pegs made, cut a crotched stick about ten feet long. Run a rope through the ridge of your tent and fasten it between the two trees selected. Draw the rope as tight as possible and do not be discouraged if it sags, for this will be remedied by the crotched stick after the tent is pegged down. Stake down the four corners of the tent and be sure to get them square and just the right distances from the centre and from one another, to make the tent hang smoothly. Then proceed with the rest of the pegs and finally wedge the crotched stick under the rope just outside the tent. If a few stubs of branches are left on this it will come in handy to hang things on. Sometimes you will have trouble driving the pegs in rocky ground. In such cases drive them at a sharp angle and pile flat rocks on top. They will then hold even in a gale. Make your beds as in the lean-to, and you will be snug and cozy even in the worst weather.

Order in the Camp

I have always found it a wise plan to go about camping in a regular and methodical order. This saves confusion and time and prevents losing various articles. Have all your cooking utensils and food and fuel ready to your hand before commencing to cook. Stick a few light poles in the ground and bend them over the fireplace so that they will serve to hang pots on, and rinse your pots and pans. The fire between the logs will throw the heat straight up and in fifteen or twenty minutes the meal should be ready. While eating have some water boiling for dish-washing, and be sure and wash your dishes just as soon as the meal is finished. Then you should pack away the dishes neatly in readiness for the next meal, and you will feel free to laze around and enjoy yourselves without the thought that there is still work to be done.

I take it for granted that my boy campers—or at least the cook of the party—will know something of simple cooking before starting off, but if you do not, you had better get your mother, sister or the hired cook to give you a few lessons. It is much harder to tell you how to cook than for you to learn in this way, but I will try and describe a few cooking wrinkles that may help you in your camp life.

Simple Camp Cookery

Nothing is much easier to cook than the game and fish that you may obtain from woods and waters on your trip, and yet even these things require some knowledge. Campers usually have good appetites, and after a hard day's tramp almost anything in the line of food will be acceptable. Nevertheless well-cooked food is far more healthy and better than half-cooked or overcooked edibles and even if you do not miss the seasoning and flavour of your home cooking, yet the camp meals will prove far more satisfactory if well-seasoned and well-cooked. Most game should be skinned and usually small game, such as rabbits, squirrels, etc., are best broiled over the hot coals. *To broil a rabbit or squirrel,* first dress and skin the animal carefully and remove all clots of blood or bruised flesh. Cut off and throw away the head and feet. Split into two pieces by cutting through the backbone. Spit each piece on a hardwood stick and hold over the coals until slightly seared; turn over, and sear the other side.

Sprinkle with salt and pepper, and then cook slowly over the coals until done, turning from time to time until both sides are cooked equally.

To broil birds, pick as usual; open along the back in order to clean them; sprinkle with salt and pepper, and broil slowly over the coals.

Slices of venison or beef may also be broiled in the same manner as the small animals.

Sometimes the manner of cooking game may be varied by baking or broiling. *An excellent way to bake fish, birds and small game* is as follows: Cover the birds, fish or animal, with a thick layer of clay and place in the midst of a hot fire. Cover with coals, and in about an hour rake out the clay mass (which will be baked hard), break it open, and your meat will come out beautifully cooked. When using this method do not try to skin or pick the game, for the skin or feathers will stick to the clay and peel off when the latter is broken open.

To stew rabbits, or other small creatures, cut them into several pieces by removing the legs from the body at the joints and cutting the body into two or more pieces. Place these in a pot, cover with water, add a little rice, a few dried vegetables, a soup tablet or two (if you have them), season to taste with pepper and salt and boil until tender. *If you wish fried or roast rabbit* you can proceed in the same way until the water comes to a boil, then remove and place in a frying pan or baking pan. Pork or bacon is the best grease to use in frying when on a camping trip. It may surprise you to learn that muskrats are fine eating. If the musk glands are not broken or injured the meat will not have the least musky flavour, but it is always best to boil them in water a few moments before frying, broiling or baking.

All the turtles, except the musk turtles, are good eating if properly cooked, and even the wood tortoises are toothsome, although there is not much meat on them. *To cook turtles,* first kill them by placing in a pot of boiling water. As soon as dead remove and let cool. Lay the turtle on its back and with ax or machete crack the joint where the bottom shell joins the upper one. Pull off the bottom shell, remove entrails and gall bladder, cut off the head and skin the legs, at the same time removing the toes and outer coating of shell, which will be loosened by the boiling water. Place the turtle in a pot of fresh hot water and boil until all the meat has left the bones. Remove the bones and add water, a few dried vegetables, pepper and salt, and boil until the vegetables are done.

To cook dried vegetables is an easy matter, for all that is necessary is to place in boiling water, stir and add salt and pepper. Dried potatoes also make first-rate griddle cakes, as follows: After they are thoroughly cooked, mash them with a fork or piece of flattened wood. Mix in some flour, moisten until they cling together well; pat into cakes; sprinkle with flour, and fry in pork fat or cottolene. To make regular flapjacks place two pints of flour in a pan, add two heaping teaspoonfuls of baking powder, one level teaspoonful of salt, two or three spoonfuls of dried egg, and mix thoroughly while dry. Add six heaping dessertspoonfuls of evaporated milk and water (or the equivalent amount of dried milk) and mix until a thick, creamy batter results. Fry in a pan greased with a piece of fat rubbed over it. At first you will find it best to try small cakes and turn them with a knife, but after you have practised a while you will no doubt be able to make cakes the full size of the pan and to turn them by a dexterous twist of the pan. When you can toss the cake some distance in the air and catch it, the other side up on the pan as it falls, you can consider yourself a true camp cook. Another strictly camp dish is known as "dope," and is made as follows: Place a pound or so of salt pork (cut into dice-shaped pieces) in the frying pan with a little water and boil for one minute. Pour off water and fry the pork until nearly brown. Remove the pieces and rub into the hot fat three or four spoonfuls of flour and a little pepper and cook the flour without allowing it to brown. When perfectly smooth add a quart of water, in which twelve dessertspoonfuls of evaporated milk have been dissolved; slowly bring this to a boil, stirring constantly; add the pork scraps and serve. This is a very good way to serve pork. It is used a great deal as a sauce or gravy, is a good substitute for butter, and is delicious on griddle cakes in place of syrup. I think that with the foregoing hints, combined with the help you can get from your mothers, sisters or cooks, that you need not fear to attempt ordinary camp cooking.

CHAPTER III

WOODCRAFT AND TRAILING

It is a serious matter to get lost in the woods. Even when near home or settlements a person may become lost and wander for hours in a comparatively small area of woodland. In deep or strange woods it is really unsafe for an unskilled or inexperienced person to travel far, unless some marks or signs are made so that you can retrace your steps. Experienced and skilful woodsmen seldom become lost; but even such people often wander a considerable distance from the most direct path, and for this reason nearly all forest trails are marked by places cut on trees and knows as "blazes."

Trails or routes thus marked are known as "blazed trails," and although a novice may be unable to "read" the signs, yet a blazed trail is always easy to follow and we speak of people "leaving a blazed trail behind them," when we mean to impress the fact that their footsteps are easy to follow and we speak of explorers, pioneers or others "blazing a way" for others for the same reason.

Blazed Trails

One of the first things for boy campers to learn is to follow a blazed trail; by that I do not mean merely to follow from one mark to another, but to learn the meaning of the various signs or "blazes," for each different form or position of one of these marks means a different thing and after you once learn them thoroughly you can follow a trail as easily as though signboards were nailed to the trees. Of course, different men have different systems of blazing a trail, but, like the "pigeon Indian" languages of Canada, the blazed trail in any form is easily understood if the key is once known, for all are read in the same way, no matter whether the marks are large or small, high or low. Now and then we may run across a blaze that conveys no meaning to us, but this is of no importance, as it is doubtless a private mark of the maker to show some particular spot or to refresh his memory the next time he passes that way.

All blazes may be divided into three classes: The first consisting of a single spot, the second of two spots side by side, and the third consisting of three spots one above another. The first of these is used in denoting a trail, the second turns or directions, the third for warning of danger, traps, or other matters requiring caution. A glance at Figs. 1, 2, 3, 4 will illustrate this far better than a description. Thus the single spot in Fig. 1 marks a trail, and the tramper should proceed straight ahead from one such mark to another. When you meet the mark shown in Fig. 2, turn to the right and look for another single spot. If you see a mark like Fig. 3, turn to the left. Fig. 4 would serve to show you that you must proceed with caution; perhaps it may be a bad windfall, a hidden mud hole, a steep ravine, or in fact anything requiring care before proceeding. As long as you find the three perpendicular marks use every care until the single blazes reappear on the trees. Figs. 5, 6, 7 show how the three warning marks are used in combination with single blazes for special purposes. Thus Fig. 5 means a trap is set to the right and you should therefore pass to the left. Fig. 6 shows a trap to left, so pass to the right. Fig. 7 denotes the site of a survey line, so do not mar or cut trees bearing it. Oftentimes when going into camp with some of the party absent a mark is made to show the position of the camp. This is usually a long perpendicular mark, with another below and to


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5

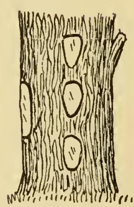


Fig. 6


Fig. 7

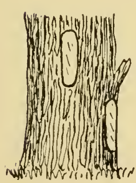


Fig. 8


Fig. 9


Fig. 10


Fig. 11

one side, as shown in Figs. 8 and 9. The position of the lower mark denotes whether the camp is to right or left. Figs. 10 and 11 show special or private marks and are of no importance, save to the makers or those to whom directions as to their significance have been given.

As the blazed spots on the trees become weathered and healed in time the trail becomes difficult to follow and hence it is customary for every traveller over such a trail to chop the blazed spots anew so that in time practically every tree along the line of march is marked.

When going into a strange forest or when some of the party are straggling behind you should always blaze a trail as I have described. It is well to practise this near home before going on a trip and a fine game of hare and hounds may be played by two boys, starting out across country and blazing a trail and then having others endeavour to find them by following the marks. This is a far more useful game than real Hare and Hounds, especially if you ever expect to do much tramping, hunting or trapping in the woods.

It is a good plan to get into the habit of always blazing a trail in the woods, and if you wish your party to be sure of your trail you can make the single- or "trail-mark" of a certain peculiar shape. It is very easy to blaze a trail and it takes practically no time, as you walk along, for all you have to do is to clip off a piece of bark with ax or machete every few rods. Make the marks for the trail about as high from the ground as your eyes, as in that position they are much more readily seen and followed.

Other Trail Marks

In localities where there are no trees, or trees are scarce, the trails are marked by the same system, but in a very different manner, this is done by means of twigs, bunches of grass or even stones. One stone on another marks the trail, the same with a third stone to right or left shows which way to turn, while three stones call especial attention, or serve as a warning. A single twig bent or broken shows a trail, this, with a twig with base pointing to right means to right, if pointed to left turn to left, while the important, or warning, sign is shown by placing a detached twig or branch in the fork of another.

Bunches of grass, or reeds, if tied or twisted together in a single knot mark a trail, if the wisp at top is turned to right or left it shows direction to follow, while the warning sign is shown by three bunches of grass. This use of three marks to signify danger, or to attract special attention, is universal and is very easy to remember.

You will see by this, and by looking at

FIG. 12 FIG. 13 FIG. 14 FIG. 15

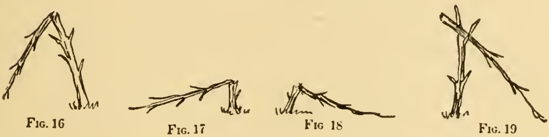


FIG. 16 FIG. 17 FIG 18 FIG. 19

FIG. 20 FIG. 21 FIG. 22 FIG. 23

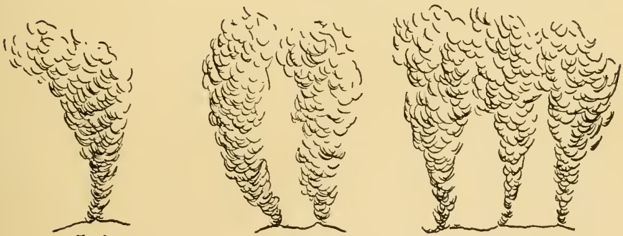


FIG. 24 FIG 25 FIG. 26

Figs. 12 to 23, that these marks or signs are as easy to read,—after you learn the real blaze signs,—as are the latter. It is a good plan to always carry a card or a slip of paper showing these various signals when in the woods. If you should get lost or become confused you may be so nervous or excited that you do not feel sure of your memory of the signs, and if you have them to refer to, there is no chance of making a mistake. Be sure to practise making and reading all the various trail-marks until you know them by heart. You will find it a lot of fun and it will always be useful in the woods. Of course a compass is a great help when in the woods and you should always have one along; but it is mainly of help when you are lost, as it aids you in proceeding in a straight line and prevents you from walking in a circle; but unless you know in which direction your destination lies you will have hard work to find it by compass alone. Bearings of prominent objects or landmarks seen from camp will help you, and the young woodsman or camper should learn to note the bearings of all hills, rivers, mountains, etc., by instinct and should train himself to retain a memory of direction in his mind at all times.

Moss on the trees is sometimes a good indication of the points of the compass; but as this varies a great deal in different places and as it often takes an expert to determine on which side of a tree the moss is the thick-est, I think it is more confusing than useful as a general rule.

Sometimes a watch may be made to serve more or less accurately for a compass. If the watch is held so that the shadow of the hour hand casts its shadow directly beneath it, half-way between that point and the figure twelve will be south. This, of course, is only approximate, for the sun's direction varies with the season and latitude, but it will give you a more or less accurate idea of the points of the compass and will keep you from wandering about in a circle, as people invariably will when lost. If you blaze a trail, however, this will never occur, for by sighting back to the last two blazes you can always be sure of taking a fairly straight line.

Signals and Signalling

While trail-signs, blazes, etc., will serve to guide you in following an old trail, retracing your path through the woods or blazing a new trail for others to follow, there are times when some other form of communication must be used. Sometimes one or more of the party may be separated from his or their companions, or may become lost, and at such times a method of communicating their whereabouts or location to their friends is very useful. The most careful person may meet with an accident and become helpless, far from home or camp, and at such a time a knowledge of signalling will prove of immense value. Even when no accident occurs, signal codes or signalling methods will often prove of great aid and value. A boy or a party may be sent to find wood, water, game or a camp-site and by the aid of simple signals the news of his discoveries may be communicated to his companions many miles away, and save a long, hard, weary tramp and a great deal of time.

Nearly all savage tribes have an intricate and elaborate system of signalling to one another and news is flashed from tribe to tribe over wide distances almost as rapidly as by telegraph. During the Boer war the natives often learned the result of a battle miles away, long before the whites knew through telegraphic advices. A great deal of information may be readily conveyed by very simple signals and it is best to begin on simple things and work up to more elaborate methods and codes.

Distance signals may be made by fire, smoke, flashes of light, flags, hats or other objects easily seen. Fires are used at night while smoke or flashed signals are the most commonly and easily used during the day. Signals flashed by a mirror can be seen for immense distances and are the basis of the heliograph signals used in the army. Although a regular heliograph is easily made, a small pocket mirror is far more useful and easy to carry for ordinary purposes. The simplest signals for ordinary purposes,—whether made by smoke, fires or mirror flashes,—are similar to those already described for trail-signs. One smoke, fire or flash means location. Thus, if a member of a party is absent and the location of a camp is to be shown, a single column of smoke, a single bright fire or a single flash of a mirror will denote the position. Two smokes, two fires or two flashes, repeated at intervals, will mean trouble and that help is required. Three smokes, three fires or three flashes convey good news, or that a hunt or search is successful and four signal smokes, fires or flashes call all members of the party to a meeting spot or camp (Figs. 24, 25, 26). These same signals may be given by shots from a gun or pistol and any additional ones may be arranged and decided upon among the campers as special signals.

While these simple signals will answer very well for ordinary purposes, yet one often wishes to convey some long, or unusual, message to friends or fellow woodsmen, and to do this you must learn one of the various signal-codes in common use. There are a number of these codes but the most widely used, and as simple as any, is the Morse Code used by telegraphers. Every boy would do well to learn this code or "alphabet" thoroughly, for it is a most useful thing to know even if you never go camping or care nothing for out-of-doors life. In addition to its usefulness any boy can obtain a great deal of amusement from it and by signalling messages in Morse two or more boys can readily talk for long distances across country—a real wireless system without instruments.

Many devices and keys have been devised to make the Morse code easy to learn and memorise, but to my mind most of these are more difficult to remember than the code itself. Ordinary Morse is a hard code to use in signalling with fire, smoke, etc., as there are many letters of spaced dots. For this reason it is better to use the Continental Morse or Continental Code, which has no spaced dots. As this is the code used to large extent in wireless it is a good code to know and is as follows:

A .— B —... C —.—. D —.. E . F ..—.
G — —. H .... I .. J . — — — K —.— L .—..
M — — N —. O — — — P .— —. Q — —.—
R .—. S ... T — U ..— V ...— W .— —
X —..— Y —.— — Z — — ..

By using this code any message may be spelled out, but in addition certain combinations have been adopted to signify certain things or sentences commonly used, thus,—D D means a call or "Signalling." W W means "Answering." F F means "Spelling." I M I signifies "Repeat." A A A means "Full stop." G means "Go on." M G, "Wait." R T, "Right." F I, "Numeral," etc., etc.

Boys accustomed to using telegraph instruments will find it very easy to use the code in signalling, but to the beginner it will be at first rather hard to so time the flashes, smokes or fires, as to make an intelligible message, for dots, dashes and spaces will no doubt be hopelessly muddled at first. A dot consists of a flash, fire, or smoke of one second's duration; a dash should be two seconds long and a space should be four seconds. Between words a longer period of say six or eight seconds should be allowed until thoroughly familiar with the code and its use. To use the code with a fire, a blanket, coat, or any other object should be held in front of the flames and by removing this for one second a dot is given, then screen the fire for four seconds and remove for two seconds for a dash. When using smoke-signals a good fire should be made and then covered with damp wood, leaves or turf, until heavy

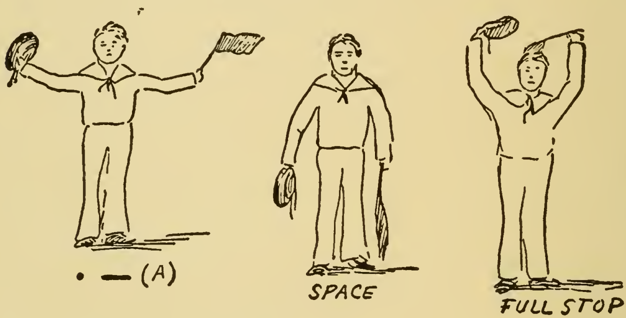


Fig. 27.

smoke rises. A wet blanket, carpet, canvas or similar object thrown over this will stop the smoke, and if quickly removed and replaced puffs of smoke of varying sizes will be sent up. These should be sufficiently distinct in size and duration to admit of no mistake in reading. A straight stick or flag and a cap or hat may be used to transmit Morse; and for use aboard boats, or where the signaller is plainly seen, this system proves most useful. In using this method the stick, shingle, flag or piece of cloth, should be held in one hand and the hat, or cap, in the other. The flag or board means a dash and the cap a dot (Fig. 27), while lowering both arms means a space and the space between words is signified by raising both arms over the head. Two flags of distinct colours may also be used to advantage and from a tree-top, flag pole or mast-head, signals may be sent for a long distance. This method has one great advantage inasmuch as the boys using it may decide on any colour they wish for dot and any other colour for a dash and thus the signals, while easily understood by those in the secret, are absolutely meaningless to others.

Almost as important as a knowledge of signalling is the ability to make either a bright, or a smoking, fire to use for signals and of far greater importance than either is the ability to kindle a fire quickly and surely under any and all circumstances.

CHAPTER IV

EMERGENCY HINTS

Making Fire Without Matches

There is really no excuse for anyone being caught in the woods without matches, but accidents will happen and matches may be lost or may be wet or damp, and the most careful person may at times forget, or use up, his supply of these useful articles. Even without matches there is no reason for going without fire, and every camper should be provided with the means and knowledge for producing fire without the civilised, and most convenient, match.

The next best thing to matches is a flint and steel with tinder. Flints and steel with tinder fuse may now be bought from any dealer in camping or sporting goods and such an outfit should be in possession of every boy who camps, traps, hunts or tramps. While these are the best and easiest to use, any piece of flint, hornstone or quartz, and any piece of steel can be made to answer. The great secret in making a fire with flint and steel is to have the right sort of tinder or "punk." Dry cedar bark, dry and rotten pine, or spruce shavings; dried lichens, or moss; dry, resinous pine or balsam, sawdust and various other common materials are all good, but the best of all are dried puff-balls and other fungus growths and cotton wicking soaked in saltpetre and dried. The large, flat, white fungus-growths found on decaying trees are splendid tinder when thoroughly dry and a supply of these should be on hand.

To strike fire with flint and steel, hold a piece of punk against the lower side of the flint, or bit of stone, and strike sharply downward across the edge of the stone with the steel (Fig. 1). A shower of bright sparks will fly off, and after one or two trials one or more of the sparks will probably rest on the punk and will begin to smoulder. As soon as this occurs blow it into a brisk glow and by placing fine shavings, sawdust, cedar bark, and similar tinder upon the glowing spot and blowing it, a flame will soon spring up.

Inflammable material should then be added a little at a time until the fire is going briskly. All this sounds easy, in fact it is easy enough once you get the knack of it, and hours of practice will not be misspent in learning this useful accomplishment, which is nowadays known to comparatively few, although a few generations ago it was used by everyone in civilised lands.

Sometimes even the flint and steel will be wanting and a fire may be required. At such times one should know how to build a fire by rubbing two sticks together, and while this method is slow and may at times fail entirely, yet it is not by any means as hard as many writers would have us believe. The rapidity and ease with which fire may be made by this method depends almost entirely upon having just the right sort of material in the first place. Many tribes of savages make fire in this way and there are innumerable variations in the materials, implements and methods used. The easiest, surest and simplest method is that known as the bow and drill. To make a fire in this way you must have the following implements and materials,—

A Bow—consisting of a stiff, bent stick with a leather string; the bow should be about 27 inches long and from ½ to ¾ of an inch in thickness (Fig. 2).

A Drill—an eight-sided stick about 12 to 18 inches long and ¾ of an inch thick, pointed at each end (Fig. 3).

A Fire Block—a piece of flat very dry wood about ¾ of an inch thick, of almost any width and length, with notches cut in one edge (Fig. 4).

A Drill Socket—a small stone, knot or bit of hardwood with a small socket, or hole, in one side (Fig. 5).

Tinder—shredded dry cedar bark or similar tinder.

The material of which the above tools are made is of great importance. The bow may be of almost any strong, light wood, such as balsam fir, hemlock or cedar. The drill should be of old dry but not punky or rotten fir, or cottonwood, basswood, cedar, larch, sagebrush or pine. The best materials are fir or cottonwood roots.

The fire block should be dry fir, pine or hemlock.

To use these implements place a piece of pine punk on the ground, set the fire block over this and hold it in place with one foot. Take a turn of the bow-string around the drill (Fig. 6); place one end of the drill in a notch in the fire block and rest the drill socket (held in left hand) on the other end of drill, thus holding the drill perpendicularly between the left hand and socket and the fire block held in place by your foot. Hold the bow in your right hand and draw it back and forth with even, steady, long strokes, thus whirling the drill in its socket (Fig. 7). In a few moments you will see a brownish powder of wood run out of the fire block on to the punk below. As the notch in the block increases in size it will darken and a light smoke will arise. When this occurs increase the pressure on the drill with the socket and work the bow faster with the right hand. The smoke should now increase rapidly and the sawdust-like powder will begin to fill up the notch in the fire block. Presently the powder itself will begin to smoke and turn black and the bow should now be discarded and the heap of powder gently fanned, or blown, until it smokes freely. Then remove the fire block and insert bits of prepared cedar bark or other tinder in the pile of smoking powder. Place another piece of dry pine-punk over this and grasping both pieces of punk,—with powder and tinder between,—wave the whole back and forth and blow upon it until it flames.

I do not suppose that you will accomplish this on the first trial, but with a little practice you will find it a very easy and interesting operation and you will soon be the envy of many other boys who have never learned the trick.

In kindling a fire, from either matches, bow and drill, flint and steel or by any other method, it will prove of value to have some dry birch bark, cedar bark and resinous pine,

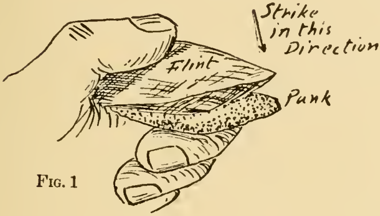


FIG. 1

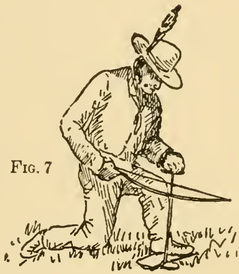


FIG. 7

FIG. 2

FIG. 3

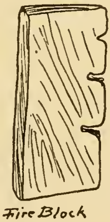


FIG. 4

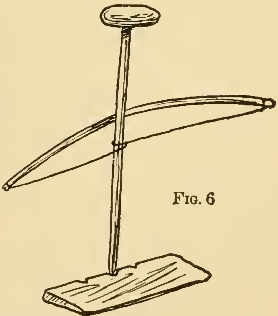


FIG. 6

Position in Use

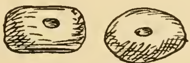


FIG. 5

Drill Sockets

or fir twigs on hand in a little pocket or bag. Even under the best conditions it is not always easy to find dry materials for building a fire when you want it and in wet weather you will find that even a small supply of dry material on hand will prove of the greatest help and benefit in starting your fires in the woods. Birch bark will burn, even when wet, and green and dry wood may usually be found in hollow logs, stumps, or under dead pine bark; but such things are often at some distance from camp and hard to find, and the boy who is always well prepared for emergencies will succeed best in the long run,—especially in the woods.

How to Render First Aid to the Injured

No matter how careful or cautious you may be, or what provisions you may make to avoid accidents, you are at all times liable to meet with some injury. Such things are not confined to the boy in the woods, on the water or camping out, for even on city streets, in vehicles or in your own home, accidents are liable to occur. Oftentimes a wound, sprain, dislocation or similar injury, if taken in time and properly attended to, will be of little moment, whereas if neglected or improperly treated it may prove dangerous or even fatal.

Even if you do not meet with any casualty yourself you are always liable to find someone who is injured, sick or disabled, and a knowledge of how to properly bandage, stop the flow of blood, revive drowning people or render first aid in any form, is of the utmost value and importance. Although this knowledge may come in handy at any time and in any place, yet it is of particular value to the outdoor boy.

How to Make and Use Bandages

Sprains, breaks, cuts and dislocations are of frequent occurrence and fortunately this class of injuries are the easiest to treat and to care for.

Every boy or party of boys who tramp or camp should be provided with certain simple remedies and appliances and among the most important of these are bandages.

Bandages are merely pieces of cloth of various lengths, widths and shapes used to bind up and retain dressings on wounds, to hold splints in place on broken or dislocated bones, to stop the flow of blood or to render immovable certain parts of the body. Bandages are made of various materials, such as linen, muslin, flannel, gauze and cotton. Bandages treated with antiseptic solutions may be purchased at any drug store and are most excellent, but any piece of clean cloth will answer in a pinch in case of emergency.

The ideal bandage for first-aid use is that known as the Esmarch triangular bandage. It is easier to use by the amateur than either the plain, four-tailed or roller bandage. A triangular bandage may be easily formed by cutting any piece of cloth forty inches square into two triangular halves and may be made from linen, cotton or gauze, but is best when made from good, strong cotton cloth.

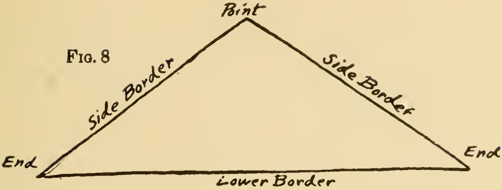
The regulation triangular bandages furnished to the army have printed directions upon them showing their use with illustrations, which are not destroyed by washing and ironing.

The longest edge of the bandage is called the "lower border" and the other two edges the "side borders." The apex of the triangle is the "point" and the other two corners are called "ends" (Fig. 8).

The bandage may be used whole, as in the case of head injuries or when a sling is required, or it may be folded into various widths and shapes to suit the needs of the part injured.

When thus folded the bandage is of great use in holding splints or dressings in position, for slings or to serve as tourniquets for

FIG. 8



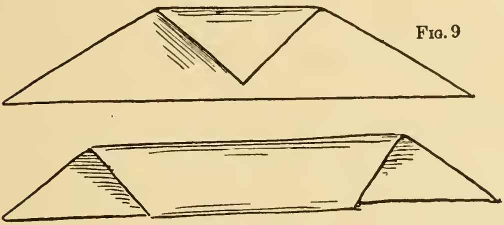


FIG. 9

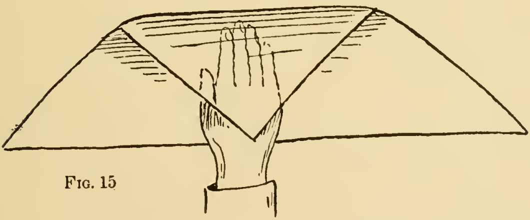
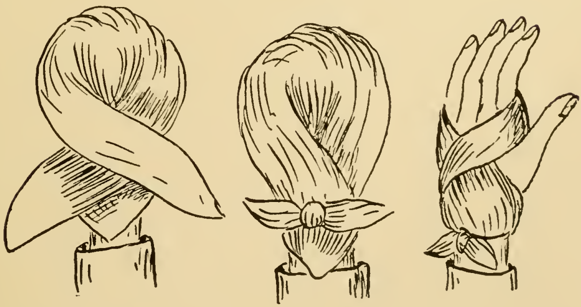


FIG. 15



stopping the flow of blood (Fig. 9). To fasten any bandage, use a strong safety pin, or tie the ends with a square- or reef-knot. Never use a "granny" knot, as it is liable to slip or become unfastened. The bandage should be used as a sling for injuries to arm, hand or shoulder by folding the triangle as shown in Fig. 9, making the folds the proper width to suit each particular case.

How to Make a Sling

The bandage thus folded is used by placing one end over the shoulder on the injured side and letting the other end hang down in front. The injured arm should then be bent at a right angle in front of the bandage with the thumb upward; then draw the loose end up in front of the arm and over the opposite shoulder, where it should be tied to the other end back of the neck (Fig. 10).

A broad sling is useful in many cases and is used by placing the point below and beyond the elbow of the damaged arm, and the upper end across the opposite shoulder, letting the point hang. Then bend the forearm across the breast with palm of hand inward and thumb up and bring the lower end of bandage up across the forearm, pass it over the shoulder on injured side and fasten the ends together firmly behind neck. Draw the point of bandage forward over the elbow and pin it snugly in place. This is an almost perfect dressing for any injury to the upper arm, such as a broken collar bone, dislocated shoulder, dislocated elbow, broken upper arm bones or sprained wrist (Fig. 11).

Injuries to the Head

In case of extensive injuries to the head the bandage should be used as a whole and not folded. This is the case in scalp wounds, especially those that bleed freely, fractured skull, severe contusions, etc. In using the bandage for these purposes a hem should be formed along the lower border about two inches wide by folding the edge over once or twice. Place the lower edge of bandage, with middle of hem over centre of forehead with lower edge of hem on a line with eyebrows (this is important, as otherwise it will slip off). The point of bandage will then hang over the centre of the back of the neck. Both ends should then be gathered backwards around head just above ears, being sure to have the point of bandage underneath the two ends. Cross the ends and bring them around to the front of head again and tie firmly over forehead. Pull the point of the bandage down so that the whole fits the head snugly and turn it up over the two ends and pin in place (Fig. 12).

For small scalp wounds or injuries to ears or eyes, it is not necessary to use the bandage as a whole and in such cases it may be folded up as shown in Fig. 9, and used as shown in Fig. 13. For shoulder wounds the triangular bandage should be employed as illustrated in Fig. 14. Place the lower border downward across the middle of arm, the point on top of shoulder or beside the neck. The two ends should next be brought around the arm, crossed on the inside and tied on the outside. The forearm on the same side should then be bent and placed in a sling as already described. Next draw the point of the large bandage under and around the sling where it passes around the neck, and pin it in position.

Injuries to Hands

For wounds or injuries to the hand the bandage may be used in two ways, either when the whole hand is to be covered or where only a small part requires treatment.

For a whole hand bandage, spread out the triangle, place the hand with palm down upon it, with the fingers pointing to the point of bandage and wrist in centre of lower border. Now turn the point over and back and down

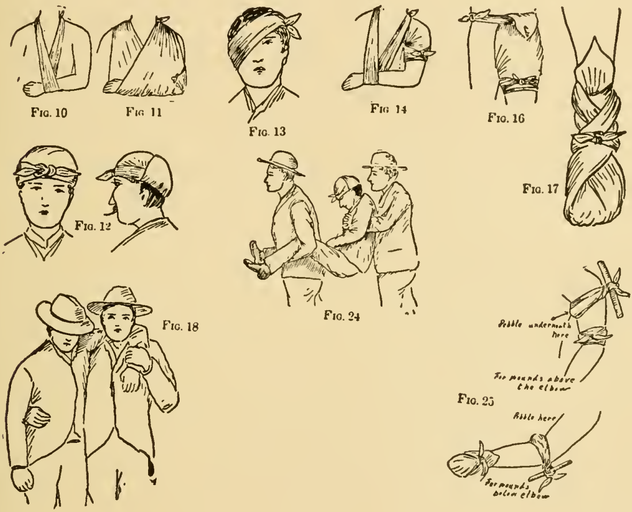


Fig. 10 Fig. 11 Fig. 12 Fig. 13 Fig. 14 Fig. 16 Fig. 17 Fig. 18 Fig. 24 Fig. 25

over wrist and bring the ends around the wrist, thus binding down the point. Cross the ends and bring them back again and tie over point. Now draw point up so that the bandage fits tightly; turn over and pin in place (Fig. 15).

Where it is not necessary to cover the fingers, as in case of wounds to palm or back of hand, the bandage should be folded to a proper width, place the centre over injured spot with a compress on wound if possible, bring the ends around the hand and cross them obliquely, then bring them in front, bring them back around wrist and tie firmly.

Injuries to Hip

For injuries to the hip two triangular bandages should be used, and these are applied very much in the same manner as already described for injuries to the shoulders. First fold a narrow bandage and tie around the waist like a belt, with the knot opposite the injured side. Then place a triangular bandage across outside of injured hip with lower border on middle of thigh, and point upwards. Pass the ends around thigh, cross them and tie on outside. Pass the point under belt, bring it over and pin (Fig. 16).

For wounds or injuries to the leg below hip and above the foot the bandage is applied folded as for a narrow sling, passed around leg several times and tied opposite to the injury so that the knot will not press on the wound.

For injuries to the foot place the foot on the triangle with toes toward the point.

Carry the point up over instep, take both ends forward around ankle to front and over point, cross them again behind, catching lower border of bandage, bring the ends forward and tie in front of ankle. Then bring the point down over knot and pin as usual (Fig. 17).

Making Tourniquets

Tourniquets are used to stop bleeding and should always be applied above the wound and at some spot where the arteries are near the surface. Under the knee, under the armpit, above the elbow, on groin or on side of neck are the usual spots. For many cuts a mere folded rag or cloth placed around the leg or arm and twisted tight by means of a stick or rod, will serve every purpose, but in severe cases, as in deep cuts or gunshot wounds, a pebble, lump of clay, a bit of wood, a ball of stiff paper, a nut or even a knot in a cloth should be placed under the tourniquet in order to press upon the arteries and stop the bleeding (Fig. 25).

Injuries to Arms and Hand

If the cut is on the arm or hand, holding the injured member above the head will help stop the flow of blood, and in case of a cut or wound in the leg the injured limb should always be elevated as high as possible.

Carrying an Injured Comrade

An important matter in the case of many injuries is that of helping or carrying the injured person to a spot where proper treatment or attention may be administered. If two or more people are present a stretcher of some sort should be used, but quite often one may be alone with the injured, and in such cases he should know how to carry the sufferer without further injury and with as little pain and discomfort as possible. If the injured person is not unconscious and can render some help himself he should place his arm over the other's shoulder so that the armpit of the injured person rests on the shoulder of his bearer, with the arm passing around the latter's neck and over the other shoulder. The bearer then grasps the wrist of the arm over his shoulder with the hand of that side and with the other arm supports the patient's waist (Fig. 18).

Another good way of carrying a conscious patient is "Pick-a-Back." This is a particularly good method for carrying children or people light in weight.

Unconscious people may be carried across the back. This is a particularly easy way to carry people who are insensible from smoke or gas, as it leaves the bearer free to use one hand in groping his way about. It is also an excellent method when obliged to carry a person up or down ladders or stairs.

When the arm or leg is broken this method, however, cannot be used. There are several different methods of this back carrying, but that most commonly used and the easiest to accomplish is known as the "Fireman's Lift."

Several successive operations are required in order to get the injured person on your back and these are best understood by referring to the Figs. 19, 20, 21, 22, 23.

First—Kneel on both knees at head of the injured person, facing the patient and turn him .over, face down, straighten arms at sides (Fig. 19).

Second—Pass hands under body, grasp patient under armpits, raise the body as high as possible while kneeling and let it rest on your knees (Fig. 20).

Third—Pass both arms around waist of patient and lift him to an upright position with his body inclined towards your right shoulder (Fig. 21).

Fourth—Grasp the patient's right hand

with your left; throwing his right arm around your neck. Now stoop and place your head beneath his body, at the same time pass your right arm between or around his legs,

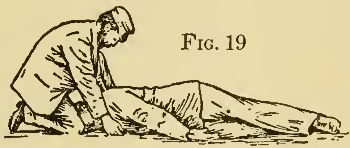


Fig. 19

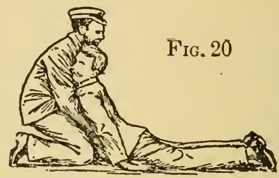
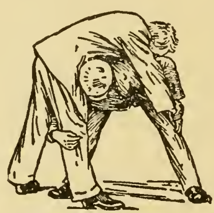


Fig. 20

Fig. 21

Fig. 22



The Fireman's Lift.

Fig. 23

bringing his weight on the centre of your back (Fig. 22).

Fifth—Grasp the patient's right hand or wrist, with your right hand, balance his body carefully on your shoulders and rise to an upright position (Fig. 23).

When litters or stretchers are not available and yet there are two or more persons present, the injured may be readily carried either by the well-known "four-handed chair" or by the "Fore and Aft Carry." The former method is so well known to every boy that it is not necessary to explain it. The latter, or Fore and Aft, is not so well known.

To do this the bearers should stand at the patient's head and feet. The one at the head should pass his arms beneath the head and under armpits and interlock the fingers in front of chest. The bearer at feet should pass one hand around each knee and thus carry a leg under each arm (Fig. 24).

Miscellaneous Hints

Never carry a patient face down by arms and legs.

In using a litter, or stretcher, care should be used in making it strong enough to safely bear the weight and it should always be tested before placing a patient upon it. A door, shutter or blind may be used for a stretcher if nothing else is handy. A litter may also be improvised by use of an overcoat. Turn the sleeves inside out; button coat over sleeves and pass pole through each sleeve. In the woods, litters may be readily fashioned by using branches of trees fastened together by vines, roots, bark or even twisted handkerchiefs and then covered with branches, leaves, grass or ferns. Never carry an injured person on a loose blanket, clothing, curtain or similar object, as a corner may slip or the material tear and drop the patient.

When a litter is carried by two persons they should be careful not to keep step but the one in front should start with right foot and the one behind with the left foot. If the two bearers are of unequal height the taller should be at the head of the patient. Always carry patient feet first except in going up stairs or up a steep hill, when the head should be in front. In case of broken or injured thigh or leg, however, the feet should go first when ascending and last in descending.

Never carry a stretcher with a patient on the shoulders, but always carry it by the hands, or hung on straps across the shoulders.

All these first aid bandagings, carryings and similar treatments should be practised from time to time until expert, for you never know when a thorough knowledge of such matters may save life or limb. Never lose your head or get frightened at sight of broken bones or bleeding wounds. Use every bit of skill and knowledge you possess in doing what you can to relieve the injury and then obtain medical treatment just as soon as possible.

Aside from bandaging for various injuries and flow of blood, there are numerous accidents met with which require very different treatment. Some of these are:

Shocks of various sorts. In shocks the patient lies pale, faint and sometimes insensible. Place the patient flat on back with head and shoulders slightly raised. Loosen clothing about neck. Give a little brandy and water, whisky and water, or aromatic spirits of ammonia and water every two minutes. External warmth should be applied to limbs and pit of stomach either by hot applications, or rubbing briskly. Wrap patient in warm blankets. As soon as patient comes to, strong, hot soup or similar stimulating nourishment may be given.

Fractured bones should be splintered by pieces of light wood fastened in place with a bandage or handkerchiefs.

Severe bruises should be treated by hot water applications. After inflammation has subsided use stimulating applications such as vinegar and water, alcohol, etc.

Sprains—Elevate limb, keep joint quiet; apply lukewarm lotions or compresses. When inflammation ceases apply liniments; spray parts with cold water, alternating with warm water, or apply hot and cold compresses alternately and bandage.

Burns and scalds should be kept from the air as much as possible and to accomplish this cover the burn with flour, oil and flour, lard and flour, limewater and oil, cooking soda and oil or grease and similar compounds and the blisters should not be broken.

Sunstroke—Take patient into shade at once; place in recumbent position with head and shoulders elevated; loosen clothes about neck and body; apply ice, or cold, wet cloths on head and nape of neck, changing frequently. Douche head, spine and chest from a height of two or three feet. Fan patient briskly and treat limbs and sides with mustard, or administer stimulants.

Poison—The first step in all poison cases is to administer an antidote and then cause vomiting. The best and handiest emetic is a tablespoonful of mustard in a cup of water or a spoonful or two of common salt in water. When vomiting has already taken place give draughts of warm water, soap and water or oil to keep up the effect until stomach is thoroughly empty.

The following are antidotes for most of the common poisons:

Strong Acids—Give common chalk, oil, soapsuds, soda or any common alkali.

For Arsenic—Magnesia, milk, raw eggs, powdered charcoal, oil and limewater.

For Prussic Acid—Cold affusion, brandy and ammonia or stimulants.

For Opium, Morphine, etc.—Keep patient moving, give strong coffee, slap with hands and switches, sting with nettles, rub with mustard, etc.

Asphyxia—In cases of patients overcome by gas, charcoal fumes, etc., the face becomes livid and the victim should at once be placed in clear air with head raised. The clothing should be removed and the body douched with cold water. Ammonia should be applied to nose and the face and body should be sponged with vinegar and water and briskly rubbed. In severe cases artificial respiration, as described for drowning, should be resorted to.

Frostbite and Freezing—Use friction on parts affected, commencing with snow or similar cold substances and later place in cold water until frost is removed. As soon as sensation returns, administer brandy and water in small quantities. If the patient is apparently dead, or insensible, the body should be stripped and then covered with snow or ice and placed in cold water. When the body is thawed, dry it, place in a dry, cold bed and rub hard under cover. Continue this for hours. If life appears give small injections of camphor and water, put a drop or two of spirits on tongue; then rub body with spirits and water and finally with clear spirits. Then administer hot tea, coffee or brandy and water.

Drowning—First, unless in danger of freezing, do not try to remove the apparently drowned, but instantly expose the face to a current of air, wipe the mouth and nose dry, remove clothing across chest and waist and give two or three quick smarting slaps on stomach and chest with open hand. If patient does not revive, proceed as follows:

Draw off water from stomach and lungs. If jaws are clenched, separate them and keep mouth open by a bit of wood or cork between teeth. Turn patient on face, a large bundle of clothing, a log, barrel, or a person's knee being placed beneath the stomach, and press heavily upon the back for half a minute, or as long as fluids flow from mouth.

Next, produce artificial breathing by clearing mouth and throat of mucus with a handkerchief wrapped around finger. Turn patient on back with roll of clothing or some round object under back so as to raise stomach above rest of body. If another person is present have him hold the tip of tongue out of one corner of the mouth, as this prevents the tongue from falling back and closing the windpipe, and with the other hand grasp both wrists and keep the patient's arms stretched back above the head. Kneel astride, or beside, the patient with balls of thumbs resting on either side of pit of stomach, let fingers fall into grooves between short ribs so as to grasp waist. Now use your knees as a pivot and throw your weight forward on your hands, at the same time squeezing the waist between them as if you wished to force the contents of chest up through the mouth. Deepen the pressure while you count slowly one, two, three, and then suddenly let go with a final push which springs you back to your first kneeling position. Remain stationary while counting one, two, three and then repeat the operation as before at a rate gradually increasing from four or five to fifteen times a minute and continue this bellows motion with the same regularity that is seen in the natural motions of breathing. If after three or four minutes, natural breathing is not restored, then without stopping the movements turn the patient on the stomach as directed for removing water, rolling the body in the opposite direction from that in which it was first turned. Continue the artificial respiration for from one to four hours, or until the patient breathes, and for a while after this aid the breathing by helping pressure. Continue drying and rubbing, which should have been continued from the first. Rub the limbs upward towards the body and continue friction even after steady natural breathing is restored. Apply hot flannels to stomach and armpits and use hot-water bottles, heated bricks or the quickest means at hand to keep up artificial heat.

When breathing is fully established the patient should be placed in a warm bed with plenty of fresh air and left to perfect rest. A little brandy and water, or other stimulant, should be given every ten or fifteen minutes during the first hour. The great danger now lies in congestion of the lungs and if perfect rest is not maintained for at least 48 hours death often results. In case any difficulty in breathing develops apply a mustard plaster over breast, or assist with artificial respiration.

Never give up trying to revive a drowned person, unless he has been under water over 30 minutes, or until absolutely sure that there is no hope. Four hours' work has been needed to revive apparently drowned persons and people who have been under water for 25 minutes have been resuscitated.

No amount of work is too great when a human life may be saved and it too frequently happens that attempts are abandoned too soon, whereas by more patience and perseverance the patient's life might have been saved.

CHAPTER V

HOW TO FIND DIRECTION AND DISTANCE

The Compass and How to Use It

Every boy should know how to find direction, how to use a compass, how to find his way by the stars and sun, how to steer a boat by compass, how to calculate the height of various objects and how to determine the distance across rivers, ponds, ravines or other areas. These things are all useful whether on land or sea, on prairie or in the woods, in valleys or on mountain tops. In addition to the real value and use of such knowledge you will find that a surprising amount of fun may be obtained by employing it in many ways.

Of course the commonest method of determining the direction of one object from another, or of finding your way or steering a boat, is by means of a compass (Fig. 1). Most boys have some idea of the use of a compass and are familiar with the cardinal points of North, South, East and West, but only a few boys can name more than eight of the compass-points correctly and in proper order. Under many conditions this might prove sufficient for ordinary directions, for the landsman seldom finds it necessary to state that a certain wind is from the Northeast by North, or that a certain spot is East One-quarter South from another. If he states that the wind is Northeast or that the spot referred to is East it serves his purpose well enough. It would be quite a different matter were he sailing a boat, following a trail through the woods or crossing a desert or plain. Under these circumstances such general and indefinite directions would never answer, for while on a short trip, or where the destination could be plainly seen for some distance, a point or two off would make little difference, yet in the course of a twenty- to fifty-mile trip the variation of a quarter-point might result in the traveller missing the objective point altogether. You can easily imagine what might happen if you were travelling across a desert, where your life depended upon reaching an oasis or waterhole only a few hundred feet in diameter. A variation of a fraction of a point under such conditions would carry you so far to one side that you would never find the coveted water and would wander about until ex-

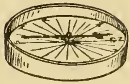


Fig. 3

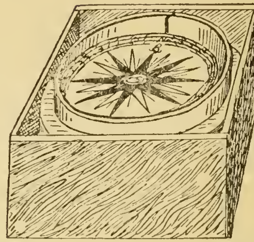
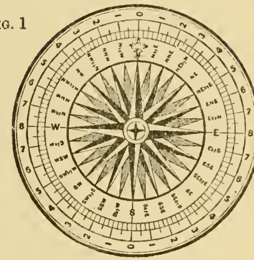


Fig. 2

Fig. 1



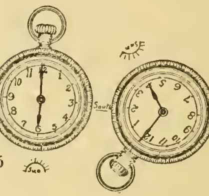


Fig. 5

Fig. 6

haused and perishing from thirst. The boy who takes to the woods must be careful of little things, and therefore I advise you all to spend ample time in studying the compass until you can rattle off the thirty-two points or "box the compass" in sailor's parlance, with ease and rapidity both backward and forward, and can tell a direction or steer a boat within a quarter-point. In travelling, or sailing, a floating card compass (Fig. 2) is far superior to a compass with moving needle (Fig. 3), but as they are much more bulky and cumbersome than a pocket compass they are better suited to boat use than to tramping outfits. In the floating card compass the needle is attached to or is part of the card bearing the points. This card either revolves upon a pivot or floats upon mercury or other material while its encircling case remains stationary and a small line or mark known as the "lubber's mark" is indicated on the case and should be so adjusted that when facing the north the North on card and lubber's mark should be in line. In the movable needle compass the card with points remains stationary while a pivoted needle swings over it. In a boat the floating card compass is almost a necessity, for with it the boat's head is pointed in the direction or "course" desired, whereas with a needle compass the card or dial remains stationary with the boat and the needle shifts about. As a result the helmsman must do some mental calculation to know how to hold his craft in order to follow a given course. This peculiarity will be better understood by looking at Fig. 4. You will see that in "A" a floating card compass is illustrated and that the boat is headed Northeast while in "B," although the same course is being steered, yet the boat's head is pointing to the "North" of the compass and the needle is pointing Northwest, or in other words you are reading your card backwards, and to steer a Northeast course you must swing your helm so as to bring the needle to Northwest. Of course this can be avoided by shifting the position of the compass so as to bring the needle directly over "North" and then steer so that the boat is in line with Northeast as shown at "C." This is frequently very inconvenient if not impossible, for in a seaway a compass will jump about and become very erratic unless fastened securely. On land, however, it is quite a different matter, for it is an easy matter to turn your compass about until the needle and the "North" are in line and then head in the desired direction. Small pocket compasses are usually of the movable needle type, but they are made with swinging cards and these are so much better and easier to use that I advise every boy to obtain one if possible.

It is excellent training to practise sailing and walking by compass, and a novel and interesting game of "Hare and Hounds" may be played by the "Hares" starting out and tramping in a course across country, meanwhile keeping a watch on the compass and travelling as nearly in a straight line as possible, and at the end of two or three miles erect a flag or other mark readily seen for a few hundred yards. These boys should then give the compass direction and approximate distance to the "Hounds," who must find the goal by following the compass course. As the players become more expert the distance should be increased and the goal made smaller and the game more interesting and instructive by changing the course at certain given points and distances. Thus a course may be given as "Northeast by East for two miles to a white flag; then North-Northeast for one mile to a dead pine tree and hence Northwest for one mile to a pile of stones marked with a cross." On the water the same game may be played by placing buoys or stakes at certain distances and then by following the given course try to locate them. If a small flag, or marked rag, be placed on the buoy this may be brought back by the "Hounds" as a trophy.

The game may also be varied by making charts or maps of the country covered and requiring the "Hounds" to find the hidden object by following the mapped direction. Later on I will give directions for readily making fairly accurate maps without the use of surveying instruments and you will find this a most interesting and instructive occupation.

Although the amateur should always depend more or less upon a compass and should invariably be provided with one when on a trip in unfamiliar country or on unknown waters, yet many old sailors, woodsmen and hunters never carry a compass but possess a natural talent or "sixth sense" of direction and can never become lost in strange woods or in strange lands. Personally I have this "sense" to a wonderful degree, and although I have tramped and hunted in many out-of-the-way lands and in the heavy forests of the tropics, I have never been lost and have never used a compass on land. But no matter how well developed this sense may be, a compass is a safeguard and convenience and the best sailors will often become confused and lost in a fog unless provided with this useful instrument.

Using a Watch for a Compass

Aside from the compass there are many ways of ascertaining one's general direction, for to the well-trained woodsman the "lay" of the land, the bark and moss on trees, the flow of streams and the direction of light will all help in determining the compass points. A very useful substitute for the compass is an ordinary watch, for while known to comparatively few, yet in reality a watch is a fairly accurate compass, although its use as such necessitates a knowledge of the location of the sun or bright sunshine. To use the watch for this purpose, place it on a level spot and turn it until the hour hand points directly at the sun,—or until the hand's shadow is directly underneath the hand itself. When this position is attained the south will be exactly half-way between the indicated hour and the figure 12 (if before noon counting from left to right or southward, and if after noon counting backward, or from right to left). This is very nearly correct for our latitude during the year, but while it will serve for all ordinary uses and distances, the mariner who depended upon his watch would have a hard time. The illustrations (Fig. 5) will make the above more readily understood, for in one figure the watch is shown in the position at 6 a. m., when the south would be at 9, and in the second figure the watch is shown with hour hand pointed to sun at 4 p. m., when south is found at 2. By remembering this it may prove of service at times, but whether using a watch or a real compass you should never expect too much from it; a compass cannot show your way home unless you know in a general way which direction home is, and if at a loss as to which way to travel; it is mainly of value in keeping you from turning round and round and travelling in a circle.

When a small boy I was once told a funny story by an old trapper which may help you to remember this. An old Indian took a fancy to a compass seen in the trader's store and asked what it was used for. He was told that with it the white men found their way from place to place, and, thinking this a fine idea, the redman at once traded off furs for the compass. A few days later he wished to visit a friend who was camping and trapping somewhere in the forest. Taking his compass the Indian placed it on a rock and said: "Now tell me where Joe Bemis' camp be." Of course no reply came from the compass and the Indian became vexed and cried;

"Tell me where Joe Bemis' camp be or I break um face." As the compass still gave no sign the Indian grasped his hatchet and smashed the compass, exclaiming: "Huh! No speak um Mik Mak, break um face, now go find Joe Bemis' camp myself."

Finding Your Way by the North Star

In addition to knowing the points of the compass and how to use this useful instrument, every boy should also learn the position of the North or Pole Star. This is readily done by finding the "Great Bear" or "Great Dipper,"—the beautiful large constellation in the northern sky. By following in a straight line from the two outer stars of the dipper, the uppermost of which would form the "lip" of the dipper or the "breast" of the bear, the North Star will be the first bright star in range of these two stars in the constellation, looking from the bottom, or foot, of the dipper upward. As the dipper revolves around the pole star it will sometimes be above it; but by running your imaginary line from the foot or bottom of the constellation across the "breast" or "lip" and then straight on, the north star may always be located if the night is clear. The diagram (Fig. 6) will make this clearer.

Finding the Height of Objects

Almost as important as a knowledge of direction is a knowledge of distance, size or

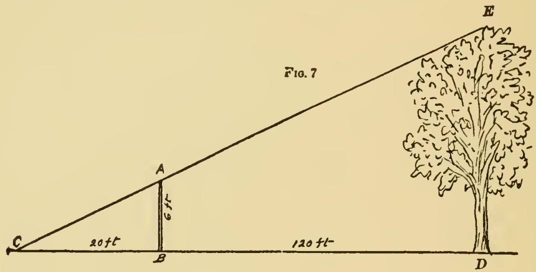


Fig. 7

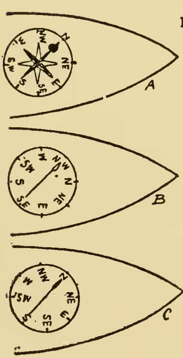


Fig. 4

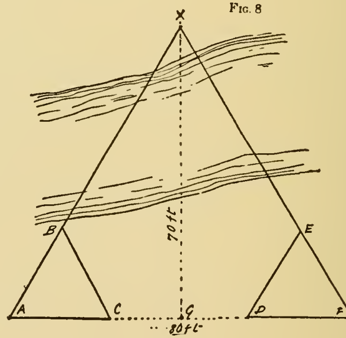


Fig. 8

height. How often we would be glad to know the real distance from one spot to another; the width of a bay or river we cannot cross, or the height of some tree, building or similar object. Usually we have to merely guess at such things, and often arrive at a result far from the truth, for distance and height are very deceptive. We are accustomed to comparisons in everything and unconsciously compare one thing with some more familiar thing constantly. Doubtless you have all noticed how huge the rising moon appears and yet how small it seems after it has fully risen. This is mainly because we compare the moon with trees, buildings, etc., when near the horizon, which we cannot do after it is high in the heavens beyond surrounding objects.

Even more remarkable is the deceptive effect of atmospheric conditions. In the clear air of mountainous countries objects many miles away appear close at hand, and in Colorado they relate how an Eastern man looked from his hotel window the morning after his arrival and saw a towering mountain peak seemingly close at hand and started out to walk to it before breakfast. Of course he tramped for hours without apparently arriving any nearer the mountain, and finally asked a native how far it was. Imagine his dismay at learning it was nearly fifty miles away. A little later a native found the Easterner standing at the edge of a tiny brook removing his clothing. When asked for an explanation he said he was going to swim across the brook. "Swim across!" exclaimed the Westerner; "why, that brook isn't six feet wide." "I know it don't look so," said the tourist, "but judging by your mountains it may be a mighty long swim."

Any boy can easily ascertain all ordinary heights and distances, to within a few feet, without instruments of any sort, and you will find it a most interesting and fascinating sport to measure trees, buildings and the width of streams, lakes, etc., in this manner.

Perhaps to determine the height of an object is the easier of the two methods and this is accomplished as follows: Erect a stick or pole in the ground so that a definite length (say six feet) projects upward (Fig. 7 A-B). Now place your face close to the ground and sight across the top of the pole to the top of the tree which you wish to measure. Back off or crawl nearer until the top of the pole comes exactly in line with the top of the tree and your eye as shown by line C-E. Now measure the distance from your eye to base of pole (C-B) and distance from base of tree to your eye (C-D). Suppose you find the distance from pole to eye is 20 feet and from tree to eye is 120 feet, then by the simple sum in ratio of 20 : 6 : : 120 : X, we obtain the result 36, so that 36 feet is the correct height of the tree.

To find the distance of an object or the width of a river is equally simple. Select some prominent object as a building, isolated tree or rock on the farther side of the river and use this as a sight (Fig. 8 X). Now make a small equilateral triangle from three straight sticks and lay these on the ground in such a way that by sighting along one edge the points A-B will be in line with the object X. Mark the three angles of this triangle with small sticks or stones and walk along as nearly in line with the stones A-C as possible until the points E-F are in line with X, and then move about until the side D-F is in line with the marks at A-C. Now by measuring the distance from A to F you can determine the distance from G to X, for this will always be just ⅞ of the distance from A to F. Thus if from A to F is 80 feet, you may be sure that the distance from G to X is 70 feet.

Making Maps and Charts

The knowledge of how to find direction and distance is of the utmost value in map-making. Of course real maps and accurate charts are made by the aid of various splendid and expensive instruments, but for boy's use or for rough sketch-maps, instruments are not necessary. Of course such maps would never serve as a basis for building a railway, as grades, elevations and hollows can only be illustrated in a general way and the heights are merely approximate. For the boy hunter, trapper, camper, sailor or tramper or for the purpose of helping other boys to find certain spots or for use in lumbering work or for reference, such home-made charts will serve every purpose. In lumber districts even the roughest of maps will be very useful, for they can be made during the summer, and by their use the quantity of timber, wood roads, best trees, and other matters may be readily found in winter as required. The boy hunter and trapper will find maps of his district useful, for by them he can locate promising spots, indicate where to set his traps, and by adding notes and details may in time possess a very accurate record of his hunting grounds. All the map-making may be done in warm weather, and when the country is covered deep in snow and the brooks and rivers sealed with ice, runways, crossings and dens can be rediscovered through the medium of the home-made map without being obliged to tramp aimlessly about in heavy snow. To the boy sailor, charts of the rivers, harbours and lakes in his vicinity will prove most valuable, even where accurate government charts are available. Although the latter are extremely accurate as far as channels and the deeper waterways are concerned, yet in many of them small rocks, reefs, shoals, etc., close to shore, or in shallow water, are omitted or only indicated in a general way. These are the very obstacles that are most important to the small-boat sailor, for in the deeper channels there is little danger to a light-draft boat while close to shore,—so close in fact that the bottom is of no interest to large vessels,—sunken snags, rocks and bars may prove dangerous to a boy's craft.

The best form in which to keep and make maps is a good-sized note-book or sketch-book. The larger the pages the better, but they should not be cumbersome to carry. It is a good plan to make the preliminary sketches for the maps in one book, or on loose paper, and later copy them carefully in the permanent book. Quite often one makes a map or chart as he travels and the constant handling, numerous notes and changes result in anything but clean and neat work. A knowledge of the compass and its use, how to find distance and height and familiarity with "pacing" distances are of importance. To learn to "pace" properly you should first measure off various distances of from 30 to 300 yards on fairly level ground, and walking over these with long, even steps, count the number taken. The standard pace of an average man is three feet, but most men and nearly all boys pace shorter than this until accustomed to the work, and you will probably find that your paces do not average over 20 or 30 inches. By going over the distances again and again and taking longer steps you can soon get in the habit of making your paces average three feet. When this is at last accomplished over the known distances, try pacing off various distances on new ground and then measuring them. Of course some short boys, or boys with short legs, will be unable to pace in three-feet strides, but as long as you know the average length of your paces and can make them regularly and evenly, the actual length of the stride matters little. It is just as easy to figure up a distance from twenty-four-inch steps as from those of thirty-six inches. Although pacing is a very useful "rough and ready" way of determining distances, yet often one requires more accurate work. In the woods, or on very rough and uneven ground, pacing cannot be used with good results and under such conditions a tape will prove most valuable. A steel surveyor's tape is, of course, the best, but a good strong linen tape with large figures will answer. Should occasion arrive where a level is desirable—as in determining the depth of a depression or river-bed or the height of a small hill—an excellent level may be constructed from some bits of light wood and a pail of water.

We will imagine ourselves equipped with compass, tape, hatchet and small pail and start out on a map-making trip. Leaving the road we start across the field toward the distant woods. This is a good place to start our practice work, so let us jot down the first notes on your map paper. Draw a line at one edge of the paper and mark "road." Now look at your compass and find some prominent landmark; the tall pine directly north will do finely, while the old barn due east will serve for another bearing. Indicate the points of the compass at your starting point and jot down the notes of pine tree due north and old barn east. To determine our starting point more accurately we must measure with the tape to some nearby object, as for example the scraggy wild-apple tree a few paces up the road. The distance is found to be forty-five yards and so we mark a spot to indicate it on our map, giving direction as east-southeast and "distance forty-five yards."

We propose to enter the woods on the other side of the field and as the latter has no interest for us and would occupy most of our map if included in proportion to the other objects or "to scale," we merely write "open field" across the blank space above our starting point. Now glance at the compass and start pacing across the field. We find our direction is west-northwest, and we write this down and start forward. One hundred and twenty paces from our starting point we reach a bramble thicket. This is a mean place to tramp through, so mark "brambles one hundred and twenty paces west-northwest from starting point." To make a detour around the brambles we walk twenty-five paces west and then turn to due north-west. Notes are made of this, and two hundred and forty-six paces further on brings us to the edge of the woods. These facts having been entered on our map, we notice a broad shallow depression near us, with a ledge of rocks jutting up beyond, while on the other side a large oak tree attracts attention. These are good marks and we quickly determine

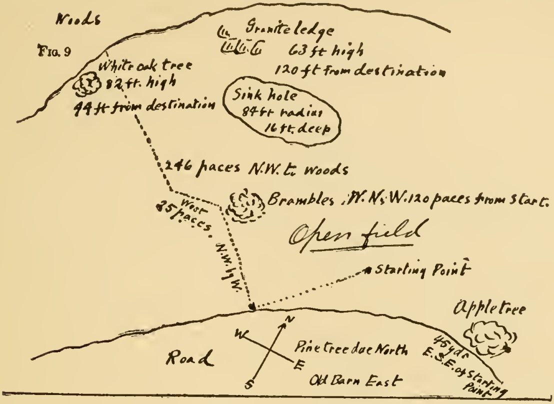

Woods
Granite ledge
63 ft high
120 ft from destination
White oak tree
82 ft. high
44 ft from destination
Sink hole
84 ft radius
16 ft. deep
246 paces N.W. to woods
Brambles W.N.W. 120 paces from Start.
West
25 paces.
N.W. by W.
Open field
Starting Point
Apple tree
N
W
E
S
Road
Pine tree due North
Old Barn East
45 yds
E.S.E. of Starting Point

FIG. 9

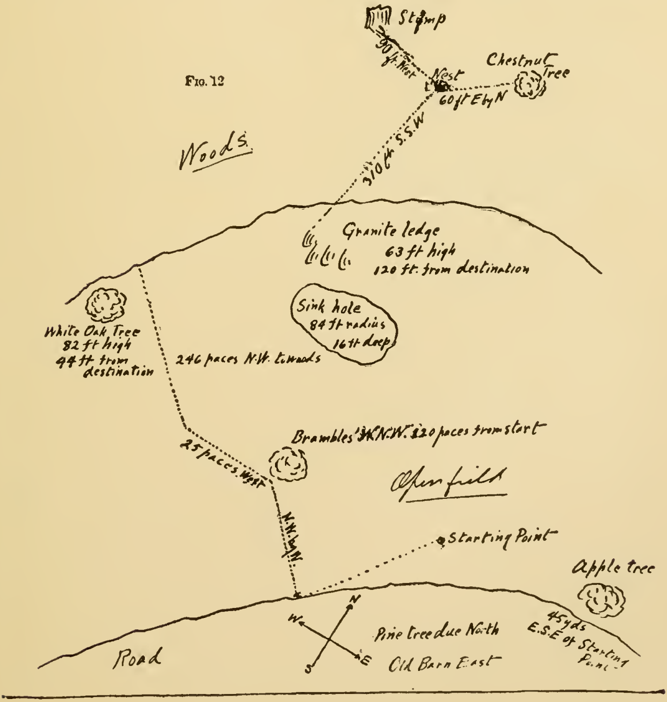

Stump
90 ft. West
Nest
Chestnut Tree
60 ft E by N
310 ft S.S.W
Woods
Granite ledge
63 ft high
120 ft. from destination
White Oak Tree
82 ft high
44 ft from destination
Sink hole
84 ft radius
16 ft deep
246 paces N.W. to woods
Brambles W.N.W. 120 paces from start
25 paces West
N.W. by W.
Open field
Starting Point
Apple tree
N
W
E
S
Pine tree due North
Old Barn East
45 yds
E.S.E of Starting Point
Road

FIG. 12

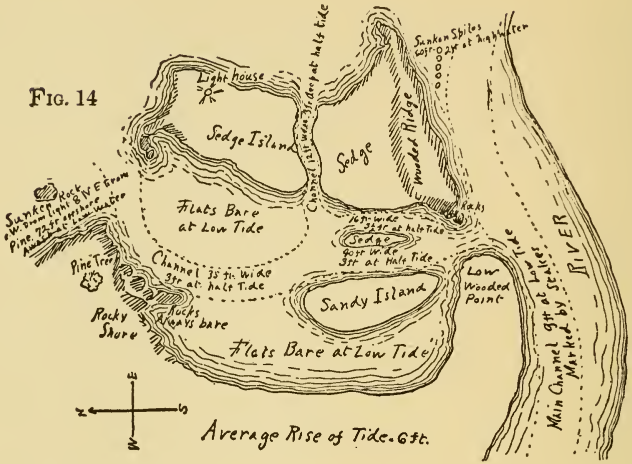
the distance and direction of the ledge and the distance and direction of oak tree by using the methods described under "Finding direction and distance." The map will now appear as in Fig. 9. This is a good opportunity to experiment with our level and by its use find the depth of the little "sink-hole." Cut a thin flat piece of wood, a little shorter than the diameter of the pail, and in this insert two little pegs or "masts" of exactly equal length, one in each end of the thin piece or float (Fig. 10). Fill the pail with water at the nearby brook and cut a straight, light sapling or branch. Measure off ten feet on this with your tape and mark them plainly by cutting through the bark into the white wood beneath.

Our level is now ready for use. Set the pail at the edge of the sink-hole and while one of us sights across the two "masts" the other should walk into the depression, holding the rod vertical with one end on the ground. Sight carefully across the "masts," keeping the two tops exactly in line, and when the rodman has reached the point where the last notch on his rod is exactly in line with the two tops of the sights, have him halt. The highest notch is ten feet, so we make a note of this and, with tape, measure off the distance from pail to rod. This gives us thirty feet and we now move the pail to the spot where the rod was, and proceed as before with the rodman walking toward the bottom of the hole. Presently we notice that the marks on the rod are moving up from our sights, so we know our comrade has passed the deepest spot and is ascending. He must, therefore, return slowly until we find the lowest spot, whereupon we find the reading to be six feet. The tape is again brought into play and measurements show the distance at last observation to be fifty-four feet. Now we know that the hole is eighty-four feet from our side to the deepest point and that the depth from edge to centre is sixteen feet. Moreover as we have the heights and distances of two levellings we can draw an accurate diagram of a sectional view of the pit, showing the grade of its sides. This will be easy to accomplish by laying off the two angles as illustrated in Fig. 11. You will find this very fascinating work and in company with your friends you can make interesting sectional diagrams of cuttings, pits, quarries, beds of rivers, hillsides and many other natural formations.

As we emerge from the sink-hole and start into the woods, a grouse whirrs up from under foot and beneath the shelter of a clump of thick brush we find her nest with its twelve buffy eggs. This will be a fine thing to photograph some other day, but can we be sure of finding it again? Without the map we might have hard work, but with it, it will prove easy. Standing by the nest and sighting back through the trees, we catch a glimpse of our ledge and find the direction south-southwest. Turning slowly about we find a large chestnut tree due east by north, while a dead stub bears due west. The distance from the nest to each of these is soon determined and the results written on our sketch, which now appears as in Fig. 12. Of course we could have found the nest again by marking a tree or sticking up a peeled sapling, but such a method might result in the nest being disturbed and would moreover give us no permanent record of the nest on our map, and the pleasant recollections of interesting things brought up by looking over a map is one of its most valuable features. From the nest we walk through the woods in a westerly direction, for with constant detours around trees and other objects our course is more or less crooked and we cannot spend the time to make notes of all our turns and twists; still, frequent glances at the compass show our course to be in a general western direction, while observations of the trees and ground show us that white oak trees predominate, that the ground is dry and rather sandy and a measurement of a few trees gives their trunks as averaging four feet in circumference and their height to the main branches as twenty feet. These are valuable notes, and to further aid us in the future we occasionally "blaze" a mark on a tree beside our trail. All of these points are entered on the map and presently we reach the edge of a wood road. Before proceeding let us make an entry of the surroundings to locate our position more accurately. Far down the road we see an old log bridge, and pacing to this, find it two hundred and sixty yards. The road runs northeast to the bridge and then turns and runs east. In the other direction we find the road runs southwest for two hundred and ten yards and then turns to northwest. These facts, written on the map, will locate our position nicely. At the bridge we look down on a little woodland brook, and presently we see a mink steal out from the crevices of the bank and cautiously travelling down the waterside he leaps upon a fallen log and disappears in a cavity. This is interesting, and as his actions plainly show that it is his usual haunt, we will be sure to locate the spot for trapping purposes next winter. Again resuming our tramp, we travel over the old road and presently find it ascending a rise and note that birches and chestnuts are mixed with the general oak growth. This should be entered on the map as well as any distinct turns in the road. Soon the road descends and the earth becomes damp and presently we reach the borders of a dense alder swamp. The swamp extends on either hand and the road passes through it east by north. All this time we have been talking and have neglected to note distances, so let us at least determine some distance to locate the swamp more accurately. Looking back up the road we estimate the distance to the crest of hill at three hundred and ten yards, and pacing it, find it to be two hundred and eighty; looking down the other side to the bridge we guess it to be at least twice as far and so enter the fact. The distance across the swamp is six hundred yards and just beyond we enter a large clearing. This space is practically oval, is four hundred and sixteen yards across; eight hundred and five yards long and runs N.N.W. and S.S.E. At its northern corner is a pile of about six cords of mixed wood, while a broken cart wheel forty-six yards from the entrance of road on the western edge will serve to identify this clearing whenever we find it again. Walking down the clearing we find a little path which leads us to where a sparkling brook crosses our way. The brook crosses ninety yards from the clearing and we wonder if it is the same brook which we crossed on the old wood road, when we saw the mink. It would save a long walk if it proved such and so we follow up its bed, until we find the brook issuing from a deep swamp. Perhaps this is our alder swamp near the clearing. If so we will soon know, for by reference to our map we find the swamp was but six hundred yards across and that its eastern edge bordered on the clearing. So we turn to the east and presently come out on the clearing, about half-way down its length. This gives us additional data regarding the size of the swamp, and we now know that it extends for at least four hundred yards south of the wood road. Returning to where the brook issued from the alders we find the ground too swampy to enter, but again referring to our sketch, we find there was no brook crossing the swamp at the road and that the mink brook was the only stream encountered on our walk. We therefore must skirt the western edge of the swamp to find where the brook enters, and doing this, we soon encounter it again. Here we find the brook flows from the west a trifle north and as this would indicate that it is the same brook that crosses the road, we continue a little further until we sight the old bridge. Rather than go back by this circuitous route we decide to cut straight through the woods and by referring to our map and notes and looking at our compass, we start in a direction due southeast. Presently we pass a tree freshly "blazed" and know we are passing our first trail and soon we see the open field before us and come out into the sunlight close to the ledge of granite where we first entered the woods. This will complete our first day's experience in map-making, and the result of our labours should appear as in the illustration, Fig. 13.

If you are a boy sailor and wish to make sailing charts, your method will be somewhat similar but in many ways will differ greatly. Here a tape, or knowledge of pacing, is of little value and your distances must be determined either by patent log, guesswork, dead reckoning or by bearing on shore objects whose distances are well known. If you use a motor boat and its speed is accurately known it is an easy matter to determine distances by timing the run and deducting or adding the speed of tides or winds, according as to whether they are with or against you. In a sailboat, dead reckoning is next to impossible for a beginner and good judgment and frequent bearings on prominent landmarks are necessary. To locate rocks or reefs, soundings should be made and the state of tide at such times should always be noted with care. A rock that would prove dangerous at low water, or half tide, might be six feet beneath the surface at high water and the depth of water on a reef—unless the state of tide is given also—is of little help. Most rocks and reefs can be readily located by a long sounding rod or a weighted line, but frequently one strikes a rock which is so narrow or pointed that it is next to impossible to find it with line or rod. When a rock of this character is encountered you should use two boats and a drag line. This is merely a long line with several fathoms kept on the bottom by lead or iron weights attached at intervals. Each boat takes one end of the line and pulling along slowly a few yards apart, drag the entire bottom between them and any rocks are soon located and are readily sounded and buoyed. The accom-

FIG. 14


Light house
Sedge Island
Sedge
Wooded Ridge
Flats Bare at Low Tide
Channel 35 ft. wide 3 ft at half Tide
Sandy Island
Flats Bare at Low Tide
Rocky Shore
Pine Tree
Low Wooded Point
Main Channel 9 ft at Low Tide Marked by stakes
RIVER
Average Rise of Tide. 6 ft.

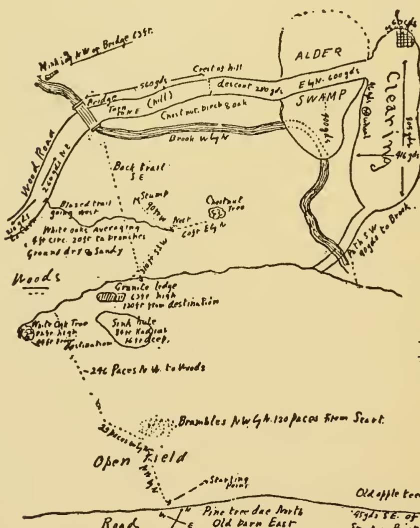

ALDER
SWAMP
Clearing
Bridge
Brook
Wood Road
Woods
Open Field
Road
Old apple tree
Old barn East
Starting Point

FIG. 13

panying illustration of a home-made chart of a river and harbour will show the sort of work you should strive to accomplish (Fig. 14).

In this case there were already plenty of excellent charts of the main river and the harbour channels, but these were so large that the boys did not care to carry them about and there were no charts obtainable of the "gut" or cut-off across the mud-flats. It occurred to the boys that if a channel could be found across the flats which would accommodate their little launch at half tide it would save a run of several miles down the river and around the island to the bay. The map shows how well they succeeded and while formerly the flats and their channels had been beneath the notice of the government charts, yet since the boys found and charted its waterways it has become of considerable value to light-draft boats and is well illustrated on more recent charts.

Whenever you find a rock, reef, sunken spile, snag or any other impediment to navigation you should note down its bearings accurately. A tree, rock, hill, house or barn on shore answers very well as a bearing, but of course you must give cross bearings in order to locate the object properly. As an

Fig. 10

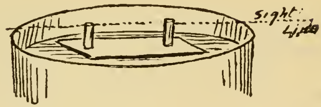


Fig. 11

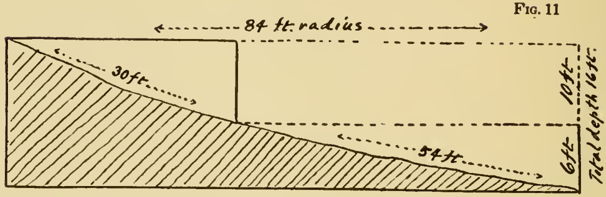
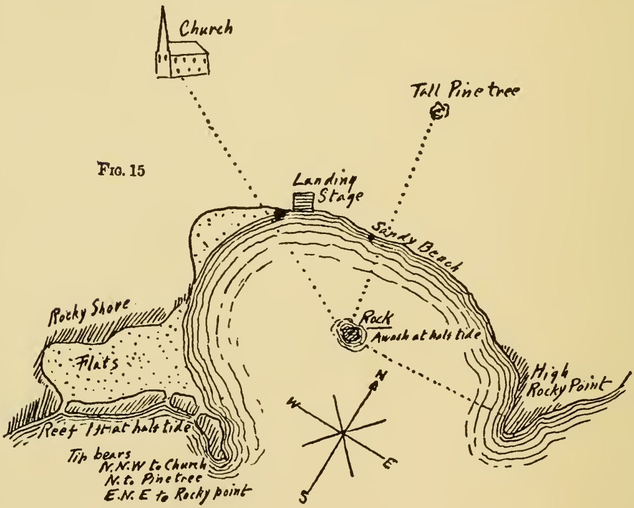


Fig. 15



example take the little diagram of a bit of shore shown in Fig. 15. Here the bearings are given for several rocks. By having three bearings to each rock there is no danger of mistaking a location and where distances cannot be measured the importance of having such is most important. Thus in the case of rock "A." If the distance offshore was known, two bearings would be ample, but as this is not given the third bearing serves instead. Aim at accuracy and full details in your work and keep on adding notes and sketches to the original map or chart until you are sure you have embodied everything of interest or importance. If I am not greatly mistaken you will find map- and chart-making a most enjoyable sport, and, moreover, it may sometime prove of the utmost value. The miner, forester, sailor, engineer or explorer who can furnish an accurate, if crude or rough, map of the country over which he has travelled, possesses an enormous advantage over the man who is compelled to depend upon the maps of others, or must trust to memory or mere sketches.

CHAPTER VI

SAVAGE WEAPONS AND HOW TO MAKE THEM

Indian Bows and Arrows

The majority of boys who are fond of out-of-doors life have a strong desire to get back to primitive conditions and "play Indian." Scarcely a boy exists who has not at one time or another danced impromptu war-dances, uttered weird cries which he thought were war-whoops and has painted his face and stuck feathers in his hat, and imagined he was a noble redman.

While many of the Indian's traits and habits are scarcely to be recommended for civilised boys to follow, yet the self-reliance, healthy life and knowledge of woodcraft and nature, which are brought about by imitating the savage, are most beneficial.

Even if the outdoors boy does not play Indian, he will find an added interest and much greater pleasure in his woodland life if he makes his own weapons and traps, constructs his own camps, tans the hides of his game, fashions his own moccasins, and depends upon his individual prowess as a hunter and trapper for a large portion of his food and other necessities of life.

Almost any boy can become a good shot with a rifle or shot-gun and with modern firearms comparatively little real skill is required to hunt and kill game, and all too many boys carry a gun or rifle constantly when in the woods and blaze away at every living thing in mere wantonness. This is a practice which cannot be too strongly condemned, as unnecessary slaughter is cruel, wasteful and unsportsmanlike, and with firearms the advantage is all on the side of the hunter. While a sort of latent savage instinct causes civilised boys and men to enjoy hunting, yet the real pleasure is in the chase itself and not in the actual killing. Hunting is the best of training for body, mind and eye, but far more real pleasure may be obtained by using bow and arrows for weapons than by the use of your up-to-date gun. The boy who hunts with bow and arrows and depends upon matching his own skill and cunning against that of his quarry gets far more enjoyment and benefit from his hunt than his friend with the gun, and gives his prey a fair show besides. Moreover, wild creatures, hunted with bow and arrows, seldom become shy or wild, even if shot at repeatedly, whereas the report of a gun soon frightens all the game within hearing.

Even if you do not hunt, a good bow and arrows will lend added pleasure to your out-of-door life, for target shooting at imitation animals can be made quite interesting and exciting.

Many of my readers may scoff at the idea of using a bow and arrow, for nowadays these implements have come to be regarded as mere toys or playthings by most people. You should not forget that the bow was the most important weapon of our ancestors for many centuries, and that the prowess of the English archers won many a hard-fought battlefield and laid the foundation for the great British Empire. Even our pioneer forefathers found the Indian bows and arrows dangerous weapons, while at the present time many tribes depend entirely upon the bow for hunting. Archery reached its highest development in the days of Robin Hood and the English bowmen, and while the stories of their deeds are doubtless greatly exaggerated, there is no question of the remarkable skill acquired by many of the British archers.

It is an easy matter to become proficient in the use of the bow, and within the last few years many lovers of out-of-door life have adopted the bow and arrow as hunting weapons. It seems almost incredible that geese and ducks may be killed in flight by an archer, and yet such men as Maurice Thompson and his followers have repeatedly accomplished this feat.

Armed with a really good bow and properly made arrows any boy may easily become an expert archer, for practice is the only requirement, and you will be mightily surprised to find what a lot of fun you can derive from the use of these simple weapons. No one who has not experienced the sensation can possibly imagine the thrill felt by the archer at the twang of a taut bowstring and the soft whistle of a well-driven arrow, or the breathless interest with which he watches the flight of his feathered shaft as in a graceful curve it speeds straight and true to its mark.

The first and most important requirements for the archer are perfect bows and arrows, and of the two the arrows are far more difficult to make and are of greater importance. As there is little chance for outdoor life during the late winter and early spring, much of your time may be happily employed in preparing your equipment for the coming season, and no portion of your outfit is worthy of more care and trouble than your bow and arrows. It takes time and patience to make these weapons properly, and it is an excellent plan to have several bows and a large number of arrows and strings on hand.

The first step in making a bow is to secure the proper wood. Yew, Cedar, Orange Wood, Lancewood, Ash, Elm, Hornbeam, Apple and Hickory all make good bows, but of all the native woods, I prefer good, straight-grained white Hickory. The wood should be thoroughly seasoned winter-cut sticks, and if there is a carriage or wagon shop in your town, you will find that the best place to obtain the right material. Bows vary greatly in length, width, thickness and shape with different tribes and people, but as a rule the long, slender bows are best adapted for target work and long range, while the shorter and broader forms are more suitable for hunting.

The North American Indians use short, broad bows, while the Central and South Americans use very long, slender bows, and both seem to succeed equally well. The arrows vary as much as the bows and many of the South and Central American tribes use arrows four to six feet in length and entirely destitute of feathers. With such weapons I have seen them kill birds from the tops of tall forest trees and shoot fish several feet beneath the surface of rapid mountain streams. These peculiar arrows are, however, the exception, and you will do best to follow the most usual and conventional styles.

For ordinary hunting use, your stick of wood should be about five feet long and two inches square and should be cut so that the line between heart and sap wood runs exactly through the centre. However, you should not be discouraged if you cannot obtain a piece with both heart and sap wood, for excellent bows may be fashioned from clear hickory or other wood, provided the grain is straight, fine and free from knots or curls.

The stave should then be worked down with draw shave and plane until about an inch thick and an inch and a half wide for fifteen to eighteen inches in the centre, and from this should taper off to about three-fourths of an inch wide and half an inch thick at the ends. Great care should be used in scraping and working down the bow, in order that the heart and sap wood may remain of equal thickness the entire length. As you work you should test the bow frequently to see that both ends bend evenly, and all the surface should be scraped with glass, rubbed smooth with fine sandpaper and kept as smooth and even as possible. The bow should be flat on one side and slightly convex or rounded on the other, and the flat side should be the outward side when bow is bent (Fig. 1). The exact size of the bow depends upon your own strength and judgment, but as a rule a bow drawing at from fifteen to thirty pounds is about right for boys' use. A short distance from each end you should file or cut a smooth diagonal notch on each side and connect these by another groove across the flat side (Fig. 2). The bow should now be rubbed with linseed oil (being very careful not to put on too much or the spring will be lost), and then rubbed until polished with paraffine, bayberry wax or similar polish.

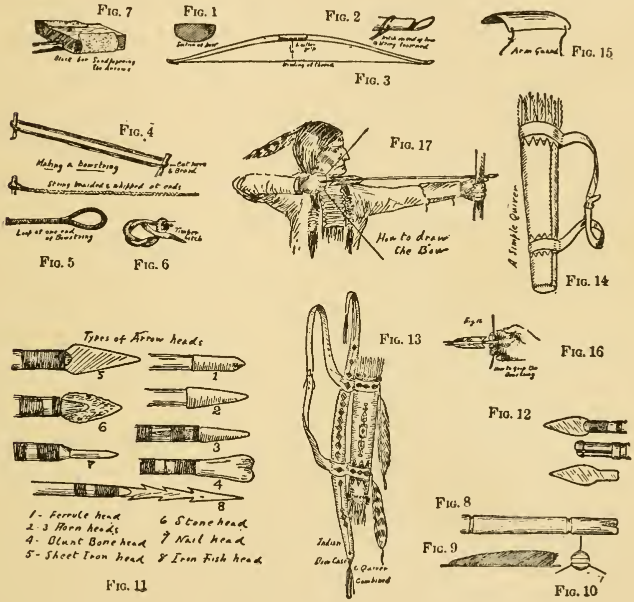
At the centre of the bow a space about six inches long should be covered with soft leather or cloth, glued in place and with the edges neatly sewed together on the back side of bow. This serves as a grip for your hand and prevents slipping of the arrow (Fig. 3). An excellent grip may be made by winding the bow with fine and strong waxed linen thread or by winding with adhesive bicycle tape. The string is now the next thing to make, and as bowstrings are often broken or frayed, the boy archer should provide himself with a number of extra strings. Catgut, sinew and rawhide are all used as bowstrings, but I have found clear, unbleached flax or hemp the best material. To make a hemp or flax bowstring secure the best shoemakers' flax and some shoemakers' wax. Wax the thread thoroughly and wind it around two nails or pegs seven feet apart until you have fifteen or twenty strands (Fig. 4). Wax these and cut through the bunch of strands where they cross one of the pegs. Divide the strands into three equal parts and braid them loosely together. Now wind one end of the braided string with fine silk or linen thread thoroughly waxed. At the opposite end make a neat, smooth loop by winding the string where it goes around the peg and then, removing it from the latter, wind the loop formed by the unbraided threads (Fig. 5). Now slip this loop over one end of your bow, draw the other end of string around notch in opposite end and bend the bow carefully until the string stands out about six inches from the bow at its centre (Fig. 3). Secure the string by a timber hitch (Fig. 6) around the other notch and wind a space of six or eight inches in the middle of the string with fine silk thread (Fig.

3). Loosen the string by slipping off the loop (so it slides down on the bow) (Fig. 2), and give all the windings a coat of quick-drying varnish or shellac.

For arrows you may use either White Pine, Oregon Spruce, Norway Pine, Ash or Hickory. For target use, pine arrows will do, but for hard use and hunting, ash is the best material. Indians often use straight shoots of arrow-wood (Viburnum) and similar shrubs, but it is very difficult to obtain these perfectly straight. If you wish to try this sort of material you can make the shoots much straighter and better by hanging them up while green by one end with a heavy weight attached to the other and allowing them to dry thoroughly in this position.

In making arrows from wood, secure a block of perfectly straight-grained, well-seasoned pine or ash about 24 to 28 inches long and split this in half; split each of these pieces in half again and continue halving the pieces until the pieces are all split into straight sticks about half an inch to three-quarters of an inch square. Place these sticks on a smooth level board or bench and plane them straight, working around and around until the sticks are smooth, fairly round and absolutely straight and true.

When all your sticks are in this state go over them with coarse and then fine sandpaper and work at them until they are as round and smooth as possible. If you work the sand-



paper with your hand or fingers your arrows will be very likely to have hollows in them, and to avoid this cut a half-round groove lengthwise of a block of soft wood and place your strip of sandpaper in this and use it like a plane (Fig. 7).

The next step is to cut notches in the arrows. Examine each stick and determine which way the grain runs, and in the end towards which the grain runs cut a smooth notch quarter of an inch deep and wide enough to readily admit the wound, central part of the bowstring. A fine saw-notch, smoothed and widened with a fine file, is the best and easiest to make, but very good notches may be made with a small-bladed penknife (Fig. 8).

To feather your arrows secure a number of stiff wing feathers of some large bird, such as turkey, eagle, swan, goose, blue heron, gull, cormorant, pelican or crane. Keep the feathers from each side of the bird by themselves, for if feathers from opposite sides are placed on one arrow, you will obtain very poor results, owing to the different curves of the feathers. Strip the feathers or plumes, with a thin piece of the midrib attached, from the quill and cut these into pieces of even length and trim so that a short piece of the midrib projects at either end (Fig. 9). Now mark three lines on your arrows, spaced equal distances apart and so arranged that one comes opposite and at right angles to the notch, while the others are nearly parallel with it (Fig. 10). These lines should be drawn on with a ruler, or straight edge, and if they all turn slightly at an angle or "twist" they will result in better feathering, for these marks are to guide you in fastening on the feathers, and the feathers act like the grooves in a rifle barrel, causing the arrow to revolve in flight and thus travel straighter and more evenly, as well as to prevent its tendency to turn end over end or "keyhole." Your arrows being marked, glue the strips of feathers along the lines, keeping them straight and true, and finish by winding or lashing the projecting ends of midrib with fine waxed silk or linen thread. Indians use sinew to wind on the feathers and there is no reason why you should not use similar material if you wish. Remember, however, that the materials used by savages are due to necessity and not choice, and that the uncivilised man is only too anxious to adopt civilised materials whenever he can obtain them. Place your arrows in a cool, dry spot, and while the glue is thoroughly hardening you may prepare the tips, or heads, of your arrows. These may be made of hardened wood, brass, horn, stone, bone or iron. For hunting purposes wooden heads, hardened by fire, will answer, but these soon become dull and their light weight has a tendency to cause erratic flight. Brass or steel ferrule heads may be purchased of sporting goods dealers at nominal cost or may be made by any blacksmith or machine shop by drilling a hole in pieces of rod (Fig. 11, 1). Bone makes very good heads, but is too brittle for everyday use. Horn makes good hunting points and is excellent for birds and small animals, although for birds blunt wooden, or bone, heads answer very well (Fig. 11, 2-3-4). In certain districts,—such as Ohio and Indiana,—where stone arrowheads are found in large numbers, the boy archer may readily obtain excellent stone arrowheads for hunting use (Fig. 11, 6). The best heads of all for hunting and general utility are made from thick hoop iron, or thin steel, and these can be cut up into any shape desired (Fig. 11, 5). Steel wire nails may also be used as arrowheads with good results (Fig. 11, 7). Use your own taste and judgment as to material and shape of heads, and when you obtain good results, stick to your own style. The heads,—if of ferrule pattern,—are merely glued in place, but if made of horn, bone, stone or sheet metal, should be inserted in a notch, glued in place and the shaft wound tightly with very fine copper wire or strong thread (Fig. 12). This lashing holds the head in place and prevents the arrow from splitting, and should be wound as evenly and tightly as possible and thoroughly waxed and varnished. The last step in finishing your arrows is to varnish or paint them, and as bright colours render arrows more readily seen among brush or grass and serve to distinguish one boy's arrows from those of another, there is nothing better to use than quick-drying enamel paint.

When the arrows are thoroughly dry you may go forth and try your new weapons, although before doing so I advise you to prepare a quiver and an arm guard.

These may well be made while your arrows are drying, and while not absolutely necessary, they are very useful. A bow case and quiver combined is easily made from leather or canvas and may be ornamented and fringed to suit your own fancy (Fig. 13). The bow case should be long enough to completely cover the bow and loose enough so that the bow may be readily and quickly drawn when needed. The quiver should be a little shorter than the arrows and fairly stiff, and a study of the illustration will show you how to make it without any description (Fig. 14). The arm guard consists of a piece of flexible leather,—an old boot leg does very well,—laced or buckled on the arm which holds the bow to protect the wrist from the bowstring (Fig. 15). You will also find gloves, with tips of fingers cut off, a great help for the feathers of the arrow, and the snap of the bowstring will soon chafe and cut your hand and fingers if you shoot very much.

To use the bow with success you should stand with your heels in line with the target, your left hand with bow extended toward the object and at almost right angles to your feet. Place the arrow on the string and rest it across the bow and on and across your thumb and finger of the bow hand. Now hook your first three fingers of the right hand over the string with the notched end of arrow between the first and second fingers (Fig. 16). Raise your bow hand to the level of your chin and draw back on the string and arrow with your right elbow raised almost to your shoulder line and in line with the arrow (Fig. 17). Draw until the head of the arrow is almost to the bow and, glancing along the arrow until in line with the target, release the string by opening the crook of right fingers. Keep your left hand and bow fixed till the arrow strikes and watch the result. Doubtless your first few arrows will fly wide of the mark, but note whether they travel to right or left, above or below, and you will rapidly improve. Learn to draw your bow in exactly the same manner every time and remember to draw your right thumb to the same spot on your cheek at each shot. This will result in uniform shooting and failures may be more readily corrected. You will find that there is a most remarkable variation in the way your arrows act. Some will fly almost straight, others will swing and wabble, others will travel through a wide arc or curve and still others will prove so erratic that they cannot be depended upon to shoot true. Discard the latter, if after trying trimming the feathers or fitting new heads they are still unsatisfactory. All arrows (even though made exactly alike) have distinct individuality and the successful bowman studies the peculiarities of each shaft until he knows instinctively just which arrow to select from his quiver for each and every purpose and condition.

Some arrows travel best on windy days, others on calm days; some will shoot straightest against and others with the wind, and some are better for long than short shots, and vice versa. An expert arrow-maker can fashion an arrow for a certain purpose and knows just how to trim and set the feathers and balance the head to develop the best possible results; but this knack can only be acquired by long and constant practice and experiment and cannot be described or taught. As a rule the long, small-feathered arrow is best in the wind, while a large-feathered shaft is superior in calm weather, but much depends upon the size and weight of the head and the general balance of the arrow.

In shooting at a mark use an old sack or similar object stuffed with hay, leaves or straw; or place your mark on a haystack. Unless you have arrows to waste, never shoot at a hard object, such as a tree, fence, barn or post, for the impact will be almost sure to spring or split your arrows.

Excellent practice may be obtained by setting up cardboard or cloth birds or animals backed with a sack of straw, for in this way you learn far more than by shooting at a conventional target of rings and bull's-eye. You should commence shooting at a mark not over twenty or thirty yards distant and gradually increase the range as you become more skilful. When you can drive three out of five arrows into a paper deer at sixty yards, you may consider yourself quite proficient and need not fear to try your hand at real game. You will find, however, that shooting among trees or brush is far harder than in the open, and for that reason I strongly advise you to practise in the woods a great deal, setting up your imitation game at various distances and under various conditions of light and shade.

A very interesting and instructive game may be played by a number of boys travelling through the woods and dropping bits of paper, or beans, for a "trail" and setting up cardboard or cloth targets representing game, in spots that the real game might select as resting-places. The archers are to follow the "trail" exactly as if they were stalking real game, and as soon as they see the quarry are to shoot. This method may be varied by having the trail-makers attach a string, or rope, to their targets and as the archer draws to shoot they should endeavour to jerk the target out of sight before the arrow reaches it, thus more closely imitating the action of a wild animal. This will teach the bowmen to act more rapidly and surely, and will develop far more skill in stalking and shooting than a fixed target.

Running or jumping targets are easily designed and will prove most useful in perfecting your marksmanship, while the ambitious bowman will not be content until he has become an expert wing shot and can pierce a cloth ball or pasteboard box when thrown into the air at ten or a dozen yards.

Boomerangs

Nearly every boy has read of boomerangs, those strange wooden weapons used by the native black men of Australia. Boomerangs, in the hands of an Australian native, are deadly weapons and with them the black fellows kill wild game, such as emus, kangaroos, etc., and in former times they even fought battles with the queer crooked sticks, which in skilled hands can perform most wonderful feats.

As means of killing game, boomerangs are far inferior to other implements for civilised man, but it is lots of fun to throw them and it does not take a great deal of practice to become very expert in their use.

The ordinary idea that a boomerang will invariably return to its thrower is erroneous, for in unskilled hands a boomerang is liable to do almost anything, and is quite as likely to sail away and land at a distance as to return. In skilled hands the same weapon may be made to return, or not, and by dexterous throwing the boomerang may be made to perform most marvellous gyrations and weird evolutions, eventually returning to the very spot from which it was cast. It must always be borne in mind, however, that a boomerang, after striking any object, remains at the spot where it struck and does not continue its flight.

Boomerangs are very easy to make, but a great many may be constructed before a single one is obtained which will work well. There is almost no limit to the number of forms of boomerangs which are in use, and each variation in form, shape or size has a different manner of flight and requires distinct manipulation in throwing. It is impossible to tell beforehand which shape will work the best or which will perform the most wonderful flights, and it is very interesting to make several different styles and try each one in turn. You will find that one will soar high, whirl round and round and return in a long graceful curve; another may fly low, clipping across the tops of the grass, and will suddenly turn, rise perpendicularly and dash back at redoubled speed. Another will zigzag and twist, turn somersaults and spirals and fall like a plummet from a height, while still another may fly straight away, turn about and sail back in a most staid and matter-of-fact manner.

The accompanying illustration (Fig. 18) shows several typical forms, and the types shown in Figs. A and B are the conventional and best known. They are far harder to

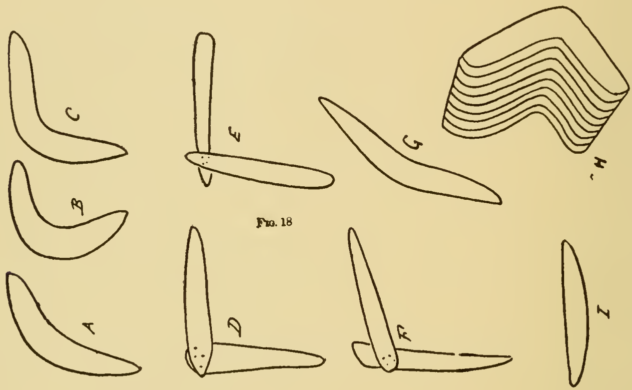


FIG. 18

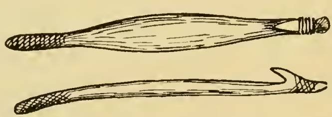


FIG. 19

FIG. 20

make than those shown in Figs. D, E, F, however, and are no better, in fact I have had better success with these angular two-piece affairs than with the one-piece curved forms. The two-piece boomerangs are glued and screwed together, each piece being rounded on one side and flat on the other, as shown in Fig. I. To make the curved forms, a natural bent piece of tree must be shaved down to the desired thickness, or a piece of wood may be steamed and bent into the desired shape and then sawed into sections, which are worked down to the proper shape and thickness (Fig. H).

In any case the finished boomerang should be light, smoothly finished, flat on one side and rounded on the other and should not be less than ten or twelve inches long on each side. The exact weight, width and curve must be determined by experiment. Constant practice is required in order to throw a boomerang exactly the same way every time, but with practice wonderful skill may be acquired. Recently I saw a juggler on the stage of a theatre, who threw over a dozen boomerangs out over the heads of the audience, and, although every one circled about in a different manner, each returned to the thrower, who caught them in his hands. At one time four of the odd instruments were in the air at once. These were all the angular two-piece affairs shown in Figs. D, E and F. Do not attempt such "stunts" until you are thoroughly master of your boomerangs, however; even a light wooden boomerang can inflict serious injuries if it strikes a person on the head or face.

Spears and Throwing-Sticks

Another peculiar implement of the chase and of warfare, which is used by the Australians and many other savages, is the spear and throwing-stick. Although an ordinary throwing spear or javelin is a powerful and deadly weapon in the hands of an expert, yet its range is limited and tremendous muscular power is required to throw it with sufficient force to be effective. By the use of the ingenious throwing-stick, the spear or javelin may be cast two or three times as far and with less effort than by the unaided arm. The throwing-stick consists of a piece of wood, shaped as shown in Fig. 19. The small, narrow end is the handle, the spear rests upon the broad flattened centre and the little hook at the other end presses against the end of the spear haft. The stick and spear are held as shown in Fig. 20, and by bringing the stick violently forward and releasing the spear at the same instant the stick acts as a lever or an extension of the thrower's arm exactly as the springy stick thrust into a green apple will enable the boy to throw the fruit much farther than it is possible to do by hand.

Throwing-sticks may be constructed of any fairly hard, tough wood, and the hook at the end may be carved from the wood or may be made of metal, bone or wood, and lashed in place. Some of the best throwing-sticks I have ever used or seen were made from a natural branch, with a side branch trimmed close, to form the hook. Care should be taken not to have the hook sharp enough to catch on the end of the spear. It should be quite broad, blunt and merely deep enough to hold the spear in position until it is actually cast. At first you will find there is a tendency to throw the spear downward, but with a little practice you can throw it as straight and much more accurately than with the unaided hand.

The spear itself should be from six to ten feet in length with a light, straight haft and a head heavy enough to prevent it from flying wild. A haft of straight cane or bamboo will answer, but straight-grained spruce is far better. The head may be of brass, iron, stone or even hard wood, and it should be lashed in place and the spear, for some distance below it, should be wound with linen thread or fine wire to prevent the haft splitting from the force of the stroke. It is also a good plan to wind the other end of the haft for a few inches as well.

CHAPTER VII

TRAPS AND TRAPPING

Every outdoors boy, who goes into the woods, should have some knowledge of trapping. To be able to trap the wary, valuable, fur-bearing animals, for their hides, is an art in itself and requires a great deal of skill, practice and knowledge. To trap common creatures for food or skins is quite a different matter and requires comparatively little skill.

Trapping at its best is somewhat cruel, and a great many forms of traps cause the victims the utmost torture. For that reason no one should trap wild animals unless it is necessary, or of such great importance, as to more than offset any suffering caused the animals. If you require food, skins, furs, or animals are a pest or a nuisance, it is all right to trap or kill them; but in any and every case you should use traps which cause as little suffering as possible and should use every effort and care to prevent needless pain.

Many of the fur-bearing creatures are so destructive to poultry, game and other animals and birds that they may be classed as pests and may be killed and trapped without compunction. Weasels, ermine, foxes, mink, and in some places badgers and skunks, as well as coyotes, belong in this class. Moreover the furs of these creatures are valuable and useful and I can see no objection to boys trapping them, provided the traps used are merciful and are visited regularly. In many places rabbits, hares, gophers, squirrels, muskrats and similar small animals are very abundant and are a serious menace to crops. Such creatures may be trapped, their skins used for various purposes and the cultivated things benefited at the same time. Nearly all these small, common animals are good to eat and the boy camper need not hesitate to eke out his larder by trapping, if he does not trap during the breeding season when the animals have young that would be left to starve if their parents were destroyed.

There are a great many kinds of traps in use, some of which catch the animals alive, while others kill them outright. The latter are the most merciful and are usually the surest. Such traps are known as "deadfalls" and "snares," and while there is an almost unlimited variety of each, a knowledge of a few kinds will prove sufficient for ordinary purposes.

Snares

Snares consist of slipnooses of wire, cord, horsehair or other material arranged to catch the feet or neck of the victim. They are most useful in catching birds, especially such species as quail, grouse, partridge, etc., but they may also be used in capturing rabbits, hares, squirrels or various other small animals.

The simplest of all snares consist simply of a noose of hair, fine fish-line or wire, attached to a spring pole or swinging weight and set in the accustomed path or runway of the creature it is intended to capture. A small tree or sapling may be lashed to a tree like an old-fashioned well-sweep (Fig. 1 A), and the noose attached to the small end and held down by catching it under a forked stick, or the noose may be attached to a springy sapling bent down as shown in Fig. 1 B. The principal skill required in setting successful snares is in arranging the trigger and noose, so that the animal or bird will be sure to get caught. One very good method is to build a little brush or twig inclosure and set the noose in an opening therein, as shown in Fig. 2. The bent sapling is held down by a strong cord attached to a trigger, which is merely a light cross-piece set into slight notches in two stakes driven into the ground. Bait may be placed just within the noose in the inclosure, and a slight pressure against the noose will dislodge the trigger and allow the sapling to spring up and swing the snared creature into the air. Another form of "twitch-up" snare is shown at Fig. *2a*. In this form a circle of sticks is made by driving short stakes in the earth, setting them one inch apart and forming a circle five or six inches in diameter. The tops of the stakes are notched and the noose laid evenly in the notches. The sapling to which the noose is attached is held down by a cord fastened to a simple trigger. A reversed "Figure Four" is excellent for the purpose, and the long end is baited and projects within the circle of sticks. Another adaptation of this trap is when the noose is set in an opening in the side of an inclosure.

Partridges and other ground-loving birds may often be snared by means of nooses caught into little arched doorways in a brush fence as shown in Fig. 3. Other birds may be snared by setting a number of small horsehair nooses attached to a central line, as shown in Fig. 4, and scattering grain, crumbs or other bait about over the snares. Still another form of bird-snare is illustrated in Fig. 5. This is a twitch-up and its construction is so obvious that no explanation is required.

Snares should never be used unless it is absolutely necessary to capture birds or animals for food and in nearly every state they are forbidden by law.

Deadfalls

Deadfalls consist of heavy weights, usually a log or stone, so arranged as to fall upon the head or back of an animal when a trigger is sprung. Deadfalls are the best of all traps for catching weasels, skunks, marten, mink and other small animals, and when made large enough, they are often used for killing wolves, foxes, lynx or even bears. There are various methods of constructing a deadfall. Two of the simplest are shown in Figs. 6 and 6*a*. The first consists of a log with a space on the upper surface cut smooth and with a slight ridge as shown in section at A, and with another similar log, B, held directly above the first by the stakes C driven into the ground for guides and with the trigger D, to which the bait is attached. In order to compel the animal to take the bait in such a manner that the log will fall upon its neck, a little fence or inclosure of sticks is built, as shown at E. Instead of using the forms of triggers illustrated, the old and reliable " Figure Four" may be used. This is shown in Fig. 7, and the construction and operation is so simple and easily understood that no description is required. The best bait for deadfalls, when set for carnivorous animals, is chicken or turkey heads, but any raw meat or dead birds will answer. It is not necessary to set deadfalls near the animals' dens or holes; a fence corner, stone wall or any partly sheltered spot will serve just as well.

Many animals have the habit of frequenting definite paths or "runways," and if one of these is discovered a deadfall may be set in such a position that the animal passing along his accustomed pathway will be almost certain to spring the trap. Squirrels usually travel along old fences or walls, and in such places deadfalls may be set to advantage. Rabbits usually travel over well-worn and easily recognised paths, and a deadfall set on one of these will usually bring results. In setting a deadfall it is not always necessary

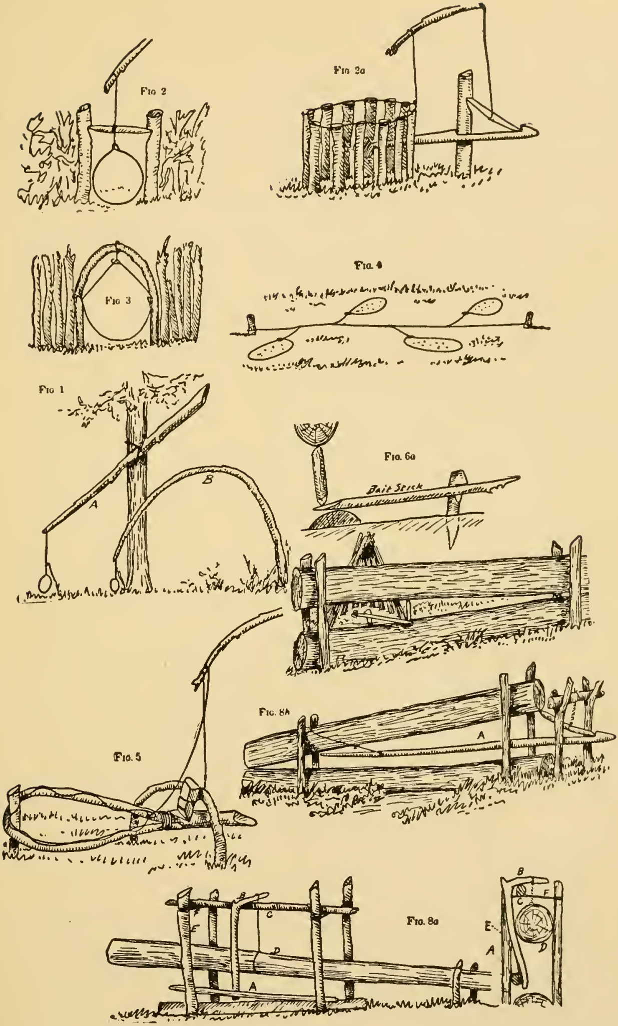


Fig 2
Fig 2a
Fig 3
Fig 4
Fig 1
A
B
Fig 6a
Bait Stick
Fig 8b
A
Fig 5
Fig 8a
B
C
D
E
F
A

to use a trigger with bait, triggers arranged as shown in Figs. 8*a* and 8*b* are often excellent when the trap is set on a runway, for the animal stepping upon the part A springs the trigger and causes the log to fall. Although a heavy log makes an excellent deadfall, yet stones or any other weight will serve just as well. In setting a deadfall be sure that the weight is sufficient to crush the skull or break the back of the victim instantly. If this is done there will be no pain or suffering caused, and for this reason a well-constructed deadfall is probably the most humane of all traps.

Box Traps

Among the most useful of all traps are the old-fashioned box traps, which catch animals alive and unhurt. The box trap consists of a box-like contrivance with the top and one end hinged or pivoted as shown in Fig. 9, and with the other end carried up to a sort of peak as illustrated. The trigger (Fig. 9 A) is passed through a hole in the high end and a cord passing from the pivoted top over the peak and to a small piece of wood shown at B, which is caught in a little nick in the end of the trap and in a notch in the end of the

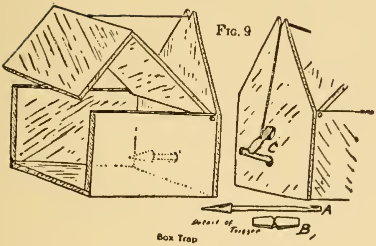


Fig. 9

Box Trap

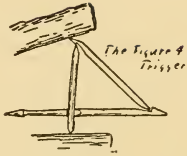


Fig. 7

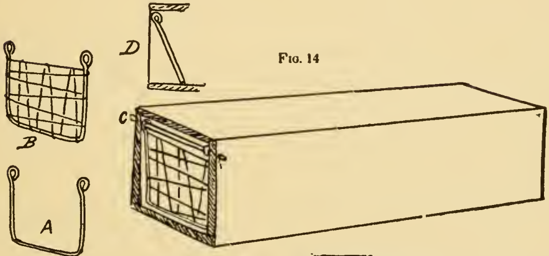


Fig. 14

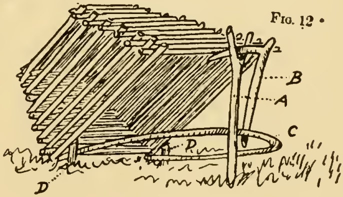
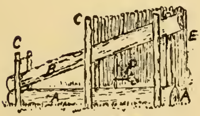


Fig. 12



Deadfall Trap for Weasels, Etc.

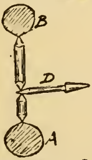


Fig. 6

Sectional View of the Trigger

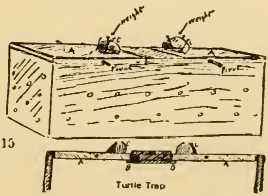


Fig. 15

Turtle Trap

spindle as shown at C. As long as the spindle is undisturbed the cover to the trap will remain suspended by the cord, but with the slightest movement of the spindle the cover drops into position, thus closing the trap. Box traps are excellent for rabbits, squirrels and other small creatures, and birds are also frequently captured in them. For catching animals for pets there is nothing better. For squirrels, rabbits and birds the trap should be baited with green vegetables, corn on the cob, apples, or similar things attached to the sharpened end of the spindle. For carnivorous creatures chicken heads, raw meat or similar baits should be used. If the trap is set for mice, rats, squirrels or gnawing animals it should be lined with tin or zinc around the edges, to prevent the captives from gnawing out.

Another style of box trap is illustrated in Fig. 10. This trap has a hinged end and cover exactly as in the last, but instead of the high peak at the other end and the spindle and trigger, this form of trap has the spindle passed through the top and a long piece of wood or a stick for a trigger. The manner of adjusting and setting this trap is plainly shown in the diagrams and an explanation is not necessary.

This is really a simpler trap than the one just described and it has one advantage, inasmuch as the rear end may be covered with wire netting, thus enabling you to see the captured animal without opening the trap itself. Sometimes a box trap is constructed with a sliding door instead of the hinged door. This method of construction has one great merit; the captured animal cannot lift the door and escape and you can open the door slightly without any danger of the creature escaping through the top, which often occurs when the pivoted door trap is used. A box trap may also be modified to operate as a deadfall. This is done by making the sliding door operate in a groove or guide a few inches from the end of the spindle, and by weighting it with some heavy object, such as a large stone, a piece of old iron, a piece of lead or even a heavy log resting upon it, and kept in position by means of guides. Such an arrangement is shown in Fig. 11.

Coop Traps

The coop trap or "hen-coop trap" is a splendid form of trap for capturing live birds, such as quail, pigeon, grouse, etc. It will also do well for small animals and is very easily constructed from materials found in the woods.

The trap consists of a coop or box held tilted up by some form of trigger. The common figure-four trigger or the two-spindle triggers described under Deadfalls will serve very well for coop traps, but for birds the form shown in Fig. 12 is preferable. This trigger consists of two forked sticks (A B), and a piece of pliable stick or withe (C). The withe is bent into a half-circle a little smaller than the diameter of the coop and the two ends are kept from springing apart by two short sticks driven into the ground just inside the rear end of the coop as shown at D D. One of the forked sticks,—the longest,—is then placed upright outside of the withe and with the fork uppermost. The second and shorter stick is then placed in the position illustrated with one end of the fork resting in the fork A and with the tip supporting the coop and with the lower end inside the bent withe. The pressure of the coop upon the fork forces the lower end against the bent withe and the coop cannot fall. As soon as a bird alights upon the withe the latter slides down and releases the forked trigger and the coop drops over the bird.

The coop may be built of rough sticks tied

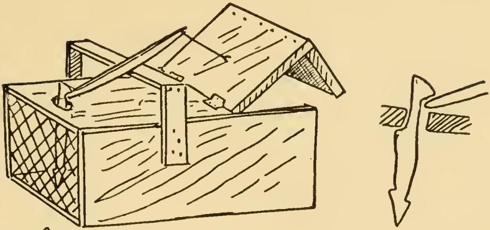


Fig. 10

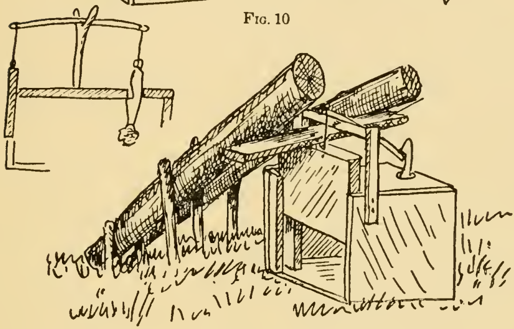


Fig. 11

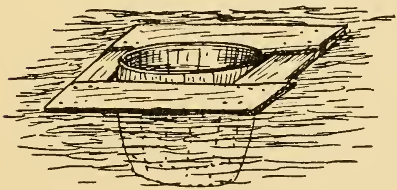


Fig. 13

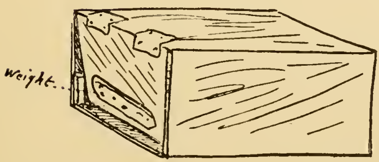


Fig. 16

together with bark, grass withes or string, or it may be constructed of sticks or lathes nailed together. The bait for birds may be dried corn, grain, peas, etc., and for animals, nuts, fruit, corn or meat, according to the habit of the creature you wish to capture. If a figure-four or spindle trigger is used the bait should be fastened to the trigger inside of the coop, but if the forked stick and withe arrangement is used the bait may be simply scattered on the ground within. It is usually a good plan to scatter some bait outside to attract the birds or animals. When this trap is set for animals it is usually necessary to weight the coop with stones or similar things to prevent the captive from lifting it up. Moreover a layer of fine netting should be set on the ground under the coop, or the trap should be set on a rock, to prevent the captive from digging out.

Steel Traps

These are the most widely used and the most cruel of all traps, and unless you depend upon trapping for a living or are anxious to capture some obnoxious or dangerous creature, you should never use them. Steel traps are baited with something which is a favourite food of the creature it is designed to catch, and in order to succeed well with this class of traps you must study the habits of the animals and must know just how and where to place the trap for each particular species of animal. Nearly all wild animals are very suspicious of steel traps, and if they are set openly, the animals will seldom approach them. It is usually necessary to cover the traps with sand, earth or leaves, and they should be smoked or rubbed with grease to destroy any human scent. An excellent method is to wash the traps in weak lye and water and afterwards rub them with chicken or goose fat. After the traps are washed you should never touch them with your bare hands before setting them, but should wear gloves of some sort. There is nothing that will create greater suspicion in a wild animal than the smell of a human being.

Oftentimes ashes or burnt wood, or chicken or rabbit manure, or even horse or cow manure, scattered about the trap will prove valuable in destroying human scent, and in addition will attract many animals. Do not forget that the chain to the trap must be just as carefully treated and just as well concealed as the trap itself.

When setting traps for mink, muskrats or water animals of any sort, an excellent plan is to attach the chain to a stout wire, one end of the wire being fastened to a stake driven in the bottom of the pond or stream or to a heavy rock and the other end being fastened to some higher spot on shore. The struggles of the captured animal will cause the chain to run or slide down the wire and the creature will be drowned.

Meat, chicken or turkey heads, offal, small animals or birds and similar things are all good bait, but these should never be placed on the trap itself, but should be suspended a short distance above it so that the animal will step upon the trap in endeavouring to reach the bait.

Few wild animals will step upon a dead or brittle twig or branch, and trappers frequently take advantage of this trait and place dry twigs about the trap so that any animal, in attempting to avoid the twigs, will step on the trap.

Traps set for mink, otter, muskrat, etc., are usually placed on a stone or log close to water or even in the water or under water near the shore. If a trap is set in shallow water, with a chicken or fish head hung above it, mink and otter may often be captured, when all other methods fail.

In most places it is necessary to make a trail or "scent" to lure animals to the traps. This is done by fastening a piece of bloody meat or a freshly-cut chicken's head to a stick and smearing it over with fish oil, oil of anise or some similar strong oil, and dragging it over the ground in several directions leading to the trap. The passing animals will smell this odour and will usually follow it to the trap and bait.

Oftentimes a trap is set carefully hidden on a path or runway frequented by animals and the trapper trusts to passing creatures stepping upon the trap and uses no bait whatever.

Sometimes animals may be induced to step upon a trap by building a little pen or inclosure, like that described for the deadfall, and placing the bait within, with the steel trap concealed at the entrance.

In setting steel traps for large animals the traps should never be chained to a solid object; in that case the captured animal will often break loose by pulling his leg out of the trap or by biting or chewing it off. To prevent this, the chain should be attached to a heavy log or stick known as a "drag." This will prevent the captive from travelling far or rapidly and will leave a trail which the trapper may easily follow.

Muskrat Traps

These well-known and common creatures are fairly easy to trap. They are valuable for their furs, they are good to eat, and in many places they are serious pests, so the boy trapper need have no compunction about trapping them, provided he does so in a merciful manner.

Steel traps are the commonest form used for catching these creatures, but they are not nearly as satisfactory and are far more cruel than many other forms of easily-made traps. One of the most deadly forms of muskrat traps is merely a barrel half filled with water and floated by a frame or platform of boards as shown in Fig. 13. The bait of fruit, vegetables, etc., is placed upon the boards and barrel with some more bait scattered upon bits of board floating inside the barrel. The rats jump from the boards into the barrel and cannot escape. Another form of trap is shown in Fig. 14. To make this trap, construct an oblong four-sided box, eight inches square and from four to eight feet long, using one-inch boards. Bend some stiff wire into the shape shown at A, and across this weave some stiff wire—hay-bale wire is good,—as shown at B. Place two of these doors on the box, one at each end, pivoting them so they swing easily by passing a wire through the eyes as shown at C, and placing the doors so that they slant slightly towards the centre of the box as shown at D, with the lower edges resting against the bottom of the box. In this position the doors can swing inward, but not outward. To set the trap, sink it with stones or other weights, in a stream or pond, and be sure that it is completely under water so that the captured muskrats will drown. Place bait, consisting of fruit, green vegetables, etc., in the trap. The muskrats will dive down and swim into the trap to secure the bait, but they cannot get out and will soon drown. Sometimes a dozen or more rats are captured in a trap of this sort in a single night.

Turtle Traps

In nearly every pond, lake or stream, turtles are found, and, although they are very common and may be seen sunning themselves on rocks and logs, they are by no means easy to catch. Turtles are invariably interesting to boys; and many a boy spending his vacation in the country has longed to capture some of the turtles that he sees on the old stumps in the mill pond, but which dive into the water long before one can come within reach of them.

Moreover turtles are nearly all good to eat and boy campers will find that snapping turtles, terrapin and even the ordinary "mud turtles" are not to be despised as an addition to camp menus.

Like a great many other things it is easy to catch turtles if you know how, and with a very simple sort of trap you may catch all of these creatures that you wish, either for food or for pets. The best turtle trap, which is shown in Fig. 15, consists merely of a box with perforated sides and with a cover made in one or two pivoted sections (A A), which are arranged to tip down, but are prevented from tipping up by the cleats (B B), and are held in position by the weights (C C). When this trap is weighted and placed in the water, with the top an inch or so above the surface, and a turtle crawls upon it, his weight tips the pivoted door down and Mr. Turtle slides into the box. The weights (C C) then pull the door back into position and the trap is thus automatically set, ready for the next visitor. The only care is to get the weights (C C) just heavy enough to swing the doors into position, for if they are too heavy the weight of the turtle will not spring the trap and he will enjoy a nice place to sun himself at your expense. The trap should be set in some spot where turtles are common and are in the habit of sunning themselves. No bait is required for this trap, as the turtles are attracted to it merely as a convenient spot to crawl out on to enjoy the sunshine. I have sometimes caught over fifty turtles of all kinds and sizes in a single day with one of these traps. In addition to turtles this trap often catches large frogs.

Another form of turtle trap is shown in Fig. 16. This operates much in the same manner as the muskrat trap already described. It consists of a perforated box, fitted with a door at one or both ends, so arranged that the door swings in, but not out. There should be a space of half an inch or so beneath the doors and meat, dead fish or similar bait should be placed in the box, which should then be weighted and sunk beneath the water. The turtles, in attempting to reach the bait, will push in the doors and will be unable to get out again. A piece of lead, iron or some similar weight should be fastened to the doors at the lower edge in order to prevent them from floating open. This is an excellent trap for snapping turtles, terrapin, etc., but is not as satisfactory for ordinary turtles as the one first described. Moreover you must visit and examine this kind of trap at frequent intervals for the turtles, unable to reach the air, will drown, whereas with the former trap they will remain alive for days as the trap is not completely submerged.

Sometimes a trap, designed and set for one creature, will accidentally catch some very different animal, and it is always wise to look into a trap with caution. It is an unwelcome surprise to find a lively and angry skunk in a box trap set for rabbits, and in turtle traps you will often find muskrats, mink or water snakes.

CHAPTER VIII

SKINNING ANIMALS AND TANNING HIDES

There is scarcely any animal whose skin or hide is not useful or valuable for some purpose. In the winter the hair or fur of all animals is thicker, softer and warmer than in the summer, and it is at that season that all the fur-bearing animals are killed or captured for their pelts. If you wish hides with the hair or fur on, you should preserve the winter skins, but the creatures trapped or killed at other seasons for food, or because they are pests, will furnish skins which may be tanned and used for leather for a variety of purposes.

Skins to be sold for furs are merely dried, for the manufacturers have their own methods of tanning or dressing. For your own use, however, you may dress and tan the fur-bearing skins so they are as soft, pliable and tough as those tanned by professionals. A hat, gloves or other fur garments made from the skins of the animals caught or killed by yourself will seem much nicer than those bought ready-made, and you will take pride in knowing that you tanned the skins and obtained the hides by your own skill and knowledge.

The skins of animals captured in warm weather may be tanned with the hair off, and you will be surprised to find what good leather some of these will make, and what a variety of uses you will find for them.

Many small animals, such as rabbits and hares, have such thin, papery skins that they are worthless for leather, but all the weasel family, the cat family, woodchucks, squirrels and muskrats have good, thick, tough hides that make excellent leather. For pouches, bags, gloves and many other purposes these small skins will serve very well, but for leggins, moccasins or similar things, larger and heavier skins are required. Deer have the best of all skins for such uses, but calf-skin, sheep-skin or goat-skin may be tanned soft and pliable and will make excellent moccasins, etc.

The first step in preparing a skin for tanning is to skin the creature properly. If you are saving the hides to sell as furs they should be "cased," that is, the animal should be skinned by making a slit across the belly from the inside of one hind foot to the inside of the other, and drawing the animal's carcass out through this slit.

In doing this the skin is turned inside out. When removed from the body the hide is slipped over a piece of board whittled in a wedge shape, and is dried in a shady spot. For your own use, however, the skins may be cut along the abdomen and taken off flat, using great care not to cut or tear the skin.

The skins may be tanned at once, or they may be dried and saved until you have a number and then all may be tanned and dressed at one time. This is the best method with small skins, but if you have a large skin, such as that of a deer, goat, calf or cow, it is better to tan it at once.

Tanning Skins with the Hair On

The main secret in tanning skins so they will be soft and pliable is to use plenty of "elbow grease." Unless the skins are worked, rolled, rubbed and pounded they will not be soft, and unless you are prepared to use plenty of time and exercise in finishing them you need not expect to get soft, pliable skins.

There are various methods of tanning and nearly every professional tanner has methods and formulæ of his own, and many of these are kept as trade secrets. Many of the best methods of tanning are very simple, and the following will be found very satisfactory.

As soon as the skin is removed from the animal, place it over a smooth, rounded surface, such as a log or tree trunk, and scrape off all adhering bits of meat, fat, etc. In doing this use a blunt knife or scraper and take great care not to cut or tear the skin. Next wash the hide thoroughly in strong soap-suds, or in a weak solution of washing soda, until the grease and dirt are all removed. Hang up the skin to drain, and when half dry, place it in a tanning liquor composed of the following:

1 lb. salt; ¼ lb. alum; 2 oz. of saltpetre and 2 oz. of sulphuric acid to each gallon of water.

Soak the skin in this liquid and turn it each day for from two to ten days, according to the size of the skin. After the first day or two, take out the skin, drain it and scrape off all remaining flesh, fat and sinews. While doing this note if there are any dark, bluish spots on the skin, and if so, be sure and have these come in contact with the liquor when the hide is again placed in the tanning mixture, as such spots indicate unequal tanning and show that the area where they occur did not come in contact with the tan.

Replace the skin in the liquor and let it soak (turning and sousing it about frequently) until there is no sign of slipperiness or jelly-like consistency to the skin. Wash the skin thoroughly in fresh water, drain and scrape it until smooth and clean and nearly dry.

Give the skin-side a coat of neatsfoot oil and lay it away in damp sawdust. When the oil has thoroughly soaked in, apply a coating of soft-soap, roll the skin tightly and place it again in sawdust. When again dry unroll the skin and work it back and forth over a beam and beat and pound it until thoroughly soft and pliable.

Another process which produces a waterproof leather is to soak in the solution above described and then place the skin in a 5- to 10-per cent. solution of either sulphate of chromium, sulphate of aluminum or sulphate of copper, after which the scraping, drying and softening are accomplished as described.

Extract of sumach, tannic acid, solution of oak bark or galls and various other compounds are used in place of the chemicals, but when these vegetable compounds are used the skin will turn brownish. If an extra fine finish is desired the skins may be smoked over a fire of green birch or other wood, but care should be taken not to allow the hides to become heated or burned. The smoking gives the skins a pungent odour like Indian-tanned buckskin, and makes them softer and more pliable, besides rendering them more or less moth-proof.

Tanning Skins Without the Hair

If you wish to tan skins for purposes where the fur or hair is objectionable, you may easily remove the hair by soaking them in water in which some wood ashes have been dissolved. The hides should remain in this solution until the hair rubs off readily, but if left too long the skins themselves will be injured. Another method is to bury the skins in mud for a few days, being careful to have the mud touch every portion of the hide. In either method, as soon as the hair comes away readily the skins should be washed in fresh water and then laid hair-side up over a log or other rounded object. By going over the skin with a piece of board with narrow edge or with the back of a large knife, the hair can be all rubbed and scraped off after which the skin should be again washed and tanned exactly as described for skins with the hair on.

After you have tanned some nice hides you will wish to make some use of them and one of the best uses to which you can put well-tanned strong skins is to make some moccasins.

How to Make Moccasins

Moccasins are the best of all footwear for the woods, for they are soft, comfortable and almost silent. Moreover they will not slip on smooth rocks or logs and will stand an enormous amount of hard wear. Do not be deluded into thinking that ordinary moccasins are waterproof, however. Moccasins can be made waterproof, but they must be made of specially-tanned leather and must be sewed and fitted with great care to withstand water satisfactorily. The ordinary Indian moccasin is not supposed to be waterproof, but if moccasins are wet they can be readily dried and are as good as ever, and they are so easily made and so cheap that a boy camper should always have several pairs on hand so that if one pair gets wet another can be worn until the first are thoroughly dried.

Every different tribe of Indians has a particular form of moccasins and an Indian or a skilled woodsman can tell the tribe to which an Indian belongs merely by his moccasins, or even by their imprint in many cases. Our Eastern Indians used moccasins with soft soles made in one piece with the uppers, but many of the Western tribes used moccasins with heavy soles sewed to the uppers. In some cases the soles were of thick, flexible leather while in others the soles were made from stiff, hard rawhide. These Western moccasins are not nearly as easy to make nor as comfortable as the Eastern forms, the commonest of which is that used by the Algonquins and with minor variations by the majority of Eastern Indians.

The Algonquin Moccasin (Figs. 1-5)

From soft, tough leather or buckskin, cut two pieces shaped as in 1, and two others of the form shown in 2. The size of these pieces must be gauged by the size of your feet, or by a last of the size shoe that you wear. The length from A to B should be one-third longer than the sole of your foot, while the width from C to D should be the same as the circumference of your foot around the instep and sole. In other words if you stand on the piece of leather the sides C and D should just meet over your instep. The flaps E and F may be as long or as short as you please, depending upon whether you desire a low or high moccasin. Having cut out the four pieces as directed, next cut some long straight pieces or strings from the same leather. These may be cut from a very small piece of leather by cutting around and around a circle in spiral form as shown in diagram 12. Commencing at the point marked G, in 2 and 3, make holes with an awl in the pieces 2 and 3, and sew the pieces together with a strip of the leather, tough shoe-thread or sinew. Make each stitch short on the tongue 2, and long in the edge of the piece 3, and thus gather the edges of the moccasin in tight, neat tucks as indicated in the diagrams 4 and 5. Some little practice will be required before you learn just how large to make the stitches in order to have the two sides of the moccasin and the edges of the tongue come out even; but if you fail at first, pull out the stitches and try again. If the leather is thick and stiff it will prove a help to wet the edges of the moccasin, and if this is done and the tongue remains dry, the lower part will pucker readily without puckering the tongue. If you can secure a wooden shoe-last of the right size, it will help you a great deal in making the moccasins, for they can be fitted tightly over the last and will be much neater and more workmanlike when completed. When the tongue is sewed onto the moccasin satisfactorily, cut two little slits in the back of the sole, as shown at H H, and then sew up the back as illustrated at 5, sewing over and over through both sides until the little tab H is reached. This should be sewed down closely and neatly as shown in the illustration. Tie a string of leather at the bottom of each side of the uppers, or pass a string through a hole in each edge and around the back and your moccasins are finished.

The Seminole Moccasin (Figs. 6-12)

The Seminole Indians of Florida use moccasins that are very distinct in appearance and construction from those of other tribes. They are splendid moccasins and made of a single piece, and a Seminole can make a pair in a few minutes with only a knife for tools.

To make the Seminole moccasin, illustrated in Figs. 6-12, cut two pieces shaped as in 7 and two strings with a large end on each like 8. The size of the pieces 7 is determined in the same manner as for the Algonquin moccasin, except that the width should be a little greater than the distance around your foot. Make a hole at the toe end of 7, as shown at A, and thread the piece 8 through this from

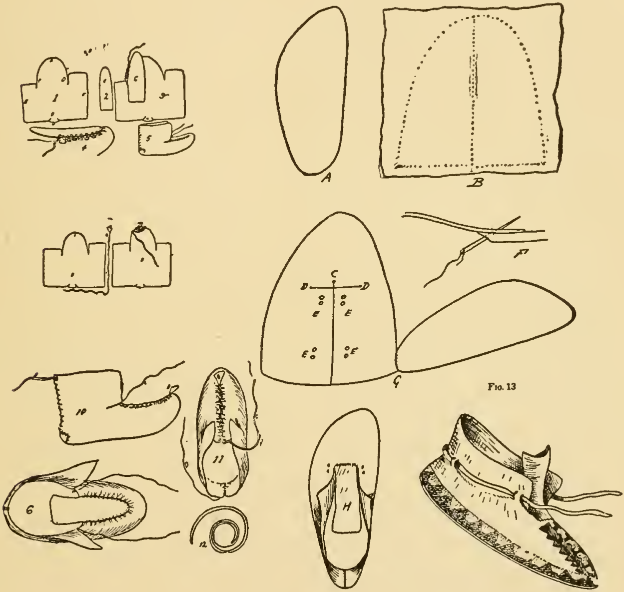


FIG. 13

the under side; the large end B will stop it from pulling clear through. Then with this thong, sew over and under as illustrated, pulling the stitches tight each time until neat puckers are made, but gradually decreasing the length of the stitches and making the tucks looser and looser as you work up towards the instep. By wetting the edges near the toe and leaving the portion near the instep dry, this may be easily accomplished. When the two sides are thus gathered together to the side-flaps, knot the thong so it cannot slip back and leave the long end loose as a tie-string to wrap about the leg. Sew up the heel and back as in the Algonquin moccasin, but leave a loose end of thong projecting at the top as shown at 10. When the string C is wrapped around the leg it is tied to this thong D, and holds the flaps smoothly in place. After you have learned either or both of these moccasins you may wish to try your hand at making one of the Western Indian forms. The easiest of these is the style worn by the Sioux.

Sioux Moccasins (Fig. 13)

For these moccasins you must have some soft, thin, tough leather or buckskin, as well as some very heavy, soft hide, such as elkskin or soft-tanned horse or cow hide, or if you prefer, some heavy rawhide. Place your foot upon a piece of the heavy leather and mark around it and cut it out to the approximate form shown in A. Using this as a pattern, cut another similar piece, but be sure and have the two pieces right and left by turning the first piece upside down when you use it for a pattern in cutting the second. These will be the soles of the moccasins, and the lower side should be the hair side of the skin. Next spread out the thin leather and with a string, or rule, measure the length of the sole, and, adding one inch to this mark, the length on the thin leather. Now measure from one side to the other of your foot across the instep and mark this length at one end of the first measurement and at right angles to it, as shown at B. Draw a curved outline as indicated by the dotted line in diagram B, from one end of the instep measurement around the lengthwise measurement and back to the other end of the instep line. Cut out around this line, place the piece upside down on the remaining leather and cut out another piece of the same size. In each of these pieces make a cut as indicated by C C, and another as shown by D D, and make two holes close together at E E. These will be the uppers of your moccasins and must be sewn to the soles by stitching through as illustrated at F, taking care that all the stitches pass diagonally through the edge of the sole, for if they go straight through they will soon wear off and the moccasins will come apart. Commence the stitching at the rear, or heel, of the sole and at one of the rear corners of the upper as shown at G, and work around to the other end. When this is done, sew up the back seam neatly and sew a tongue of soft leather in position as shown at H. If the sole is of rawhide, or very heavy leather, you will find that it will be much easier to sew it if it is soaked for a few hours in warm water until thoroughly soft. You may have some trouble at first in making neat stitches and keeping the uppers from puckering, but as the moccasin may be turned inside out until the heel-seam is sewn up you will be able to work at it quite readily. It may seem easier to sew the tongue in place before sewing the uppers to the soles, but I have always found that the tongue is a nuisance and in the way while the uppers are being stitched on.

When all the sewing is done, thread a soft leather thong about eighteen inches long through the holes for a tie-string and the moccasins will be complete.

Sioux moccasins are low, slipper-like affairs, and if high moccasins of this style are desired, leg-pieces must be sewn onto the uppers after the moccasins are completed.

Even if you do not tan skins yourself you will find it economical to make moccasins for use in the woods and in camp. Any kind of soft, pliable leather will serve for making moccasins, but in order to wear well the leather must be tough. Indian-tanned buckskin, elk-skin, soft-tanned horsehide and similar leathers are excellent and the leather known as "Chrome calf" is probably the best of all.

CHAPTER IX

PERMANENT CAMPS

For a temporary or one-night camp, there is nothing handier and more satisfactory than the Lean-to, already described, but for camps to be used for several days or weeks, something more substantial is usually required.

A lean-to may be constructed so strongly and well that it is practically waterproof, and will stand the storms and weather of several seasons. If built on a stout frame and constructed of birch bark, held in place with lashed poles, or of slabs of hemlock bark, a lean-to may be made tight and warm enough for even mid-winter use.

Tents are all very well for summer camping, and if near a town or city or where the camp-site may be reached by wagon, canoe or other conveyance, tents will be found of great service. They are cumbersome to carry, however, and the light-weight silk tents are too easily injured for rough work and boys' use. Moreover tents are quite expensive and it never seems like real "camping out" to carry along a tent and set it up.

There are many forms of tents and a smart boy or boys can easily make a tent during spare hours. The easiest of all tents to make and the one which is the easiest to set up and carry about is the Indian wigwam or "tepee." Moreover the tepee always seems in harmony with the woods and fields, and gives a feeling of real "wild life" to its occupants, that is quite lacking when the civilised wall or "A" tents are used.

How to Make an Indian Tepee

The size of the tepee to be used depends very largely upon the number of boys who are to occupy it, as well as upon the distance it has to be carried. A tepee 14 feet high and with a floor space 14 feet in diameter is large enough for three or four boys. To make a tepee of this size you will require canvas or cotton drill ten yards long and five yards wide and this will have to be made up by sewing several breadths together. In sewing the breadths let each seam lap slightly and sew both edges as shown in Fig. 1 A. When the piece of cloth is ready, stretch it out flat on a floor or on a smooth piece of ground and mark the exact centre of one of the long edges as at B. Drive a stout nail at this point and tie a strong piece of twine loosely around this nail and make a loop in the other end of the cord, which should be 15 feet in length. Slip a piece of coloured chalk, a piece of charcoal or a soft lead pencil through the loop and with the string and pencil draw a half-circle on the cloth as shown at C D. Mark two V-shaped places at E E, each ten inches deep and ten inches wide. Then mark off seven feet eight inches on each side from C to F, and from D to G; divide each of these spaces into eight equal parts of 11½ inches each. On each of these marks draw two small circles or place two dots two inches from the edge and two inches apart, as shown at H H. Along the curved edge from C to D mark off twenty-five spaces each two feet apart. From the corners of the square canvas outside of the circle or from another piece, cut two pieces the shape shown in J J, each seven feet on the long side, six and one-half feet on the shorter side and with the ends three and one-half and one and one-half feet wide. In the corners of these pieces at K K, sew small triangular pieces and fasten pieces of light, strong rope (L L). Now cut out around the half-circle from C to D, cut out the triangular pieces E E, and your tepee will be ready to sew and finish.

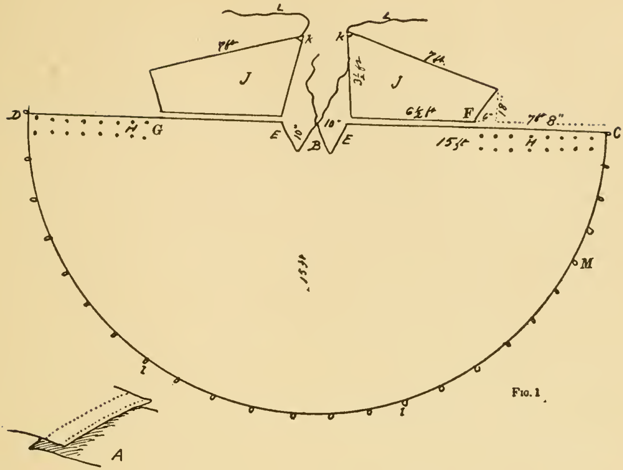


Fig. 1

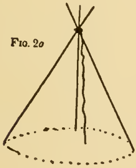


Fig. 2a

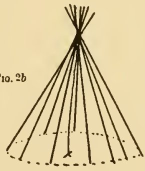


Fig. 2b

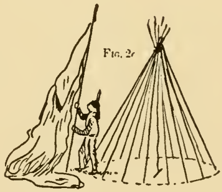


Fig. 2c

Fig. 2d

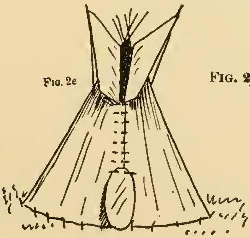


Fig. 2e

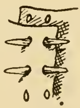


Fig. 2f

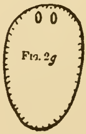


Fig. 2g

The edges C to F and D to G should be hemmed, and the edge from C to D should have light rope hemmed in the edge with a loop at each of the marks I I, about an inch and a half in diameter as shown at M. The two pieces J J should then be sewn in place as illustrated and a piece of stout line should be attached to the point B. The edges of the "smoke-flaps" J, and the edges of the cuts E E, should also be neatly turned over and hemmed. At each of the marks I I, holes should be punched in the cloth and "button-hole stitched," and your tepee will be ready to set up.

For erecting the wigwam you will require ten straight, strong poles, about sixteen feet long, and two lighter poles twenty feet in length and a piece of light rope about twenty-five feet long. You will also require eight lacing-pins of hard wood, each about eight inches in length by ¼ inch square, and twenty-five tent pegs one foot long and one inch square. To erect the tepee, mark off a circle on the ground fourteen feet in diameter, and erect three poles (with their tops tied together by the long rope) in the form of a tripod (Fig. 2*a*). Against these lay six more poles at equal distances apart and fasten all together by winding a few turns of the rope about them (Fig. *2b*). Drive a stake into the ground near the centre of the floor and tie the end of the rope firmly to this as shown. Now tie the short rope shown in Fig. 1, at B, to the end of the tenth pole and lift the tepee cover into position as shown at Fig. *2c*, letting the tenth pole lean against those in place and pulling the bottom around and pegging it in place with the tent pegs driven into the ground through the loops provided for the purpose. The front edges should then be lapped over and through each of the holes I I a lacing-peg should be thrust as shown in Fig. *2f*. The two long, light poles should then be inserted in the little pockets in the smoke-flaps (K K), and the flaps swung into position quartering the wind as indicated at Fig. *2d*. The door of the tent may be closed by merely lapping the two sides across, but it is better to provide a regular door (Fig. *2e*). This may be made of canvas or other material sewed onto a frame and hung to a lacing-pin as shown at Fig. *2g*, or it may be simply a loose piece or flap of canvas sewed to one of the edges of the opening and fastened shut by strings of lacing-pins. Indians, as a rule, erect their wigwams facing the east. In this way they receive the morning sun and light and are protected from the west winds that usually prevail. In bad weather, or in an easterly wind, the smoke-flaps are swung about by means of the poles until the flaps are crossed, and if there is difficulty in making the fire draw, the lower edge of the cover is slightly lifted.

During the day the lower edge of the tepee may be raised a foot or two to allow a free circulation of air. As the tent pegs, lacing-pins and poles may be cut from standing trees, it is not necessary to carry them along when shifting camp, and the cover alone, rolled into a compact bundle and tied up with the rope, is easy to carry. The tepee may be left its natural colour or may be painted, dyed or ornamented with Indian patterns to suit the owner's taste. If properly made and erected a tepee will prove a very cozy, dry and comfortable dwelling-place in the woods and with a small fire in the centre it will be warm even when a winter storm rages without.

Other Permanent Camps

For a permanent home in the woods, one that is to be used year after year, there is nothing better than a log cabin. Log cabins are not difficult to construct, but to build one a person must be an expert axman, and a great many large forest trees must be sacrificed. Our forests are being far too rapidly destroyed, and to cut trees for the sake of making a log cabin, save where absolutely necessary, is a waste of material not to be encouraged. Many other forms of camps may be constructed of waste material or of small growth, which will serve every purpose as well as a log cabin for boys' use.

Wattled Huts

In many parts of the world the natives live in houses or huts made of grass, reeds or branches, and known as "wattled" construction. For many places wattled cabins are excellent as permanent camps. They are wind, water and storm proof, and are warm in winter and cool in summer if well made, but they will not prove as enduring as log cabins. For warm climates they are excellent and as they are easy to make they serve very well for one or two seasons in any locality where the materials used in their construction can be obtained.

Wattled huts may be made of withes or small boughs of willow or other trees or of bundles of grass, bunches of reeds, bulrushes, cat-tails or any flexible material of a similar nature.

In order to construct a wattled hut it is first necessary to build a rough framework of the desired size and proportions. This may be of logs, poles or timbers, and may be lashed or nailed together. In the illustration (Fig. 3), a framework of rough poles is shown. In this case no nails are used in the entire construction and all the materials used may be obtained in almost any part of the country. The framework, having been constructed, the next step is to tie poles or sticks from the upper poles of the framework to the ground frame or "sills" (Fig. 3*a*). These should be about three or four inches apart and spaces should be left for door and windows as illustrated. Next with light, flexible withes, strips of bark, stout rushes or any similar material (even benches of grass or straw will answer) weave the material in and out between the upright poles as shown at *b*. This will seem like slow work, but if you have an abundance of material you will find that it proceeds very rapidly. When the withes, branches or rushes come to the edge of a door or window, bend them around the pole and back under and over one or two poles, as at *c*. The roof should then be treated in the same way and made waterproof by laying sheets of bark, bunches of rushes, layers of evergreen boughs or other materials over the

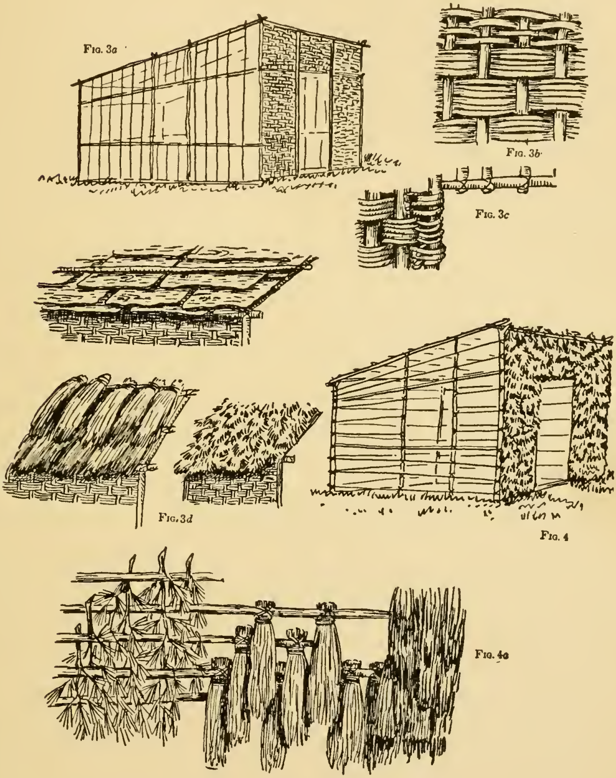


Fig. 3a

Fig. 3b

Fig. 3c

Fig. 3d

Fig. 4

Fig. 4a

wattling like shingles (Fig. 3*d*). If the weaving or wattling has been done well the sides of the house will be quite tight and little wind will penetrate, but it may be made quite waterproof and windproof by daubing clay or mud over it and thus filling all the cracks and crevices. The door may be made of similar construction or of canvas and the window may be covered with a shutter of wood, canvas or wattled work.

Another method of building a house is by "thatching." In many parts of the world thatched houses are used by thousands of people and even in England and other European countries thatched roofs are in daily use.

Thatching

To make thatching, bunches of straw, grass, rushes or leaves are used, and for temporary purposes evergreen boughs will serve. In making a thatched hut the framework should be constructed as in the wattled hut, but the light poles should be placed from end to end, longitudinally, instead of from top to bottom, perpendicularly, as shown in Fig. 4.

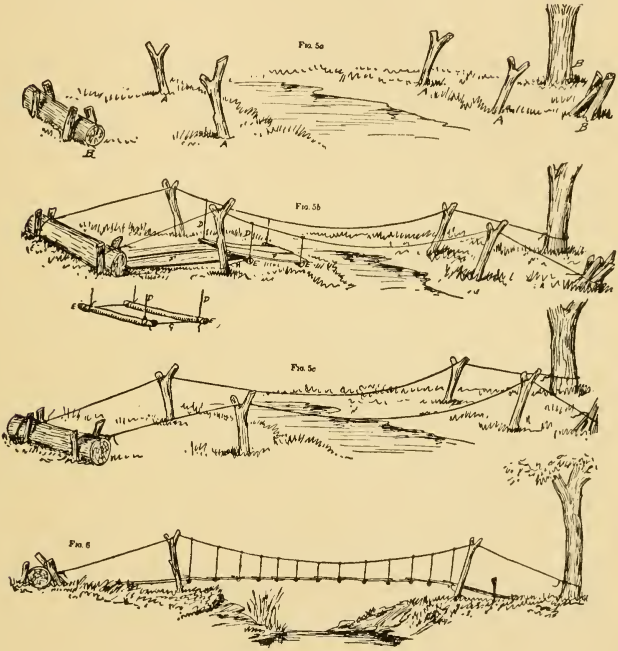
Beginning at the bottom place the thatching material on these light poles, finishing one complete row before commencing the next higher, and thus letting each successive layer overlap the one beneath like shingles. In Fig. 4*a* the method of thatching with various materials is shown. The roof is finished in the same manner and the thicker the bundles of thatch and the closer the layers the tighter and more waterproof will be the finished hut.

Making Bridges

If you are camping out near a brook or stream which must be frequently crossed, you will find some sort of a bridge very useful and you have no idea how much fun it is to build bridges until you try it. Even if you are not camping you will find that building bridges across small streams is lots of sport, and you can spend many a vacation day in bridging the small streams of your neighbourhood.

There are many easy ways of building bridges and the simplest of all is to fell a good-sized tree across the stream and cross over on this. Such a bridge is by no means satisfactory, however, and unless one " coons it " across one is apt to get a ducking, especially if it is raining and the tree trunk is wet and slippery. A better method is to fell two trees side by side and lay branches or limbs across from one to the other, thus forming a walk or pathway between the trunks.

Such extemporised bridges serve very well over narrow streams, but quite frequently a stream may be too wide to bridge with any nearby trees or there may be no large trees near the banks. In such cases a suspension bridge is probably the best style to construct, and if you have some strong rope or cable, a serviceable suspension bridge may be easily constructed. By using a stone attached to a light line, or an arrow with a string attached, the line may be carried across the stream and once you have a string across it is easy to pull over a larger line and by this you may pull over a still larger rope. If there are trees or stumps on the banks of the stream they will make good supports for the cables to your bridge, but it is seldom that four stout trees can be found at equal distances apart and at the same distances from the banks of the stream. It is usually necessary to make special supports or "towers" on each side of the brook. These may be made in a variety of ways, but the simplest is to erect four stout posts with a crotch at the upper end of each, as shown in Fig. 5*a*. These four sticks should be driven firmly into the ground and should point slightly backward from the brook or stream as shown. When driven into the ground all should be the same height and they should be at least six feet apart. It is a serious mistake to make the cables of a suspension bridge too close together, for if you do this the bridge will swing badly, whereas if the cables are



wide apart and the footway is narrow the bridge will be very steady. About ten feet behind the crotched supports drive stout stakes deep into the ground for "anchors." If there are trees available use these, for the anchors do not have to be exactly in line or all the same distance from the " towers," although it is better to have them so. If there are no trees near and the ground is too soft or too hard to drive stakes, you may construct anchors by burying large rocks and attaching the cables to these or a large log may be used and held in place by small stakes driven in front of it, as shown at B. The next step is to stretch the cable from one anchor over a tower across the stream, over the other tower and last attach it to the anchor on the further side. It is not necessary to have the cables very tight, but they should both be stretched the same amount, and the crotched sticks should be high enough to let the cables swing well above the water at their lowest point (Fig. 5*c*). When the cables are in position you can proceed to build the bridge proper, and this can be done by commencing at either bank and building a footway as you proceed, so that by the time the footway is completed you have crossed over the stream while constructing it.

To construct the footway, you will require a quantity of rope strong enough to support your weight, as well as numerous stout poles or sticks as long as the width of the footway. The amount of rope you will require and the number of sticks will depend upon the length of the bridge. If the supporting ropes and cross-pieces are three feet apart they will be near enough for ordinary purposes, but if they are closer together the bridge will be firmer and steadier. First, tie a rope to each cable close to one pair of the "towers," using a slipknot about the cable and letting the ropes hang almost to the ground and cutting both exactly the same length (D). Tie these to the ends of one of the sticks (E) and guy the cross-piece to the "towers," as shown at Fig. 6, and place light poles, boards or mill slabs with one end resting on the ground and the other on the cross-piece, to which they should be lashed with ropes, withes or cord. Standing on this you should fasten the two next ropes, making them slightly shorter than the first two and attaching them to a cross-piece and placing the footway as before. Proceed in this way toward the centre of the supporting cables and then gradually increase the length of the hanging ropes toward the further shore, so that the bridge appears as in Fig. 6.

If slipknots are used in attaching the hanging ropes to the cables, they will not slide out of position. The exact dimensions of the various parts will depend upon the size of the stream to be bridged, the width of the footway and various other matters. A footway two feet wide should have the supporting cables at least four feet apart and the hanging ropes should be so graduated in length that the footway arches up at the centre of the bridge. Instead of lashing each footplank to the cross-pieces the latter may be connected by side ropes, as shown in Fig. 5*b* G.

A suspension bridge may even be constructed of wild grape-vines or twisted withes and in many out-of-the-way countries bridges of this sort span deep canyons and roaring torrents. I have seen native-made suspension bridges constructed of lianas or tropical vines, which seemed most frail and insecure and which supported pack-trains of burros with perfect safety. Some of the South American suspension bridges that are built by the Indians are very crude and consist of but one cable with a line of bamboo poles for a footway beneath it. These affairs swing and sway horribly and one expects to be dashed to pieces upon the rocks far below at any minute. Nevertheless they have been in constant use for many years and serve every purpose for the natives' use.

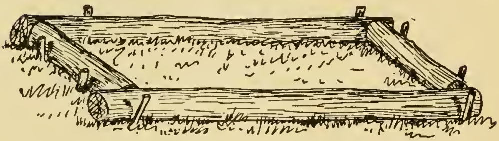
Camp Furniture

When camping only at night and tramping and fishing or hunting during the day you will not require any camp furniture, for a log will serve very well for a chair and a couch of fragrant balsam twigs makes the softest and most comfortable of beds. In a permanent camp or where one spends several days or weeks in one camp, simple camp furniture is a great convenience and you can obtain a great deal of pleasure and may occupy many spare hours in constructing tables, chairs and other furniture from the material that grows in any patch of woodland.

A very simple camp bed may be constructed by merely cutting four logs, two about eight feet long and two four feet long, and arranging these in the form of a rectangle and securing them in position by means of stakes, as shown in Fig. 7.

The space between the logs should then be filled by placing balsam "fans," as for the lean-to bed already described. In the present bed, however, the balsam branches should be placed thicker and larger branches may be used than for the lean-to affair. The four logs will prevent the boughs from

FIG. 7



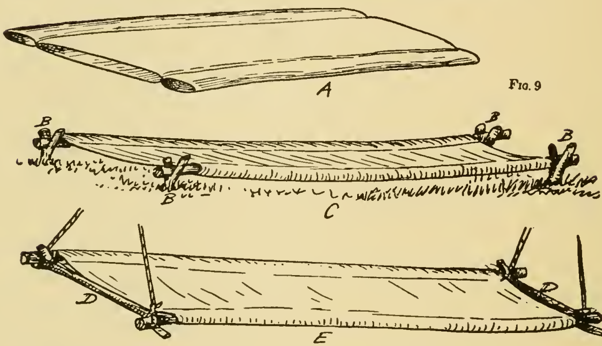


FIG. 9

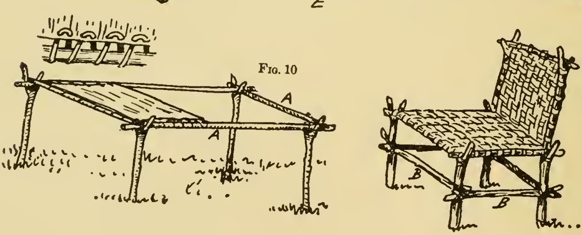


FIG. 10

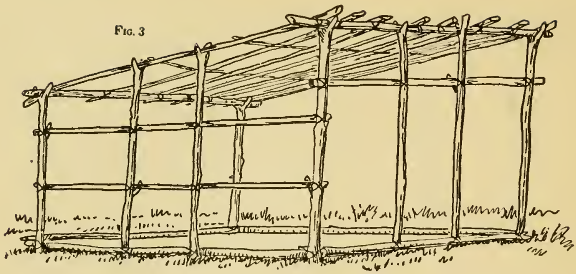
spreading out sideways and a very soft, springy bed will result.

Another form of camp bed, much used by the Western Indians, is the willow bed. To construct this bed you will need about sixty or seventy straight rods of willow or other flexible wood, each about the size of a lead pencil and thirty inches in length. You will also require a few rods that are longer than the above and at least half an inch in diameter. These should all be pulled and at each end of every rod you should cut a small notch or groove about half an inch from the end.

In addition to the rods you must have a ball of strong cord about an eighth of an inch in diameter, a spool of fine, strong linen thread and some shoemakers' wax.

Cut four pieces of cord each twenty feet in length and double each piece in the centre and tie a loop-knot, as shown in Fig. 8 A. Find two trees about seven or eight feet apart and in these drive four nails or pegs nine and one-half inches apart up and down the tree, as shown at B. Slip the loops of the cords over the pegs and twist the doubled cords tight and secure them in position by twisting around the pegs in the second tree (Fig. 8 C). Select one of the stouter rods and opening the twisted strands of the cord insert the ends of this stick (at the notches) and push the rod up tight against the knot (D). Place another rod in position in the same way, but leaving a space of an inch between the two and placing the large or butt

Fig. 3



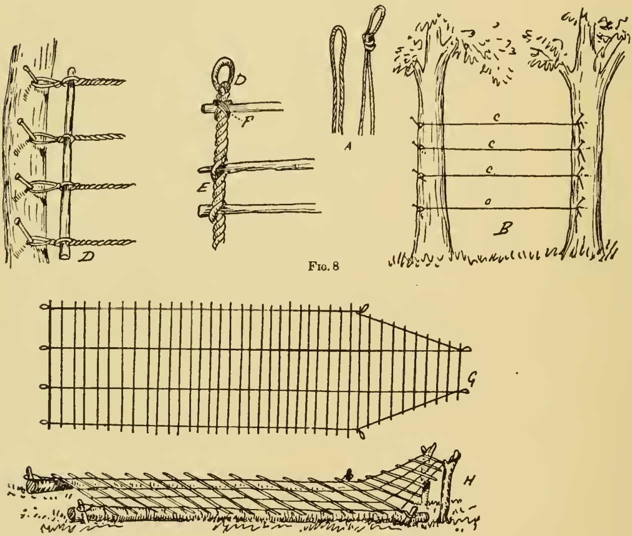


Fig. 8

end of one next to the smaller or tip end of the other (E). Continue to insert rods in this manner and wherever a rod passes through a cord (four places on each rod) lash rod and cord with waxed linen thread, as shown at F. When the rod work has progressed for six feet, insert a stout rod and tie loops in the cords. From this point insert rods of shorter length so that for eighteen inches more the frame narrows down as shown at G. The bed is now complete and only requires placing on a frame or support to be used. The bed may be supported on logs or poles three or four inches in diameter with the ends of the rods resting on the logs and the loops of the cords staked out with short stakes driven at an angle in the earth to support the head (Fig. 8 H). If desired, the head may be covered with canvas or cloth. Such a bed is easily rolled up for transportation and is really very comfortable when covered with a blanket or even a layer of fir twigs, the butts of which may be stuck between the rods. If made with good, stout cord the bed may be supported by the end loops only, thus forming a sort of hammock.

If there are no trees at hand on which to stretch the cords while making the bed, a frame of wood may be built or a couple of sticks may be driven into the ground or the cords may be fastened to an overhead beam and the lower ends held taut by a heavy pole or log suspended from them.

A Simple Canvas Cot Bed

A very simple and easily transported bed for camp use may be made as follows. Take a piece of light canvas or heavy twilled cotton fifty-four inches wide and seventy-two inches long and fold it lengthwise and sew the edges together to form a cylindrical case twenty-seven inches wide and six feet long. Along each side, about four inches from the edge, run two or three rows of strong stitching, as shown in Fig. 9 A. To use the cot, set four strong crotched sticks in the earth about six and a half feet apart one way and twenty-six inches apart the other (Fig. 9 B). Cut two stout strong poles two or three inches in diameter at the large ends and seven feet long. Slip one of these through each of the two sleeves in the sides of the canvas, with the ends of the poles projecting six inches at each end and rest the ends in the crotched sticks and your bed is complete (Fig. 9 C). By lashing a short crotched stick between the ends of the poles, as shown in Fig. 9 D, the cot may be used as a hammock by attaching ropes to the poles as illustrated in Fig. 9 E. When not in use the canvas may be rolled up and carried easily.

Tables and Chairs

Tables may be arranged by driving forked sticks in the ground, placing a rectangular frame around from stick to stick (Fig. 10 A), and covering the top with birch bark lashed around the frame with withes, hemlock roots or cord. If no birch bark is available the top may be made of cords stretched from one side of the frame to the other and "wattled" with rushes, light willow-withes or similar materials. Chair seats may be made in the same way with legs lashed to the corners and with other pieces lashed from one leg to another for rungs (B), or permanent chairs may be made just like the table, but smaller. If you have saws, hammers, nails and other civilised tools with you, it is easy to make all sorts of rustic furniture, but the ones described may all be constructed with the materials found in the woods, a little cord or rope and the ordinary ax and jackknife.

CHAPTER X

ROPES, KNOTS AND SPLICES

One of the most useful accomplishments for any boy, and especially for the outdoors boy who camps, sails or tramps, is a thorough knowledge of knots and splices. Many times human life may depend upon a knot or a rope, and while practically everyone can tie some sort of a knot, yet, as a rule, they are undependable, makeshift affairs which cannot be trusted to hold or may become so jammed as to be impossible to untie. We often hear of a knot being "tied like a sailor's," and while it is true that the old-fashioned, deep water sailors were experts in handling and knotting rope, yet many landsmen, such as lumbermen, plainsmen, campers and others are fully as adept at such work. Sailors' knots are, as a rule, quite different from those used by landsmen, for they are designed and used for very different purposes, and although at first sight it may seem as if any good knot would serve to tie a rope, yet in reality every knot and splice known is best adapted to some particular use or purpose. There are such a vast number of knots and splices in everyday use that they are really bewildering, but among them all there are a certain number which are most useful or important. Knots may be roughly divided into two general classes: useful knots and ornamental knots. The line between the two classes cannot be made hard and fast, however, for many of the most useful knots are highly ornamental as well and a great many of the ornamental knots serve useful purposes. It is best to learn the really useful ones first, however, for, as a rule, they are the simplest, and if you once learn the simple knots the others will come easy later on.

In the first place a knot to be useful must possess several essential features. It must be easily and quickly tied; must be firm and strong, with no possibility of being accidentally untied or loosened, it must be equally easy to untie or "capsise," as the sailors say, and finally, it must be adapted to the specific purpose for which it is to be used.

Before attempting to learn knots you must understand something about ropes, as well as the terms applied to the various parts of a rope, line or cable. A rope is made up of a number of fine threads or "yarns" twisted together into a strand and three or four of these "strands" form the rope itself. In the following descriptions I shall speak only of three-stranded rope such as is commonly seen and used. Some ropes are "laid up," or twisted together "left-handed" or "cable laid," but most of the rope we usually see is right-handed and three-stranded.

In the directions the "standing part" must be understood to mean the principal portion or longest part of the rope; the "bight" is the part curved or bent in the rope while working, while the "end" is that part used in making the knot (Fig. 1). Before commencing to work with a rope the loose strands at the ends should be "whipped" to prevent the rope from unravelling. To do this take a piece of strong, soft twine and lay it on the rope an inch or two from the end, pass the twine several times around the rope, keeping the ends of the twine under the first few turns to hold it in place; then make a large loop with the free end bringing it back to the rope, continue winding it for four turns round rope and end of twine and finally finish by drawing the loop tight by pulling on the free end (Fig. 2).

In Fig. 3 are shown two loops, or rings, of rope known as "Cuckold's necks." These are easily made by merely bringing the end

FIG. 2 Whipping a Rope.

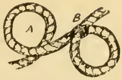


Fig. 3.
A. Cuckold's Neck.
B. Clinch.

Fig. 4.
Overhand Knots.

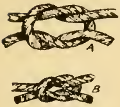


Fig. 6.
Square or Reef Knots.

Fig. 7.
Granny Knot

Fig. 8.
Slippery Reef Knot.

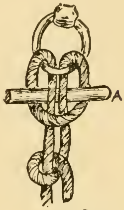


Fig. 9.
Lark's Head.

Fig. 10
Slippery Hitches

Fig. 11.
Half Hitches

Fig. 12.
Clove Hitch.

Fig. 13.

Fig. 16.
Carrick Bend.

FIG. 5

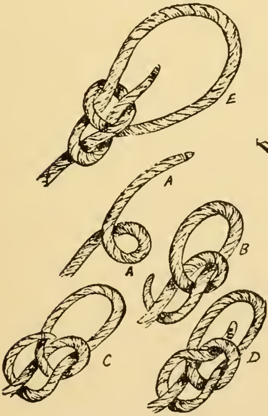


Fig. 17. Bowline Knots.

Fig. 14. Catspaw

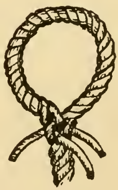


Fig. 19.
Eye Splice.

of a rope around in a circular bight and by placing a seizing of rope or twine about the end and standing part where they cross, a "clinch" is formed (Fig. 3 B). These cuckold's necks are used in forming many knots and the "clinches" are often useful about a boat, as they are much stronger than one would think. The simplest of all true knots is the "overhand knot" (Fig. 4). To make this knot merely pass the end of the rope over the standing part and through the bight or "cuckold neck" thus formed (Fig. 4 A). When drawn tight it appears as in Fig. 4 B. A "figure-eight knot" is also easily made, and in Fig. 5 this knot is shown commenced in A and drawn taut in B. The most useful of simple knots is the "square knot" or "reef knot" (Fig. 6). This knot is used in tying reef points, to furl sails, to fasten two lines together and for various other purposes and is the best all around knot known; if all the boys would learn to tie this knot without mistake and would use it in tying their shoe strings they would never become difficult to untie or "jammed" as a sailor says. To make a reef knot take one end of the rope in each hand, pass the left over and under the right, then the right over and under the left. If you remember the formula "left over, right over" you will never make a mistake and tie a "granny" (Fig. 7). To tie a "granny" shows the maker to be a land-lubber and the knot is a useless, bothersome and insecure thing for any purpose. If in tying a reef knot the bight of the left or right end is used instead of the end itself, the knot becomes a "slippery reefer" and may be quickly untied by jerking on the free end (Fig. 8). A very useful and easily made knot for fastening a boat or any other object where it may be necessary to unfasten quickly is the "Lark's Head" shown in Fig. 9. To make this knot pass the bight of a rope through the ring or other object to which you are making fast and then pass a piece of wood, marline spike or any other object through the sides of the bight and under or behind the standing part as shown in Fig. 9 A. The end of rope is then laid over and under the standing part and back over itself. This knot is instantly unfastened by pulling out the "toggle" (A). Another useful and easily made slipknot is the "slippery hitch" (Fig. 10). To make this run the end of the rope through the ring or eye, then back over the standing part and pull a loop or bight back through the cuckold's neck thus made. To untie merely pull on free end. A more secure hitch for fastening a boat or other object is made by two "half-hitches" (Fig.

11). This knot is widely used by sailors and others and is the most reliable and secure of quickly tied and easily learned knots. To make it pass the end of the rope around the post, ring or other object, then over and around standing part between itself and the post, then under and around standing part and between its own loop and the first one made. It will be more easily understood by referring to the illustration and after a little practice you will find that you can tie this useful knot in a few seconds. It will hold forever without working loose and even on a smooth spar or stick will stand a great strain without slipping. A more secure knot for fastening to a round stick or spar or to another rope, is the "clove hitch" (Fig. 12). To make this pass the end of rope around spar or stick, then over itself, over and around the spar and pass end under itself and between rope and spar as shown in figure. Often you will have occasion for fastening a rope to a block or hook and for this purpose the "Blackwall hitch" (Fig. 13) is very useful and is quickly made. To make it merely make a loop or cuckold's neck with end of rope underneath and pass it over the hook so that standing part jams the end. Another strong knot for fastening to a hook for hoisting is known as a "catspaw" (Fig. 14). To make this lay the bight of your rope over the end and standing part, then with a bight in each hand, take three twists from you, then bring the

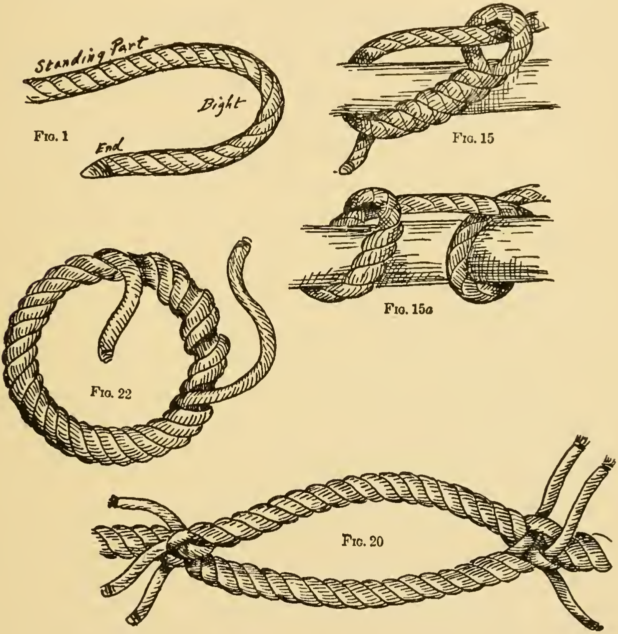


FIG. 1 FIG. 15 FIG. 15a FIG. 22 FIG. 20

two bights side by side and hook over the hook. For towing a log or piece of timber, or for fastening to a spar or mast without danger of slipping, the best knot to use is the "timber hitch" (Fig. 15). This is easily made by passing the end of the rope around the spar or log, round the standing part and then twist it three times around under and over its own part. If you wish this still more secure, a half-hitch may be taken with the line a couple of feet farther along the spar (Fig. 15*a*). Sometimes you may need to fasten two very stiff or heavy ropes or hawsers together and will find it impossible to do this by any of the knots you know. In such cases nothing is better than the "Carrick bend" (Fig. 16). Form a bight by laying the end of a rope on top of and across the standing part. Then take the end of the other rope and pass it through this bight first down then up over the cross and down through the bight again so that it comes out on the opposite side from the other end, thus bringing one end on top and the other below, as shown in the figure. If the lines are very heavy or stiff the ends may be seized to the standing parts by twine or light rope in addition. The last knot I shall describe is the "bowline." This is the sailor's knot *par excellence,* and when you can readily and surely tie this knot you may consider yourself quite an adept. It is useful for a great variety of purposes, never slips, never jams, is easily untied and will prove of the greatest value around boats. In Fig. 17 the knot is shown in its various stages of tying and by following the figure you will understand it much better than through a description. In A the rope is shown with bight or cuckold's neck formed with end over standing part. Pass A back through the bight; under, then over, then under again, as shown in B, then over and down through the bight, as shown at C and D, and draw taut, as in E.

Although knots are fairly easy to learn and are very useful, yet splices are often more valuable than knots and really are no more difficult to master. The simplest splice is the "short splice," shown in Fig. 18. This is made as follows: Untwist the ends of the rope a few inches and wrap some twine around it to prevent further untwisting, as shown at A A. You should also tie bits of twine around the ends of all strands to prevent them from unravelling. After you have become an adept at splicing you will be able to splice a rope without these seizings of twine, but they are quite necessary at first.

It will also be far easier to learn to splice if you wax or grease the strands of the rope. Now place the two ropes together, end to end, as shown in B B. With a marline spike or a smooth pointed stick or piece of smooth iron, such as an old ice-pick, work open the

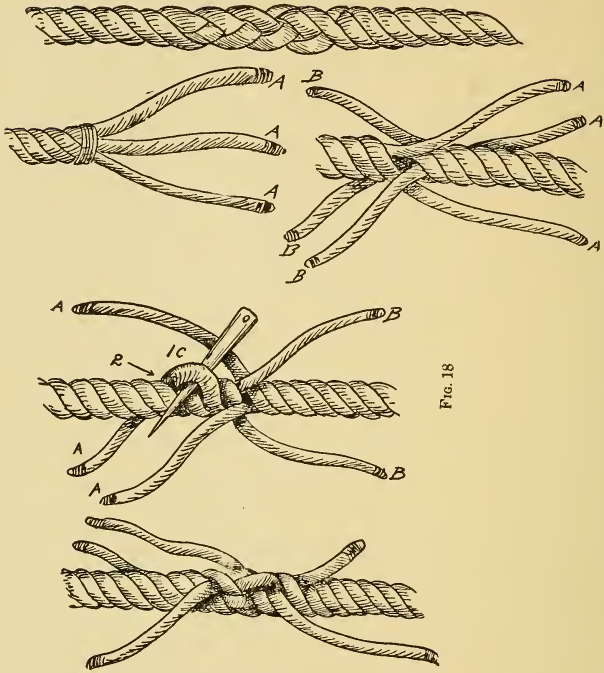


Fig. 18

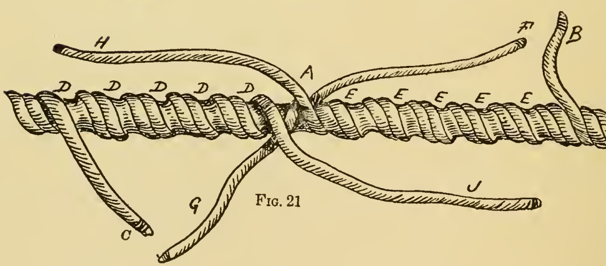


Fig. 21

strand 1 C, and through this push the strand A of the other rope. Next open strand 2 and pass the next strand of the other rope through the aperture. Then treat the third strand in the same way. Now open the strands of the second rope in the same manner below the seizing and through the openings push the strands of the first rope. The two ropes will now appear as at D D. Next untwist each strand and cut off about half the yarns in each and seize the ends with string as before. Each of these reduced strands must then be poked under the whole rope strands as you did before reducing them. After drawing each strand tight pass them once more under the whole strands and then trim off close to the rope. If you wish a really neat, fine splice you may cut out a little of the yarns each time the strands are passed, thus gradually tapering the ends and in this way making a splice that is but slightly larger than the original rope.

An "Eye splice" (Fig. 19) is made in the same manner as the short splice, but instead of splicing the two ends of separate ropes together the end of the rope is unlaid and then bent into a loop and the ends spliced into its own strands as shown in the illustration.

A "Cut splice" (Fig. 20) is made much in the same way as the eye splice, but instead of turning the rope in a loop or "bight," two ropes are spliced together overlapping, or a short rope is spliced at both ends into another rope.

A "Long splice" (Fig. 21), is the hardest splice to learn to make, but if it is well done it cannot be distinguished from the original rope and will pass through a block or an eye as readily as a whole rope. To make the long splice, unlay the ends of the ropes about four times as much as for a short splice or from four to five feet and unlay one strand in each rope for half as much again. Place the middle strands together as in A, so that the long strands will appear as at B and C and the spiral groove left where they were unlaid will look like D E. Take off the two centre strands F and G and lay them into the grooves D E until they meet B C and be sure to keep them tightly twisted while doing this. Then take the strands H and J, cut out half the yarns in each, make an overhand knot in them and stick the ends in the same way as in making a short splice. Do the same with the strands B C and F G, dividing, knotting and sticking the reduced strands in the same manner. Finally stretch the rope tight, pound and roll it until smooth and trim off any loose ends of yarn close to the rope. Another very useful piece of rope work is a ring, known as a "Grommet" (Fig.

22). This is very easily made by taking a strand of rope, unlaid from any common rope, laying one end over the other at the size of the ring you desire and with the long end follow the grooves or " lay " of the strand until it comes back to where you started, thus forming a ring of two strands. Continue twisting the free end into the groove between the other strands until the ring is completed with three strands all around. Next finish the grommet by dividing the yarns of the two ends where they meet, making overhand knots in them and passing them underneath the nearest strands as when making a splice and finally trim off all loose ends. Such rings or grommets make very nice quoits and are useful for a variety of other purposes as well as for handles of chests and boxes, rings for masts of small boats, etc.

If you learn all these useful knots and splices you will be able to form a knot or make a splice for any and every occasion, and if you master the fancy or ornamental knots you will find a great deal of amusement in making them and in many cases they will come in very handy.

Many dull hours or wet, unpleasant vacation days may be spent pleasantly and advantageously in making various knots, and you will find that you and your boy friends can get a lot of fun out of knot-tying competitions.

Fancy Knots and Other Rope Work

After you have learned how to tie the knots already described and how to splice ropes properly, you may find a great deal of amusement and may pass many a spare hour learning the more ornamental knots and "ending knots." A great many of these pretty knots are very useful, especially about boats, and if you look about on board any sailing vessel, whether yacht, man-of-war or merchantman, you will be sure to find a number of them in use. Many of these knots appear very intricate and difficult to the inexperienced observer, but in reality it is no harder to learn to tie a good "Turk's Head" or "Matthew Walker" than a reef-knot or bowline, and after you once learn how to tie them you find it an art you will never forget. In the old sailing ship days every able-bodied seaman could tie practically every knot known, and "marline-spike seamanship" was considered of great importance. With the increase of steam vessels and the adoption of wire rigging; knots, splices and fancy work became of less value and importance, but even to-day nearly every ship that sails has at least one member of her crew who is a proper sailor and can tie knots, splice ropes, serve, or weave sennet as well as many of the old-time salts.

Once you have learned how to tie the various knots you will constantly find new uses for them which never occurred to you before, and if you own a boat of any sort you can add much to her appearance and "yachtiness" by a liberal use of your skill in knotting and splicing. The most important of the ornamental knots and the ones I shall try to teach you to make, are the Crown, with its variations (Figs. 23, 24); the Wall (Figs. 25 and 26); the Matthew Walker (Fig. 32) and the Turk's Head (Fig. 33). By the use of these and combinations of two or more an immense number of fancy knots may be devised and many of these combinations have been in such general use that they have become recognised as regular knots, such as the Wall and Crown, Double Wall and Crown, etc. In addition to these real knots, the covering of rope or rigging to make a smooth even finish or "Worming, Parcelling and Serving," should be included as ornamental work, while Four-Stranded

Braid and Crown Braiding are widely used in making lanyards, hand lines, fenders, etc. In addition to these the amateur rope worker should be familiar with the "Monkey Chain," and should know how to properly sling a barrel, cask or bundle.

The material best suited to tying fancy knots is either very fine stranded and flexible hemp or closely twisted soft cotton rope. Either of these is good, but ordinary manilla is too stiff and bristly to work well for the beginner. Select a piece of new rope and some fine cotton twine and if possible have a fid, marline spike or piece of smooth-pointed hard wood to help in your work. Unlay the strands of the rope for six inches or so and pass a seizing of twine around the end of each strand and around the rope below as shown in the figure. This will keep your strands and the rope from unlaying further and will save lots of bother. An expert can work without the seizings but you will find it best not to try this. We will now try the simplest of fancy knots, known as the Crown. Holding the rope in your left hand, fold one strand over and away from you, as shown in A, Fig. 23, then fold B over A and, holding these two strands in place by your thumb and finger, pass C over B and through the bight of

A as shown. Now pull all the ends tight and work the bights up snug and you will have the single Crown knot shown. This is a poor knot to stand by itself, however, and is mainly of value as a basis for other

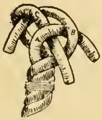


FIG. 23


FIG. 24

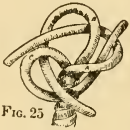


FIG. 25


FIG. 26

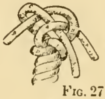


FIG. 27


FIG. 28


FIG. 29

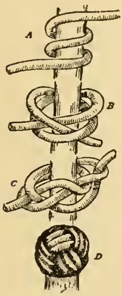


FIG. 33

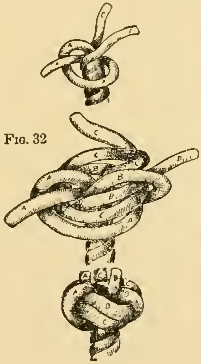


FIG. 32

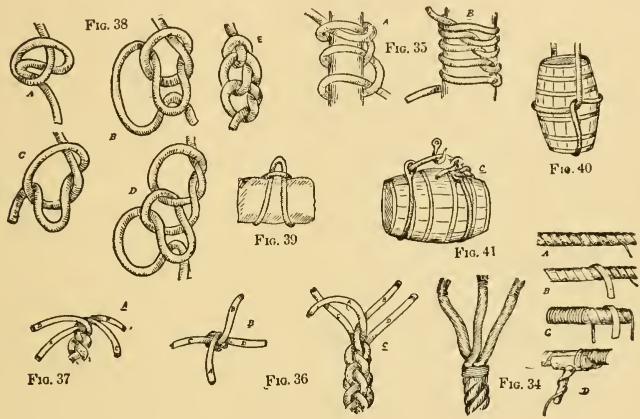

FIG. 30


FIG. 31

knots and for ending up rope. To end up a rope with a Crown it is merely necessary to tuck the ends of the strands under and over the strands of the standing part as shown in Fig. 24, and taper them down and trim closely exactly as in making an Eye Splice, described already. This makes a most neat and ship-shape way of ending up ropes such as painters, halliards, etc. It will never work loose like a seizing and is quickly put on at any time, whereas one often wants to end up a rope when no small stuff for seizings is at hand.

The Wall (Figs. 25, 26) is almost as simple as the Crown, and in fact is like a Crown reversed. In making this knot bring C downward and across standing part, then bring strand A over C and around standing part and finally bring B over A and up through bight of C. As in the Crown, the Wall is of value mainly as an ending knot when ends are tucked as in Fig. 26, or as a basis for other knots. Either the Wall or Crown may be rendered more ornamental and useful by "doubling." This is done by following around the lay of the strands on a single Wall or Crown. That is, after making your single wall knot, bring strand A up through its own bight, beside the end of C. Then bring B up through its own bight beside A and bring C up through its own bight beside B. This will give you the knot illustrated in Fig. 27. A still better effect may be had by crowning a Wall knot. This is done by first making a Wall and then bringing the strand A up over the top, laying B across A, and bringing C over B and through bight of A. This is the foundation of the most beautiful of rope-end knots known as the Double Wall and Crown or Man-Rope knot, shown in Fig. 28. Make your single Wall and Crown it, but leave the strands slack. Then pass the ends under and up through the bights of the slack single wall and then push the ends by the side of those in the single crown, pushing them through the same bight in the crown and downward through the walling. It sounds quite difficult, but if you have learned to wall and crown before attempting it, you will find it easy enough, for it is really merely "following" the strands of the single wall and crown. The result, if properly done and ends drawn tight and cut off closely, is surprising and, to the uninitiated, most perplexing, for if the ends are "tucked" through the strands of the standing part, as shown in Fig. 28, there should be no sign of beginning or ending to this knot. This is, perhaps, the most useful of ornamental knots and it comes in very handy in many places. It is often used in finishing the ends of rope railings to gangways, the ends of Man-ropes (hence the name), for the ends of Yoke-lines, and to form "stoppers" or toggles to bucket handles, slings, etc. Its use in this way is illustrated by Figs. 29, 30 and 31, which show a handy topsail halliard toggle formed by turning an eye splice in a short piece of rope finished with a double wall and crown at the end. Such toggles are very useful about small boats. They may be used as stops for furling sails, for slings around gaff or spars for hoisting and in a variety of other places which will suggest themselves to the young sailor. The most difficult of ending knots and one which every amateur sailor should learn is the Matthew Walker, or "Stopper Knot" (Fig. 32). To form this knot, pass one strand around the standing part and through its own bight, then pass B underneath and through the bight of A and through its own bight also. Then pass C underneath around and through bights of A, B and its own bight. The knot will now appear as in Fig. 32 A, but by carefully hauling the ends around and working the bights tight a little at a time, the knot will assume the appearance shown in Fig. 32 B. This is a very handsome and useful knot and is widely used on the ends of ropes where they pass through holes, such as bucket handles, ropes for lifting trap-doors, chest handles, etc. The knot is well adapted for this purpose as it is hard, close and presents an almost flat shoulder on its lower side.

The Turk's Head (Fig. 33) is a knot much used aboard yachts and warships and is so handsome and ornamental that it is a great favourite. It is used in ornamenting lower rigging, in forming rings or shoulders on stays or ropes to hold other gear in place, to ornament yoke lines and for forming slip-collars on knife lanyards, gun lanyards, etc. It is also used to form collars around stanchions or spars, and placed around a rope close beneath a Man-rope knot it gives a beautiful finish. Although so elaborate in effect it is really an easy knot to make and while you may have difficulty in getting it right at first, a little patience and practice will enable you to become proficient and capable of tying it rapidly and easily in any place or position. To make the Turk's Head, have a smooth round stick or other object and some closely twisted or braided small line. Pass two turns with the rope around the rod, A, Fig. 33; pass the upper bight down through the lower and reeve the upper end down through it, B, Fig. 33. Then pass the bight up again and pass the end over the lower bight and up between it and the upper bight. Dip the upper bight again through the lower one and pass the end over what is now the upper bight and between it and the lower, C, Fig. 33. Work around in this manner to the right until the other end is met, when the other part is followed round until a plait of two or more lays is complete, as shown in Fig. 33. The Turk's Head may be drawn as tight as desired around the rod or rope by working up the slack and drawing all bights tight. A variation of this knot may be formed by making the first part as directed and then, by slipping the knot to the end of the rod, work one side tighter than the other until the Head forms a complete cap. This makes a splendid finish for the ends of stanchions, poles or flagstaffs. Ropes that are to be used for hand lines, stanchions, man ropes or lifelines or, in fact, for any purpose where appearance counts, are usually wormed, parcelled or served. Worming consists in twisting a small line into the grooves between the strands of a rope (Fig. 34 A). This fills up the grooves and makes the ropes smooth and ready for parcelling. This is done by wrapping the rope with a strip of canvas (Fig. 34 B). This is tarred and the whole finished by "serving" or wrapping tightly with spun yarn, marline or other small stuff (Fig. 34 C). Although this may all be done by hand, yet the serving is usually accomplished by using a "serving mallet," shown in Fig. 34 D. This instrument enables you to work tighter and more evenly than by hand-serving, but in either case the rope to be treated should be



stretched tightly between two firm supports. Often a rope is served without parcelling and for ordinary purposes the parcelling is not required. A variation of serving is made by "half-hitch" work, as shown in Fig. 35. This is quite pretty when well done and is very easy to accomplish. To do this, take a half-hitch around the rope to be covered, then another below, draw snug, take another half-hitch and so on until the object is covered and the half-hitches form a spiral twist as shown in the illustrations. Bottles, jugs, ropes, stanchions, fenders and numerous other objects may be covered with this ornamental half-hitch work and as you become expert you may be able to cover things with several lines of half-hitch work at the same time. Four-strand braiding is highly ornamental and is very easy and simple. The process is shown in Fig. 36 and consists in merely crossing the opposite strands across and past one another as illustrated in A, B and C, Fig. 36. A still more ornamental braid is made by crowning four or more strands or separate lines and looks like the right-hand illustration in Fig. 37. The process is exactly like ordinary crowning and does not require any description. Walling may be continued in the same way, but is not as handsome. The Monkey Chain is sometimes used in ornamental rope work, but is principally useful for shortening rope in such a manner that it may be readily lengthened. It is well shown in Fig. 38. To make the chain draw a loop of the rope through its own bight, A, Fig. 38, another loop through this, C, Fig. 38, another through this, and so on until the rope is shortened to the required length. The end may then be passed through the last loop as shown at E, Fig. 38. If to be used for a permanent chain, the end may remain thus and the chain will never work loose. If used to shorten rope and the slack is required at any time, it is only necessary to slip out the loose end and jerk on the end, when the entire chain will unravel instantly.

No article on knots would be complete without some mention of slings, for to sling a barrel, cask, box or bale safely and easily is often of great value and importance. While the boy familiar with knots and splices will no doubt devise practical slings of his own, yet the three shown herewith in Figs. 39, 40 and 41, may serve as hints to readers. Fig. 39 shows a useful sling for bags or bales, and consists merely of a length of rope spliced together and slip-noosed around the object as shown. Fig. 40 shows how to sling a barrel upright, while Fig. 41 shows how to sling a cask in a horizontal position. In this case the rope may be used with an eye-splice at one end, as illustrated, or it may be merely tied at both ends. Sometimes a similar sling is used in which an eye-splice is turned in each end in place of the knot shown. There are numerous other knots both useful and ornamental, but those described are the more important and if you learn to make all of these you will be able to pick up others from sight or description, for each one learned makes the next easier.

CHAPTER XI

SWIMMING AND DIVING

Every boy should know how to swim, even if he never expects to go on the water. Fortunately nearly every boy wants to learn how to swim and comparatively few out-of-doors boys fail to learn. The best way to learn to swim is to get some other fellow to teach you; it's a hard matter to teach anyone to swim by writing about it, for even with the help of a good swimmer it's not always easy to learn. One tries and tries again and again and almost gives up in despair and then suddenly, without just knowing how, you find you are really swimming. Some boys never can learn the trick, but with patience and perseverance nearly everyone can learn to swim after a fashion. Of course some people are more expert than others,—there are always experts in every line,—but as a rule, after you once learn to swim a little, you can rapidly improve and learn a number of strokes and "fancy swimming." If you once learn to swim you never forget how and although you may go for years without swimming a single stroke, yet the first time you try you find all your old skill comes back instinctively.

The first thing to learn, and to always remember, is that the human body will float as long as the lungs are filled with air; that is, the body is lighter than the water it displaces. It is so slightly lighter, however, that only a small portion of the body will remain above the surface, but few people,—if indeed any,—will actually sink if they do not become frightened or thrash about. Some people float better than others and women float better than men as a rule; but it is only necessary to have confidence and keep your head in order to float quite comfortably without the slightest effort, and by a slight motion of your hands or feet a good portion of your head and body may be kept above the surface. The first step in learning to swim is confidence. If you fear the water it will take a long time to learn to swim, for you must have full confidence in your ability to conquer the water if you expect to learn to swim well. Perhaps the best way to gain confidence is to practise floating and this can be done in quite shoal water where you feel perfectly safe. To float on the back one needs to merely lie down on the water, throw the head well back, with mouth and chin up, and drop the arms beneath or hold them at the sides. If you find the water rising around your ears or even to the corners of your mouth, do not get nervous or try to rise; remain perfectly still or paddle downward slightly with your hands, and you will find that before the water rises to your mouth and nose you are floating upon the water as comfortably as if lying on a soft feather bed.

The next step in learning to swim is to learn to breathe properly. More swimmers have been drowned by improper breathing than by any other cause. A good swimmer may drown by having cramps, by becoming chilled, by striking some other object or by exhaustion; but if he has learned to breathe properly he will never choke or drown by his mouth and lungs becoming filled with water.

The majority of people, when rising to the surface, attempt to expel the air in their lungs and inhale a new supply as their head bobs into the air. This is a mistake, for if the air is expelled just before you rise to the surface, you can inhale a good long breath before a wave slaps you in the face or you sink again.

In order to learn to breathe properly it is a good plan to stand in water about up to your shoulders and move your head up and down in the water by bending the knees, keeping the head well below the surface by lifting the mouth clear. Take a long, deep breath with your mouth open, turn the head beneath the water, exhale the air through the nostrils, swing the mouth up again and repeat over and over again until it becomes perfectly natural to breathe in this manner.

Water-wings are an excellent aid in learning to swim and every beginner will do well to use them. The commonest, and supposedly easiest, of all styles of swimming is the "breast stroke," but it is by no means the swiftest or the easiest and nowadays it is largely giving place to the "crawl," "side" and "back" strokes. In using the breast stroke the head, and often the shoulders, are held above water and the result is that a good deal of energy must be used in keeping them there. Moreover when swimming on the breast a "bow-wave" is made and the body presents a large, broad surface to the water. In addition, the kick required for the breast stroke is a complex affair and is far from natural. By turning on the back the frog-like kick is easier and the mouth may be held out of water without a strain on the neck muscles. In the "crawl" the entire body and head are beneath the water in a horizontal position, the head being merely turned to one side to inhale the air, and thus no effort is wasted in keeping afloat and comparatively little resistance is offered to the passage of the body.

A person may learn to swim with the crawl-stroke with wrists and hands alone, but the leg work is important and is also far more difficult to learn than the hand work.

The old-fashioned side stroke is another good form of swimming and even the despised "dog-paddle" is far better than nothing and serves a useful purpose. No matter which style you learn first you should not rest content until you have mastered them all, for on a long swim or when in the water for some time, you will find it a great relaxation to shift from one stroke to another. It makes little real difference which stroke you acquire first, for if you are learning to swim in order to be safe in the water you can just as well learn one stroke as another at first. Long before the crawl-stroke was known in America people saved their own lives and the lives of others with the old-fashioned breast stroke and I doubt if there are any more lives saved to-day in proportion by the newer and showier crawl-stroke. Nevertheless the newer strokes are splendid and for fast, easy work are far superior, but if you find it easier to learn to swim on your breast or back or even to dog-paddle, by all means learn that way; you will have greater confidence in yourself if you can swim some one way and that will make learning other methods much easier.

Diving, like swimming, requires practice in order to become proficient and the only way to learn to dive properly is to have someone teach you, you cannot learn from printed directions. There are a few important points in regard to diving which you should always bear in mind. Never attempt to dive unless you are able to swim well, and never dive unless you are sure there is sufficient depth of water to insure your not striking bottom. Many boys and men have lost their lives by neglecting this simple precaution. Commence diving from a short distance above the water and increase the height as you learn to dive better. Do not hesitate too long; as soon as you are ready and properly balanced dive at once; to hesitate and dally invites disaster in diving, and people are often injured in this way. Do not dive if you feel nervous, uncertain or lacking confidence.

The chances are that under such circumstances you will involuntarily make some motion or effort to check yourself at the last instant and as a result will strike the water in a dangerous, or at least uncomfortable, attitude. If you use a springboard have it smooth and free from splinters; spruce or yellow pine is better than oak. Do not try fancy diving until you are expert in straightforward diving. Do not dive where others are swimming or bathing; a human body falling from even a few feet strikes with dangerous force.

If you wish to have real fun make a rope swing, as illustrated in Fig. 1. This beats a springboard all to pieces for sport, but it cannot be called either a graceful or useful method of entering the water. To make the swing, merely fasten a smooth round stick to a piece of rope, the other end of which is attached to a branch or beam over or near the water. Grasp the two ends of the stick in your hands, walk back to the limit of the rope, run rapidly forward and as the rope swings you off your feet and over the water let go with both hands. With practice you may learn to turn somersaults or double somersaults before striking the water, but at first you will strike the surface in a heap and with a mighty splash. The swing should be so arranged that it is a little higher than your head as you stand directly beneath it.

Finally let me advise you not to overdo things and stay in the water too long; an

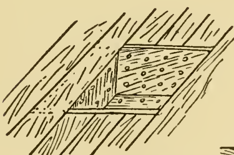


Fig. 4

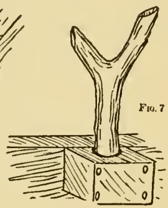


Fig. 7


Fig. 1

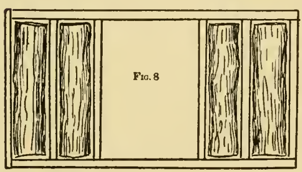


Fig. 8

hour is as much as most people can stand. And last and most important of all, never go into the water right after eating; there is no better way of bringing on peritonitis and other deadly stomach and intestinal troubles; wait at least an hour and a half after meals before entering the water, and always avoid plunging into cold water when you are warm, perspiring or overheated.

Swimming Floats and Springboards

As a rule the shores of lakes, ponds, streams or even salt water are seldom safe places from which to dive and swim. Of course there may be deep water close to shore, but in the majority of cases there are stones, stumps, shoals or other obstructions which make diving dangerous. By building a swimming float a safe and convenient place may be made from which to dive. By attaching a springboard to the float and by erecting a shelter on one end, the float may be made to serve many purposes. It may be moored in any convenient spot and will serve as a raft, house-boat, fishing-float, boat-dock and swimming-float combined.

It is a very easy matter to construct such a float, and if several boys work together the whole affair may easily be built in a couple of days. The first requisite is six strong, water-tight barrels, which should be given a good coat of paint, tar or pitch. Secure two pieces of 2 x 6 scantling, each ten feet long, and four pieces each twenty feet in length, and nail these firmly together in a rough frame, as shown in Fig. 2, having the space between A and B and C and D just wide enough to admit the barrels easily, as illustrated. Place the

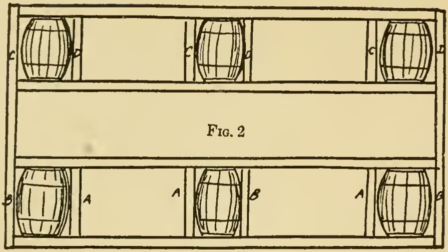
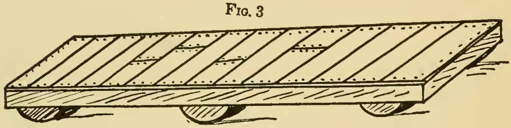


Fig. 2

Fig. 3



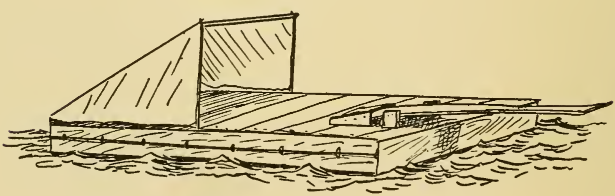
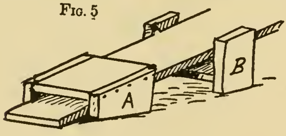


Fig. 5



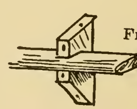


Fig. 6

six barrels in the frame, as illustrated, having a barrel close against each end on both sides and with the odd ones half-way between. Cut eight short pieces of the scantling, each the length of the barrels, and nail these in position on either side of the middle barrels and on the inner sides of the end barrels as shown at Fig. 2 A, A, A. Now lift the framework from the barrels and placing it on a smooth, level surface or on horses, proceed to nail boards across the top, as shown in Fig. 3. The boards or planks should be smooth on the upper side and those at the ends should be long enough to extend clear across from one side of the frame to the other, but those in the middle may be shorter pieces extending only from one timber to another. Drive the nails well below the surface of the boards and if the planking is rough or splintery, cover the deck with old canvas or carpet. A fish-well may be added to the float by boarding up a space in the middle, as shown at Fig. 4, and boring a small hole through the bottom. A trap-door should be fitted over this in the deck and in this well you may keep live fish, turtles or other aquatic creatures for as long as you please.

At one end of the float a bracket and socket should be made for the springboard. The construction of this is so plainly illustrated in Fig. 5 that no explanation is required. By merely pushing the board into the socket A and placing the support B beneath it the board is ready for use, and the springiness and angle may be varied to suit your taste by simply moving the support B forward or back. When the board is not in use or when the float is being moved from one spot to another the board may be lifted from the socket and placed on deck out of the way. A hand-rail may also be added and you will find this a great convenience in getting onto the float from the water, as well as in tying up boats or in fastening the float to the shore. The method of constructing the hand-rail is shown in Fig. 6. At one end of the float a lean-to tent or a light board hut may be erected and if it is desired to move the affair about, crotches should be placed on the sides and ends and long sweeps or oars should be provided. The crotches, which serve as oarlocks, may be cut from natural forks of trees and may be set into holes bored in blocks spiked to the side timbers (Fig. 7).

If the water is far from where the float is built the latter may be carted to it and the barrels rolled or carted to the shore. Do not launch the float before placing the barrels in position, but set the frame over them and roll the whole affair into the water, using planks or timbers for a track if the ground is rough or uneven. If there are large mill-logs in your vicinity and no barrels are handy, you may use logs instead of barrels, placing the logs crosswise, as shown in Fig. 8. You will find no end of fun in such a float and may camp out on it all summer, moving from place to place along the water-course or lake as your fancy dictates and having just as much sport and comfort as if you owned a palatial houseboat. In winter the float may be drawn up anywhere on shore and left without further attention until spring, and if the barrels are given a coat of paint each season and new hoops are added as the old ones rust out, the float should serve you well for many years.

CHAPTER XII

HOW TO SAIL AND HANDLE SMALL BOATS

Nearly every out-of-doors boy who lives near a body of water longs to have a boat of some sort and sooner or later he will become tired of rowing and paddling about and will wish to try his hand at sailing.

There are numerous fatal accidents every year due to the careless or improper handling of sailboats, and many people have become so fearful of sailing craft and so prejudiced against them that they have an idea that to venture out in a sailboat is far more dangerous than to paddle a canoe. As a matter of fact a sailboat, if well built, properly rigged and intelligently handled, is as safe as a rowboat or launch and far safer than the best canoe ever built.

Everyone who uses a sailboat, however, should learn to swim, for although excellent swimmers are often drowned, yet the knowledge that you can swim will give yourself and your friends confidence and may result in saving your own or some other person's life. The same is true of rowboats, launches or canoes, and a person who cannot swim has no business fooling around in boats. No matter how well you can swim never take to the water, as long as the boat floats; stick to your ship no matter in what condition she may be, until compelled to desert her by her sinking beneath you. A water-logged or capsised boat will float for hours or even days, it will support several persons and is far more likely to be seen by other boats or by people ashore than a swimming person. It takes very little to support a person in the water,—an old bucket or pail held perpendicularly wrong side up, an open umbrella, a high hat, or even a derby will hold enough air to support a person for a long time, while an oar, a grating, a plank or a spar will serve the same purpose.

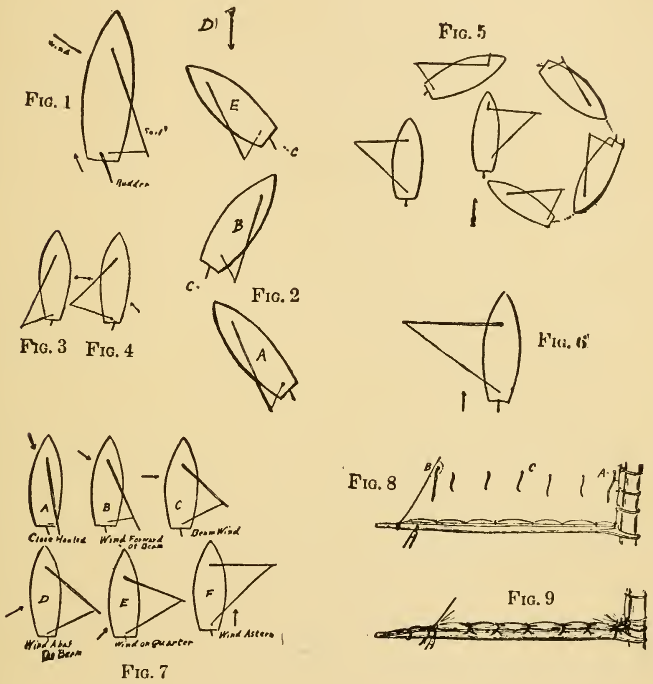
There is no need of having a boat capsise or sink under normal conditions, but even the best sailor may meet with an accident, a sudden squall or a collision, and it is well to be prepared. In boat sailing, as in many other things, it is of the utmost importance to keep your head; don't get "rattled" no matter what happens. Learn to move and act quickly, surely and intelligently without clumsiness or getting tangled up in ropes or gear. "Make haste slowly" is a fine motto for boat sailing and *never take chances;* it is far better to reef or shorten sail too soon or in a moderate wind than to wait too long or carry too much sail in a blow. One often sees some foolhardy boy or man sailing in a stiff blow with all sail set and risking boat and life to "show off," and although such people may laugh at your caution, in the end you will come out the best.

Remember that no two boats handle alike and if possible confine yourself to one boat and learn her every whim and trick; just how much sail she requires to do her best; just how she sails to the best advantage; just how she steers and handles and all the other little peculiarities belonging to that boat.

Before telling you how to sail, it may be well to explain in a few words just how and why a boat under sail does certain things, such as sailing against the wind or sailing with a beam-wind without tipping over or capsising. In the first place the wind pressing against a sail has two effects on the boat; one tending to push it ahead or sideways, the other to push it over or upset it. Whereas the pushing effect must be preserved and encouraged, the upsetting effect or "heeling" must be overcome or resisted. The resistance to this upsetting force is called "stability," and many boats have sufficient stability arising from form alone to overcome the tendency to upset, but more often additional stability is obtained by adding extra weight near the bottom of the boat, either by a heavy metal keel, a weighted centreboard or ballast within the boat. In addition to stability a boat, in order to sail well, must possess lateral resistance, or in other words must be so constructed as to offer a greater resistance to travelling sideways than ahead. When sailing in any direction, except before the wind, there is a strong sideways pressure against sails and boat as well as the forward pressure, and unless the boat is provided with means of resisting this she will slide sideways, or diagonally, over the water, or in other words will make "leeway." This lateral motion is usually overcome by a deep, narrow keel or by a centreboard which consists of a metal or wooden plate let down through the bottom of the boat to prevent the sideways motion but which may be pulled up when sailing before the wind and thus cause less resistance to the speed of the boat.

The action of the wind on the sails has a tendency to force the stern of the boat away from and the bow towards the wind, and to overcome this the rudder must be turned until the pressure of the water against it has sufficient force to balance the action of the wind on the sails (Fig. 1). If a boat is properly rigged and planned and if left with the rudder loose and sails up she will sail a short distance and then come up into the wind and lose headway; after a few moments she will again sail a short distance and repeat the operation, and so on over and over again. If, on the other hand, she is not properly planned and rigged she will sail along faster and faster, falling off more and more from the wind until the sail suddenly flops over to the other side, carrying away ropes and mast or upsetting the boat. Such a craft is exceedingly unsafe, and a good plan is to always try a new boat by sailing a short distance and then letting the rudder swing free. If the boat comes up to the wind quickly and her sails shake, you may be sure she will come about readily and will take care of herself if the rudder is free in case you should be obliged to leave the tiller.

To many people, the fact that a boat can sail against the wind is very perplexing and hard to understand and it really is a rather difficult thing to explain simply and plainly, but in Fig. 2 is shown a diagram of a boat sailing against the wind or "tacking." If we suppose the wind to be blowing from the direction of the arrow and the boat to be in the position shown at A, we will see that the



sail is in such a position that the wind striking it tends to push the boat sideways. As the centreboard, or keel, prevents this, the boat must move forward diagonally in the direction of the dotted line C while the wind glances off the sails toward the stern. This direction, however, would never bring the boat to the destination D, so that when we have sailed as far as we consider advisable the tiller is pushed over; the boat comes around and the wind filling the sails on the other side pushes the boat as shown in B. A little further on the rudder must be again turned and the boat headed as in E and so, by sailing diagonally first in one direction and then in another, or zigzag, the destination is at last reached. This sailing against the wind or, in sailors' terms "tacking" or "beating" to windward, requires considerable practice, skill and judgment, as well as an exact knowledge of your boat and her capability. Some boats will sail much closer to the wind than others, or in other words will "head up" nearer the direction in which the wind comes from, and the nearer to the wind you can point the boat, the more closely the sail must be hauled in toward the centre of the boat. If the boat is kept too close to the wind, or the sail trimmed in too flat, the boat will move so slowly ahead that she will drift sideways and nothing will be gained. In sailing into the wind, therefore, you must endeavour to keep your boat pointed as near the wind as she will sail well and the sails should be trimmed in quite flat and then gradually eased off until the edge of the sail next to the mast just commences to flutter and wrinkle. This shows you are sailing "full and by" or in other words as close to the wind with sails as flat as is advisable. Every few minutes the boat should be brought up a trifle closer to the wind and then eased off so that the sails are always filled and yet the edge, by its fluttering, shows the sailor that the sheet is trimmed correctly. When ready to come about on the next tack the boat should be eased off a trifle, the sails loosened slightly and as soon as increased speed is gained the rudder should be thrown hard over, *the tiller being pushed away from the wind,* and as the boat wheels about, the sail should be hauled in briskly until it begins to fill on the opposite side. Then ease it off again gradually until she is sailing on the other tack, as nearly as possible under the same conditions as already described. As a matter of fact very few boats will sail equally well on both tacks, and you must learn by experiment which tack gives the best results with your craft, and must aim to secure your greatest windward gain on that tack. When tacking with other persons in the boat you should always signal before going about or tacking. This is usually done by crying "Hard a-lee" and at these words your passengers should duck their heads as the boom swings over or should shift their seats to the other side of the boat, if she keels over very much. Some boats are very difficult to bring about when tacking and in such cases, if they fail to swing around on the other tack even with the sheet eased off quite a little, the centreboard may be swung up just as you tack and again dropped after you have come about, or the stern may be swung around by an oar. This failure to come about is called "missing stays," but if the boat is well built and rigged it will hardly ever happen except in a strong tide or current. Sailing on the wind, or in other words, with the wind blowing to one side or partly from the stern (Figs. 3 and 4), is very easy and in this position most boats get their greatest speed and are the easiest to handle. If, when sailing in such a direction, you wish to turn about you should always haul in your sheet, push tiller to leeward (away from wind) and bring the boat around into the wind as in tacking and then ease off until you are sailing in the direction you wish. This is shown in the diagram (Fig. 5). If you attempt to turn about without doing this, the sail will swing suddenly across the boat or will "jibe," and although an old sailor can jibe in moderate wind with perfect safety an amateur may capsise his boat or carry away masts and rigging. In sailing before the wind as in Fig. 6, great care must be used, for many boats have a decided tendency to "yaw" or swing wildly from side to side in this position. If care is not used under such conditions the boat may jibe with serious results or the sail may "kick up" and become unmanageable, and wind itself around the mast or break away entirely. If a boat shows a tendency to yaw when sailing before the wind it is best to sail partly side to, or with the wind over the quarter (Fig. 4), and go about, as described above, every little while and in this way tack down the wind instead of trying to sail directly before it. This is known as "wearing ship," and although a good sailor can safely jibe a boat in a stiff wind it is far better to take no chances. If it does become necessary to jibe, it should be done by hauling in the sheet rapidly until the boom swings over to the other side and then pay out the sheet smoothly and quickly, so that there is no jerk or sudden pull as the wind swings the sail over. If there is much wind it is also a good plan to lower the peak of the sail before jibing. In sailing before the wind it is of great importance to have your boat ballasted or "trimmed" properly. If the weight is too far forward she will "yaw" or swing about badly and will be hard to steer and handle, and will be really dangerous if there is a brisk wind and sea. Too much weight near the stern will also result in difficult handling, but is not so bad as the forward weight. As a rule the weight should be so distributed as to bring the boat a little deeper aft than forward, and while the effect of poor trim is more apparent when sailing before the wind it is really a great disadvantage when tacking also. The figures in diagram (Fig. 7) will show about how a boat's sails should be trimmed for sailing with the wind in various quarters. A, shows the boat sailing against the wind or "close-hauled"; B, with wind forward of the beam; C, with wind abeam; D, with wind abaft the beam; E, with wind on the quarter, and F, with wind astern or sailing free. Remember that a boat's sheets can be trimmed flatter in light winds and smooth water than in rough seas and heavy winds and that most boats will sail nearer the wind with full sail than when reefed. As soon as the wind freshens so that the boat tips down or "heels over" to any great extent, or if a squall or storm is likely to come up, the sail should be reefed without delay. This may be done either by anchoring or while "laying to." In either case bring the boat into the wind, drop the peak of the sail or partially lower it and bring the boom amidships. Tie the front edge of the sail to the boom with a short piece of line called a "reef-earing," then pass the earing of the cringle on the leech (after edge of sail) (B, Fig. 8) through the eye in the boom and stretch the foot of sail as taut as you can and tie it securely. When this is done roll up the bottom of sail neatly and tie all the reef points (C, Fig. 8) tightly with good square or reef knots, around bottom of sail as shown in Fig. 9. The sail may then be hoisted and unless the wind is very stiff your boat will be able to carry the reefed sail with safety. Most boats have two or more sets of reef points and, if necessary, a second reef may be taken over the first. Then if the wind dies out, the second reef may be shaken out and later the first. If taken unawares in a sudden squall or puff, the peak of the sail may be dropped and thus the size of sail reduced very quickly. In case you are caught out in a severe blow or thunderstorm, where there is plenty of room and you cannot anchor, you may ride out the blow by means of a drag or sea anchor. This is easily made by tying oars, old sails, cushions, or, in fact, any objects that will float, on the end of a line and passing it over the bows of your boat. This serves as a drag on the boat, and keeps her head to sea and wind. Remember never to make your sheet fast, even in the pleasantest weather. Hold it in your hand, or take a turn around a cleat so that it may be eased off instantly in case of puffs or squalls. In puffy weather it is best to ease off the sheet and bring the boat into the wind a trifle as each puff comes along, and bring her back to her course and haul in the slack of the sheet as they pass. Many a boat has been upset and many lives lost by making a sheet fast. As long as sheet and sails are free a boat cannot be upset by any ordinary wind, for it then will shake free and offer but little surface to the wind. In bad weather keep as near the bottom of the boat as possible and keep to windward of the tiller. Always have sheets, halliards and all ropes free from tangles and neatly coiled so they can run freely in case of need. Nothing is more dangerous than to have a tangle of ropes and gear in the bottom of a boat. Always keep steerage way on a boat if possible, and in case of doubt be on the safe side and reef, anchor or get to land as soon as possible. Never go out without oars, water and compass (except on small lakes or rivers). Never sail strange waters without a chart or pilot. Remember that when tacking, a boat on the starboard tack (with wind from right-hand side) has the right of way over a boat on the port tack (wind from left side). Avoid breakers, rapids, tide-rips and whirls. Keep your eyes to windward and watch out for squalls, puffs and storms. Never try to tack or go about in the face of a heavy wave, wait until a "smooth" comes. Remember that a boat may always be helped about with an oar. In rough water watch out that the boom does not catch in a sea and "trip" when running free; this may be avoided by trimming in sail and bringing the boat on the wind slightly, or by reefing. Always stand to windward of a sail when reefing. Never luff a boat in bad weather so as to lose way; better ease the sheet a little, for if way is lost you may quickly upset when you try to get her on the wind again. A boat will steer easier before the wind with centreboard up. If sailing in heavy seas that threaten to come over the stern, a pail, or a couple of oars towed behind will break the seas, or oil dropped over will help. Be cautious when passing in the lee of a large boat or island, the wind may come quick and strong when passed. Never try to sail near a moving steamer to "feel the swells." Never leave the tiller when sailing, or jump about. Never sit on the gunwale or climb the mast. Never let clothing, sails or rope trail overboard. Never trust a squall or thunderstorm. Never sail in fog. Never lose your head or get nervous, and if you are capsised try to crawl up on the side or bottom of your boat and she will keep you afloat. If you strike a rock or snag do not get frightened and leave the boat until you are sure she is sinking. A coat, hat, piece of sail or any other object may be stuffed into a hole and a boat worked to land even when badly stoven in.

CHAPTER XIII

SAILING ON THE LAND

Sailing Carts

In a great many places there are broad, level open stretches of country or long, wide smooth sand-beaches, and the boys who are fortunate enough to live in such districts can have lots of fun with Sailing Carts. It is not at all difficult to build a good sailing cart and as they are perfectly safe and are handled in much the same manner as a sail-boat you will obtain a lot of practice in handling boats, in tacking and in steering by amusing yourself with one of these land craft.

The first step in building a sailing cart is to construct the frame or chassis. This may be of almost any size, but a very good size is fourteen feet long by four feet in width. At one end, which will be the stern, make a support for the steering-post as shown in Fig. 1 A. This is essential, for a bicycle wheel with fork is to be used as a rudder and the space beneath the truss must be high enough to accommodate the fork and wheel.

This gallows-like truss should be firmly built with the uprights mortised into the side timbers as shown at Fig. 1 B, and in addition there should be braces at the corners as illustrated. The upper piece of this support must be at least three inches thick, in order to provide a firm, steady bearing for the steering-post and if possible a bushing or piece of metal tube should be inserted in the hole for a bearing to the steering-post of the wheel. The main frame should be of 2 x 4 material, edgewise, with a space of twenty-four inches between the inner sides, and the main beams should be mortised firmly to the two cross-pieces (C C) of 4 x 1 stuff. Across the ends of these cross-pieces fasten the pieces D D, of 4 x 7/8 material, with two more pieces inside (E E) just far enough from the pieces (D D) to admit the rear wheels of old bicycles. The wheels should be supported by setting the cones on the hubs in holes bored in the timbers and fitted with metal plates as shown in Fig. 2, and great care should be taken to have both front wheels in line and parallel. This is the only difficult part of the work and it can only be accomplished by frequent measurements and care in lining up and squaring the frame and holes.

The rear wheel or rudder is simply placed under the support provided for it with the upper part of the fork passing through the hole in the timber. A tiller should be at-

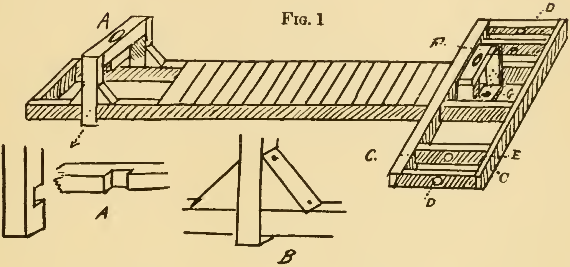


Fig. 1

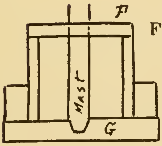


Fig. 1

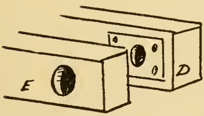


Fig. 2

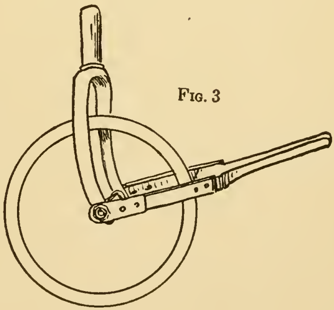


Fig. 3

tached to the fork of the wheel as shown at Fig. 3, and a step should be fastened near the front end to hold the mast as shown at

F, Fig. 1. The mast should be about fourteen feet in length and should slip readily through the hole in F and rest in a socket in a second cross-piece G. The sail may be of any desired style, such as the leg-of-mutton, sprit, fore-and-aft, lateen or lug design.

Without the sail the car may be used for coasting and with a fair wind the owner may sail gaily along any fairly smooth road. A great deal more fun may be obtained, however, by taking your sail cart to a smooth hard beach, to an open level field or to a circular race-track. In such places, especially on a track, you will be able to try sailing before the wind, on the wind and against the wind and will be able to learn all about tacking, going about, jibing and reaching.

How to Build and Use a Glider

Nearly every boy has longed to fly at some time during his life and since aeroplanes have come into use and man has learned to actually fly, a great many boys long to become aviators, or at least to soar far above the earth in an aeroplane.

Aeroplanes at best are more or less dangerous and moreover they are excessively expensive toys, and a great deal of experience and not a little skill are required to handle one at all.

There is a way for boys to fly, however, and a safe way at that, and this is by using a "glider." Gliders paved the way for the solution of the problem of human flight and in a broad sense are nothing more nor less than aeroplanes without power. In one of these affairs a boy may have all the exhilaration and sensations of flight without any more danger than coasting down hill and, moreover, a glider may be built by any handy boy at very small expense.

There are many forms of gliders, the two most common forms being known as "Monoplane gliders" and "Biplane gliders" just as aeroplanes are known as Monoplanes and Biplanes. While some of the monoplane gliders work very well, they are not so easy to build nor so safe and satisfactory as the biplane type.

Before commencing work on your glider have all the materials ready and familiarise yourself with the names of the various parts, so that you can easily follow the directions for building, assembling and using the glider. The parts of a glider are not many and all the important parts are shown clearly in Fig. 4.

This diagram represents the completed glider frame without the covering and with portions of the lower plane removed in order to show the stays, trusses and rudder-parts and to avoid confusion.

At the front and rear of each "plane" or surface are long slender pieces known as "horizontal beams" and extending from the upper to the lower beams are a number of uprights called "stanchions."

From the front horizontal beam to that at the rear on each plane are six pieces on each surface which are known as "struts."

Between these struts and parallel with them are a number of curved pieces called "ribs."

Between the centre struts on each plane and parallel with the long horizontal beams are short, stout pieces to which the long, light "rudder beams" are fastened, and the latter have braces or struts connecting them at their extreme ends and at a spot between the ends and the planes.

Hung between the two rudder beams and two "rudder-frame struts" is a rectangular frame which forms the "horizontal rudder" when covered with fabric.

In addition to these essential parts there are two stout sticks on the lower plane between the two middle struts. These are used as supports for the operator of the glider and are known as "arm pieces."

All of these "timbers" are made from the best selected dry spruce with a straight grain and free from knots, and each and every piece

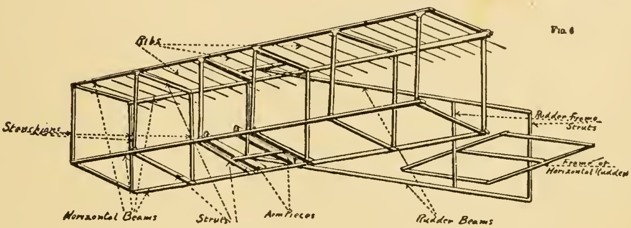


Fig 6

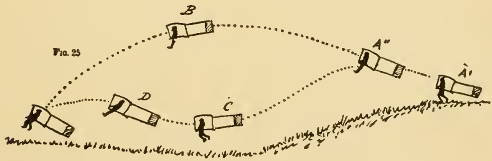


Fig. 25

must be made as carefully as possible and all must be finished with sandpaper and coated with two good coats of spar varnish. It is usually a waste of time to try and obtain the proper lumber for a glider from local dealers and you will get better results and will save time and money by securing your wood from a dealer in aeroplane supplies. In every large city there are dealers in such things and by looking through any one of the various aeronautical magazines you will find their advertisements.

The material that you will require for the glider is as follows:

Struts

Twelve pieces each 3 feet long, 1¼ inch wide and ½ inch thick.

Horizontal Beams

Four pieces each 20 feet in length by 1½ inches wide by ¾ inch thick.

Stanchions

Twelve pieces each 4 feet long and ⅞ inch square.

Ribs

Forty-one pieces each 4 feet long and ½ inch square.

Arm Pieces

Two pieces each 3 feet long, 1 inch wide and 1¾ inches thick.

Rudder Frame

Two pieces each 8 feet 11 inches in length; two pieces 3 feet 10 inches in length; four pieces 2 feet in length and two pieces 6 feet in length and all 1 inch square.

Rudder-Beam Supports

Two pieces 2 feet 11¼ inches long, 1¼ inches wide and ¾ inch thick.

Covering

About twenty yards of either silk or cotton fabric one yard wide. Stout silk or plain unbleached cotton will answer, but you will have better success if you purchase the regular aeroplane fabric, as this material is exceedingly tough and light in weight and is treated chemically to make it waterproof and airtight.

Stays

One roll of No. 12 piano wire.

Miscellaneous

Twenty-four strut or stanchion sockets. These may be obtained ready made and these regular sockets are more satisfactory than anything you can make yourself. Some copper or galvanised carpet tacks; some stove bolts, shellac, glue, carpenter's tools, varnish, sandpaper.

After the various parts are cut to the exact dimensions and have been smoothed carefully

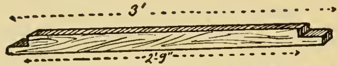


Fig. 10

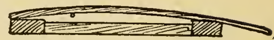


Fig. 12

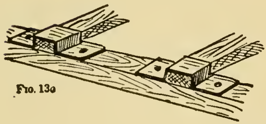


Fig. 13a

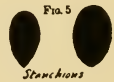
Fig. 5


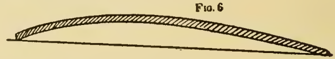
Fig. 6


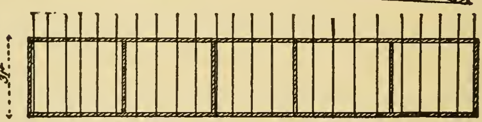
Fig. 9


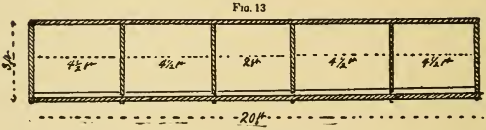
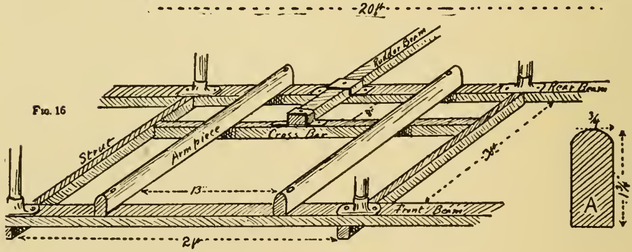
Fig. 13


Fig. 16


you should round off all square edges and should work the stanchions into the form shown at the section in Fig. 5.

The pieces intended for ribs should next be steamed and bent on a wooden form so as to make the curve shown in Fig. 6, the central portion of each rib being some two inches above the ends.

The form may be built of planks sawed the right shape and with strips nailed across, as shown in Fig. 7, and on this a number of ribs may be bent at one time, which will result in a uniform curve in all.

The curve required is very slight, and you will find but little trouble in bending the ribs, which should be held in the proper position while drying by cleats placed over them and secured to the sides of the form by hooks or twisted wires, as illustrated in Fig. 8.

Although steaming is the best way to prepare the ribs for bending, yet they may be soaked in boiling water in an old wash boiler and may thus be softened sufficiently to bend them into shape.

The ribs having been bent and the other woodwork rounded off at the edges and the proper shape given to the stanchions, go over them all with fine sandpaper and varnish with the best spar varnish obtainable. When the first coat of varnish is thoroughly dry, smooth it off with fine sandpaper and apply a second coat of varnish. Do not attempt to proceed with the work until this second coat is thoroughly hard and dry.

The next step is to select two of the long horizontal beams and lay them on a smooth floor so that they are exactly parallel and three feet apart. Between the two beams place six of the struts, arranging them so there is one at each end of the beams and the others are spaced two feet apart and 4½ feet distant from the end struts.

You will now have a rectangle composed of the two horizontal beams and the end struts and with the interior divided into five sections by the struts (Fig. 9).

In fitting these struts in place be very careful to see that their ends fit snugly against the beams and true up every point of contact so that each strut is exactly at right angles with the beams.

This is of the utmost importance, for if the plane is askew or out of true the machine will never fly well.

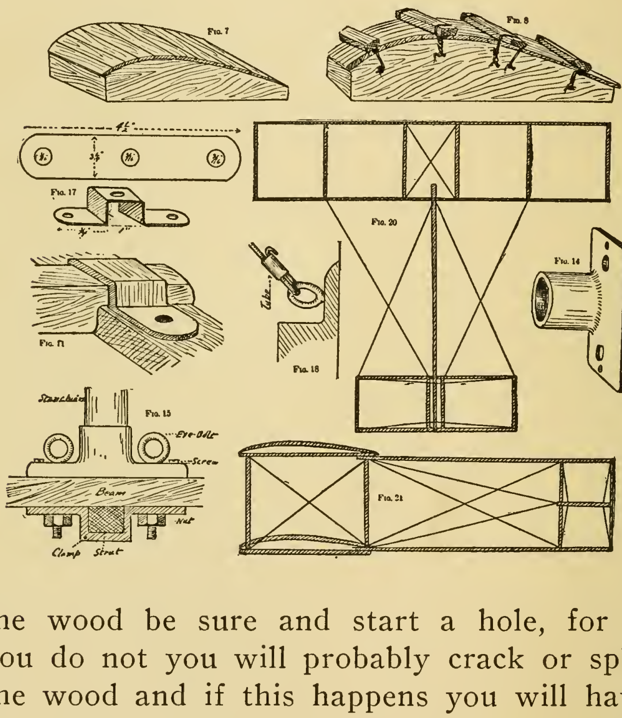
After attending to this detail, mark the position of every strut and then carefully cut away one edge of each strut for a distance of 1½ inches from the end and ¾ inch deep (Fig. 10).

These notches must be cut true and square and when this is done place the struts on the beams and fasten them in position by small wire nails and glue. When the glue sets the struts must be attached to the beams by "clamps." These are simply pieces of sheet brass each 3⅞ inches long, 1 inch wide and 1-16 inch thick with the corners and ends rounded off and with a ¼-inch hole bored in each end as shown in Fig. 11. You can easily make the clamps yourself, but as they are secured in position by the stanchion socket eyebolts you can make them while waiting for the glue to harden. After completing the frame for one plane proceed with the other in the same way. Then place one of the planes with the struts above and the other with struts beneath and across the beams place the ribs with the curved side up, as indicated in Fig. 12. On the upper plane, which is the one with the struts above, place twenty-one ribs spaced one foot apart and on the lower plane place twenty ribs, leaving a two-foot space in the centre of the frame for the operator's body.

Arrange the ribs carefully and see that they are absolutely square with the beams and that one end of each rib is flush with the front beam with the other end projecting a foot beyond the other beam (Fig. 13).

You may now secure the ribs in position by tacking them in place with fine wire nails and then over each rib place a strip of brass or copper 2¼ inches long and ⅝ inch wide with the corners rounded, fastening the pieces to the beam on each side of the ribs with No. 5 round-headed, brass wood screws about ½-inch long (Fig. 13*a*).

Before attempting to place these screws in



the wood be sure and start a hole, for if you do not you will probably crack or split the wood and if this happens you will have to throw it aside and start all over again. When all the ribs are clamped in position the skeletons of the wings or planes will be complete, and you may go ahead and fasten them together by means of the stanchions. In doing this you will require the twenty-four brass or aluminum sockets mentioned. These are shaped as shown in Fig. 14, and may be purchased of any dealer in aeroplane supplies. The sockets come designed to receive either round, stream-line or oval stanchions and in various sizes. Those used for the glider should be of the form decided upon for the stanchions and about 3¼ inches long, 1¼ inch wide and ¼ inch thick on the base with an internal diameter of ⅞ inch and an outside diameter of 1¼ inch. The height from the base to the top should be one inch and the screw holes should be ¼ inch in diameter separated 1⅞ inch apart. Two smaller 3-16 inch holes should be bored in the base outside of the larger holes.

It is a good plan to secure the sockets before working down the stanchions, as in this way the stanchions may be smoothed down to exactly fit the metal sockets.

The sockets should be placed, six on the front beam of one plane with one exactly over the end of each strut, but on the opposite side of the beam as shown in Fig. 15.

Each socket should then be screwed into place with small wood screws inserted through the smaller holes in the bases and over each strut a brass clamp (already described) should be placed and the eyebolts for the sockets should be passed through the base of the latter and through the ¼-inch holes in the clamp underneath and the nuts screwed firmly in place so as to draw socket, beam, strut and clamp together (Fig. 15).

After the sockets are all attached to the front beam, place another set on the rear beam and when these are in place fasten the other twelve to the other plate in the same manner, taking care to place the struts of the upper plane above the beams and those of the lower plane below the beams.

The next thing is to set up the stanchions in the lower plane sockets, and when doing this you should use care to keep the ends snug in the cups. In case they are too tight to slip in with a little pressure you can rub them down a little with sandpaper, but you should never whittle or cut them down or attempt to drive them into the sockets. If they are too loose you will have to make new stanchions, although a thin piece of cloth glued about them will make a good fit if the looseness is not too great. After all the stanchions are placed in the sockets of the lower plane lift the upper plane-frame and set it carefully on the stanchions. You will probably require a couple of friends to help you at this, for the frame, while light, is very clumsy and it is a hard matter to handle it alone while placing the upper ends of the stanchions in the sockets. If your friends will lift the frame and hold it steadily in position it is easy to fit each stanchion in its proper socket and to get them all evenly and snugly in place.

You should next place the arm pieces in position after rounding them smoothly on the top, as shown in the section in Fig. 16. Bore holes through each arm piece and the lower frame beams, using a 3-16 inch bit and placing the holes so that the pieces are 6½ inches on each side of the exact centre of the beams, thus leaving an open space 13 inches wide between the arm pieces. Bolt the pieces in place with stove bolts (Fig. 16), and then place a cross-piece 2 feet 11¼ inches long and 1¼ x ¾ inches between the two central struts, 8 inches from the lower beam, and another in the same position on the upper plane (Fig. 16). These should be fastened in place with fine wire nails and glue, and with small brass angle-irons screwed onto struts and cross-pieces with round-headed screws. These angle-irons may be made from sheet brass or may be purchased already made as desired. The cross-pieces are to support the rudder frame, which should next be constructed. You must also make some rudder-frame sockets which are simple affairs of 1-16 inch sheet brass, 4½ inches long. Two of them should be ¾ inch in width and the other two 1¼ inch wide bent, as shown in Fig. 17, with all ends rounded off and with holes drilled as indicated and with additional 3-16 inch holes through the centre of the smaller sockets, as shown in the cut.

One of the large sockets is attached to each of the rear beams and the smaller ones are fastened to the cross-pieces by bolts, as illustrated in Fig. 16, the utmost care being taken to have the sockets absolutely in line and exactly in the centre of the beams.

If you have done your work carefully the frames will now be quite stiff and strong, but they must be still further strengthened by staying with wire trusses before they will serve to support the weight of your body and bear the strain of the air against the surfaces of the planes.

To accomplish this properly the framework should be placed on a couple of horses so that it is perfectly level and true and so that no unequal strain comes on any one portion. Place the roll of No. 12 wire handy as well as some pliers, some short pieces of brass or copper tubing of ⅛ inch inside diameter and about ⅜ inch long, and your soldering outfit.

There are several methods of trussing in use, but the simplest and best for your glider is the only one I will describe. A great many builders trust to pulling the wires tight by hand, but this is a difficult and far from satisfactory method, and it is much better to use small turnbuckles. Turnbuckles for the purpose cost but ten or fifteen cents each, and it is not worth while to spoil a good frame by attempting to use makeshifts. To truss the frames slip a piece of the copper or brass tube over the end of a wire, pass the wire through an eyebolt, run the end back through the tube, bend the end sharply back over the tube and press the latter down close to the eyebolt, as shown in Fig. 18. Although this fastening will usually hold without anything further being done, yet it is far wiser to solder the tube and wire together. This may be done as fast as the wires are attached, but it may be accomplished just as well after all the wires are in position, thus saving a lot of bother and time.

After fastening one end of the wire to an eyebolt, place a turnbuckle on the opposite diagonal corner of the section of the frame, loosen it nearly to its full extent, pass the wire through the end eye of the turnbuckle, draw it tight and fasten it as already described. Continue fastening wires and turnbuckles on the various corners of the sections until the trussing appears as in Fig. 19, each section except the small central ones being wired diagonally as shown. As such wires would interfere with the operator of the machine in the centre, a wire is here run diagonally from the junction of each central strut with the upper beams to the opposite corner (Fig. 20). When all the wires are in position the turnbuckles should be screwed up gradually until every rectangular section is absolutely square and every wire is taut and gives out a musical note when struck with the fingers. It may take a little time to get everything just right, but by tightening in one spot and loosening in another perfect alignment may be obtained. To test the strength of the frame, place it across two saw-horses, one at each extreme end, and taking your position in the centre, place your hands on the arm pieces and lift your weight off the floor. If the frame bends or sags ever so slightly you must increase the tension on the wires until the whole affair is perfectly rigid, even when you spring up and down or add twenty pounds more to your weight.

The only things to do now are to build the rudders and cover the planes, and it makes very little difference which you do first. As a rule it is better to complete the entire woodwork before touching the fabric, for then you can lay aside your carpenter's tools and have but one kind of work to attend to.

The rudder frame is made up of two rectangular frames joined so that they cross at right angles, one being perpendicular and the other horizontal. The latter is first constructed with the six rudder frame pieces mentioned in the list of materials, the lengths of six feet being joined by the four two-foot pieces, thus making a frame six feet long by two feet wide, with cross-pieces two and one-half feet from each end and one foot apart (Fig. 21). The corners of this frame must be joined by half-and-half lapped joints glued and nailed and re-enforced by sheet metal angles, as illustrated in Fig. 22.

The frame for the vertical rudder is built up from the pieces 8 feet 11 inches long for the top and bottom, connected by the pieces 3 feet 10 inches long. One of these shorter pieces connects the two long pieces at their ends, another is placed two feet from the first and between these exactly midway from top to bottom, the horizontal frame is fastened by means of 3-16 inch bolts, which may be easily withdrawn. When in position the two frames will appear as in Fig. 23, and each joint should be carefully made and re-enforced with metal braces, for the rudder will receive a

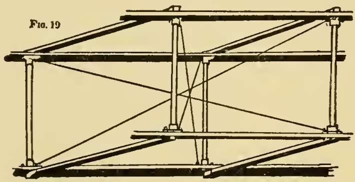


Fig. 19

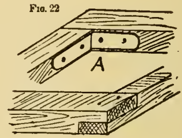


Fig. 22

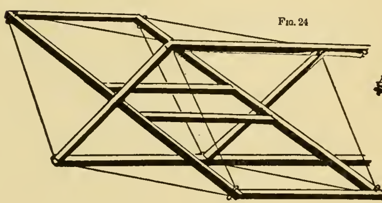


Fig. 24

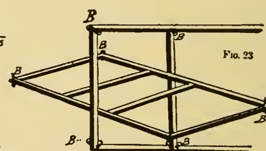


Fig. 23

great deal of strain when the glider is in use.

At the points marked B B B B, eyebolts are placed through the corners of the frames to receive stay wires, which support and stiffen the rudder frames. The complete frame is merely slipped into the sockets already provided on the planes and by passing bolts through these sockets and the frame it is secured in position while truss wires run, as shown in Fig. 21; steady the frame and keep it true. Two truss wires should be carried from the top of the vertical plane to the lower sockets on the rear beam of the planes 4½ feet from each wing-tip, and two other wires should be run from the lower corners of the rudder to the top sockets of the same stanchions. Four other wires are used to brace the horizontal plane of the rudders extending from its corners to the socket eyebolts which support the inner beds of the rudder beams.

The eight additional wires simply serve to brace the vertical and horizontal rudders and secure them together and pass from eyebolts in the corners of the two frames to eyebolts in the opposite frame, all of which are plainly shown in Fig. 24.

The next and last step in the construction of the glider is to cover the main planes and rudders, and upon the material you use and the care with which you cover the planes a great deal of the success of the glider depends.

Nowadays there is no need to use makeshift materials for covering a glider, for special fabric is sold at all dealers in aeroplane supplies and costs little more than plain silk or cotton.

There are several methods for covering planes in vogue. One is to cut the fabric into seven strips, each 4 feet 6½ inches long, and sew the several pieces together to form a single piece a little over 20 feet long. The seams should be re-enforced by sewing narrow strips 1½-inch wide across the cloth and turning these over to form a double thickness above each rib. An easier method is to cut the cloth into strips a little more than four feet long and glue the end of each strip around the front horizontal beams and tack them in position with small copper or galvanised tacks. Then draw the other end of the fabric back over the ribs and tack the edges of the strips to the ribs as you go along. When placing tacks through the fabric, a narrow strip of felt or tape should be placed under them to prevent them from tearing out, but such strips must be almost as narrow as the width of the tack-heads, and each piece of tape and fabric must be kept very tight and smooth and free from wrinkles. The ribs are one foot apart and, as the cloth is one yard wide, the edges will lap on the ribs. The rear edge of the fabric, outside of the rear beams, will be loose and flexible between the rib ends. This is intentional and you cannot get it otherwise. Planes that are covered in this way are known as "single surfaced," and somewhat better results may be obtained by covering both upper and lower surfaces of the planes. This, in the case of real aeroplanes, is important, but for a glider it is a waste of time and trouble and merely adds to the weight of the machine.

It is a difficult job to cover the planes with the stays and everything in position, but you are far less likely to strain or injure the frames if it is done at this time. The surfaces of the two rudder frames must also be covered with fabric, which is stretched over both sides of each frame, passing completely around one end, and is then tacked along all the edges. The last edge must be turned under before tacking in place in order to prevent any possibility of tearing out.

When you have driven the last tack in the fabric and have trimmed off the last rough edge, your glider is ready to fly, and all that is necessary is to find a proper spot in which to try it. If such a place is near your home, you can easily carry the glider entire, but if it is far away the rudder should be disconnected and carried separately.

The rudder is very easily detached by merely removing the bolts that hold the frame to the cross-pieces and loosening the truss wires that extend from the rudders to the frame of the planes. The machine may be readily taken apart and shipped flat for long distances by removing the rudders, loosening and unhooking all the turnbuckles, lifting the upper plane from the stanchions, removing the stanchions from the lower plane and tying all the parts neatly together. In packing the machine be very careful to coil up the wires neatly and tie each coil to its proper socket; for if the wires are bent or kinked they will never come true again. Wooden plugs four inches long should be inserted in each corner socket and the four central sockets of the lower plane and the upper plane should then be set onto these, thus keeping the two planes a few inches apart and avoiding all danger of chafing or rubbing. The coiled wire may be slipped between the planes and the turnbuckles, tied to the sockets so they will not get lost. The two rudder frames should be tied flat together and in this way the entire glider may be packed in a space 20 feet long, 4½ feet wide and 10 inches thick.

How to Use the Glider

Although a biplane glider is perfectly safe after you once get accustomed to it, yet you should begin carefully and should not attempt a flight or glide from a high hill for some time. Make your first experiments on a low gently-sloping hillside, with a light wind blowing, and never attempt a flight in a strong, gusty or uncertain wind; even if you do not injure yourself, you may wreck your machine. Always run toward the wind when gliding and remember that in order to make a glide you must jump into the air while running down hill. Never try to glide over rough, broken or uneven ground or over a place that is rocky or has stumps, brush or other objects that might injure you if you fell.

In your first attempts at gliding you will require two friends to help you. Have these two companions hold the ends of the lower plane, and while they do this, get beneath the machine, grasp the front main beam and lift the glider until the arm-rests are close up under your armpits.

Now run quickly down the hill, your two friends letting go of the plane as soon as you are in motion, and you will not proceed more than a few yards before you discover that the glider has apparently lost all of its weight and is really trying to lift you from your feet. This is the time to elevate the front edge of the machine slightly and at the same moment leap into the air. If your glider is well made and your position is correct, you will leave old mother earth behind and sail smoothly off to the foot of the hill. As you near the ground again push yourself towards the rear of the glider. This will tip the forward edge up and cause it to rise slightly, but at the same time it will act as a brake, and the machine will lose its forward motion and will drop slowly and gently to the earth, where you may alight on your feet as easily as a bird. Don't attempt to fly more than a few feet at first, start near the bottom of the slope and gradually walk higher and higher up as you gain confidence and experience.

If, during the glide, you discover that there is a tendency to tilt to one side or the other, you may maintain your balance by swinging your legs and body toward the higher side. Only a very slight motion is needed to accomplish this and at first you will no doubt swing too far or too quickly, but practice will soon make perfect and you will find that you keep the glider on an even keel almost by instinct.

Remember that if you swing your body forward the centre of gravity will be changed toward the front and the glider will descend. On the other hand, swinging your body backward will tilt the forward edge of the machine up, and the machine will rise, but decrease in speed. Most beginners throw their weight too far back, but with a little care the operator will learn just the angle to maintain in order to secure the longest glides under various conditions and will be able to adjust his balance in such a way as to increase or decrease the velocity of the glider at will.

The principle of thus regulating a glide by varying your centre of gravity is illustrated in Fig. 25. At the point A′, the operator starts to run down the slope for a glide, and the dotted line from A′ to A″ shows the line of flight first taken by his machine. If his weight is too far back the glider will continue to rise, but will rapidly slow down and will drop to earth swiftly and from a considerable height, as shown at B. On the other hand, if the operator throws his legs back when he reaches the point A″, the machine will travel downward but with increasing speed to the spot indicated at C, when the operator, realising that he is approaching the earth, swings his legs forward, as shown at D, and the machine again rises and sinks gently to the ground from a low elevation. This is the safest and most pleasant kind of a glide, for a much longer flight is made and the low elevation prevents any danger of a bad fall. Always bear in mind that a gust of wind from ahead will cause the glider to rise, while a sudden wind from the rear will cause it to fall. Thus if you are gliding along and you feel a sudden wind from in front and the machine starts to "rear up," throw your legs back and your weight forward, while if the machine starts to dive and you feel a gust from behind, throw your legs forward and your weight back.

Gliding is not difficult and any smart boy should be able to make long and enjoyable flights in a couple of hours' practice. Never, under any circumstances, attempt to make a glide from a house-top or other elevation. Nine times out of ten injury or death will result from such an attempt; you can get all the fun there is in gliding from a sloping hill-top.

PART II

WINTER

CHAPTER XIV

SNOW SPORTS

The healthy, red-blooded out-of-doors boy enjoys the cold winter weather fully as much as the summer, and looks forward to his winter vacation with as much pleasure as to his summer playtime. When the country is covered deep in a mantle of snow there are a thousand-and-one things a boy may do for amusement. He may tramp through the silent woods, mysterious and strange in their white blankets, may trap and trail wild things for furs, may build snug winter camps, in which to sleep and loaf in comfort while raging blizzards howl outside; or he may spend days and nights coasting on the snowy hillsides.

When all these things pall, there are still wonderful possibilities on frozen lakes, rivers or ponds where, shod with steel, one may skim with the speed of the wind across the glassy surface, sail with the rush of an express train, in an ice-yacht or fish for pickerel and other finny creatures through the ice. Although the average boy knows so many ways of getting fun out of winter weather, yet there are numerous other winter sports which are comparatively unknown to the majority of American boys, especially in the Eastern states. In Canada, and many parts of Europe, regular winter ice carnivals are held, and winter is considered the best of all seasons for merry-making and out-of-doors fun. In certain parts of our own country snowshoeing, tobogganing and skiing are known and indulged in to some extent, but as a rule, the snowshoe and toboggan are considered more as necessities than as playthings, and the boys use bob-sleds, double-rippers and the common runner-sleds for the greater portion of their coasting.

Perhaps the most exciting and healthiest of out-of-doors winter sports,—as well as the safest,—is ski-running. The Norwegian ski (pronounced "ske") is a long, narrow wooden snowshoe, quite different from the common Indian snowshoe of Canada and our northern states. The American shoe is an oval or racket-shaped affair of netting, made from rawhide stretched over a light wooden frame, and is designed to prevent the wearer from sinking too deeply into soft snow. The ski, on the other hand, is a mere runner of polished wood, which is not intended to prevent the wearer from sinking, so much as to enable him to glide rapidly over the surface of crusted or hard snow.

Any boy who is at all accustomed to using carpenter's tools can make a pair of skis. Select some straight-grained, tough, elastic wood, such as white-ash, hickory, cedar, tupelo or sycamore, and get out two pieces six or eight feet long, from four to six inches wide and about an inch thick. Have these two pieces as nearly alike in weight and grain as possible and find which way the grain runs. Mark the end from which this runs and consider that the front. A little more than half the length back from this make another mark which will serve to show where the foot will rest when the skis are complete. For six inches on either side of this mark leave the ski the full thickness, and from these points work down the upper surface of each ski toward the two ends. This should be done so that the ski thins gradually from the full thickness at the foot-rest to about one-quarter of an inch at the front end and half an inch at the rear (Fig. 1). The upper edges should be rounded or bevelled off. The thin front ends should now be bent sharply up for six or eight inches, and this is easily done by dipping the ends in boiling water and bending them over any convenient object, where they are to be left in place until dry. A ladder is

FIG. 1

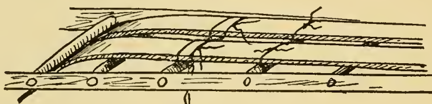
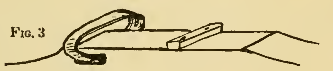


FIG. 2

FIG. 3



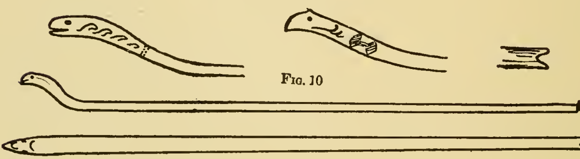


FIG. 10

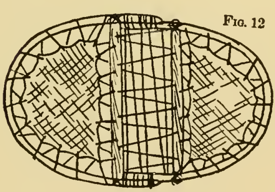


FIG. 12

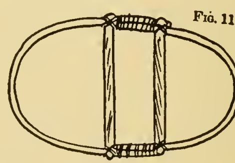


FIG. 11

very good for this purpose, as shown in Fig. 2. Both skis should be steamed and bent at the same time to have them exactly alike. When thoroughly dry they should be sandpapered and smoothed as much as possible and thoroughly rubbed with linseed oil. The bottoms are also improved by rubbing in paraffin or bayberry wax. The next thing is to arrange a foot-rest. There are many ways of doing this, but the object in all is to arrange some sort of fastening which will bind the foot to the ski, leave room for bending the toe and at the same time be capable of instant release. Personally I consider a light cleat fastened across the ski at the back of the heel, a stout strap screwed on across the toe and a second strap (adjustable with buckle) passing up from the heel and over the instep, the best arrangement (Fig. 3).

In Norway the skis usually have the rear end rounded or pointed, but I could never see any advantage in this, and consider a smooth, square end far more serviceable. A steering-pole must be provided, but as any stout, strong stick will serve for this purpose a description, or directions for its construction, are not required. Professional ski-runners use a pole provided with a hoop or wheel-like arrangement a short distance from the tip, and this, when plunged into the snow, acts as a brake. To the beginner, however, this proves an added impediment and it is best to learn without it. When I first learned to use skis

I used no pole whatever, and I must confess that although falls were numerous, I have always enjoyed running without a pole far more than with one.

Having made your skis, the next thing is to learn to use them, and printed directions in this matter will be of no value and will only confuse. Try your skis on the level first. When you have learned to shuffle along without tripping yourself, or falling down, try sliding down some small, smooth hill free from rocks or other obstacles. The first hill should not be over fifty yards long and with a gentle slope. Even on such a place you will find plenty of falls and tumbles, but once you learn to master your skis no hill will be too steep or too long, and skating, coasting and all your old winter sports will be quickly abandoned in favour of this new and exhilarating pastime. When you are thoroughly at home on your skis you may attempt ski-jumping. This is a wonderful sport and an expert has been known to jump over one hundred feet through the air with a descent of more than sixty feet. In jumping, a place called a "take-off" is built some little distance from the bottom of a hill. This take-off is merely a wall of packed snow with its top moulded to the slope of the hill and its outer edge sheer. The wall for a beginner should not be over a foot high and should be gradually added to as your skill increases. Sliding rapidly down the hill and reaching the take-off, the ski-runner shoots out into space and, if successful, lands easily and softly upon the snow some distance below and continues on his course. In Scandinavia ski-jumping is a favourite sport and regular contests are held. The take-offs are often five feet or more in height, and the impetus acquired by the run down the high mountain-side, carries the jumper through the air far above the heads of the spectators, and with extended arms, flying scarf and whistling skis he soars through the air like some huge bird.

In fact skis are sometimes called "The Wooden Wings of Norway." In Scandinavia and in some parts of our own country skis are used for other things besides sport and pleasure. In the mountains of many Western states all travelling during the winter months is done on skis, while Uncle Sam depends entirely upon the ski runners to carry the mails to outlying villages and towns.

In Norway and Sweden skis form a regular portion of the army equipment, and Norwegian soldiers often cover fifty miles a day on skis without fatigue, whereas without them scarcely any progress could be made through the deep snow drifts.

Toboggans

Another splendid winter sport that is all too little known to American boys is tobogganing. Toboggans are used all through Canada and our northern states, both for pleasure and for transporting loads across the snow-covered land, but over the greater part of the country they are practically unknown. Tobogganing bears some resemblance to skiing, for the toboggan is in reality nothing more than a number of skis fastened side by side or,—looking at it from another point of view,—the ski is like a section of a toboggan worn on the foot.

Toboggans are just as easy to make as are skis, and any boy can readily make one which will provide no end of winter fun.

The first thing is to select tough, springy wood with a smooth clear grain. Hickory, ash, white cedar or spruce will do, but in my opinion there is nothing quite so satisfactory as good, clear, second-growth hickory. The lumber should consist of a number of thin, narrow boards about three or four inches wide and about three feet longer than you wish your finished toboggan to be, with some heavier strips about three inches wide and ¾ of an inch thick. The thin long pieces will form the toboggan proper and their thickness may be anywhere from ¼ to ⅝ of an inch, but for the best results ⅜ is a good thickness.

The most difficult thing to accomplish in making a toboggan is to bend the strips of wood to form the curved shape of the sled. It is possible to secure a curve by steaming the wood and bending it around a post or between the rungs of a ladder, as described for skis, but far better results can be obtained by making a regular form of wood. To do this saw two pieces of plank in the shape shown in Fig. 4, and nail or screw cleats across the edges, as shown in the illustration at A. Screw this form securely to the floor or wall and fasten a piece (B) as shown, leaving a narrow space at C just wide enough to insert the ends of the boards to be bent. When the boards are softened by steaming or soaking in hot water, insert the ends in the opening C and bend backwards slowly and carefully until they lie evenly over the curve. Fasten them in position by lashing them down, or by cleats placed across them and nailed to the form, and leave undisturbed until thoroughly dry. No doubt you will

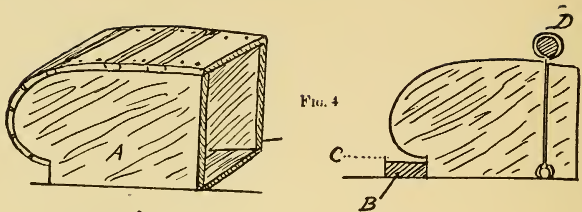


Fig. 4

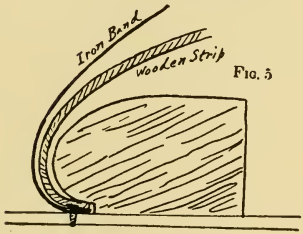


Fig. 5

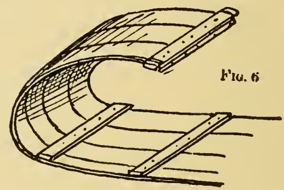


Fig. 6

Fig. 7

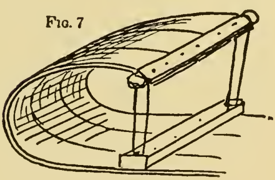


Fig. 8

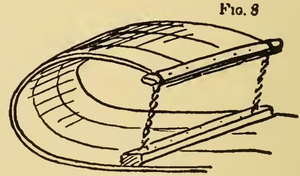
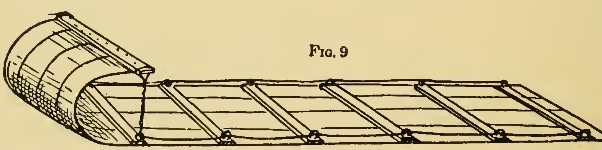


Fig. 9



break, split or crack quite a number of the boards, and for this reason it is best to have several extra boards on hand. Still better results may be obtained if you provide strips of thin steel or sheet iron the width of the boards and long enough to extend over the curve of the form. By placing a strip over each board and bending the board by pressing on the iron, the boards may be bent without any danger of breaking. It is best to bend all the boards at one time to insure an even curve, but if you desire you can bend each board separately and in this way can use a narrower form and only one strip of steel or iron (Fig. 5).

After the boards are bent and dry, lay them side by side on the floor and with the curved ends evenly placed. Lay a cross-piece of the heavier stuff across the boards and screw it to each board with screws that are not long enough to penetrate the lower side of the bottom boards. Place one of these cross-pieces close to the curve and another near the rear end (Fig. 6). Between these two cleats several other cross-pieces should be fastened, the number depending upon the size of the toboggan. As a rule the cleats should be spaced about eighteen inches apart. They may be either screwed or lashed in place, but the ones at front and rear should always be screwed. Indian toboggans have the cross-pieces lashed to the runner-boards with moose-hide and for this reason they are particularly easy riding and swift. Factory-made toboggans are usually screwed, nailed or riveted together and, as a rule, are bumpy, stiff and hard riding. I have found that a toboggan made with the boards wired to the cross-pieces with tough copper wire is very easy, swift and strong, but care should be taken to have the under side smooth and to have the wires run with the grain of the wood and to have it beneath the surface by cutting small grooves for it to rest in. When all the cleats are in position and fastened, you should place a stout cleat across the outer surface of the extreme end of the curve, and with its ends extending a couple of inches on either side. From these ends strong raw-hides or wires should extend to the first cleat on the bottom, as shown in Fig. 7. These thongs should be tightened up until they bend the curve down slightly, and the best way to accomplish this is to draw them as tight as possible, make them fast and then have a friend sit on the curve, and as his weight springs it down, twist the thongs until you can just slip the loops over the ends of the cross-piece (Fig. 8). The thongs may be fastened to screw-eyes in a cross-cleat, but it is better to have them run clear through to the bottom where they may be sunk into grooves, as shown in the cut.

The toboggan is now complete, save for finishing and hand-rails. The bottom should be sandpapered as smooth as possible, oiled and given a wax polish, and the hand-rails may be of stout rope led through screw-eyes set in the cross-pieces. The entire affair, when finished, should appear as in Fig. 9. Every different Indian tribe and nearly every white manufacturer have a certain curve and shape to their toboggans and the exact form is not material, as long as the curved end is high enough and rounded enough to ride over drifts or hummocks, and throw off the snow.

Toboggans have a great advantage over sleds, inasmuch as they can be used on soft snow where a sled is useless, while on a light crust they will glide over the surface without breaking through, when an ordinary sled would cut the crust at once. They are far safer than sleds or rippers, for their light weight and all-wood construction renders them safe in case of a spill, and their broad bearing surface resting on the top of the snow allows them to be easily skewed or swung around, in case of danger. The toboggan is easily steered and handled, the steersman usually sitting at the rear with one foot extended and the toe of this foot, dug into the snow on one side or the other, regulates the course of the toboggan. In hard or crusty snow, however, it is far better to sit wholly upon the toboggan and steer by means of short, pointed sticks held in the hands.

Toboggans are splendid things for carrying loads across country over deep snow, and every country boy who traps, hunts or has to carry anything from place to place in winter time, should provide himself with toboggan and skis. In this way he can easily bring heavy loads for many miles without being overtired, and whenever a down-grade is reached he can slide gaily to the bottom without effort, and a tramp after wood, or to the village store for supplies,—which would prove hard work under ordinary conditions,—will become a pleasure and recreation if a toboggan and skis, or snowshoes, are his companions.

Snow Snakes

Throwing Snow Snakes is a favourite pastime with many of the northern Indians, but it is a game almost unknown to white boys. The snow snake is a long, narrow, polished runner of hard wood, with the forward end curved up like a ski. The rear end is notched to receive the finger, and in use the snow snake is thrown forward close to the ground. If well made and properly thrown, a snow snake will speed across the snow like a living thing, and will travel a remarkable distance. A number of boys with these playthings may hold contests and strive to see who can throw a snake the farthest. If the throwers have skis or snowshoes it will add to the sport. It is very fascinating to throw the snakes and watch them speed across the smooth snow, rising to each little hummock or drift, swaying gently from side to side and seeming to gather increased speed as they travel with their upraised forward end looking like the head and neck of a real serpent.

The success of a snow snake depends upon the proportions, size and finish of the snake, and the only way to determine the very best form and proportions is to experiment. Snow snakes are so cheaply and easily made that every boy should have several, and in this way you will soon find that while one will go better on hard snow, another will be better on soft snow; some will travel faster than others, while still others will be steadier and against a wind will outrun their more speedy competitors. To make a snow snake, select a piece of smooth even-grained hickory or ash and bend the end in a curve. Smooth and polish the lower surface until like glass, and cut a notch in the rear end for your finger. The curved front end may be carved or ornamented to imitate some bird, animal or reptile, and the upper surface may be painted in bright colours to make the snake easier to find in the snow. A shallow groove cut in the bottom of the snake will make it travel straighter, while snakes with the front end slightly wider than the rest will often prove very fast and steady. Every boy who is fond of winter sports should have snow snakes, and while it may sound like a very simple and childish sport, you will be surprised to find that throwing the snow snake is really very interesting and requires considerable skill. Several forms and styles of snow snakes are shown in Fig. 10.

Snowshoes

One often sees directions for making snowshoes, but to make a really practical and serviceable pair of snowshoes is quite beyond the capabilities of most boys. To select the wood, bend it into the proper shape and net in the rawhide strands, requires a great deal of practice, and can only be accomplished by watching some old snowshoe maker at his work. Barrel hoops and belt lacings do not make good snowshoes and it is a waste of time to fool with such things. Makeshift snowshoes which will enable a person to travel over deep snow can be made, but such shoes are useful only in an emergency and are clumsy, heavy and ungainly. To make such shoes, two pieces of light tough wood are bent into half-ovals and lashed together, as shown in Fig. 11, with cross-pieces or spreaders—to form the frame of each shoe. The openings are then filled in by pieces of hide, leather or even cloth stretched across the frames with cord, roots, thongs or other material. The finished shoes appear as in Fig. 12, and will easily support a boy or man on soft snow, which is impassable without some form of snowshoe. If you wish really good snowshoes by all means purchase them ready-made, but you will find skis quite as useful and a great deal more fun, save in very soft light snow. Wherever there is a crust or the snow "packs" well, skis may be used, and skiing is far easier and faster than snowshoeing, and in many localities skis have almost entirely superseded the American snowshoes for winter travelling.

CHAPTER XV

ICE SPORTS

Making and Sailing Ice Boats

Wherever there are large bodies of water which freeze over with thick ice in winter, ice boating is the most exciting and exhilarating of winter sports. Ice boats may be made in any size from little, simple affairs that any boy can knock together in a few hours, to great white-winged racing yachts, costing hundreds of dollars. It is not an expensive or a difficult matter for a boy to build a serviceable and practical ice boat and one of the prize-winning yachts a few years ago was built by a couple of boys at a cost of less than fifteen dollars. This boat carried three hundred square feet of sail and with it the owners won a cash prize of fifty dollars in gold.

The size and proportions of an ice boat are varied to suit the ideas of the builder, and the only portions which a boy cannot make for himself are the steel runners and other hardware. In a general way the hull of an ice boat consists of a frame or skeleton much like that of a kite in general shape. The "backbone" consists of a strong, solid timber, flattened at the stern and pointed at the bow, but two timbers bent in a curve and fastened together by cross-braces may be used instead and will be even stronger and stiffer than the single piece (Fig. 1). At one-third of the distance from the forward or bow end is the cross-piece to which the runners are attached. This cross-piece consists of two beams or boards about two-thirds as long as the backbone, to which they are firmly and immovably attached; one piece being placed above and the other below the centre timber and with the extremities then bent together and bolted securely (Fig. 2). The mast is set where the cross-pieces and backbone join and at the outer ends of the cross-pieces the forward runners are fastened. On large boats the runners should be made especially for the purpose and should be fastened to strong wooden "shoes" bolted to the cross-piece. On small or medium-sized boats old wooden-topped skates may be used for runners, the wooden part being bolted directly to the runner arms (Fig. 3). The rudder is an exact duplicate of the forward runners, but is placed at the extreme stern of the backbone and is arranged so that it can be turned readily by means of a tiller (Fig. 4). The cockpit should be merely a shallow wooden tray or a plat-

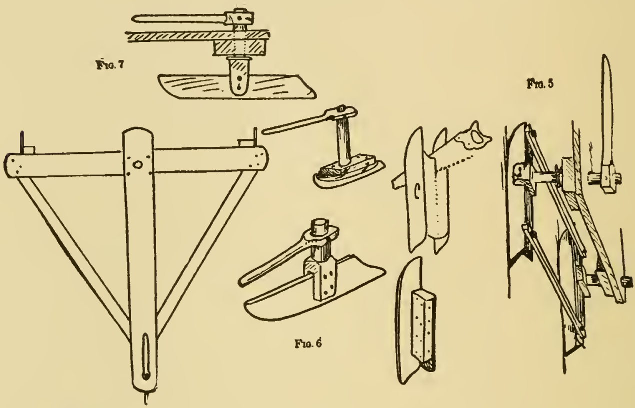


Fig. 7 Fig. 5 Fig. 6

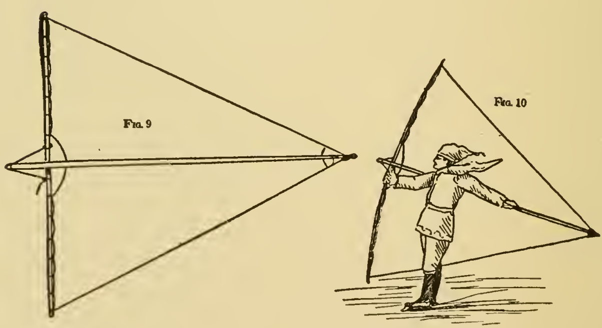


Fig. 9 Fig. 10

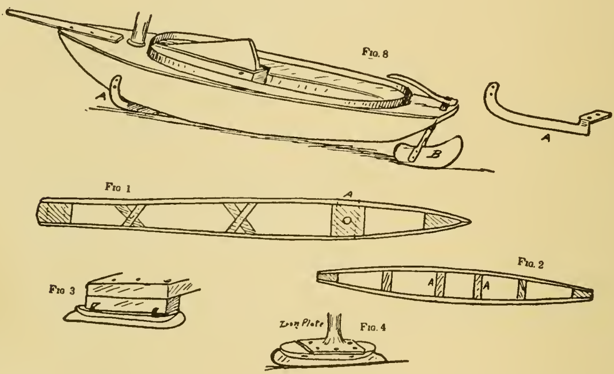
form with rails about it, and should be built on the backbone near the stern. Care should be taken not to have the cockpit too wide, the average width being from two to five feet, according to the size of the craft and its height above the ice. The length of the cockpit is optional with the builder, but the forward end should not extend nearer the bow than the cross-piece. Any form of sail may be used for an ice boat, but the lateen is probably the handiest and most satisfactory. The "leg-of-mutton," "sprit," "fore-and-aft" or "lug" sails are all excellent, however, and if you own a sailboat you can use the sail and rigging for your ice boat during the winter. In small ice boats the mast will be stiff enough without stays, but in the larger craft side-stays and a fore-stay will be required. For safety and lots of fun there is nothing better than the Catamaran ice boat. This consists of four pieces of 2 x 4 inch timbers, each eight feet in length and bolted or nailed into a square frame, braced by boards or timbers across the corners. Runners constructed of old skates are fastened to each of the four corners. Those at the forward end should be immovable, while those aft should be pivoted and fastened parallel by rods or sticks so that both runners will turn with a single tiller (Fig. 5). The mast is stepped in the forward cross-piece, as shown, while the cockpit should be built across the stern and should be just wide enough to hold two or three boys lying close together. Such a craft is almost impossible to capsise, and yet is capable of surprising speed.

Another form of small ice boat may be built from old sleds, and while this is not so fast as the others and is apt to slide sideways on very smooth ice, yet on rough "snow ice" or even on a hard crust it will furnish lots of fun at very little expense.

The backbone of this boat consists of a plank two inches thick, ten feet long and from six to ten inches wide. The cross-piece is also of two-inch stuff and of the same width as the backbone, but only eight feet in length. The two pieces are firmly bolted or nailed together, as shown in Fig. 6, and are braced with 4 x 1 inch pieces, six feet in length, as illustrated. The forward runners consist of the two halves of a sled sawed in two lengthwise and screwed onto the ends of the cross-piece. A block of 2 x 3 inch or 3 x 3 inch timber should be screwed or bolted to the top and side-piece of each half of the sled to stiffen them before placing them in position. The steering runner may be made from the runner of a sled, but a skate fastened to a wooden shoe will grip the ice better. The tiller post may be made of iron by a blacksmith or it may be of hard wood attached to the rudder, as shown. The post should pass through a smooth round hole in the stern of the backbone and a thick block should be bolted thereto, to give the post a firm bearing (Fig. 7). The mast is stepped as usual where cross-piece and backbone join and a small cockpit should be built near the stern.

Scooters

Scooters or "scoots" are a form of ice boat used on southern Long Island and in other places and designed to sail either on water or on ice. Scooters are really sharpie- or skiff-like boats without a stem or stern-post, and with both ends rounded up and with runners near the bow and on the rudder. A good size for a small scooter is twelve feet long by four feet wide and with a centre-board, rudder and rigging exactly like an ordinary water-going boat. On the forward portion of the hull two iron shoes are bolted, each twenty-five inches long by an inch in width and arranged as shown in Fig. 8 A. The rudder is of heavy sheet iron and is so hung that it supports the stern of the boat when on ice (Fig. 8 B). Another and more easily handled form of scooter is a scow-like affair about twelve feet in length, five feet in width and fourteen inches deep. Scooters are not so fast nor so easily handled as real ice boats, but they have the advantage of being amphibious. If the ice is broken or there are open spaces of water, a scooter may sail



just as well as when the ice is one broad, smooth expanse. When the queer craft reaches the edge of the ice it slides into the water, the centreboard is dropped and the boat sails gaily along until the next ice is reached. The centreboard is then hauled up and the scooter slides up onto the ice and continues its course over the surface.

Any boy that is handy with carpenter's tools can make a good scooter out of pine, cypress or spruce boards, and an old skiff, sharpie or punt may be easily converted into one of these ice-water boats by removing the perpendicular stem and carrying the bottom up in a curve.

Sailing Ice Boats

A great many people have an idea that ice boats are extremely dangerous, for they see pictures of the yachts sailing at a giddy angle on two runners and apparently about to tip over. In many cases the same people would not hesitate to sail in a real yacht with lee decks awash and at an angle a great deal sharper than the ice boat assumes. The reason that ice yachts appear to tip so much is because the windward side lifts instead of the leeward side sinking. It is true that accidents do happen in ice boats, but such occurrences are oftener due to carelessness and a desire for speed than to inherent qualities of the boat; an ice yacht at moderate speed seldom upsets, and if it does, a few cuts or bruises are about the worst injuries that one receives; there is no danger of drowning as in a sailing yacht on water. Ice yachts are probably the swiftest of all craft and will travel faster than the wind itself. Even on thin or cracked ice there is little danger, for the craft moves so rapidly that there is no time for the ice to give way, and the wind supports the greater portion of the boat's weight. A large ice yacht will often pass safely over air holes, cracked ice or thin ice that would not support a man or boy skater. In many cases the boats lift entirely clear of the ice, and an adept will often drive his boat across an open space five or six feet wide merely by giving a certain twist to the tiller so that the runners are lifted clear and the craft actually flies across the opening in the ice.

The cold is intense when sailing an ice yacht, and you should bundle up in the heaviest garments you can secure. Particularly should the feet be protected, for they are not used in ice yachting and remain almost immovable as one snuggles down in the cockpit. Thick felt boots, fur-lined moccasins or a foot warmer should be provided and heavy blankets or fur robes should be wrapped about the occupants of the cockpit. Sailing an ice yacht is quite different from sailing a real boat, for the skipper must depend almost wholly upon himself, and even in the largest yachts there are seldom over two in the crew. Passengers may be carried for ballast, and when racing or in a strong wind they are expected to crawl out on the runner-arms to maintain the balance of the craft.

An ice boat is far more responsive to a touch of the helm or an alteration of the sail than a water boat, and a slight mistake or rough handling will often result in disaster, and for this reason every beginner should learn to sail in very light airs or with a closely-reefed sail. After a few trials you will get "the hang" of sailing on ice and will find it the king of winter sports, and ordinary skating will have no charms, and will seem slow and dull work in comparison to flying over the glassy surface of the ponds like a great, swooping bird.

Skate-Sails

If you have ever skated across a pond or lake or along a river with a stiff wind blowing, you know how easily and rapidly you can glide before the breeze by merely spreading your coat and arms to the wind. The sensation is fine and with a little trouble and work you can turn this slow coasting into the speed of an express train and instead of merely drifting along before the wind, you can tack against it, run across it or speed before it at your will. All this is readily accomplished by the use of skate-sails, and why these simple and delightful accessories of skating are not more widely known and extensively used, is a mystery. In Denmark, Holland and other European countries, skate-sails are as common in winter as sailboats in summer, and the skate sailors skim from place to place over the frozen canals, lakes and fiords in every direction as easily and far more swiftly than it is possible with real boats during the summer months.

There are many forms of skate-sails in use and each has its advantages and disadvantages, but the simplest is usually the best for the beginner and the simplest of all skate-sails is the triangular style, known as the "Lake Erie," "Dan Beard" or "Marcus Model." This sail consists of two light spars (usually bamboo), and a triangular sail the shortest side of which is laced to the short spar. The apex of the sail is provided with a loop to fit snugly over the end of the long spar and the other end is made fast and the sail stretched tight by means of a lanyard fastened to the centre of the short spar or "mast." By loosening this lanyard and slipping the loop from the end of the long spar the sail may be rolled up and easily carried. The construction of this sail is so simple that

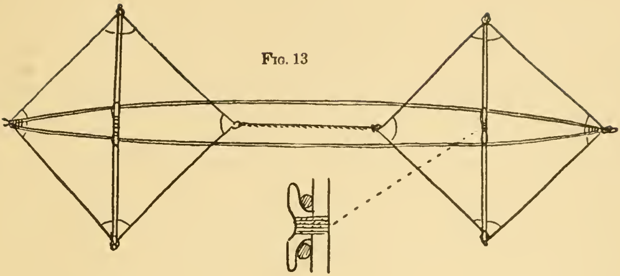


FIG. 13

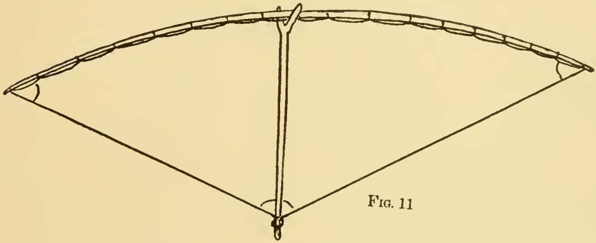


FIG. 11

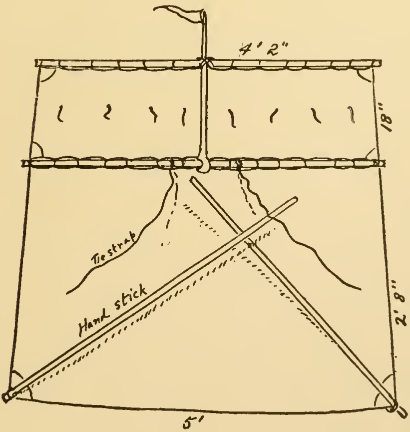


FIG. 12

detailed directions are hardly necessary. The size depends upon the size and strength of the user, the speed at which you wish to travel and the weight of prevailing winds. If the long spar is nine feet long and the short mast seven feet in length it will be large enough for beginners. The details of construction are plainly shown in Fig. 9, and the manner of holding it is shown in Fig. 10.

Another type of sail, known as the "St. Vincent," is illustrated in Fig. 11. This is a fast and simple rig, and in use the long spar is carried like a gun over the skater's shoulder with the "mast" resting against the back. The "Danish Rig," Fig. 12, is a great favourite in Europe and has the advantage that it may be "reefed," or the area decreased in hard winds, merely by folding down the topsail or upper part of the rig. It is, however, a rather difficult affair to handle and requires considerable practice in order to tack and go about with it. Moreover it is fastened to the skater's body, which is an objectionable feature to many.

The "Norton" sail is a two-sailed affair, and while not as speedy as the large single rigs, it has the great advantage that the user can see in all directions and thus avoid collisions or bad places in the ice. If the tw poles are 10 feet long and the cross-pieces are ⅝ inch in diameter and 4½ feet long, the sails will be large enough for any boy. Bamboo is excellent material to use in making this sail and good bamboo fish-poles may be employed, using the entire poles for the long spars (binding them with the butt end of one to the small end of the other) and splitting the poles up for the shorter pieces. Light, clear-grained spruce is just as good as bamboo and a neater job can be made with it. Near the ends of the cross-pieces metal buttons or knobs should be placed, and in the centre of each piece a cleat should be lashed, as shown in the illustration Fig. 13. The sails should be made of strong cotton, measuring four feet across the diagonal, and well bound with strong tape. At the corners small rings or loops should be placed. The sails are attached to the cross-yards by slipping the rings or loops over the knobs or buttons. The main spars are then sprung apart and the cleats slipped between them. The sails are then stretched taut by lashing the outer ends to the extremities of the long spars and drawing the two inner ends together by a lanyard through the rings or loops, as shown. In making any kind of a skate-sail, double-stitch and hem all edges and re-enforce the corners with a piece of cloth sewed on.

No particular skill is required in order to use a skate-sail, but of course the sailor must have some knowledge of how to skate and also of tacking and sailing. By altering the position of the sail you may readily sail in any direction, but you must bear in mind that you must always have the sail between your body and the wind and must preserve your balance by leaning against the sail. In using the Lake Erie model, the sailor "tacks" by running dead into the wind, letting go of the long spar when the sail flutters and swinging it over your head as you come about. Then grasp the spar on the other side and dart off on the next tack. To stop with this rig, either shift the position of the sail until the mast is close to your body, let go of the boom and let the sail shake or come up into the wind and stop by means of your skates.

Any boy can readily make one or another of these forms of skate-sails and can have lots of sport with them, for even on ice that is too soft, too rough or too snow-covered to afford good skating, you can skim swiftly and easily by means of the sails; they transform one to an individual ice boat, and you will find ordinary skating unattractive work after using a skate-sail. Little muscular exertion is required in skate-sailing; all one has to do is to lean easily against the sail, keep his feet and turn and manœuvre as his fancy wills.

Fishing Through the Ice

Most boys think of fishing as a summer pastime, but in reality one may obtain some of the best fishing in the dead of winter. In many of our northern and eastern states fishing through the ice is a regular occupation for many fishermen. If one is skating or sailing with skate-sails, it is an easy matter to attend to numerous set lines for pickerel and other fish. If on the other hand you wish to fish through the ice as a means of profit or pastime you may build little shanties on runners and sit over a hole in the ice and fish comfortably for hours at a time. The shanty may be of canvas stretched over a light wooden frame (Fig. 14), or it may be built of thatch, wattled reeds or even of tarred roofing-paper tacked to a frame of light boards. If a small stove or even an oil or alcohol lamp is placed in the shelter, the interior may be made quite warm and comfortable. The floor of the shanty may be an open framework or it may be boarded over and a hole cut through the centre. In the latter case the water and the fish in it may be quite plainly seen through a hole cut through the ice beneath the movable hut, and in this way it is possible to spear or snare fish which

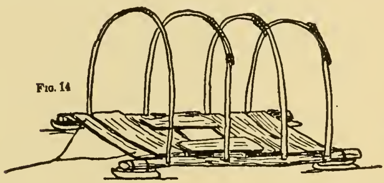


Fig. 14

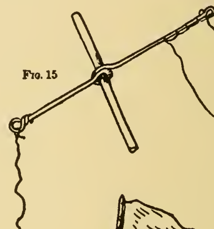


Fig. 15

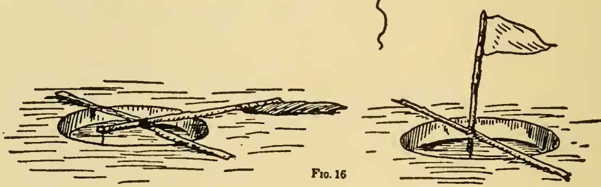


Fig. 16

are attracted to the spot by bait dropped in the water at the end of a line.

The commonest and most interesting method of ice fishing, however, is to cut numerous small roundish holes through the ice and in each one set a baited hook and line attached to a simple little contrivance, which automatically raises a red flag when a fish is hooked. These devices may be made of stiff wire, as shown in Fig. 15, or they may be constructed of two sticks tied loosely together, as shown in Fig. 16. Do not trust to merely binding the sticks together, however; have a fork on the upright resting against the cross-piece, as shown, and be sure to have both sticks strong enough to withstand the pull of any fish that the line will hold.

It is easy to set and attend several dozen such set-lines and enjoy skating at the same time and it is quite interesting and exciting to see the red flag bob up, and to dash to the spot, not knowing what you may find on the hook,—for muskrats, and even mink, are frequently captured on lines set in this manner for pickerel.