



BUCKS and BOWS

By Walter Perry

Decorative Illustrations by Edward B. Hagy, Jr. Technical Drawings by the Author



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First Printing, 1953 Second Printing, 1954



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> Printed in the United States by THE TELEGRAPH PRESS

Established 1831 HARRISBURG, PENNSYLVANIA This book is dedicated to the memory of the dean of modern archery in America, the late Dr. Robert P. Elmer.

Preface

FOR information and courtesies received which have been invaluable in the composition of this work, the author is indebted to the following:

Dr. J. K. Doutt, Curator of Mammals, Carnegie Museum of Pittsburgh, Pennsylvania; Professor Edwin L. Peterson of the University of Pittsburgh; Thomas D. Frye, Formerly Executive Director of the Pennsylvania State Game Commission; Jim Ramsey; Roy I. Case; Edward B. Hagy, Jr.; and the Game Commissions of all the states mentioned in the chapter on "Hunting Laws." To all of them the author conveys his thanks and appreciation.

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Go, my son, into the forest, Where the red deer herd together, Kill for us a famous roebuck, Kill for us a deer with antlers. *Hiawatha*

Introduction

"So long as the new moon returns in heaven a beautiful bent bow, so long will archery keep hold of the hearts of men."

-MAURICE THOMPSON.

WOULD that through some medium we could call in the ghost of Robin Hood; no doubt it could and would reveal the secrets of successful hunting with the good bow and shaft. But, be that as it may, we must rely on our own devices to ferret out these secrets as best we can.



From a practical standpoint, there are no real secrets about hunting the white tail deer with archery tackle. It is a matter of education. One must know a lot about the bow. One must become proficient with it. One must know a lot about the nature and habits of deer. When these things are mastered, the hunter may have hopes of being successful on occasion.

It must not be assumed that the bow is as efficient as the rifle. It is not. It has not the power, the range or the accuracy. The hunter who chooses the bow is taking a handicap of 20 to 1. It follows, therefore, that the archer is either crazy or the king of all optimists, or so say the non-archers.

The toxopohilite, however, takes an entirely different view. In most cases the would-be bow hunter has hunted for many years with firearms. He has reached a point where his sporting conscience tells him that he has taken his share of this noble animal. He has become conscious of the fact that fish and game cannot vote; he has, for sometime past, concluded that it is time for him to do something about conservation. But, when he reflects on the 20 to 1 handicap the archer must take, conscience appears to issue a parole. He knows that bow hunters will never be able to reduce the herd even though the season be open to both sexes. He knows there will be very few if any permanent cripples.

After reviewing these facts, he feels the urge to sally forth with a full quiver of arrows and a dependable bow to see what the red gods have in store for him. Success or not, he will be out with nature and will enjoy a full cup of pleasure.

Few people seem to realize the important part the bow has played in man's advance toward civilization. It has been said that the three most important incidents in man's early development were the discovery and application of fire and the inventions of the wheel and the bow. Without fire man could not have advanced to a position much above the ape, without the wheel man could not have progressed and without the bow he may not have survived. The bow is the instrument that

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marked the time when man really gained "Dominion over every living thing that moveth upon the earth."*

It is not the purpose of this volume to record a history of archery. Such a story would be the history of man's progress from the third interglacial period to the 17th century. But, in order to appreciate the antiquity and the importance of this weapon, a short sketch touching the highlights of archery seems to be in order.

Paleontologists have found arrow points embedded in deposits known to have been formed during the 3rd interglacial period. These points bear the trademark of Mousterian culture, the first artifacts made by pressure flaking. This would indicate that certain tribes, at least, of the Neanderthal group used the bow—one hundred thousand years ago!

When the Wurm glacier retreated northward, thus freeing central Europe of ice, our progenitors, Cro-Magnon men, appeared armed with the bow. Their arrow points were of Soulutrean culture, the highest development of pressure flaking. These points are artistic in design and some are wafer thin. Their celebrated paintings in the deep recesses of certain caves located in Southern France and Spain sometimes depict arrows in the slaying of such game as bison, reindeer and wild horse. It must be assumed that these men used the bow to protect their families from the cave bear, the cave lion, the cave hyena and the tiger—dangerous beasts, all.

In 1926, at Folsom, New Mexico, the late Dr. J. D. Figgins discovered the fossil of two ribs of an extinct buffalo with an arrow point embedded in the matrix. This fossil is now in the museum of natural history at Denver. Since then other finds have been made in this geological deposit that clear up any and all doubt that Folsom man roamed our Southwest during the latter part of the last ice age which scientists have placed at around 25,000 years ago. These arrow points would indicate that Folsom man was armed with the bow.

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[•]Gen. 1:28.

The whole western hemisphere, from the Aleutian Islands to Patagonia, is strewn with arrow points—unmistakable evidence of a hemisphere wide use of the bow. Excepting only the aboriginal Australian tribes, all known peoples of earth, at some period of their progress, used the bow. For thousands upon thousands of years man has had to look to the bow for securing food, for protecting his hearth and fighting his countless wars!

Some historians believe that Britain's rise to empire was largely accomplished by the efficiency of the English archers. If they had been less proficient with this weapon, we, in America, might be speaking Spanish or French. This is only one of the many political destinies that may have been influenced by the bow.

Since the early part of the 17th century, firearms, in the civilized nations, have driven the bow into discard except as an implement for sport.

The first organized archery club in America was founded in 1828 and was known as The United Bowmen of Philadelphia. It is still a going concern. The National Archery Association was founded in 1879 and has enjoyed a continuous existence and growth. The Annual Archery Tournament, sponsored by this association, is one of America's most colorful sporting events; but, having no commercial affiliations, it does not have the ballyhoo of baseball and prize fights.

Hunting with the bow, in the modern sense, can be said to have started with one Maurice Thompson just after the Civil War. He and his brother, Will, were southern soldiers belonging to a Georgia regiment. Near the end of the war Maurice was severely wounded. After the surrender they made their way back home only to find that Sherman had passed that way leaving the old home in ashes and ruin. Maurice's wound healed but his doctor advised a period of living in the open. He had no money, he was denied the use of firearms. He could think of no way to secure food other than with the bow; he

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must have had some previous experience. In his book, "The Witchery of Archery," written in poetic prose, Thompson describes his experiences at Lake Okechobee where he lived for sometime, armed only with the bow. In those days this was wild country, there were no white settlements. He made friends with at least one Seminole Indian, in his wanderings in Florida, who taught him much native lore firsthand.

Maurice became an expert archer and hunter. He killed all manner of animals and fowl native to that region.

He was a gifted writer. Many of his articles were accepted and printed by Harpers magazine. Through these articles many people took up the sport and it was largely by this influence that the National Association was founded.

The next great exponent of archery in hunting is to be found in the late Dr. Saxton Pope of California. He was later joined by Arthur Young. This team killed specimens of all American big game including the Kodiak bear. In 1925 they and the famous author, Stewart Edward White, made a trip to Africa; there they killed 17 lions with the bow as well as many other specimens of African big game.

Prior to the African trip, Dr. Pope wrote a book on archery hunting which has been the inspiration of the recent surge forward in this sport. In this book Dr. Pope tells the story of Ishi, the last wild American Indian.

He says that in 1872 white emigrants fought a terrible battle with a tribe of Yana Indians near Mt. Lassen in California. This tribe was all but wiped out; the few survivors were hounded from place to place until a lone descendant remained. In 1911 he was found hiding on a ranch in a starved and crazed condition.

He was identified by Dr. Watterman, an anthropologist attached to the University of California, as belonging to a little known and, presumably, extinct tribe known as Yanas.

After he was nursed back to health, Dr. Watterman took him to San Francisco and attached him to the Museum of

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Anthropology where he was studied by members of the staff. Dr. Saxton Pope was an instructor in surgery at the University Medical School which was situated next to the museum. Dr. Pope became Ishi's "personal physician." This was the beginning of a strange and beautiful friendship between a man of the highest modern culture and a man literally dragged from the neolithic past. It was Ishi who got Dr. Pope interested in archery. He taught the doctor much of the native Indian lore. It was largely through the lessons he learned from Ishi that he became so successful in hunting with the bow.

After World War I target archery grew rapidly. American ingenuity went into equipment. Doctors of Philosophy took time out to study bow efficiency. Prominent engineers redesigned the bow, which greatly increased its efficiency. Arrows were made with three-dimensional matching; the guesswork was all taken out of them. Shooting technique was revolutionized. These improvements raised scores by 40%.

In the meantime, certain individuals and groups forsook firearms and began to hunt with the bow. Their ranks grew in numbers and spread to all sections of the country. The bow hunters organized and became strong enough to get the attention of state legislatures. One by one various states passed measures favorable to archers until now most of the states that boast of large deer herds have laws opening up the season to archers prior to the regular or firearms season. The latest of these pre-season measures was enacted by the Maine state legislature.

Hunting with the bow is now an accomplished fact with legislative blessings. The road is open and we have the green light. But this road is unfamiliar to many; there is need for a traffic signal. It is the purpose of this book and the hope of the author to assist in directing the traffic on this highway that leads to the realm of the hunter's dreams.

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By the shores of Gitche Gumee, By the shining Big-Sea-Water, Stood the wigwam of Nokomis, Daughter of the Moon, Nokomis. *Hiawatha*

CHAPTER ONE

Archery Tackle

WE SAID in the introduction that "One must know a lot about the bow." We will expand that statement to include all items of archery tackle.

The interested observer may attend an archery tournament and watch the contestants as they come on the field. He will be impressed with the archers' equipment; he will notice a certain bowman with a long roll of something on his shoulder

and an impressive looking box in his hand. This observer will be curious to know what is in that roll and box; he will make it convenient to be within good looking distance when the contents are opened up.

The roll will contain from two to five bows; an American round bow, a york round bow, a flight bow, a clout bow and, perhaps, a hunting bow—just to show to the boys. The box will contain arrows; two different sets of target arrows, a few flight arrows and, maybe, a few hunting arrows—also just to show to the boys. The box will also contain an arm guard, finger tab or shooting glove, extra bow strings, bow string wax, serving cord and an assortment of small tools such as a 6" mill file, a pair of small pliers and a husky knife. Some place about his equipment there will be a quiver for his arrows, either a belt quiver or a ground quiver.

In this chapter we will endeavor to discuss these various items and, since the bow is the most important, we will begin with it.

BOWS

The definition of the word "bow" as it appears in the dictionary is as follows:

> "A weapon made of a strip of wood or other elastic material, with a cord connecting the two ends when bent, by means of which an arrow is propelled."

There are many questions to be answered in order to clarify this definition and to give the novice a comprehensive picture of what the bow really is.

According to their usage, bows are divided into three classes; the target bow, the flight bow and the hunting bow.

At this point your attention is directed to Fig. 1 and Fig. 2. References will be made to these sketches from time to time as we discuss various phases of this implement. These sketches will acquaint you with the fundamental dimensions and the

names and locations of all the pertinent sections of the bow. All three of the above mentioned bows are constructed according to these cardinal principles, the only essential difference between them being dimensions.

Fig. 1 illustrates a braced target bow of modern construction showing the location of its parts by their traditional names.



FIGURE 1—Braced Bow.

A—Upper nock, B—Lower nock, C—Grip, D—Lower limb, E—Upper limb, F—Arrow plate, G—Upper dip, H—Lower dip, I—Back, J—Belly, K—String, L—Serving.



FIGURE 2—Dimensions of a Target Bow.

Fig. 2 represents an unbraced bow showing the proportional dimensions of a target bow. This is superimposed with working diagrams in the braced and full drawn positions. It

will be noted that line AB is the over-all length of the bow. Line C is the mathematical center. It will be noted that the upper limb is 2 inches longer than the lower limb. The exact center or line C bisects the grip 1 inch below its upper edge and 3 inches above its lower edge. By reason of this difference in the length of the limbs the bowyer has to so tiller the job as to compensate for this difference. Therefore, when the bow is braced (strung), the distance from the string to the belly is 3/8 inches greater in the upper limb area than in the lower. But, when the bow is fully drawn, the limbs are perfectly equalized, or "come compass," to use an old English term. (Fig. 2, lines H and I.)

Target Bows

Target bows, as the name implies, are designed for target shooting. They are divided into three classes or styles; the English long bow, the flat bow and the modern modified flat bow.

The English long bow is not of English origin; it was brought to England during the 8th and 9th centuries by raiders from Norway and Denmark. The decisive battle of Hastings was largely fought with this weapon, being used by the troops of both William and Harold. This is the bow of Robin Hood and his merry men. From the date of the conquest throughout English history, the long bow was their standard weapon until the reign of Charles II. Of course, there was that interval from Henry VIII to Charles II during which firearms and archery overlapped. When archery first started in America the long bow was the type used. This style prevailed until after World War I.

The standard length of the long bow was 6 feet, though, of course, there were some variations. A cross section of either limb makes one think of the cross section of a chocolate drop (Fig. 3), the flat section being the back and the rounded section the belly. The nocks were of cow's horn, which were often

beautifully made. Every bowyer seemd to have a style of his own. An experienced archer could usually tell who made a given bow by merely glancing at the nocks. The grip, or handle, was usually covered with plush; sometimes it was leather or a winding of cord. The materials used in its construction were yew, lancewood, lemonwood, ash, and wych



FIGURE 3—Cross Section of English Long Bow. A—Belly, B—Neutral zone, C—Back.

elm in order of their accepted merits. The string was of linen, usually from 30 to 36 strands of No. 12 Barbours' shoemakers thread. The string had a handmade loop in the upper end, the lower end being reinforced and fastened with a timber hitch; it was served with linen thread and usually had a gaily colored ribbon connecting the upper loop to the bow nock to prevent it from sagging when the bow was not braced.

The long bow, especially one made from prime yew, is very smooth and sweet shooting. It lacks, however, that quality known as cast. In other words, arrows shot from it do not have the velocity of ones shot from shorter bows. At distances up to 60 yards the long bow is a joy to use but, when the archer tries for a good score at 100 yards, he finds that his arrows drop short. He is compelled to select a point of aim well above the target in order to make hits. The English (who have always been bound by tradition) made no attempt to increase the cast

by making their bows shorter. The Yankee, being less allergic to tradition, did not hesitate to do something about it. This idea did not get general recognition until we had our feet well planted after World War I.

The Flat Bow

It was the late Philip Rounseville, of the firm Rounseville Rohm, who pioneered the flat bow during the twenties. He proved to the growing host of archers that the hundred yard target could be reached with a point of aim on or below the



FIGURE 4—Cross Section of Flat Bow.

target with a bow that was not too heavy for the average man to shoot.

It was very simple in construction. A cross section of the limbs is a rectangle the proportions of which are about four times as broad as it is thick. (Fig. 4.) The length is five feet. The broadest part of the limbs is 1 3/4 to 2 inches. The limbs form a straight taper from a point just forward of the dips to



FIGURE 5—The Flat Bow.

the nocks. (Fig. 5.) The grip is narrow and deep (Fig. 6.) The nocks are merely notches cut in the wood at the end of the limbs. The general proportions are the same as Fig. 1 and 2.

This was a very easy bow to make as much of the work could be done with machinery. Several of our bowyers tried very hard to get general acceptance and it was popular for some four or five years.

Its greatest drawback for target work was the acute angle the string formed when at full draw. This sharp angle tended



FIGURE 6—Flat Bow Grip or Handle.

to bunch the fingers so closely together that clean arrow release was difficult; accuracy was, therefore, sacrificed. It proved to be a tricky bow to shoot.

The Modified Flat Bow

During the 1930's science went to work on bow design. Outstanding men of science, prominent engineers and others made separate studies of bow stresses and strains. Separately, they came up with some rather surprising data. It was found that the highly stacked cross section of the English long bow was of the worst possible design. They worked on the correct premise that a bow has two distinct and opposite strains, stretch and compression.

The belly of a bow is subjected to compression while the back is subjected to stretch. Those portions subjected to the greatest strains are the extreme outer margins of the back and the belly. The mass lying between these outer margins is a neutral zone that actually performs no work other than acting as a bridge to hold the back and belly apart but it does undergo the stress of shear.

It has long been known that a stacked yew bow would develop what are known as crysals or frets (tiny lateral frac-

tures or cracks) on the belly.* These frets were accepted as a natural consequence and no one seemed to have bothered about why it happened. It did not take the scientific boys long to figure that out.

Refer to Fig. 7 and note that the regions of greatest compression and stress are represented by the heavily shaded lines



FIGURE I—Cross Section of a Stacked Yew Bow.

on this cross section. It is noted that the field of greatest compression appears at the apex of this diagram (A). It is further noted that this point of greatest compression occupies the smallest portion of mass and area. A very small portion of the general mass must bear the greatest load of this strain. The result is that the energy thus created soon crushes the cells of the fibres, thus causing the frets. Note, again, that the neutral zone (B) contains the greatest amount of the general mass with its accompaning weight. The only thing correct about this traditional design is the back (Zone C). Why such outstanding men as Horace Ford, Dr. Robert P. Elmer, James Duff (not the Senator from Pennsylvania), Shepherdson, McMeen

^{*} Crysals or frets have been the bane of nearly all the old English archers. Reference is made to this weakness in The Badminton Library of Sports, Archery Volume, page 295. We also see comments by Horace Ford in his Archery—Theory and Practice, American Edition, pages 25-32. Ascham made comment at some length as early as 1545 which may be found in his Toxophilus, 1869 Edition, Book 2, pages 120 and 121.



and others never tried to correct this sorry design is a most difficult question to answer; perhaps it was because mankind is very slow at living down traditions.

In order to create a bow design that would have greater efficiency, it was found necessary to increase the area of Zone (A) and decrease that of Zone (B). The rectangular cross section made this correction (Fig. 8). In this design Zone (IA^1)



FIGURE 8—Cross Section of a Rectangular Bow. 1A—Belly, IB—Neutral zone, 1C—Back.

occupies a much greater area. Zone (IB) is greatly reduced while Zone (IC) remains practically the same; this resulted in a much faster bow and one that was free from frets.

These experiments were expanded with a view to creating a still more efficient weapon. It was found that the ratio of compression and stress was about 45% stretch and 55% com-



pression. It was reasoned that if the area of compression (2A, Fig. 9) was 20% greater than (2C, Fig. 9), the ratio would about balance. This resulted in the trapezoidal design $(^{Fi}g-9)$ -

In Fig. 9 we note Zone (2A) occupies the greatest area of any of the dimensions of this cross section. A full quota of fibres are arrayed to bear the load equally and in unison. No bow of this design has ever developed a fret. The neutral Zone (2B) is reduced to a minimum yet it performs the same duty as Zone B in Fig. 7. This eliminates a lot of mass and weight. Zone 2C has not been greatly altered during this series of design changes. The trapezoidal bow is the most



A-Early English, B-1875 to 1910, C-1912 to 1925, D-Streamlined 1930 to 1940.

efficient design yet conceived as applied to a self bow or a backed self bow. That is the author's opinion at least.

The length of this bow is 5 feet 6 inches, about midway between the long bow and the flat bow. This does not unduly crowd the release fingers and permits a clean release. The long bow when fully drawn scribes the arcs of two circles joined at the grip while the modified flat bow scribes the arcs of parabolas.

The long bow was not heavy enough in the handle section. Many of them tended to bend somewhat at this point. It was found that the handle or grip zone had to be heavy enough to prevent any suggestion of movement when in action. This

resulted in a deep grip with sharp dips fading into the limbs. This grip is usually leather covered. There are, however, many ideas as to grip shapes, some of them quite fancy indeed.

Horn nocks are no longer used. The prevailing design is a reinforcement of fibre on the back at the tip ends of the limbs with a rather simple notch carved there. It was found that any extra weight in the limbs slowed up the action. It cannot be denied that those elaborate horn nocks did add some extra weight. Fig. 10 illustrates some nock designs.

The general design of the modified flat bow follows the fundamental principles as shown in Fig. 1 and 2. Bow strings are still made of linen but rayon thread called fortisan has been added to the list of string materials. Modern strings have hand laid loops at each end. These strings must be made with great accuracy. We will tell how to make a double looped string later on.

Re flexed Bows

Many readers of this book may have seen bows with the ends bent rather severely backward and wondered why. These are known as reflex bows. The idea is not new. The Turks used them during the Crusades; Genghis Khan and his illustrious grandson, Kublai Khan, armed their foot and horse soldiers with bows incorporating this principle; it was used by the Greeks as far back as Homer. This classical design has been handed down to us by tradition and song; it is the bow of Dan Cupid. The reason for its incorporation in modern bows is not tradition or beauty; it is to increase the cast.

As has been pointed out, a short bow will outshoot a long bow for distance. The properly designed reflex bow is a short bow when the string is at rest (Fig. 11). As the string is drawn the bow becomes longer (Fig. 12). In Fig. 11, lines AD and BC are about 3 inches long; this makes the line AB 6 inches shorter than line DC. As the string is drawn, line AB becomes

increasingly longer so that, when the bow is fully drawn, line AB becomes line CD. Assuming that line DC is 5 feet 6 inches, then line AB would be 6 inches less or 5 feet. When the string is at rest, the bow is actually 5 feet long and, when fully drawn, it is 5 feet 6 inches. Now, when the bow is being



FIGURE 12—Reflexed Bow at Full Draw.

drawn and the string begins to lengthen, the weight appears to decrease because of this added leverage. In reverse, when the string is released, the limbs start their snap back to recovery causing the string to become shorter as it descends. The string picks up added velocity in the exact ratio of its decreas-

ing length. Therefore, when the arrow leaves the bow, it does so with this added velocity.

In shooting at the shorter ranges from 60 yards on down, the reflex bow does not add to the score. But, when the archer shoots at 100 yards, this added velocity is to be desired. If the design of the reflex is properly done and the work properly executed, it does add to the cast. On the other hand, if design and workmanship are not properly done, the bow is probably not as good as a straight one.

Flight Bows

The flight bow has been called the archer's luxury. Flight bows are very difficult to make and require the very finest materials, all of which make them expensive. Their lives are short. They are made for one purpose only, to shoot an arrow the longest possible distance. They are designed to get the last drachm of energy out of the material; every fibre is strained to the very verge of its limit. Special flight arrows have been shot over 600 yards!

In general design, the fundamental principles and proportions are used. They are extremely short with wide, thin limbs. Many of them are reflexed.

Since few archers indulge in this specialized phase of archery, a further discussion is not in proper order. Flight shooters develop a technique that, as a rule, renders them unfit for top notch target work.

The Hunting Bow

Most of the things we have said about target bows can be applied to the hunting bow as to fundamental design. It should be of the modified flat type. While the trapezoidal design is to be desired, they are difficult to find in dealers' stocks. The trapezoidal bow is the product of master craftsmen; it requires a lot of hand work. In these days of high labor costs one cannot blame the manufacturers if they tend

to sidestep this design. Most stock designs are rectangular. Quite a few have slightly oval bellies (Fig. 13). This style is not stacked enough in the belly to cause frets, while the rounded corners are less liable to become dented or scarred from rough usage.

The length should be somewhat shorter than a target bow. If proper materials are used the hunting bow can be safely reduced to 5 feet 4 inches or even 5 feet 2 inches.

The hunting bow is subjected to more abuse than any other



FIGURE 13—Cross Section of Hunting Bow with Rounded Belly.

type. It must withstand all kinds of weather; sunshine, rain, and snow; 90° to below zero. It must, therefore, be immune to temperature and humidity. It must be tough. A hunter often falls; the bow must stand any results of such an accident. It is often struck against rocks and trees; it must also take this abuse. It must have a good cast. In order to insure this quality, the hunter is wise in selecting a reflex bow.

The weight of a hunting bow should be somewhat heavier than a target bow. There is no royal rule as to the weight a hunter should use. Some strong men can handle 75 pounds while less robust men may have trouble with 40 pounds. Under no circumstances should one choose a bow the weight of which is all he can manage to draw. To over bow oneself is the worst possible blunder one can make. A good rule to go by is to select a bow 20% lighter than one can actually pull. For instance, if an archer can draw an 80 pound bow (with struggle) to the chin, he should select one of 64 or

65 pounds. There is a lot of difference in the physical efficiency of a person under normal conditions in normal temperature as compared to field conditions in zero weather. That 20% margin of physical reserve will pay dividends.

It does not require the very heaviest archery artillery to kill a deer. A 40 pound bow will drive a broadhead through a deer, feathers and all. Not over a month ago a woman in Pennsylvania killed a nice buck with a 35 pound bow. From the author's observation and the opinions of several good bow hunters, a 50 to 55 pound bow is ample for white-tail deer.

All bows found in dealer's stocks are finished with either a good spar varnish or a cellulose lacquer which makes them shine like the proverbial cue ball. No doubt the bowyers who make them take great pride in producing a "super duper" paint job, free from bubbles and a joy to behold. I, too, like a good paint job on my target bows. I also like a good finish on my hunting bows. But the good hunting bow finish does not sparkle, it is a coating of flat paint, camouflaged in forest green and brown or some other drab color that will absorb but not reflect light. When the sun is shining, a highly varnished bow will reflect flashes of light not unlike those of a mirror. Such light flashes are not natural in the woods and deer do not like unnatural light displays; they usually vanish from that part of the woods when they see them. I might suggest that a dark colored bow string be used.

BOW MATERIALS

A list of the various kinds of woods from which bows have been made is a long one. By trial and error this list has been whittled down until only three remain:

Yew

Yew is an evergreen somewhat akin to cedar. It has a limited distribution. It is found over our Pacific Northwest and in Europe, especially Spain and the Urals. Our best yew

comes from Oregon's Sierra Nevada mountains. It is found growing with big timber such as spruce and Western cedar. It is by nature of very slow growth and, if planted out in the open, it forms a spreading tree with branches growing all the way to the ground; such a tree would not make a bow as it has too many knots. In the deep forest, however, it must fight for light and grows upward. It is only in such forests that a trunk can be found that is long enough to make a bow that is not full of knots.

We have said that it is of a very slow growth; a cross section of an 8 inch log may contain over two hundred annular rings. Some of these trees bear berries of which bruin is very fond. Bear will climb these trees for the berries and, in so doing, often tear the bark with their claws. This wound will heal and be covered with new wood and bark but the scar will forever remain in the wood. Fifty or a hundred years afterward the tree may be cut by a bowyer only to find the stave ruined by this old scar. A yew tree large enough to yield bow staves, when split, that is not of twisted grain, that does not contain ancient bird pecks, that is not wind shaken and that is free from bear scratch and knots is rare. Those who make it their business to harvest yew staves say that only one tree in fifty is fit to make a bow. Results, expensive. A pair of prime yew bellets alone cost from \$7.50 to \$20.00.

I can bear witness to this statement because I have cut down yew trees and split them into billets. It was back in '37 that my wife (also an archer) and I took a trip to the West Coast. In Seattle, we called on the old war horse of archery in the West, Kore T. Duryee. Kore took us on a trip through the mountains to Mt. Rainier. On the way we made a number of stops and climbed the mountains in search of yew. We saw any number of yew trees but there was something the matter with nearly all of them; the boles would be crooked on some, the bark would indicate a twisting grain on others, some would have broken tops which meant injured heartwood,

others would have too many knots, etc. We finally felled two trees that turned out to be only fair. I, for one, am ready to verify the statement that "one tree in fifty is fit for making a bow." And, if any one thinks that cutting yew is an easy job, just let him try scaling those Western mountains, cutting the trees, splitting out the billets, then packing them on his back for a mile or two to the car.

Yew has a thin rind of pure white sapwood, the heartwood being dark in color ranging from yellow to dark red. The heartwood reacts wonderfully under compression while the sapwood admirably stands stretch. It would seem that nature has created yew for one purpose only, to be made into bows. For as far back as records go, the long bow has been made from yew, using a thin portion of sapwood on the back and heartwood for the belly. This wood makes one of the very best target bows. At present there is a trend toward laminations but I predict that the time will never come when yew bows will not be represented at every major tournament.

Yew makes a good hunting bow but it is not tough enough to stand the abuse that the average hunter gives such a weapon, neither is it reliable in extreme cold weather.

Osage Orange

Osage is a very hard, heavy and resilient wood. It is sometimes called hedge apple, probably because it is used to form hedge rows and bears a fruit that may resemble an apple or an orange to some people but hedge apples certainly do not taste like either apples or oranges.

This tree has a general distribution from the plains eastward to the Atlantic Coast. The best quality for bow purposes comes from Texas, Arkansas and Oklahoma.

It has rather wide annular rings consisting of two distinct and different parts, one being of a hard, horny texture while the other is of a pithy cellular nature. The difference in the density and hardness of these rings renders it the most difficult

of all bow woods to work. It cannot be planed or shaved with a draw knife. It must be rasped, scraped, and sanded into shape. It cannot be glued until the resin in the area of the glue joint has been neutralized with caustic soda. By reason of the hand labor necessary to make a bow from it, bowyers try to avoid making them. It is also expensive.

Like yew, osage has a thin rind of white sapwood and a heartwood of a light yellow color. This yellow appears to oxidize and turn much darker when exposed to the light for a year or so. Also, like yew, it is difficult to find a tree large enough to make a bow that is not full of imperfections.

An osage bow has excellent cast. It has never been popular as a target bow because it is rather harsh shooting. But, when it comes to a hunting bow, it stands pre-eminent. It is tough. It will stand all the abuse the hunters give it. One can literally use it for a tent pole, a vaulting pole or a hand spike—he may fall on it or crash it against hard objects and it will come up in shooting condition. Zero weather does not affect it. However, the hunter is warned to carefully inspect any osage bow, which he may contemplate buying, for knots and cross grain. A knot in an osage bow is usually fatal and cross grain in any bow is to be avoided.

Lemonwood

Lemonwood is not the wood of the lemon tree as many suppose. It gets this name because the heartwood is a pale yellow, much the same shade as a ripe lemon. These two woods have nothing else in common. The correct name for this wood is degame. It is found in the islands of the Caribbean Sea; most of it comes from Cuba.

The grain of this wood is so close and so fine that it is difficult to see with the unaided eye. No attempt is made to follow the grain in making lemonwood bows. The staves are sawed and planed perfectly straight. A bowyer can even risk

a limited cross grain construction. One well known bowyer claims a safe bow can be made from a stave with a cross grain ratio of 15 to 1. In other words a stave I inch thick may have the grain cross from back to belly in a distance of 15 inches. It is easiest of all woods to work. It planes well and finishes beautifully. It is used exclusively by boy scouts and most factories specialize in lemonwood bows. It is the least expensive of all. Some noted archers prefer it for target work. It is the bow seen in most dealers' stocks.

It has a fair cast but has a tendency to follow the string; this is an old term used when referring to a bow that does not recover its original shape when unbraced. When dried out in heated houses over winter, they become somewhat brittle and are liable to break. Lemonwood bows should be stored in an unheated attic, shed, or garage over winter. Lemonwood contains no resin and bows made from it cannot be reflexed. Since it is a tropical wood, it has evolved no qualities to withstand cold weather. Such bows lose cast in cold weather and are very apt to break.

Lemonwood stands up well under compression but is not so good for stretch. Nearly all fractures start in the back of these bows. An excellent bow can be made from this wood by reinforcing the back with a tougher material such as a strip of hickory $1/_8$ inch thick or fibre glass.

Hickory

In this chapter on bow woods we named only three and, perhaps, we should stick to this statement. However, we can hardly leave this subject without saying something about the toughest wood that grows in our native forests. The Eastern Indian tribes used a lot of hickory in their bows. Most of us made bows from it when we were kids. One of our large manufacturers specializes in hickory hunting bows.

For a target bow it is out, dead out, on my card. It does,

however, make a fair hunting bow, perhaps the best one can get if one's limit is around \$15.00. It is tough, no question about that. It will stand all manner of abuse and cold weather. It can be reflexed.

It is the reverse of lemonwood as to strains. Hickory will stand all manner of stretch but will not stand compression. It does not have good recovery, it is very slow in action and badly follows the string.

All bows of this kind are made from hardshelled or white hickory which is nearly all sapwood. A 12 inch log will have a heartwood core of not more than 2 inch diameter. I believe that the shell bark or red hickory would make a far better bow. This has a relatively thin rind of sapwood with a dark colored heartwood. This wood it tough and is easily worked.

Laminations

Many American archers were not satisfied with the bows made from nature's products. In the hope of creating a more efficient bow, a number of bowyers tried some experiments with combinations of different kinds of wood; some with wood and synthetic materials, some with wholly synthetic and some with combinations of metal, synthetics and wood. This could not have been possible prior to World War I because these synthetics had not yet been created and, even if they had, the old hide and fish glues would not have held them together. These old style adhesives were not stable, even with the addition of isinglass, because they were affected by temperature and humidity which resulted in joints that crawled or crystallized.

In making a bow, a glue joint must not soften or crystallize; it must be a bond as strong or stronger than the materials being glued. It must be immovable and unaffected by temperature or humidity; it must be elastic enough not to crystal or powder under strain. The old glues, when weighed in these balances, were found wanting.

The war caused a great improvement in adhesives and the creation of new ones including casein. Casein has been perfected to the point of meeting most of these exacting demands. Science has evolved many new plastics including fibre glass, So, with these new creations and adhesives that will hold them together, the bowyers have come up with some exceptionally good bows.

In the creation of laminated bows, the bowyers recognized the principles of stress and compression. Dr. Hickman, of the Bell Telephone laboratories, introduced a silk backing that added much to bow efficiency. This was followed by a backing made from a rayon product called fortisan which is also an excellent material. Then came fibre glass which seems to be the best backing yet developed. All these materials have a very fast and complete recovery when in action.

In working out the other strain, compression, natural wood such as osage orange, plastics such as toxwood and fibre glass and metals such as aluminum have been successfully used. These, too, have a quick and satisfactory recovery when in action.

For the neutral zone, the bridge holding back and belly apart, a long fibred hardwood is used, such as maple, lemonwood, and even yew.

The archer may now find two types of laminated bows in some dealers' stocks. One has a toxwood belly, a hardwood neutral zone and a fibre glass back. Toxwood is a plastic which is very tough and has good recovery but it seems to be rather slow in making the recovery. These bows are reflexed. See Fig. 14.

The other type has a fibre glass belly, a hardwood neutral zone and a fibre glass back. Recently, I visited the factory where these bows were made and was amazed at the special machinery used in producing them. The engineering plans are so complete and the predetermined measurements of the bows' components are so exact that the operation of tillering

is unnecessary. These bows may be had either reflexed or straight. See Fig. 15.

Both of these laminated bows are excellent weapons and are



FIGURE 14—*Cross Section of Laminated Bow.* A—Toxwood, B—Hardwood, C—Fibre glass.



FIGURE 15—*Cross Section of Laminated Bow.* A—Fibre glass, B—Hardwood, C—Fibre Glass.

highly recommended for any form of archery, especially hunting.

Metal Bows

Since the days of the organization of the United Bowmen of Philadelphia in 1828, men have tried to make bows from steel. Until rather recently, they have not proven satisfactory, the only successful design being of a tapered tubular construction. It has the advantage of not being affected by temperature or humidity. It has a good cast and has proved to be a stable weapon. It is a reflexed bow.

I believe the first aluminum bow ever made was produced by James S. Giles of Pittsburgh. The author put a cork handle on it for him. It is now in the private collection of Walter Cramer, a former member of the Pittsburgh Archery Club. It was not satisfactory. While it had a satisfactory cast, it was a harsh bow to shoot.

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Since that time new designs of aluminum bows have been tried out and, as a result, some very satisfactory bows are being produced. These bows have to be quite short which hampers a good release. They are not all stable—some of them break without warning. One usually sees quite a few aluminum bows at tournaments. These bows are also reflexed.

Fibre-Glass Bows

For the last several months, there have been rumors that an all fibre-glass bow would make an early appearance. Most of us, who are interested in bows, have been looking forward to the time when such a bow would be announced and, especially, to the time when we could examine and shoot some of these new weapons. We have been expecting some unusual performances from fibre-glass bows.

We based our expectations on the remarkable records set by the fibre-glass fishing rods which have literally driven the steel rod off the market and are dangerously crowding the aristocrat of roddom, the split bamboo, toward a minor position except for the fly rod. There will always be bamboo fly rods. Glass rods made their debut shortly after the close of World War II. At first, they were very expensive but, as competition and know-how began to affect them, they became cheaper and better. They have now had the test of time and they have not been found wanting. They have proved to be better, from a practical standpoint, than ones made from any other material. Among their virtues are immunity to "set," imperviousness to water, dampness and temperature fluctuations. They are tough; they will take an amazing amount of abuse; they have come to stay.

Fibre-glass, as applied to items that must bend and make quick recoveries, is processed by arranging thousands of strands of spun glass-threads—much smaller than human hair —in a form then binding them in a matrix of synthetic resins. The process is technical and requires certain specialized
equipment in order to accomplish the desired results. It has really been the task of big money; the small manufacturers, such as bowyers, could not afford such expense; this, probably, answers the question as to why the fibre glass bow has been so long in making its appearance.

A few days ago, a sample of one of these long awaited weapons reached this writer who gave it a fairly thorough field trial. It was found to be stable, sweet shooting and of satisfactory cast. It may not be quite as fast as some of the recurved laminated jobs or a bow made from prime yew but it is decidedly faster than lemonwood and is about on par with osage orange. This fibre glass bow did not lose cast neither did it take the slightest set; the last arrow that was shot held up just the same as the first one. Its chief virtue seems to be dependability.

The bow tested was "set back in the handle" but it was not recurved. It is quite possible that a properly constructed recurved, fibre-glass bow will be equal in cast to any bow now on the market.

The fibre-glass bow certainly has possibilities. No doubt that it will be improved in design and appointments—such as nocks and grips. Your author predicts that these new bows will grow in popularity and may, at a rather early date, become a dangerous contender for first place in this field. From present observations, this writer believes that the fibre-glass bow is destined to be one answer to the bowhunters' prayers.

IN PROSPECTUS

/ dream of a bow with a cast just so;
Can science give me such,
With the pith* of glass and a yew wood cast
That weighs one fourth as much?

• Pith, as applied here, takes its meaning from an old English word and used by Aschara in his Toxophilus to denote the good qualities of a bow.

The above ditty was composed as I pondered over the question of just what is the ideal bow. I believe that this little rhyme comes pretty close to answering that question; at least, it reveals some of the fundamentals.

In order for an arrow to have good cast, it must have a fast velocity. In order to give an arrow a fast velocity, the limbs of the bow must react in the minimum of time. In order to react swiftly, the limbs must be constructed of a material that has rapid and complete recovery for both stress and compression. Rapidity of reaction of the limbs of a bow depends on the ratio of their mass to their weight. It follows, therefore, that the less the specific gravity of the limbs the faster their reaction. This brings us to the last line.

A yew target bow will weigh about 13 ounces; if, according to the rhyme, it weighed only one fourth as much, it would register 31/4 ounces on the scales. If the bow were to weigh 31/4 ounces, the limbs would react much more swiftly and impart a greater velocity to the arrow.

I believe we are working in the direction of the ideal bow. Fibre-glass comes close to complete recovery, when in action, but its specific gravity is too great for ideal recovery time. Yew wood has good recovery time but it does not have complete recovery. We are longing for a bow that will have both complete recovery and ideal recovery time.

Fibre-glass comes nearer to having all the ideal qualities except for recovery time—than any other known material. So, if some scientist can change the formula of producing fibre-glass so that it will weigh "one fourth as much" as the present product but retain all its present qualities, he will have produced a bow material approaching the ideal.

ARROWS

Arrows are the archer's messengers.

Whether or not these messengers will find the right address depends chiefly on two things: First is the archer's ability to

direct them and, second, on their construction and matching. Almost any good fletcher can make one nearly perfect arrow. But to make eleven more exactly like it requires the services of a master craftsman who has access to proper materials and tools. Matched arrows must meet the following specifications:

They must all be straight.

They must be the same length.

They must be round.

They must be made of the same material.

They must be fletched exactly the same.

They must balance at the same point.

They must be the same weight.

They must be the same in spine (stiffness).

In addition, they must be of the proper spine to match a given bow weight.

Arrows of these matchings have all the guess work taken out of them; they will group in the same place on the target if they are correctly loosed.

It is obvious that an archer cannot carry around with him a pair of accurate scales, a micrometer and a spine tester when he goes shopping for arrows. This is one time he will have to recognize the old-fashioned word, faith. He will have to depend on the reputation of the maker to furnish these qualities in his products. Happily, there are such manufacturers even in these times of mass production.

Now, let us see what an arrow really is and what makes it tick. Fig. 16 represents a target arrow. The locations of its pertinent parts are shown and named according to traditional terms. Reference will be made to this figure from time to time as we expand our comments.

You will note the arrow has three general divisions; shaftmen, shaft or stele and foreshaft. The foreshaft is composed of the fine footing and the pile. The shaft or stele is the main

shaft of the arrow. The shaftment is occupied by the nock, the butt, the fletching or feathers, and the crest.

There are two forms of construction; these are known as (a) self arrows and (b) footed arrows. The self arrow is made from a single piece of wood; this would eliminate the section known as "footing" as shown in Fig. 16. The footed arrow is a self arrow with a reinforcement of hard wood on the front end.

Target Arrows

A correctly made wooden arrow is round in shape, the diameter being 9/32 inches, 5/16 inches, and $^{11}/32$ inches depending on the weight of bow out of which they are to be shot. As a rule, ladies' arrows are 9/32 inches diameter and



FIGURE 16—*Target Arrow.* A—Nock, B—Butt, C—Fletching, D—Crest, E—Footing, F—Pile.

men's are $\frac{5}{16}$ diameter, about the thickness of an ordinary lead pencil. The shaft scribes parallel lines from the pile upward to a point about 5 inches from the nock; from this point it tapers slightly toward the nock.

In discussing the various sections of the arrow we will begin with the pile. This is the metal armour on the end of the arrow. Its purpose is to protect the end of the arrow. It is made from cold rolled steel or brass. Fig. 17a shows a cross section of a parallel pile showing the average dimensions. It scribes parallel lines from the open end forward to the place where the point begins; here, it tapers to a sharp point on a 60° angle; it weighs about 50 grains. Fig. 17b shows the bullet point pile. This is made from the metal jacket of a 30 cal.

spitzer shaped bullet. Its composition is a copper alloy. The lines scribe two parabolas starting from the open end and joining in a rather sharp point. Bullet points are usually used on inexpensive arrows. They are not considered to be the best shape for good target arrows for the following reason: If the arrow is drawn so that the point is even with the back of the bow, it will be deflected to the left, when shot, because



FIGURE 17B-Bullet Point Pile.

the curved lines of the pile bear on the arrow plate beyond the parallel line of the shaft. (Dotted line outlines cross section of bow at arrow plate Fig. 17b.)

Since the days of Roger Ascham, in the reign of Henry VIII, target arrows have been footed. In those days the targets were sod butts which may have contained gravels and small stones. No doubt many self arrows were broken when shot into these butts, so the footed arrow was probably invented to prevent this breakage.

In making a footed arrow, a piece of tough wood is spliced

on the front end of the shaft by means of a fish joint. This footing is usually made from beef wood, dyed lemonwood or even hickory. Beef wood is the first choice; not only is it a very strong wood but the rich, dark red color contrasts most beautifully with the light colored shaft. This footing adds some 30 grains to the weight of an arrow and moves the point of balance forward.

The nock is the extreme upper end of the arrow in which is cut the notch. This is quite an important part of the arrow. The bow string rests in this notch. It must be deep enough to contain the string and wide enough for the string to fit without crowding. It should fit the string just tight enough so that the arrow will not quite drop off if suspended from the string. The nock must be strong because it bears the entire energy exerted by the bow. Just an ordinary notch cut in the arrow shaft will not do, it must be stronger. In order to increase the strength at this point the nocks are either reinforced with a tougher material or an entire nock of stronger material must be glued on the shaft. Fig. 18 illustrates some of these methods.

Fig. 18A shows the wedge reinforcement. This was first made from horn; later, fiber was found to be tougher. In Fig. 18B we see the simple reinforcement made by sawing a slot in the arrow and gluing a piece of sheet fibre in the slot. This makes a good nock.

Fig. 18C illustrates the latest construction. This is a separate nock, die cast from a cellulous plastic. It has a tapered hole into which the shaft is fitted and cemented on with a cellulous cement. It is tough. It comes in almost any desired color. It is easily replaced. If a nock is broken, all one has to do to replace it is to set it afire and it will burn off cleanly without damaging the wood; then another nock can be cemented on and in 20 minutes it is ready for use. For hunting arrows, these nocks are cast with a small knob on the cock feather side which enables the hunter to "feel" the arrow on

the string in the proper position without taking his eyes away from the game—very clever.

Crest

The crest is the distinguishing marks, located just below the feathers. The crest had its origin back in medieval times; it usually incorporated the colors of the family coat of arms.



FIGURE 18—Arrow Nocks. A—Wedge reinforcement, B—Simple fibre reinforcement, C—The plastic nock.

The crest has a two-fold use; one is to enable the archer to recognize his arrow instantly which prevents confusion when scoring and the other is for decorative purposes only. The discriminating archer of today has his own crest; he can identify his arrow anywhere at any time.

Some crests are works of art. Some are painted between the feathers, extending beyond the feathers with one or more rings around the butt. Gold leaf has been used with very pleasing results. In most of the artistic jobs, the primary rings are separated by very thin rings of black.



Fletching

Fletching is an old English term which means the application of the feathers to the rear end of the arrow. If some person whose name happens to be Fletcher would trace his genealogy, he would find that his grandfather, many times removed, was an arrow maker.

The purpose of these feathers is to keep the arrow on a true flight. They are located near the rear end. Most arrows have a space of 11/4 inch from the nock to the upper zone of the fletching which is known as the butt; I like mine an even inch. The size of feathers on target arrows is 21/2 inches to 3 inches long and about 1/2 in. high- On flight arrows the fletching is tiny celluloid veins. On hunting arrows the feathers are much larger.

These feathers are three in number on a given arrow. Fig. 19 shows that one of these is placed at right angle to the bow string slot; this is called the cock feather and is usually of a different color which makes it easier for the archer to nock the arrow with this cock feather out or at right angles to the bow. The two others are called the hen feathers which are placed at points 120^{0} from the cock feather and from each other. Feathers on all arrows, wood or metal, are held in place by cellulous cement. Feathers are rights and lefts, depending on whether they are taken from the right wing or the left wing of the bird. It makes no difference whether arrows are fletched with rights or lefts but the set of arrows should be all the same.

Some fletchers glue the feathers straight on the shaft while others put them on with a slight spiral. No one has ever proved that one system is better than the other. Naturally, the spiraling of feathers is for the purpose of causing the arrow to rotate in flight thus holding it on a more steady course. As a matter of fact, feathers have a natural curve that has the same effect as spiraling but to a lesser degree. If we apply the mathematical formula used in rifling firearms, we find that

the "twist" would be exceedingly slow for an arrow. The natural curve of the feather gives a faster rotation than the above formula calls for.

The main thing is that each arrow is fletched the same. The feathers should be all rights or all lefts. They should be of the same thickness, they should be spaced as nearly as pos-



FIGURE 19—Looking at the End of the Fletching.

sible at 120° from each other, they should be at right angles from the arrow (not leaning to the right or the left) and, what is more important, they should be cut or trimmed to the same size.

The shape of the feathers has undergone many changes. The first records show that no attempt was made to trim them to any desired shape (see Fig. 20a). The old English archers trimmed them to triangles (Fig. 20b). Before World War I the prevailing style was called balloon fletching (Fig. 20c). The present style is parabolic (Fig. 2od). The whims of future archers will no doubt create other designs.

The kind of feathers best suited for this purpose are the five pointer feathers from the end of a turkey's wing. Before the white man ever heard a turkey gobble or saw him strut,

archers of Europe, Asia and Africa had to use feathers from other large birds. The grey goose—of song and story—furnished most of the feathers for the English archers. The swashbuckling Henry VIII probably had his arrows fletched with



A—Primitive, B—Old English, C-Balloon, D—Modern.

feathers from the peacock when he shot at the historic "Field of the cloth of gold."

The method of applying feathers to arrows has undergone a great change. In the olden days, the barbs were stripped from the vane; this process left the barbs attached to a thin,

cellular base. They were cut to length and attached to the shaft by winding with sinew thread or by gluing. While this method held them securely to the arrow, the feathers were not standing up straight on the shaft; they leaned toward the inside of the feathers. This was corrected by cutting the vanes so as to leave a small wedge of pith on the underside which causes the feathers to stand at right angles to the shaft. Cutting the feathers and gluing them on was a delicate and painstaking job; not every one had the patience or the skill required to do it.

Now, we have clamps to hold the feathers while the bases are ground to shape. We also have fletching tools with which almost anyone can do a precision fletching job. We have an electrical apparatus that burns the feathers to any desired shape. Cellulose cement will hold the feathers securely to the arrow no matter what the weather conditions are. In respect to fletching, at least, we are miles ahead of our ancestors.

The Shaft

We now come to the shaft. The shaft is constructed from a long list of woods which include Port Orford cedar, Norway pine, Douglas fir and birch.

Select red birch makes a fair arrow. Its good points are that it is very tough and will not fracture under the roughest usage which makes it the favorite for commercial galleries and for hunting and roving in rough terrain. Its drawbacks are that it will not stay straight and that it is too heavy for top target work.

Douglas fir, a West Coast tree, makes a fair target and hunting arrow. Arrows made from this wood will stay reasonably straight. It is inexpensive, usually of very straight grain and is easy to work. It is a little heavy for target work and the spine is affected by temperature variations.

Norway pine—known as red deal in England—was the wood most widely used in that country from before the Conquest

up to World War I. It was the arrow of Robin Hood and his merry men;* it was the arrow of Roger Ascham, the scholar; it was the arrow of Horace Ford, the greatest of all English archers; it was the standard, top grade arrow in America until Port Orford cedar was recognized as a superior arrow material.

Norway pine is of close grain, it is light in weight, it is strong, it has good spine, it will stay straight, it takes glue well and it will take a beautiful finish.

Port Orford cedar is a true aromatic cedar. It is said that there are only two stands in the world; one on our West Coast and the other in the mountains north of Palestine, the famed Cedars of Lebanon. The author cannot vouch for the accuracy of the last statement as he has never seen any authentic comparisons of these trees.

In the year 1720 the Duke of Orford, anchored in the bay of Port Orford, noticed these cedars which now bear his name. The area producing these trees is rather small, occupying a stretch of about 150 miles of Oregon's coast, dipping slightly into California and extending eastward for about 40 or 50 miles.

Port Orford cedar is a very light wood of a creamy white color. It is very strong for its weight and has, perhaps, the best spine of any wood yet tried for arrows. It is of a very straight grain and will stay straight. Since 1920 most all commercial wooden arrows have been made from it, both self and footed.

I have seen Port Orford cedar growing in the forest. I would like to digress from the subject long enough to tell about the place where we saw these trees. It was on that same Western trip, back in '37, that we left the central Oregon highway and drove over to Port Orford for the purpose of seeing

[•] It is generally believed that Norway pine has been used in making arrows for at least a thousand years but Ascham, in his "Toxophilus", does not mention it. Horace Ford makes mention of it in his "Theory and Practice" which was written about 1856.

³⁵

these cedars as they grew. A kindly lady, who owns the land around this historic spot, gave us permission to wander around and pointed out some of these trees to us. We found them to be rather large trees with straight trunks and a light gray bark.

A descendant of the discoverer of the port, the present Duke of Orford, had visited the spot earlier that year. We were sorry that we missed him.

The ocean, at this place, is very impressive; outside of a few large rocks which lie close to shore, the water is an unbroken expanse westward for seven thousand miles. We were greatly impressed as we watched the surf roll in—water that is crystal clear, very much unlike the brackish looking surf of the East Coast. A mountain stream feeds some fresh water lakes that are on this place in which one can catch seven species of trout. I would like to visit that spot again, just to relax and rest; to wield the magic wand over those fresh water lakes and to watch the surf roll in and back again.

It would be a novel experience for an Eastern angler to hook so many various species of trout, all of which are native bred, and never be sure what is hooked or what will rise next.

Metal Arrows

Metal arrows are made from steel and aluminum. Steel was first tried out by the American Fork and Hoe Company but was soon abandoned. Steel arrows were too stiff and too heavy. Then, just before World War II, the steel arrow was revived by the other experimenters. They were made tapering at both ends with a swell near the midway point. They were used with varying success. Being of a small diameter they were not affected so much by wind. They have not made their appearance since the last war.

The aluminum arrow is a success. It was pioneered by William Folberth of Cleveland about the year of 1930. Folberth is an inventor and has precision machinery of his own

with plenty of time to devote to experimentation. After trying out various alloys of aluminum with various diameters and wall thicknesses, he came up with an arrow that astonished the archery world.

The symbol of this alloy is 24SRT—, a very hard alloy with more spring than any other type. The diameter is 1/4 inchsome were 17/64 inches. The wall thickness ranges from .012 inches to .020 inches. Up until the federal government banned the use of aluminum for arrows, a number of fletchers were producing arrow from it.

The individual arrow of aluminum is no better than a good wooden arrow. Their excellence lies in their uniformity. This was the first time that the fletcher could work with a material that was of a constant density. Arrows of the same material symbol, the same diameter and the same wall thickness would be the same in weight and spine. They are not affected by temperature. They have a longer cast than wooden arrows because their smaller diameter offers less air resistance.

In making wooden arrows, the fletcher cannot pick up a dozen dowels, even though they are made from the same billet, and make a dozen matched arrows. Since the strength and weight of wood depend on the distribution of the resin and cellular arrangement in the annular rings and, since each annular ring represents a year's growth which may be wide or thin according to the growing conditions of the season that produce it, the density of a given billet may vary greatly at points not even an inch apart. The only way matched arrows can be made from any kind of wood is by selection. Dowels in lots of one to five thousand are selected and divided into piles by weight with a tolerance of five grains. Each of these piles is then tested for spine and divided into yet other piles with a tolerance of 2 per cent. I once bought a lot of five hundred choice dowels cut from the same log and when I divided them into bunches that exactly matched there were not over 30 dowels in any one bunch.

Then again, the spine of a wooden arrow will vary with temperature changes, get stiffer when the temperature falls and get softer when the thermometer goes up. The difference will not be great but enough to affect one's score by several points.

The aluminum arrow eliminates all these variations.

Up until the ban on aluminum, the observer would see aluminum arrows predominating in all the big tournaments. Those of us who may be unlucky enough not to have a reserve set or so will probably have to use wooden arrows until the ban is lifted. Many will cry "Oh, woe is me!"

Spine

We have mentioned this word, spine, on several occasions and many of you may want to know something about what the term means and just how it affects arrow performance.

Actually, it means stiffness or the degree of stiffness. It really means more than just stiffness; we might say that this additional quality is the recovery time, or springiness.

Up until after World War I, spine, as applied to arrows, was an unknown term. No one seems to know just who developed the idea; it seems to be a natural development in arrow evolution. As yet, there is no accepted symbol that denotes a given spine. Every good fletcher has had to evolve some kind of system that works well enough for him but is understood by no one else. I made a device which I christened with the \$10.00 word, "Toxoshaftograph." This worked on the principle of the weight required to deflect the arrow one inch when placed on bearings 26 inches apart. I was able to work out a system by which arrows could be spined to fit any given bow weight. For instance, for bows from 40 to 45 pounds, it required 35 ounces to deflect the arrow 1 inch, and for bows 32 to 35 pounds, it required 30 ounces, etc.

Until this term is stated by some symbol that is generally understood and accepted, the archer will have to depend on

the recommendations of the makers in selecting his purchases.

The oil companies had just such a problem. They had to evolve a symbol that denoted the thickness or viscosity of their product. As a result, the motorist will ask for SAE 30, SAE 20, SAE 40, etc. He may not know what it is all about but he does know what to ask for when he needs oil.

The archer will be better served when he can call for a dozen arrows 26 inches long, 290 grain weight, and X42 spine, which would probably be abbreviated to "26-290-X42."

While on the subject of spine, it is in order to bring up the subject which Dr. Elmer has named "The archer's paradox."

Until the mid thirties there was one thing that baffled all students of the bow. The question was why does the arrow follow the line of sight when all reason says that it should veer to the left? Since the arrow is shot from the left side of the bow, the bow itself is pointing to the right of the line of sight (Fig. 21-IC). The bow handle at the arrow plate is approximately 1 inch thick; the string, naturally, bisects the handle. It follows that the right side of the arrow, where it contacts the bow, is $1/_2$ inch to the left of the string's path. At full draw we have an angle scribing 28 inches on the hypotenuse (arrow) and 1/2 inch at the base (distance from center of bow handle to arrow).

Now, when the arrow is loosed, the string descends pushing the arrow forward. The angle grows wider as the hypotenuse becomes shorter. When the string reaches its rest position, 61/2 inches from the bow, we have an angle with 1/2 inch base and 61/2 hypotenuse. According to all previous lines of reasoning the line of the arrow's flight should be considerably to the left of the target, but, when the arrow is properly aimed and loosed, it goes, unerringly, to the mark—why?

Dr. Elmer, in discussing the problem, gave it as his opinion that the pressure of the arrow against the bow pushed the bow hand slightly to the right, thus permitting the arrow to

FIGURE 21—*Explaining the "Archer's Paradox"*. *A*-Bowstring, B—Arrow, C—Cross section of bow at handle, D—Target.



pursue an undisturbed course. He cited tests which were, in a way, somewhat convincing.

It took the high speed camera to settle the question. Dr. Hickman took some slow motion pictures set up to 4000 frames per second. This recorded every movement of release, string, arrow, and bow which revealed some surprising results. It showed that the arrow actually snaked itself around the bow then followed the path in which it was started.

We will try to explain how this happens. Refer to Fig. 21, sec. I. This pictures the arrow at full draw and pointing directly down the line of sight. Fig. 21-II we see the arrow just after the release with the weight of the string on one end and the resistance of the bow handle on the other end which bends the arrow slightly to the right. You will further note that point A (bow string) is slightly to the right of the line of sight. In section III of Fig. 21, the string has descended to a point about midway its course. The resistance (point C) is no longer at the end of the arrow; it has moved back to near its center; the string (A) is noticeably to the right of the line of sight. These changes of positions have widened the angle and have caused the arrow to bend to the left. Looking at section IV, Fig. 21, we note the string has come to rest and the arrow has parted contact with it. The arrow is relieved of the string's pressure. The arrow, which was smartly bent to the left just before it left contact with the string, now violently reacts to recovery, vibrating so that it is again bent to the right. In section V, Fig. 21, the arrow has just cleared the bow and the spine of the arrow is starting a second recovery toward steadiness. In section VI the recovery has again passed over the straight axis of the arrow and shows a slight curve to the left. In section VII the arrow has made full recovery and is speeding directly down the line of sight. Dr. Elmer's theory may have added something toward solving the problem; the pictures, however, did not record it.

Because the spine of the arrow was of the proper stiffness

and speed of recovery, the arrow in Fig. 21 negotiated all the contortions of passing the bow and performed properly. Had the spine been too stiff and too quick, the nock of the arrow would have slapped the bow handle (Fig. 21-V-C). On the other hand, if the spine had been too soft and the recovery too slow, the arrow would have been deflected to the right.



The weight of an arrow is not so important provided that all the arrows in a set weigh the same. It is desirable to have the arrows as light as possible. Neither does it greatly matter where an arrow balances provided they all balance at the same point.

Flight Arrows

We have made reference to flight arrows from time to time, and I believe the reader has a fairly good picture of them. We will, however, assemble these statements into a descriptive review.

The flight arrow must be stiff enough to be shot from a heavy bow, yet they must be as light in weight as possible. To meet these specifications, the flight arrow is barreled shape. The swell is found with its greatest diameter about 8 or 9 inches from the nock end where it gets the severest strain. The lower or pile end is less than 1/4 inch diameter tapering up to the swell. The nock end is 1/4 inch diameter and tapers forward to the swell. The pile is usually the jacket of a 22 cal. bullet or a special ferrule turned from aluminum. The fletching consists of three small veins of celluloid. No attempt is made to match them as their sole purpose is to be driven as far from the archer as possible. See Fig. 22.

Hunting Arrows

All that has been said about arrows up to this point is also applied to hunting arrows; the only essential difference being size and points or arrow heads.

Fig. 23 shows the fletching of a hunting arrow; note the long feathers which average 5 inches in length. Most of these



FIGURE 23—Hunting Arrow Showing Large Fletching. A—Boss on the nock.

feathers are spiraled. The crest is usually of bright colors that are easily spotted in the snow or dead leaves. The diameter of the arrow is 11/32 inches for bows from 50 to 65 pounds. Some very heavy bows may require a diameter of 3/8 of an inch. The nock should have a boss or welt of some sort that parallels the cock feather; as explained earlier in this chapter, this permits the archer to nock an arrow by feel while looking at the game.

Arrows for the hunting bow are of four classifications according to their use. The shaft, fletching, and crest of each of these classes are the same; the only mechanical difference is the style of the piles or heads.

Fig. 24, illustrates the ones most commonly used. 24F is the target pile. In practicing on a regulation target these piles are necessary; the reason being to prevent unnecessary cutting of the target. Fig. 24E is called a field point. These are used when roving, shooting at archery golf, or in shooting the field course. The extended point prevents skidding when the arrow strikes the ground. Fig. 24H is another form of field points; the screw design on the point extension is to permit easy re-



moval from a stump or tree by merely "unscrewing" it. Fig. 24G is called a blunt which is used in hunting squirrels or

FIGURE 24—Various Arrow Heads Used for Hunting.

other game that may be in the trees. This point will knock small game out but will not stick in a tree thus saving the archer many tough climbs. I like to use blunts on all small game, especially rabbits.

Fig. 24A is a modern broadhead. It will be noted that this is a fabricated product. Two formed sides are electric welded to a blade; this reinforces the head at points of greatest strain, especially the point. This is made from about 30 carbon steel and tempered to about the hardness of a knife blade. The edges are ground very sharp. It weighs 135 grains.

Fig. 24C is a broadhead formed from a single sheet of steel. This is done by a series of slots which taper toward the point, then bent alternately to right and left, forming a tapered pocket to receive the arrow. This is an inexpensive and quite satisfactory point.

Fig. 24D is an earlier version of what a broadhead should be. It is constructed from a piece of good steel which is shaped and slotted and a 35 cal. spitzer bullet jacket which is slotted and then either brazed or soldered to the blade. This makes a good head, however, it is a little heavy and is rather expensive to make. Many archers still prefer it. It is of a design that almost any archer can make.

Fig. 24B is called a bodkin head. It gets its name from the bodkin points of the 1400's which were invented and used by the English archers who were able to penetrate coats of mail with them to the consternation of the knights.

The bodkin has three cutting edges instead of two as appears on the broadhead. The bodkin is also a fabricated product, being formed sections welded together; this has become quite popular during the last two years.

There are other designs including heads with four and even six cutting edges. Some archers make great claims for these multibladed heads. But they have not as yet reached the stage of popularity as to become known as standard armour.

The wound produced by a broadhead is not unlike that produced by the thrust of a sword. The arrow has deep penetration and often completely passes through a deer. The victim does not die from the shock produced by the arrow but from hemorrhage caused by the wound.

There has been quite a bit of controversy as to the lethal effects produced by the bodkin and the broadhead. Both are deadly missiles—both will cut large veins and arteries—both have good penetration. Most experienced archers seem to believe that a well made broadhead probably has the deeper penetration. They also seem to believe that the bodkin has a more steady flight. Unless a broadhead is fitted exactly true with the axis of the arrow's shaft, it is liable to "plane" in its flight. The bodkin will not plane but will pursue a steady course. So, it will not make a great deal of difference which style one may select, the main thing is to place the shot in the right place.

ACCESSORIES

The bow hunter must have a few accessories when he takes to the field. He must wear something on his fingers to protect them from the force or weight of the bow string. There are many devices designed for this purpose but, from a practical standpoint, they have all been weeded out but two, the shooting glove and the tab.

The tab is the most simple, the least expensive and, perhaps, the best finger protector ever designed. Fig. 25A shows a target tab. It is made from cordovan leather with two holes to receive the first and third finger; the second finger is on the top side of the tab. It has a slot on the lower side through which the arrow nock passes; this places the tab between the string and the fingers. Fig. 25B is a hunting tab. The first finger is passed through the hole and the second and third fingers pass through the oval opening. This is usually made from a heavier grade of cordovan leather. While the tab gives protection to the balls of the fingers, it does not protect the inside of the fingers from "squeeze" against the arrow. Some people have trouble at this point by reason of the skin's being caught between the finger nails and the nock. I have no nail on my forefinger which renders me immune from this trouble.

Some of my archer friends have threatened to have that nail removed from their fingers, but they all compromised by using a glove.





FIGURE 25A—*Target Shooting Tab.*

FIGURE 25B—Hunting Shooting Tab.



FIGURE 25C—Shooting Glove.

Fig. 25C illustrates the conventional shooting glove. The back of the glove and the wrist strap are made from a soft glove leather. The finger stalls are formed from cordovan and sewed to the finger straps. Some gloves have a strip of elastic webbing connecting the wrist strap to the back of the glove for the purpose of keeping the finger stalls pulled up snugly on the fingers. This gives all-around finger protection. The archer cannot "feel" the string action on the fingers quite as well with the glove as he can with the tab. The archer who can shoot with a tab, without hurting the fingers, is wise in choosing a tab.

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The hunter must have some kind of protection for the wrist of the bow arm. When the string falls it often strikes the inside of the forearm about four inches above the wrist. A few smacks of the string will cause a bruise that swells up like a goose egg.



FIGURE 25D—The Arm Guard or Bracer.

Fig. 25D illustrates a popular arm guard or bracer. This is also made from cordovan with one or two thin steel stays sewed between the leather and the chamois lining. It buckles around the wrist and the forearm. Some are equipped with elastic loops which are hooked on to eyes that are fastened on the other side of the bracer.

Some hunters prefer a leather cuff that is laced on the forearm like a legging. The cuff is gradually dying out and is difficult to find in dealers' stocks.

When the archer goes hunting he must carry more than one arrow. The question of where to put them and how to carry them was solved before written history. Man evolved the quiver which has not changed in principle for over five thousand years. Ishmael's quiver was an untanned leather bag slung on his back with the mouth even with his right shoulder.

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The modern quiver is a fancy leather bag, machine stitched with streamline design, slung on the back with the mouth even with the right shoulder. Both Ishmael and the modern archer filled the quiver with arrows, feathers up; both reached the right hand upward, grasped the arrow between thumb and forefinger and, with a forward overhand swing, drew the arrow from it. How times have changed!



Fig. 26 illustrates three types: Fig. 26A is a hunting quiver made from elk skin or soft calf skin with stitched in staves in the back to keep it from collapsing. It has a wide shoulder strap to suspend it. It has a "possibles" pocket with zipper opening. It has a capacity of 18 to 24 arrows.

Fig. 26B is smaller and less elaborate in design. This is used for small game hunting and roving. It has a capacity up to one dozen arrows.

Fig. 26C is a belt quiver mostly used at the target.

Fig. 26D is a ground quiver, made from a piece of 3/16 inch diameter steel or brass wire. This has the dual use of holding the arrows while the archer shoots at the target and holding the bow when the archer goes to the target to retrieve his arrows.



But he heeded not, nor heard them, For his thoughts were with the red deer; On their tracks his eyes were fastened. Leading downward to the river.

Hiawatha

CHAPTER TWO

How To Shoot

THE ARCHER stood astride the shooting line with his left side toward the target. He shifted his feet until they were planted about 15 inches apart with the shooting line between them. He looked at the target, then made some final movements of his feet until he was satisfied the position would give him perfect balance.

His bow was in his left hand with the back down and the string up. From his right side, suspended from his belt, was a quiver containing six arrows. The quiver was not perpendicular; it tilted at an angle of some 200 so that the open end rested at a point about even with the bottom of his pants' pocket. With the thumb and forefinger of the right hand, on which he wore a finger tab, he grasped an arrow by the nock

and removed it from the quiver. The left hand moved forward with the wrist up, which placed the bow horizontally in front of him. He laid the arrow across the bow and steadied it with the forefinger of his left hand. With his right hand he turned the arrow so that the cock feather pointed upward and carefully fitted it on the string. He then turned the right hand so that the palm was up and placed it under the string, fitting the nock in the slit of the tab which placed the nock between the first and second fingers. He adjusted the three drawing fingers so that the bow string rested on the pads of the three drawing fingers. Both hands were then lowered and to the left, which placed the bow, again, with the back toward the ground.

He looked at the target again, straightened his shoulders and inhaled deeply. He lifted both arms upward until the arrow was level with the target and the bow was in a perpendicular position. The left arm was extended forward with the elbow pointing to the left. The left shoulder was down. The left hand loosely held the bow. The right elbow was elevated so that the forearm and hand were in direct line with the arrow. With a combination of biceps, shoulder, and back muscles, he seemed to stretch thus pulling the string with the arrow backward to the region of the throat. The right hand straightened out; the only parts of the hand that were not straight were the last joints of the drawing fingers. The right hand came to rest at the throat where it was snugly anchored with the jaw bone resting on the forefinger and the bowstring touching the chin near its center. The string may have, also, touched the end of his nose.

His head was shifted so that the string appeared to be on line with the left edge of the pupil of the right eye. His bow was equipped with a sight that had been previously adjusted. The bow was cradled in the left hand, the fingers not touching the bow handle. The left arm was extended rigidly forward. The string was pulled until the pile was on the arrow rest.

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The archer carefully aimed, placing the sight on the gold or the center of the target. The arrow did not creep forward.

With the right hand firmly pressed against his anchor, it seemed to perform two movements in unison. The hand crept slightly backward and the drawing fingers slightly relaxed thus loosing the arrow which sped on its unerring way to be quivered in the gold.

The archer did not move a muscle for a moment. The right hand was still at anchor and the left arm was still up and pushed rigidly forward as his eyes followed the arrow's flight.

The above recital describes the shooting of an arrow correctly, but a number of things must be discussed.

BEGINNERS PREPARATIONS

To the person who has never shot bow, it would be best to buy an ordinary lemonwood bow. If the potential archer is a mature man of average strength, a bow of 30 to not over 35 lbs. is recommended. Ladies should select a bow of 20 to not over 25 lbs. for their first bows. It is recognized that these beginners are capable of pulling bows very much stronger than these recommendations. One of the very first things the tyro should do is to forget all about how strong he or she is. This is not a contest of great strength; it is learning the fine art of shooting. The beginner should be complete master of the bow. As a matter of fact the bow should not be heavy enough to even take his mind off the many things he must remember and do.

This point is so important that I want to cite a few incidents that may influence a beginner to leave his ego at home when he goes to purchase a bow. The salesman certainly must be a diplomat of high order if he is able to sell a beginner the proper weight bow. The customer may be a strong young man, conscious of his strength and proud of it. The greatest insult the salesman can give him is to cast a reflection on his physical power.

One lusty lad walked into a sporting goods store and asked to see a 90 lb. bow; the salesman told him that he was sorry he did not have a bow that heavy. The salesman braced a 60 lb. bow, handed it to the young man saying that it was a little lighter than 90 lbs., but to pull it and see what he thought of it. The young chap strained mightily but could not pull the string all the way to his chin. The lad then wanted to know the weight of the bow; the salesman merely pointed to the weight stamped on the back of it—this took most of the wind out of the customer's sails.

The salesman very diplomatically pointed out that probably there were not ten men in the city who could pull and shoot a 90 lb. bow; that it took 225 lbs. of well trained beef to accomplish that feat. Then he sold the young man on the idea, that if he really wanted to learn to be an archer, to begin with a bow well under his power. He wound up by selling the young man a 35 lb. bow. That lad developed into a fine archer.

A number of years ago, Mrs. Milner Roberts was the ladies' champion flight shot of the United States of America. She was a strong woman and had developed her muscles to a point where she could shoot a 60 lb. bow, a feat very few women can do. On one occasion Mrs. Roberts was practicing when a Y.M.C.A. instructor, a young athlete of great strength, wanted to try her bow. He struggled with all his power, the sweat ran from his face but he never did get the string back to his chin. He afterwards said that he was never so embarrassed in his life.

The beginner must remember that, in shooting a bow, he is using muscles that he never knew he had, muscles that have never been developed; that he cannot shoot a heavy bow until these muscles have been developed. He must begin with a lighter bow, gradually building up these dormant muscles until he is capable of handling a bow of greater weight.

In the spring, when I begin to shoot after a six months' lay off over winter, I start with a light bow and build up those

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neglected muscles before I begin serious training with my regular tackle; this is merely using common sense.

The next thing to do is to get a dozen inexpensive arrows that are of proper length and spine, an arm guard, and a finger tab or glove.

The next step is to learn how to string or brace a bow. Most bows are now furnished with strings with an eye or loop on each end. Some are furnished with an eye for the upper end and a reinforced lower end. If the single eyed string is not fitted to the bow, then it must be fitted. Put the loop over the upper bow nock and slide it down 4 inches below the nock.



FIGURE 27—The Timber Hitch.

Hold it in this position with the right hand, running the string and the bow through the left hand until the lower nock is reached. Mark this position on the string and tie a timber hitch (Fig. 27) and then tighten it around the nock. II it is a double looped string, first put the upper loop over the upper end of the bow and then fasten the lower loop in the lower nock of the bow. In either case the bow is now ready to be braced.

Grasp the bow handle with the right hand with the back of the bow toward you. Place the lower end of the bow against the hollow of the right foot. The left foot should be one step away and slightly forward. Place the heel of the left hand on the upper limb slightly below the loop of the string. Now pull



FIGURE 28—The Fistmele.

backward with the right hand, keeping the right elbow close to the body, while the heel of the left hand pushes forward using the thumb and fingers to place the loop in the nock. Before relaxing the tension, make sure that the string is securely placed in the nocks of the bow. Now hold the bow in front of you and place your fist on the bow handle with the thumb pointing upward. The string should just touch the end of the thumb (Fig. 28). If the string is not high enough, unbrace the bow, take the lower loop off the nock, and twist the string. Replace the string and brace the bow again. Repeat this operation until the string is the proper distance from the handle, a fistmele (61/2 inches).

Fig. 29 illustrates the process of bracing a bow.

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When I learned to shoot I had no one to instruct me. I took my equipment to an open field and practiced shooting into the air. I did this on several occasions. Not having any target to distract my mind, I could concentrate all my attention to drawing and releasing. In this way I developed a technique and a loose that has stood me well in hand.

I believe it would be a good idea for the beginner to do the



FIGURE 29—Bracing a Target Bow.

same thing if it is at all convenient. This gives the student a chance to learn some of the first things first so that when he does start to shoot at the target he can begin with less confusion of thought. There will be those who will disagree and, no doubt, they will have some grounds for their arguments. But it seems to me that if the beginner can learn to keep his arrows from falling off his bow to the left, can subconsciously nock the arrows, draw to the proper anchor and release cleanly when he begins to shoot at the target, he will have less difficulty in learning how to group his arrows. I rest my case on that statement.

Back in the days of Henry VIII there lived one of the few

great scholars of that time, Roger Ascham. He was tutor to Princess Elizabeth, who later became the "Good Queen Bess." He was a lover of archery as a sport and wrote the first comprehensive treatise on this sport which he named "Toxophilus." Men of letters regard this book as a classic.

In this book Ascham laid down five cardinal steps to be taken in shooting an arrow from a bow. These were: standing, nocking, drawing, aiming, and loosing. No one has ever been able to improve on these steps unless we add the modern term, "follow through."

If we will refer to the recital mentioned above, we see that it follows these five steps, each paragraph representing one of these steps.

Had I never heard of Ascham, and his five points; had I not read Horace Ford's "Theory and Practice," in which he expanded these principles and added his famous point of aim theory; had I not studied Dr. Elmer's "Archery," which deals at great length on this same theory; I still would have chosen the same five points, as they are the natural steps that must be taken when one shoots an arrow from a bow.

We will now take Ascham's five points and discuss them one by one, in the order given by him, to which we will endeavor to apply the more modern interpretations of them.

Standing

Yes, there is a proper way to stand when shooting a bow. The process of shooting a bow requires a good deal of physical effort. In order to be steady when aiming and loosing, the feet must be placed so that the body will be properly braced and at the same time be comfortable and unstrained. Stand with the left shoulder toward the target, not facing it. The feet will be at right angles from the target. The feet should be about 15 inches apart and shifted around until they feel well planted and comfortable. Ford says the feet should be 8 to 10 inches apart. We all agree that the person who clicks his heels with

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military precision and stands very erect with heels close together makes a very handsome and snappy appearance. But the archer who has a stance like this never makes a good score; he sways on his narrow foundation, he is in a strained position, he cannot settle down to a steady aim. So, be less conscious of your appearance and get into a position that will produce the best results.

Nocking

Nocking is the process of fitting the arrow on the string. There are both right and wrong ways to do it. In order to get uniform performance from arrows they must all be shot in the same way. Nocking an arrow is important; it must be done exactly the same each time one shoots. It must be fitted on the string at exactly the same place. Some people make a mark on the string with ink; this should be exactly square with the arrow plate or arrow rest. Perhaps we should take time out and say something about the arrow rest, which is a rather new idea. Up until a few years ago the top of the bow hand was the arrow rest. This was not constant as the bow hand did not always grip the bow in exactly the same place, it might be up 1/8 of an inch or down 1/8 of an inch. This does not seem like a lot of difference, but, without troubling you with a mathematical formula, it does make a difference of 16 inches at 50 yards, enough to miss a deer or a sacrifice of 6 points on the target.

In order to remedy this uncertainty of launch position, someone came up with the arrow rest. It is a simple device in the form of a small shelf that is attached to or built into the left side of the bow handle at the upper edge of the grip. Instead of the arrow passing over the bow hand, it passes over the arrow rest. With this improvement, arrows pass the bow at exactly the same place. See pig. 30.

If arrows are not fitted on the string at exactly the same place, an error of $1/_8$ inch up or down will result in the same variations of impact that was experienced with those of the
bow hand. In order to correct these variations, the string must be definitely marked and the arrow fitted exactly on the mark. If only a pencil or ink mark is used, there is the danger that the arrow will be shifted from its position in drawing the



string. Most class A archers square the string with the arrow rest and mark the position; then two wrappings are made on the string, one just above the marked position and the other just below it. The space between these wrappings is just wide enough for the arrow nock to fit snugly. With both ends of the arrow assured of constant positions, a lot of guess work is taken out of shooting. See Fig. 31.

When shooting at the target some provision must be made to carry the extra arrows. Some put them in the pants' pocket, some wear a belt quiver and some use a ground quiver. A ground quiver is a simple gadget made from a piece of 3/16 or 1/4 inch diameter wire which is first bent to form a 3 or 4 inch circle on one end then the main wire is bent to form a 90 ° angle. The lower end is cut off to a length of 24 inches and sharpened. This is pushed into the ground at the archer's right side. This will hold the extra arrows at a convenient position; it will also act as a stand on which to place the bow while the archer goes to the target to score and retrieve his arrows. (Fig. 25D)

It is now time to nock the arrow. The bow is in the left hand at the archer's left side with the back down and the string up. With the right hand grasp an arrow between the thumb and forefinger and remove it from the quiver. At the same time swing the left hand upward to waist height with wrist up, thus bringing the bow horizontally before you. Now, place the arrow across the bow near the center. Some good archers place the arrow under the string and over the bow while others place it over both bow and string. It does not make any difference which method is used so long as it is done without effort or distraction of thought. The fingers of the right hand then adjust the arrow correctly on the string with the cock feather pointing upward. Steady the arrow on the bow with the thumb or first finger of the bow hand while the right hand is being placed on the string for the draw. We will assume that you are using a shooting tab and that it has previously been fitted on the right hand. The right hand is turned with palm up and placed under the string and brought up to it where the arrow nock is fitted in the tab's slot thus placing the nock between the first and second fingers. Both hands are then lowered to a comfortable position. The left side is still toward the target. We are now ready to begin the draw.

Drawing

Turn the head only toward the target, straighten the shoulders, take a deep breath, and satisfy yourself that you are comfortable and relaxed. Lift both arms until the arrow is pointing in the direction of the target and see that the bow is in a perpendicular position. Extend the left arm forward with the elbow pointing to the left, not down. If the elbow is on the underside of the arm, the bulge on the inside of the elbow will be in line of the string's path and will likely be struck with the string. This is not only painful but it will deflect the arrow, also cause it to fall short. The left shoulder should be down and not hunched up. With the shoulder down and elbow pointing left, the bow string has a clear path to fall until it comes to rest.

The position of the hand on the bow handle is very important. The bow should rest in the saddle of the hand with some bearing on the fleshy part of the thumb. The wrist should be held so that it is in direct line with the bow. If the wrist is bent in toward the bow, the arrow will be prone to fly left. If it is bent outward from the bow, the arm will tend to collapse. The weight of the bow should be on a straight line with the wrist.

The grip on the bow handle is also important. It should not be gripped tightly. This is at variance with the teachings of the old school which advocated a vice-like grip. If one could grip the bow exactly the same way each time with the wrist in the same position and the same amount of tension in the grip, one would get uniform results. But this seems rather impossible to do. *We must do nothing that will interfere with the free action of the bow*. Therefore, if the bow is cradled or rather suspended in the hand with nothing to hold it in position except the pressure against the hand, then free bow action can be had. Neither should the fingers close on the bow handle until *after* the arrow has cleared the bow. This requires timing—a feat one acquires after much practice. I have

often seen the bow fall from an archer's hand to the ground, even with experienced archers. But, to the person who can perfect this timing, the bow will slip through the hand only one or two inches before the fingers are closed. I have also seen leather straps attached to the handle and fastened to the wrist or finger which enabled the archer to shoot a loose grip without having the bow drop from his hand.

The right elbow is now brought upward so that the upper arm is at right angles to the body. Here we will have to say something about the first real difficulty that the novice will experience.

Perhaps no archer ever drew his first arrow without having the front end of it fall off the bow to the left. Try as he may, this will happen time after time. Many overcome this problem in time without ever learning why or knowing exactly how it happened.



FIGURE 32—*Rolling the String.* A—Rolled to Left.

The beginner is conscious of the pressure of the string and fears that it will slip away from his fingers. In order to feel more secure he invariably curls his drawing fingers around the string. This rolls the string to the *left* and the more he grips the string and the arrow nock the more the arrow is actually pried away from the bow. See Fig. 32. This position of the drawing hand is all wrong. In the event that the arrow can be made to stay on the arrow rest, the release or loose will be so slow and unsteady that the shot will be ruined. The

reader will do well to study this point and get it permanently fixed in his mind.

The string must not be placed in the last knuckle joints but on the pads of the three drawing fingers about midway between the last joints and the ends of the fingers. Except for the last joints of these fingers, no part of the hand should be bent; the fingers, hand, wrist, forearms, and arrow should be a continuous straight line. This must be remembered and practiced until it becomes a subconscious act.



FIGURE 33-*Rolling the String*. A—Rolled to Right.

Now, with the string in this position, instead of its being rolled to the left, it is rolled in the opposite direction. The arrow is forced *against* the bow at the arrow rest instead of being pried away from it. See Fig. 33. This point will have to be mastered before good shooting can be done. It is my opinion that this is the most important act in the process of shooting; it is my further opinion that the archer should concentrate on this phase to the exclusion of all others until he is satisfied that he is on the way to its perfection.

Most beginners will invariably draw the string with the biceps of the upper arm. They never get very far until they learn that a lot of other muscles must assist in this process. We have stated that the elbow is up so that the upper arm is at right angles to the body; when in this position, the powerful muscles of the shoulder are brought into play, also those of the upper back. The left arm is pushing with the left shoulder bearing the load while the right side of the body is



pulling. The chest, the shoulders and the back actually put on a stretching act. As one becomes more and more proficient, all these muscles act in unison with subconscious timing; one forgets about bow weight and can concentrate on aiming and holding.

There must be a definite place for the drawing hand to stop



FIGURE 33A—*The Anchor.* Note **the** continuous straight line formed by the arrow, hand, wrist and forearm.

and to stop at this place each time an arrow is drawn. This destination of the drawing hand is called the anchor. The anchor, naturally, cannot be the same place for every individual as some have longer chins than others and some have longer noses than others. This anchor must be sought until one finds a place where one's hand finds a natural and comfortable position. This should be some place in the region of the throat. The jaw bone should rest on the forefinger and the string should contact the chin near its center. The string should touch the end of the nose or on the right side of it, if the nose is longer than average. The string should be in front of the right eye. See Fig. 33A.

If one has normal eyesight, one of the eyes will be what is known as the master eye. It is the eye that directs the vision.

If your right eye is your master eye, then it is better to shoot with both eyes open. Anyone can see twice as well with

both eyes than he can with only one. Shooting with both eyes open prevents a strain that often causes blurred vision when one eye is closed. If, however, your left eye is the master, then the archer should close the left eye or learn to shoot left handed.

I have seen people, who are right handed and whose left eyes are the masters, wear glasses with the left lenses frosted so that they may shoot with both eyes open, thus preventing both eye strain and confusion.

The distance from the eye to the anchor is the elevation of the rear sight, as the anchor is actually the rear sight. It is obvious that the arrow should be drawn to the exact same place of anchor as any perpendicular deviation of this anchor will show up on the target. In order to insure a more constant distance of that elevation, some archers wrap a small sliding knot on the string with black thread so that the eye is lined up with this marker. This makes the rear sighting quite accurate. (Refer back to Fig. 31.)

Aiming

With the bow hand properly placed, the left arm extended to a point of rigidity, the drawing hand at anchor and the arrow drawn until the end of the pile is even with the back of the bow, we are now ready to concentrate on aiming.

There are three methods of aiming an arrow. One is called "instinctive"* shooting, another is known as "point of aim," and the third is the use of a bow sight.

Instinctive shooting is, perhaps, the oldest method. It was used by the American Indians exclusively, and we have reasons to believe that the English archers used this method until the 1850's when Horace Ford introduced the point of aim in target shooting. A great many bow hunters use this

[•] Instinctive shooting is a poor name, there seems to be nothing instinctive about the process. Rut, for the lack of a better name, we are obliged to use this term.

form altogether. There will be many times that a point of aim or bow sight cannot be used while hunting. At distances up to 20 or 25 yards, instinctive shooting is probably the best way to aim.

We might compare this to throwing a stone; one cannot use any mechanical aids in aiming a stone. It is done by a "sixth sense" or feel which is brought about by practice; a coordination of eye, mind, muscle and timing. So, in shooting by instinct, the archer is governed by the same principle. He does, however, have the advantage of seeing that the arrow is lined up with the target. As to elevation, this is something that comes to the archer through practice. In using this form of aiming one should concentrate on the target, look at the target only. The eye will see the bow, the bow hand and most of the arrow by indirect vision, not in the sharp outline, but well enough to keep the arrow pointing toward the target. Instinctive shooting is perfected only by target concentration and practice. By all means do not neglect this style of shooting as you progress.

Many hunters who shoot instinctively use an anchor higher on the face than the chin; this is usually somewhere in the region of the mouth. If one is to do field shooting only and elects to shoot instinctively only, he may well cultivate and perfect an anchor that is nearer the eye. However, since good shooting is the result of doing everything exactly the same way at all times, it follows that the higher anchor must be a constant station which will not allow for any deviation of the distance between this anchor and the eye or permit any deviation in the length of the draw.

Point of aim shooting simplifies a complicated problem of angles and trajectories. One does not aim at the target when shooting point of aim; one aims at some object below or above the target which has been predetermined according to the distance one is from the target.

This takes us back to the anchor. The distance from one's

anchor to the center of the eye is about 6 inches; we will use this value in the following discussion. The length of the arrow is 28 inches. Suppose we have a rifle with a distance between the sight of 28 inches and we elevate the rear sight exactly 6 inches we would have quite an angle of elevation. Yet, this is exactly what happens when the archer looks over the point of his arrow. We have an angle with a base of 6 inches and one side of 28 inches. The line of sight and the line of arrow's point direction cross at a distance of 28 inches which we will call zero. From zero on to the target or to infinity, the distance between the line of sight and the line of arrow's point direction increases in direct ratio to the distance from zero.



FIGURE 34—*Trajectory chart.* A—Line of sight. B—Arrow and arrow point direction, C—Anchor, D—Zero, E—Eye. Note: 6" from anchor to eye.

See Fig. 34. If the arrow did not have a trajectory, it would fly over the target the above stated distances at the indicated targets. But the arrow does have a trajectory. The average

40 lb. target bow usually has a point blank aim at 80 yards. In other words, if the archer sighted over the pile and held it on the target at that distance, he would hit the target. At distances greater than 80 yards he would have to hold on some object above the target and, at distances less than 80 yards, he would have to hold on some object under the target which would be located between him and the target. This object on which the archer aims or holds is called the point of aim. See Fig. 35.



FIGURE 35—A—Line of sight, B—Arrow's flight C—Point of aim, D—Eye, E—Anchor.

Most archers who shoot point of aim usually have an object such as an ice pick or a short handled screw driver, the handle of which is painted white, which they stick in the ground for a point of aim, where this aim is below the target. If it is above the target, the archer prays for a nice tree or a high hill so he can pick out a recognizable spot on it for a point of aim. If the ground is level with no visible object above the target, the point of aim shooter is in a tough spot. However, most modern bows of 45 lbs. with aluminum arrows will have

a point of aim on or slightly under the target at 100 yards-After a point of aim has been established by trial and error at a given distance, it can be recorded in the manner given below so that it can be transposed to another target with accuracy. Hold an arrow or a stick in the left hand in a perpendicular position at arm's length and sight over the upper point of it so that this point will be on the gold. Without moving the head, drop the eyes so that you are looking at the point of aim; then move the thumb up the arrow to this position and verify it by seeing that the point of the arrow is on the target and that the thumb is on the point of aim. Mark that arrow with a pen or pencil at this point. If you want to shoot at that distance at another time or on another target at the same distance, all you have to do is to hold up the same arrow in the same manner and note some flower or blade of grass that will be in line with the mark on the arrow; then, without taking your eye off the spot located, walk up to it and push down your point of aim. Some people memorize the number of paces from the shooting line to the points of aim locations; this works out fairly well if the field is level but, if there are dips or humps on the range, they will be in for some errors.

The third form of aiming is by use of a bow sight. Since the anchor is the *rear* sight, the bow sight is the *front* sight. The bow sight is a device with movable indicators that registers longitudinal and perpendicular movements; this is fitted to the back of the upper limb of the bow. The best and simplest bow sight that I have ever seen is constructed from a strip of cellulose plastic $1/_2$ inch wide by $1/_{32}$ inch to 3/64inches thick by 5 inches long, to which a piece of felt, slightly narrower, has been cemented. A light metal carriage is formed to fit this plastic strip with a sliding friction fit. The carriage contains a pin or sighting bar that also has a sliding friction fit. When this sight is cemented to the back of the bow, the archer can get "elevation and windage." By trial and error,

the archer can locate and mark the points of elevation on this sight. When he steps up to the shooting line, all he has to do is to set the carriage on the mark indicated for the distance of the target.

There are sights with glass prisms attached to the sighting bar; these are used on bows with points of aim above the target. With the prism sight, the archer sees the image of the target which appears to be in the line of sight but, in reality, is much under it. This is much better than depending on some uncertain hill or tree for a point of aim.

The sighting bar extends beyond the bow to the left so that it can be plainly seen. This location is above the arrow rest from 1/2 inch to 3 or more inches, depending on the range of the target. The archer uses this sighting bar as a front sight, holding it on the center of the target when he aims.

The bowsight has won many converts during the last decade. It predominates in the Eastern part of the United States and is growing in popularity in the West. Whether it is better than the point of aim or not is a question of much debate. Record scores have been made by both methods. It has, however, one point of superiority on which all agree; it is a lot more convenient to use.

We will now get back to the process of aiming. Whatever form of aiming you are using, the crucial thing at this stage is concentration and holding. The sight must be steadied on the gold or the arrow point steadied on the point of aim. There must be no creeping forward of the arrow, no relaxing of the bow arm, and no shifting of the anchor until the loose is made. The bow should be perpendicular in position. The string must be almost in front of the eye; the eye should have a clear view either to the right or left of the string depending on which position seems best to you.

Loosing

This is the last thing the archer does: the results will

depend on how well he has done all these things we have discussed.

If one should ask me what I do when I loose an arrow, I would have to confess that I do not exactly know. I am reminded of a conversation I once had with a very fine pistol shot. I asked him just what he did when he pulled the trigger. He thought for a moment then answered,

"Well, Perry, I think I just wish it off."

One famous archer said that he just quit holding the string. Other have gone into great detail to explain the mental, psychological, and muscular phases of this operation which left me with no clear picture of just what they did. I watched Dr. Hickman's slow movies, set up to 4000 frames per second, where I got a somewhat better idea of what happens, and from the pictures definite conclusions can be made.

We have explained how the string rests on the pads of the fingers. This forms a very delicate "trigger"; the least movement of the drawing fingers will cause the string to slip from them. Yet this small movement will permit the arrow to creep slightly forward, a movement we want to prevent.

In view of these delicate and well nigh undescribable conditions, I have come to the conclusion that the best release would be done by easing the drawing hand very slightly backward AS the tension of the drawing fingers is slightly relaxed; this permits the arrow to begin its flight at exactly full draw, prevents jerking the string and plucking. Plucking is pulling the drawing hand away from the anchor toward the right, fatal to a perfect score.

You will, in time, evolve a release of your own. I do not believe I have ever seen any two archers who had exactly the same form of release. But whatever form you use, do it exactly the same way everytime you loose an arrow.

Follow Through

When the loose is made, the tension of the body is suddenly

removed which causes a reaction of all muscles that were under strain. This reaction is visible and felt by the archer. The drawing hand moves slightly backward, as does the right shoulder; the bow starts to drop from the bow hand, bouncing forward and touching the fingers. This is the instant that the finger must close on the bow—*after* the arrow has left the bow and not *before*. The bow arm must be kept up and forward, the drawing hand must hug the anchor, the eyes must be kept on the target and no voluntary movement of any muscle should be made until the arrow has struck.

The reason for keeping this position until the arrow has quivered is to prevent any collapse or let down just prior to or during the release.

If the reader will now turn back to the beginning of this chapter and reread the recital of the shooting of an arrow, he will get a summary of the discussion that followed it.

TARGET AND FIELD PRACTICE

From here on it is a matter of practice and application of the fundamentals. I would suggest that you now go back to the open field and shoot arrows into the air with disregard as to where they fall so long as it is in the open where they can be spotted. Keep this up until you can keep the arrow from rolling off the bow hand and you have developed a snappy or "clean" release.

If it is at all practical, this would be the time to join an archery club. By doing this, you will have access to a range and targets; what is more important, you will be associating with people some of whom will know the language and will be willing to give you a helping hand. One picks up archery in this way just as an old character I used to know said that he got the itch, by "Rubbing up against them that's got it."

Start practicing on a target about 20 yards away. If one can refrain from concentrating on score and devotes one's attention to form, one will make faster progress. When all

the processes of shooting become more or less automatic, that is when you can shoot an arrow without thinking every motion through, you can then begin to concentrate on grouping the arrows as closely as possible in the target. Like learning to drive a car, one will reach a point of confidence; one will have a subconscious feeling of mastery. When a person shoots a wild arrow he knows what causes it.

Every archer who is learning to shoot will experience slumps (the English call it the rots). This is caused by something that he is unconsciously doing wrong. The best thing to do in such an event is to sit down and think the problem through. Ask yourself if you are keeping the bow arm up, is the wrist of your bow hand straight, are you gripping the bow before the arrow has cleared, are you crooking your drawing hand, are you plucking. Chances are that plucking is the cause, or it could well be the dropping of the bow hand. Have some other archer watch you shoot and point out your errors.

When you reach a point where you can immediately lay your finger on the cause of any wild arrow and know what to do to correct it, you are on the road to success.

Now, you can line up with the rest of the boys and shoot the regular rounds. Keep on shooting, but refrain from too much shooting. Twice or three times a week is a good pattern to follow. One can grow stale by too much practice.

When you can consistently shoot over 400 in the American round, with an increase in your score from week to week, it is time to buy some new equipment. You will have arrived at the correct weight of bow you should have and the exact length of arrows you should use. Buy as good a bow as you can afford. Take along a good archer who knows bows to help make the selection. If you can get aluminum arrows, by all means select that type.

If you are unable to get metal arrows, you will have to select wooden ones. Get *matched* arrows. Footed arrows cost more than self arrows but whether they are better or not is a

debatable question. Personally, I like self arrows; they **are** lighter by at least 30 grains and 30 grains can make a noticeable difference in the point of aim at 100 yards. The lighter the arrow the greater the velocity, the greater the velocity the flatter the trajectory, the flatter the trajectory the lower the point of aim. One should not be satisfied with a point of aim that is not *under* the target at 100 yards.

When you get the feel of the new equipment you will be pleasantly surprised at the way your score goes up. It is possible to be shooting 600 Americans and over 500 Yorks the first season.

In the event that the reader may not understand the meaning of the words "American" and "York," we will now discuss this phase.

The American round consists of the following:

30 arrows at 60 yards 30 arrows at 50 yards 30 arrows at 40 yards

The regulation target is 48 inches in diameter. It is divided into five values by rings of equal breadth. The center ring is a disc 9 3/5 inches in diameter and is painted gold or yellow. The next ring is painted red; its width is 4 4/5 inches. The third ring is blue, the fourth is black, and the fifth is white. The scoring values are as follows:

Gold	9	point
Red	7	"
Blue	5	"
Black	3	"
White	Ι	"

The American round consists of 90 arrows. The possible score is 9×90 or 810. So, if one can shoot a score of 600, one is considered a good archer.

The York round is much tougher. It consists of 72 arrows

at 100 yards, 48 arrows at 80 yards, and 24 arrows at 60 yards a total of 1 gross arrows. The possible score of the York round is 9 x 144 or 1296. The best scores on this round are a little over 800.

The first man that ever cracked the 800 mark was Horace Ford, almost a hundred years ago. His record stood until rather recently. If a person can reach 500 during the first season, he is doing very well.

Then there is the Clout event. This is shot at 180 yards by men and 140 and 120 yards by ladies. The target is laid out on the ground the same as a regulation target except in feet instead of inches; it is 48 feet in diameter. Thirty six arrows are shot at this distance. The Clout is a very spectacular event and one that I enjoy very much. For ladies:

> The Columbia round 24 arrows at 50 yards 24 arrows at 40 yards 24 arrows at 30 yards The National round 48 arrows at 60 yards 24 arrows at 50 yards

The ladies also shoot the American round. At first it was more of a practice event which did not count in tournament scores; but now, it is a regular tournament event.

If the student has applied himself and is able to shoot consistent scores at the target by the end of the summer season, he is qualified to prepare for his debut at hunting deer.

WORKING FOR A MASTER'S DEGREE

I do not believe that anyone should hunt deer without being a good archer. We said in the introduction that "One must become proficient with the bow." We also said that it was a matter of education. Well, the various phases we have

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been discussing make up the academic background necessary to this proficiency and, what we are about to talk about, will be the post graduate course which, if diligently pursued, will earn the student a master's degree. The Ph.D. will be conferred by the red gods after one has at least three buck tail hanging from his belt.

About the first of September, the aspirant hunter will have to procure hunting equipment. This will be different from his target tackle. The bow will have to be shorter and heavier. The arrows will be hunting arrows and matched field arrows.

This aspirant will have been thinking about that hunting bow all through the preparatory work. He will have inspected this type of bow owned by his archer friends. He will have braced some of them and drawn them. He will have formed a good idea of what he can pull and what he cannot. We stated earlier in this book that the weight of a hunting bow should be 20% under the maximum one can draw. You will have been convinced that, say, 65 lbs. is all you can manage to draw and hold for a few seconds to the chin. Deducting the 20%, you will have decided that 52 lbs. is the proper hunting bow to get. You will also have arrived at the proper length arrow to use; this may be 27 inches.

You will have heard many opinions expressed concerning the various materials to be used in hunting bows—in other words you will have formed a rather definite opinion as to the kind of bow you will purchase. Your choice may be governed largely by your purse. If you find that you do not want to exceed around \$15 for a bow, you have a choice between hickory and backed lemonwood. The decision to choose between these bows may well rest with the time of year you expect to hunt.

In Wisconsin, Michigan and Pennsylvania, the deer season opens up for the archer during early and mid Fall—the most pleasant time of the year. The worst one can expect in weather, at that season, is a cold rain or a frosty morning; it

will be mostly shirt sleeve weather. To those who expect to hunt during this time of year, a good lemonwood bow backed with fibre-glass or fortisan is a good choice. If, however, the season during which you expect to hunt will run into December, especially in the northern tier of states, a well made hickory bow would be a wise choice. While hickory does not have the cast of lemonwood, it does have qualities that will hold it together in very cold weather, qualities which lemonwood lacks.

If, however, you feel that you want something better and are willing to invest any reasonable amount in buying a bow, you have a somewhat wider range as to choice. It will probably boil down to a choice between osage orange and a laminated product. It would be well to look for a properly designed recurved bow no matter what material you choose. The reader may refer back to the chapter on bows and review the principle of the recurved bow where this was discussed at some length.*

Both the self osage and the laminated bows will stand up under any weather conditions. The choice between them will depend on your choice of two qualities—*cast* or *dependability*. Osage has had the test of time and it can be depended on to take the very roughest usage and even abuse. It has a good cast—it is one of the very best hunting bows. The well made laminated bow with fibre glass back and either toxhorn or fibre-glass belly has a superior cast, will not change weight with temperature variations and will not follow the string. But the percentage of breakage appears to be somewhat greater in these bows as compared to osage. A choice of either will be a good choice.

If one is fortunate enough to be able to hunt during the early and mid Fall season, one can very well consider a backed yew—one will have to handle it with some care but its hunting

[•] One can now purchase a fair fibre-glass bow for \$15.

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qualities will be a pleasant reward. I do not recommend it for extreme cold weather. If one can afford two hunting bows, the backed yew would be the ideal second choice.

Two types of arrows will be necessary for this field training. One will want at least one dozen of matched hunting arrows. The archer can take his choice between broad heads or bodkin points, either of which will kill a deer if properly placed. One will also want a dozen matched field arrows. These should also match the hunting arrows as to weight, length, and spine. Most reputable fletchers mark these sets with a recommendation as to what weight bows they should be shot from.

The archer must make up his mind that he will have losses in breakage and arrows actually lost. Unless his purse has no bottom he had better use wooden arrows as they cost only about one-third as much as aluminum. The choice of wood should favor Port Orford cedar.

The reason for including the field arrows is, obviously, **for** practice in the field. I personally prefer the kind with the screw type point extension. If a broad head strikes a stump, log or tree, it is necessary to chop it out with an ax; it will probably be bent or broken anyway. Hunting arrows should be reserved for shooting at game only. The field points were designed to take this tough usage. By practicing with the field points one can have his sight marked for given distances or perfect an instinctive feel so that when broadheads are used the sighting need not be changed.

The quiver should be large enough to hold a dozen or more arrows. The western pattern shown in Fig. 26a is a good one and very popular. It should be made from a soft leather with a stiffener in the back to prevent collapsing. If made from hard leather it is apt to be noisy.

Finger tabs are preferred to gloves if the archer can use one without causing pain to the fingers; otherwise, get a glove. The wise archer will also include two extra bow strings,

a cake of string wax, some serving cord (6 thread cuttyhunk fishing line is excellent), a stick of ferrule cement, a tube of cellulous cement, a compact first aid kit, a pair of small pliers (long nosed) and a 6 inch flat mill file. Carry a stout knife, either medium size belt type hunting knife or a pocket knife with at least one good sized blade—and see that they are sharp. All these items can be carried in the "possibles" pocket on the quiver. Of course one must have an arm guard.

If the new hunting bow is a recurved job one may find difficulty in bracing it; the string just cannot make the steep grade when using the conventional method. The ancients perfected a method of bracing heavy reflexed bows which is now known as the "Tartar" style—this renders the operation far less difficult.

If one is right handed, place the end of the lower limb across the left ankle, step over the bow with the right foot and



FIGURE 56—Bracing a Reflexed Bow.

bring the upper limb back of and under the right shoulder. This will place the handle on the back side of the right thigh. Grasp the upper end with the right hand and heave it for-

ward; this will flex the bow so that the string can be fitted in the nock with the left hand. See Fig. 36. The designs of some reflex stations are so thick that the eye of the string will not go over them; in that event, it is necessary to have the string attached to the lower nock only; the upper eye being held in the left hand and placed over the nock when the bow is flexed enough to permit it.

Field Practice

You are now ready for field practice.

It is a lot more fun to practice if one has a companion or two. If you belong to a club it should not be difficult to get someone to go along, as the other person will probably be anxious to have company also. Many clubs have an auxiliary branch of "Field" archers; they may even be affiliated with the National Field Archers' Association or a member of the state association. If it is at all convenient, it would be a wise move to join such a group. These organizations have a regular course on which they shoot with rules regulating scoring, etc. These courses are laid out to give the members as much practical field experience as possible. One will associate with experienced hunters and should be able to gather a great deal of practical knowledge from them. Get a copy of the National Field Archers Association handbook; this gives all the details of the official course, targets, scoring, etc.

Then, there is the game of "archery golf." This is played over a regular golf course using archery tackle instead of golf equipment. If one has access to a golf course one can enjoy a lot of practical shooting which is excellent training.

In field shooting the point of aim is of no practical use and should not even be considered as a method of aiming. Obviously, one cannot say to a lordly buck, "Hold that position, big boy, while I set my point of aim." So, if you have been using point of aim at target shooting, it will be necessary to change methods. This leaves a choice between the use of a bow sight

and instinctive shooting. If the bow sight is chosen it will have to differ from the target sight with its movable carriage which is adjusted for the various ranges. One cannot petition the lordly buck to stand still while one changes one's sight. One may hunt for a long time before that lordly buck presents such an opportunity—one must be in position and ready to loose the shaft without any delay.

It follows that the sight must be a stationary object placed on the bow where it can be plainly seen under almost any light conditions. It must be so simple in design that any danger of confusion is eliminated. The most simple and the most practical sight that I have ever seen is a strip of adhesive tape attached to the belly of the upper limb in such a position and of such length that, when sighting even with the top of the tape, the point of impact is 30 yards; when sighting through the center of the strip, the impact is 40 yards; and when sighting even with the lower edge, the impact is 50 yards. It will be necessary to do a good bit of shooting to arrive at the proper length the tape should be and just where it should be attached. A bold mark across the middle of the tape with black ink will clarify the three sighting positions. It will be necessary to become so acquainted with this sight that one will subconsciously use the proper sighting station for a given distance. At distances under 30 yards the instinctive method should be used.

Distance plays a vital role in field shooting. When the aspiring hunter takes to the field for practice, one of the necessary things to learn is to estimate distances; this requires work, judgment, and patience. The best way to acquire this knowledge is to pick out an object, make a mental guess of its distance, then count the paces to it. By practice, one can learn to regulate ones pace to 36 inches. I know archers who can pace a hundred yards and not be off as much as one foot by actual measurement. Every time one shoots at an object at an unknown distance, one should pace it off when the arrow

is recovered. By constant practice one will learn to estimate distances with reasonable accuracy. Objects up hill appear farther away, down hill they look closer. In thick cover of woods, objects appear farther away. They seem to be much closer when looking across water. When you are able to make reasonably accurate estimates of distances under all normal conditions, you are much closer to successful hunting.

Even though you use a sight, do not neglect shooting by instinct. There will be times when the bow cannot be held in a perpendicular position. Accurate use of the sight can only be had when the bow is perpendicular. Overhanging boughs may make it necessary to hold the bow at an angle; under such conditions one *must* shoot instinctively. The archer who can master the instinctive form of shooting has, in the author's opinion, a far greater chance of bagging a deer than if he depends on a bowsight alone.

It may be that there is no organized club near you; in that event it will be necessary to furnish your own target. This can either be purchased or you can make one. If you have access to a piece of ground large enough for a target range, you may consider yourself lucky. If this location is such that the target cannot be erected as a permanent fixture, then it is necessary to buy a standard target which can be transported to and from the range in any ordinary car.

There are three kinds of targets on the market. One is made from rye straw, wound and sewed. Another is made from what is known as Johnson grass; this is also wound and sewed. The third is made from compressed straw, covered with cloth and quilted something like a cheap mattress. This quilted target is of little value and, if one expects to do quite a lot of shooting, one would do well not to give it consideration.

The wound and sewed rye straw target is the best of the three types; it will stand up longer under hard usage, than any other kind. These are made in two weights, standard and tournament. The tournament target is quite a husky product,

being six to seven inches thick and weighing about 65 pounds. The standard target is about five inches thick and weighs around 50 pounds.

The Johnson grass target is more moderate in price, is lighter in weight, and will give good service. It has no seeds to attract mice and rats; these rodents usually ruin a rye straw target if not properly stored over the winter.

I would like to point out that the material used in either of these targets is sometimes harvested in localities that are infested with chigoes or chiggers. There have been instances where these pests have been introduced into sections by the medium of such targets. I had the misfortune to have that happen to me; this incident has not been pleasant to remem-



FIGURE 37A—Target from Bales of Straw.

ber. I would, therefore, suggest that any new target be thoroughly sprayed with DDT or some other strong insecticide. I have practiced this precaution for several years and am happy to report that no such introduction has occurred since. If you own the ground chosen for the range or if you have permanent access to it and if conditions will permit the erection of a permanent target, then you can make one by using bales of straw in the following manner:

1. Build a platform 42 inches x 24 inches, using 2 x 4's for a base and ordinary boards nailed to the base.

2. Place this platform on the ground, sinking the rear base deep enough to tilt the platform 10° from level.

3. Place bale No. 1 on this base as shown in Fig. 37. Stand bale No. 2 on the center of bale No. 1, then stand bale No. 3 on the right of No. 2 and bale No. 4 on the left. Cap these with bale No. 5.

4. Pass two wires (No. 10 galvanized) around the structure as shown in Fig. 37a. Pull these wires as tightly as possible with the pliers and fasten. Insert a short, stout stick between these wires; one on each side of the target, and use them as levers to twist these wires until the whole target is rigid.

5. Make a wooden wedge about 3 inches wide and use it to pound straw in the cracks between the bales.

6. Shovel some soil in front of the structure high enough to cover up and hide the front edge of the platform. This will protect low arrows from being broken.

7. Secure a stout brace in the back to keep the target from falling over.

It would be well to cover the target with burlap and sew it securely; this will prevent loose straw from littering up the range. This target will last for several years if one will protect it from wet weather by using an old tarpaulin. Either cloth or paper faces may be used. When bale No. 2 gets too much shot up, it may be changed with bale No. 5.

The shooting stations are then measured and marked with stakes driven in the ground. Keep the grass mowed from the shooting line to the target and for a space of 75 feet to 100 feet behind it. Wild arrows have a peculiar habit of snaking along the sod and, if the grass is not cut short, they are very difficult to find.

To construct an NFAA range calls for quite a lot of work and requires a plot of ground ten acres in area or larger. Unless a group of five or more can be organized to share in the work and expense, one had better not attempt it. However, if such a group can be gotten together and if such a plot of ground is available, this range can be made and enjoyed. In

such an event I would suggest that you contact the National Field Archers Association, Box 383, Redlands, California, and secure a copy of the Field Archer's handbook which gives all the details as to how to construct such a range. It contains the constitution and by-laws, the rules of the game, how to score, etc.

To prepare for hunting it is necessary to do a lot of field work, and I can think of no better practice than this field contest. One must be able to judge distance closely under all conditions and be able to shoot with accuracy and speed.

Another aid in learning to shoot at moving game is the running deer target. This is a silhouette of a deer, life size, cut from corrugated paper and suspended from a wire. This wire runs over pulleys so that the target can be made to move at any desired speed from one station to another. By practicing on this moving target the student will learn how to "lead" at various speeds. This must be practiced until the student gets the feel of shooting at moving game and can make quick and accurate shots without having to think the proposition through.

In the absence of the field range, one will have to practice in the open fields, shooting at clumps of grass, bushes, stumps or any other object that presents itself. During this practice it is necessary to concentrate on estimating distances. Too much stress cannot be placed on this point.

If the student has applied himself during this field training, he will have gradually acquired the field knowledge necessary to actual hunting by the time the deer season opens. He may then join the rest of the hunters with the confidence that he, at least, has a chance of bagging a deer.



But the wary roebuck started, Stamped with all his hoofs together, Listened with one foot uplifted, Leaped as if to meet the arrow. *Hiawatha*

CHAPTER THREE

Deer

E MUST now get acquainted with the game we are to hunt. We said in the introduction that, "One must know a lot about the nature and the habits of the deer." Most of us have seen deer both in the wild state and in the parks. They are beautiful animals. More has been said and written about these animals than any other species. They have been hunted harder and longer than any other big game. Yet



it is said that there are more deer in the continental United States now than there were when Henry Hudson first sailed up the river that bears his name. A number of reasons can be given why this is so. Before the white man came, the deer herd was preyed on by such predators as wolves, panthers, and bob cats. None of these killers recognized any game laws or any season. The Indians came in for their share also, but I do not want to classify the Indian as a killer. He was a conservationist. He took only what he needed. He killed the killers and by so doing, his take probably did not equal that which he saved.

While we have a greater number of deer now than ever before, their distribution is vastly different from what it was in colonial times. When the white man first came to our shores, the deer were scattered, virtually, all over the country. The law of the survival of the fittest and nature's balance of power caused a natural distribution of deer that assured plenty of range and food for them.

Now, there are no deer to speak of in the great Mississippi Valley. * If we name the states in which only a few deer are found, the number surprises us. If we have more deer now than ever before, where are they?

East of the Mississippi, one herd is located in the New England states, principally in the state of Maine; New York state has a large herd in the Catskills and Adirondacks; Pennsylvania has a great herd, principally in the Appalachian Mountains; West Virginia, in her mountain regions; Michigan, in the northern section, especially the northern peninsula; Wisconsin, in the pine and lake country to the north; Minnesota, in the lake region to the north. These are the places where the great herds have taken their stands. There are some deer along the coastal regions of the Carolinas, Georgia, and Florida; a few are found in the lowlands and the canebrakes of the lower Mississippi River and in the

[•] In rather recent years, a sizable herd has been built up in the Ozarks.

Ozarks. From the Rocky Mountains, west to the coast, there seems to be no great change in the original distribution. There is no state, with the possible exception of Rhode Island, that cannot boast of at least a few deer.

Fifty years ago it was a different story, especially in the State of Pennsylvania. In those days the deer were getting very scarce. It was found necessary to create a Board of Game Commissioners as early as 1896. Their first act was to stop hunting deer at salt licks and running them with dogs. In 1905, the Commission established the game refuge idea which proved to be a very wise act.

In 1906, 50 deer were imported from Michigan and placed in the refuges; the following year witnessed the passage of the famous buck law, thus giving doe absolute protection.

Two men, Dr. Joseph Kalbfus and John M. Phillips deserve the thanks of all Pennsylvania sportsmen for their untiring labor in conservation activities and the wisdom they displayed in planning programs that have given Pennsvlvania one of the largest deer herds in the country. By the year 1930, the legal deer kill had reached 95,000 animals. By 1940 the herd had reached an estimated population of a million animals and the kill for that year was 186,575 deer!

The story in other sections of the country has been the same in principle—protective laws, game refuges, education of sportsmen. We now have all the deer that the marginal lands will support.

East of the Mississippi, there seems to be no more frontiers for the deer. In some sections the concentration is so great that there is not enough natural food to support them. It was found necessary to open the season on doe in order to reduce the herd in these hard pressed regions. So, in the Eastern half of our country, it would appear as though we cannot expect a great many more deer than we have now. They are relegated to marginal lands, places that the white man has exploited, "cut out and got out," leaving nature to heal the

scars. Nature can heal the scars of cut over and burned out timber lands, but it will take the forces of nature five thousand years to restore the top soil in the path of the strip miner! May I take time out to proclaim my eternal curse on the strip miner and his ilk? Truly, soil destruction is the unpardonable sin; man was literally born of the soil; during his sojourn on earth, he is sustained by the soil and, when his life's sands have run out, he is returned to the soil!

DEER CLASSIFICATION

We have, in the continental United States, three species of deer, the Virginia white tail, the mule deer, and the black tailed deer.

The Virginia white tail (*Ordocoileus Americanus*) has, by far, the greatest distribution. Their original habitat was all of the United States except the desert country of the West and the west coast, all of Mexico and Central America and northward in Canada to the St. Lawrence, thence westward bordering the height of land.

The principal distinguishing mark is the tail. This is about 12 to 15 inches long and five to six inches wide. When it is hanging down, it has the general color of the rest of the animal except that it is outlined with a margin of white. It is shaped something like a chestnut leaf, terminating in a point. When the tail is raised, exposing the underside, it is white; this, also, exposes the white flanks of the haunches. When the tail is raised, the animal can be seen for a great distance. The tail is commonly known as a flag and deer use it for signal purposes. See sketch on page 51.

Another distinguishing mark is the antlers. These have well defined base beams that rise upward, swing outward, then curve inward. The extreme ends of the main beams sometimes lack only inches of meeting. The tines grow upward from the main beam. The base tines are well developed and rise almost straight upward. A well developed head may contain three of these tines, sometimes four on each of **the** main beams. The tines seldom fork on the white tail deer. See Fig. 38.

A third distinguishing mark is the location of the musk or metatarsal glands; these are located rather low on the shank.



FIGURE 38—The White Tail Deer.

There are three general classes of the white tail deer. The eastern white tail, the southern white tail, and the northern. Color and size appear to be the chief difference in these classes.

The northern white tail is the largest of this group. A mature buck will stand 33 inches to 36 inches from the ground to the top of the shoulders. He will average 175 to 225 pounds. The northern branch of this family is distinguished by its gray color. They are found in Minnesota, Wisconsin, Michigan and the southern part of the Dominion of Canada.

The eastern representatives of this family are distributed throughout the Appalachian chain, the piedmont and tidewater country. They, of course, were first seen by the Raleigh and Jamestown colonists, hence the name, Virginia white tail.

A mature buck will stand from 31 to 33 inches from the ground to the top of the shoulders; the doe are somewhat

smaller. Bucks will average 140 pounds. The color of the eastern deer is mainly brown with a reddish tinge. This red coloration is so noticeable that they are sometimes called the red deer.

The southern white tail deer occupies the coastal regions from the Carolinas south, all of Florida and west along the



FIGURE 39—The Mule Deer.

Gulf coast to Texas. There are several sub species of this group; size seems to be the chief difference. Some of the deer, located in the keys, are not much larger than overgrown jack rabbits, weighing as little as 25 to 30 pounds.

This Virginian's cousin, the mule deer (*Odocoileus Hemionus*) is a decided westerner. The Rocky Mountains may be said to be their eastern boundary from Mexico to south Saskatchewan, thence west to the Sierra Nevadas and south to the Russian River. From the mouth of the Russian River they occupy the coastal region, including Southern California. Much of this territory is also occupied by the white tail.

The mule deer has some characteristics that are much different from the white tail. He is larger. Males stand full 36 inches high or over and weigh from 175 to 250 pounds. Their ears are large; they remind one of the ears of a mule: this is probably why they are called mule deer.



Their antlers difter somewhat from those of the white tail. The brow points are not distinctly developed. The main beam swings around and forward with the same compound curve of the white tail. The tines are forked, making a mature rack look like the growth of a stubby bush. See Fig. 39.

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The tail, too, differs from that of the white tail. It is rather round in shape. It is usually white in color from the base; the last one third of its length is black. The white hair of the underside of the haunches extends upward beyond the base of the tail thus giving the rump a distinguished white appearance. See sketch on page 191.

The metatarsal glands are large and are located high on the shank. See sketch on page 101.

The black tail deer (*Odocoileus Columbianus*) is located in a more limited area. Their eastern boundary approximates the Sierra Nevada range, thence westward to the Pacific coast. The northern boundary is southern Alaska and the southern boundary is, roughly, the Nevada elbow to the Golden Gate. He is a denizen of the big timber area.

The black tail is much like his neighbor, the mule deer, except that he is not as large. The antlers have the same characteristics. The metatarsal glands are high on the shank. The mark that distinguishes him from other deer is his tail; this is decidedly black on the upper side. Some authorities believe that he is a sub species of the mule deer.

While deer differ in appearance, size and color, and while their habits must, of necessity, differ in these various locations, the biology of the deer is basically the same in all the sub species.

The fawns, usually two in number, are dropped in the spring. They nurse from the doe until the summer months when they begin to learn to eat the various vegetation. In this stage they are camouflaged by being spotted in coloration markings which are fawn brown with lighter colored spots.

The metatarsal glands are not developed, therefore, they

have no odor. The doe will hide her fawns before she goes to feed. Nature has instilled in the doe an inherent knowledge concerning how to hide these fawns. Nature has, also, given the fawns an inherent knowledge of how to keep still when hidden. So, without odor, being camouflaged in color, being securely hidden and being absolutely still, the chance of being detected by their natural enemies is meager.

The fawns shed their coats of fine hair before cold weather comes, thus losing their spots. A new coat is grown that consists of much coarser hair. These hairs are filled with a kind of pith which makes the coat more insulating. By the next fall (the deer will then be 18 months old), the males will develop a button or spike, the first indication of antlers. By the following fall the antlers will have a Y. At 31/2 years of age, the buck will probably be a six pointer. After this age, the number of points and the size of the antlers will depend largely on the amount and quality of food the animal has plus other contributing factors. Bucks reach full maturity between the ages of six and seven years. Beyond the age of 10 or 11 years, the rack declines and often becomes misshapen and unproportionally small.

The metatarsal glands are located on the shanks of both bucks and doe. These glands secrete a scent or musk that is generally believed to be the agent whereby a scattered group can reassemble—or, a buck can follow a doe. There is much to be learned concerning all the functions and purposes of these glands. Deer also have glands on each of the four feet, located just above and on line with the cleft of the hooves; these secrete an unpleasant odor. Very little authority can be found that sheds any positive light on the purpose of these glands. It is believed, however, that by reason of this secretion, a scent is left in the tracks that enables others of their species, as well as natural enemies, to trail them.

Does a deer have a voice?

White tail deer have fairly well developed larynxes and, by

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all physiological standards, they are capable of making vocal noises. Yet, you ask the old hunters, men who have killed many deer and who have had opportunities to observe these animals under many circumstances, and most of them will tell you that they never have heard any vocal sound from a deer. Others will say that, when badly wounded, they have been known to utter a bleat resembling that of a sheep. Fawns have been known to utter such a sound when in a state of great fright. Deer will snort when surprised, especially the bucks. This is produced by exhaling the breath through the nostrils. Sometimes this will be of such force as to produce a sound not unlike a whistle.

The presence of the larynx and the apparent absence of its use have caused men to give this condition a great deal of thought. Some species of the deer family, such as the elk and the moose, certainly make use of their voice in no unmistakable way. Some of the old world deer use the voice. Some students of the deer advance the theory that since the deer is an old animal, geologically speaking—having reached a state well resembling the present species during the Pliocene—it may have used its voice as a mating call in ages past. These students reason that, perhaps, the ancient predators, which could well include the sabre tooth tiger, took advantage of the call in locating their prey and that self preservation caused the deer to silence the call. This is a subject for the scientists to give further study.

THE CYCLE OF THE ANTLERS

In order to give the reader a more comprehensive picture of natural selection, it may be well to look at the real story that lies behind the antlers—one of nature's ways that is little understood.

The breeding season comes once a year, usually in October and early November. All hunters know that bucks do a lot of fighting for possession of the doe and, as is common knowl-
edge, the victor, which we must assume is the stronger, takes this possession. This champion is called on to perform a long and exhausting biological service. Nature has equipped him with organs sufficient unto the task. But, when this service has been rendered, these glands cannot become inactive and remain dormant for another year; so, nature has created a safety valve which permits these glands to function but directs the energy created by them into a different and useful channel. This safety valve is the antlers.

A few weeks after the breeding season is over, the antlers are shed, leaving this erstwhile proud and lordly buck without his crowning glory; he is now no more impressive than his adolescent son. A few weeks after this (about early Spring) the buck begins to grow a new set of antlers. But these new antlers very little resemble the streamlined rack he so lately lost. The new antlers are spongy, filled with blood vessels, very sensitive and covered with a velvet like skin which, in its turn, is covered with very fine hair. These new racks grow rather rapidly, developing the main beams and the tines arising from them. By late Summer the new antlers will have reached their maximum size. They do not look much like antlers; they always remind me of certain cacti.

The genital organs have been active during the time these antlers have been growing. The energy from their secretion has been diverted and has contributed to the growing of the new antlers. The amount and quality of food that the buck gets and the virility of his genital glands are reflected in the size of the antlers.

Along in September, a constriction develops at the base of the new antlers; this cuts off most of the circulation and the antlers begin to dry up and harden. As the antlers shrink, the velvet covering wrinkles and loosens. It is at this time thai the bucks rub their antlers on the trees thus removing the covering. By the first of October the new antlers gleam like Toledo blades.

The secretion of the organs is now no longer used to grow antlers; it is diverted to a preparatory biological use. The buck takes on a different appearance. The neck is swollen, he seems to be in a fever, and he becomes belligerent. He has again come into his own; he is again the lordly buck and ready to venture down the primrose path in search of the lady of his choice. When he finds his mate, he remains with her for a few days until she has reached a state of emotional tranquility; then he deserts her and seeks a new mate.

It is during this activity that the bucks fight for the possession of the doe.

These antlers that, only a short while ago, were so sensitive and had to be protected with such care, are now used as weapons of offense and defense. Sometimes the combatants will spring the antlers into a lock which they cannot break. In such an encounter both animals are doomed to a lingering death from starvation. For them, as for us, "The paths of glory lead but to the grave." Happily, this does not often occur; usually, one of the contestants gives up the fight and runs away.

FOOD

Deer, like cattle, are ruminants, that is they chew their cud. Their diet consists entirely of vegetation. They must, of course, have salt.

They obtain salt by licking the mud and water around certain seeps and springs that have noticeable salt contents. In most any area, that has sedimentary rocks as a foundation, these salt springs will appear here and there. Deer have an uncanny way of locating these "licks." The old time hunters also knew the locations of these licks and many of these old timers used them to their advantage by hiding near these places and shooting the deer when they came for salt. Modern sportsmen frown on such methods, regarding them as not quite cricket.

The food that deer eat varies; they satisfy their appetites with the vegetation the area has to offer. They arc, however, more of a browser than a grazer. They eat that which is in season. In the early spring, the first green vegetation is grass. They, naturally, eat this grass and become, for the time being, grazers. But, when the buds begin to swell on various trees and shrubs, they browse on these buds. When tender leaves and shoots appear, they eat these leaves and shoots. During the summer months, there is no lack of food; they are able to get all the food they want. They feast in the fall on the bounties of nature's various harvests; it is then that the deer wax fat and build up a reserve against the lean months that lie ahead. There are still succulent twigs, leaves, dried grass, seeds of various weeds, and many other forms of food that they are able to get during the early part of winter. It is in the dead of winter, when deep snows cover the landscape, that they feel the pangs of hunger. There are storms during which they must yard up in the thick clumps of pine or hemlock and remain there until the storm lets up. If these storms are extremely severe, if the snow becomes very deep and if they last for a long period, the plight of these animals becomes extremely critical. The weakest die from starvation; herds have been greatly reduced and even wiped out by exposure and lack of food. Back when wolves abounded, these were the times when the herds suffered the greatest slaughter. But, even in mid winter, when there are normal snows, deer manage to get along. They will eat bark, bows, and laurel; even hemlock and pine. They will paw the snow from the ground and nibble on dead grass, leaves and roots. The strong usually manage to pull through the winter, thus completing another cycle of their eating habits. It is an interesting fact that the largest of the species are found in the roughest northern part of the range; the smallest are in the southern extremity. Further reference will be made to feeding in the chapters on hunting.

DEER HABITS AND ALERTNESS

A deer's defense is not its antlers. Doe do not have antlers and bucks do not have antlers that can be used as weapons except for a short period in the fall. Their defense is their fleetness of foot and being just downright smart. They are masters of strategy; they usually outguess their enemies, including *Homo sapiens*, or is it *Homo skunkus*; at least some of this genus rate the latter classification.

Their senses of sight, hearing and smell have been developed to a degree not known to man. They can smell an enemy or a friend a quarter of a mile away if the wind is right. They can see any unnatural object or movement. They can hear and distinguish any unnatural sound.

Through these senses they have evolved a protection technique that is most remarkable. They have been able to survive the wolf raids and the inroads of man himself. As long as there is food for them to get, they seem to carry on. They even flourish around farms and near centers of great populations, in some instances. As this is being written, there is a herd of some seven or eight deer, including two prime bucks, within ten miles of downtown Pittsburgh, Pennsylvania; 1 know, because I have seen them. Though they have nipped the vegetables in my garden and have trampled my flower beds, I wish them good luck and immunity to the hunters' bolts be they bullets or broadheads.

Deer have evolved a number of protective habits that seem inherent and universally adopted. One of these habits or strategems (this seems to be a better word) is to travel up wind, in other words, to travel in the direction from which the wind is blowing. When they bed down they face down wind, depending on their sight to protect them from the front and their sense of smell to protect them from the rear. They do not bed closely together; they take positions that cover all approaches to the bedding area. When they are feeding they have a habit of lifting their heads frequently for a quick

glance around. When a herd is feeding fairly close together, there is never a moment when all heads are down at the same time. If danger is detected by any of the feeding group, a hoof will stamp the ground, a tail will flick—then the whole herd will take flight with flags waving at top staff.

They seem to know the natural forest sounds such as wind blowing through the trees, the bark of a squirrel, the songs of birds, the noise of rippling water and even the noise of a storm. They know that sounds that are natural during the mid day may not be natural in the morning or evening and are alerted to those sounds. The tread of the untrained hunter, though the hunter may think he is very cautious, will be heard by the deer and recognized as a disturbance that does not belong to the area; this will put them on alert. The rubbing together of canvas clad hunters' legs, the brushing of the hunter's coat against trees, the crashing of twigs by the hunter's boots are all unnatural sounds which cause the deer to be on the alert.

Deer recognize all natural movements such as the swaying of branches, the movements of small animals, the flight of birds, etc., and pay them no heed. But, they instantly recognize any unnatural movement or object which puts them on the alert until they are satisfied that these movements or objects are harmless.

Deer are curious. If they see an object or hear a sound that seems unnatural, they will cautiously investigate by circling around, peeping from behind bushes and testing the air for scent. Sometimes they will take flight for a short distance then turn and look things over.

They have a full bag of tricks. If they think they are being trailed, they will back track, circle around, hide in the bushes and watch the hunter pass by them. They will, sometimes, actually follow him.

This, my friends, is the manner of beast that we are to hunt and endeavor to get within 40 yards or less of him.

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TRACKS

One of the most important things in hunting deer is to be able to recognize deer tracks and to know them so well that they will never be mistaken for the tracks of pigs, sheep, or cattle. If the hunter knows these tracks well enough, he can identify the tracks of fawn, doe, buck, or buck in the breeding season. He can do more; he can just about tell what the deer were doing when the tracks were made and can tell just



FIGURE 39A, SECTION *I—Deer's Shank and Foot*. 1A—Metatarsal gland, IB—Dew claw.

about when they were made. A person cannot qualify as a Class A hunter until he has a pretty fair knowledge of deer tracks.

Fig. 39A should give the reader an idea about tracks. Section 1 shows a deer's foot. Please note the lesser digits of the hoof, located on the hind part of the foot and just above the two major members on which the deer normally walks. These small sections are called dew claws. These are used as auxiliary

weight bearing units when the animal is running at a rapid gate. Sometimes these dew claws will show up in the tracks of a heavy deer when walking in soft mud and they are most always present in the tracks of a running deer.

Section 2 represents the track of a deer. The heavily shaded illustration is that of a hind foot track; the light shaded por-



FIGURE 39, SECTION 2—A Deer's Tracks. The heavily shaded print is the hind foot track. The lightly shaded print is the fore foot track. FIGURE 39A, SECTION 3—Pigs Track. FIGURE 39A, SECTION 4—Sheep's Track.





tion of this sketch represents the track made by the forefoot. It will be noted that the forefeet are larger than the hind feet. Note the sharp points of the toes and the slender, streamlined contour of these tracks. A deer can do a lot of damage with their front feet; they can cut a snake to ribbons in short order. If you are ever lucky enough to get a deer down, do not get within reach of his feet until you are certain he is dead; many a hunter has received some nasty wounds by not observing this rule.

Section 3 is the track of a pig. It is smaller and more rounded than a deer track and the stride is not nearly as long. There is little excuse to mistake pig tracks for those of a deer.

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Section 4 is the track of a sheep. You will note that this track is also smaller than a deer's track; the points of the toes are rounded instead of being sharp and the cleft is wider than a deer's.

Section 5 shows the tracks as made by a bounding deer. When bounding, a deer makes long, graceful leaps which are from is to 20 feet apart. When the deer lands, it strikes the



FIGURE 39A, SECTION 5—Tracks as Made by a Bouncing Deer.

ground with all four feet; the hind feet strike the ground in front of the forefeet. You will note the prints of the dew claws in these tracks. The extra strain on the feet causes the hooves to spread and the dew claws to contact the ground thus making a wider and stronger landing gear. Since the powerful muscles of the haunches furnish the motive power for these long leaps, it is natural to expect that the hind feet will show a deeper imprint than the forefeet do.

Section 6. Tracks of a walking doe or fawn. It is noted that the toes are pointed straight ahead, that the hind feet are

planted directly on the tracks of the forefeet. These tracks, however, are not on the center line, being two or three inches to each side of the line.

Section 7. Normal prints of an adult doe or a buck. You will note that the hind feet slightly over reach the forefeet; otherwise they have the same characteristics as described in Section 6.

Section 8. You will note that the hind feet have overreached the forefeet by several inches and that the tracks are quite a bit off the center line. These are the tracks usually made by a big, fat doe.

Section 9. Here, you will note that the hind feet do not reach as far as the forefeet; the toes are pointed slightly out-



FIGURE 39A, SECTIONS 6-12-Deer Tracks.

ward and the tracks are a noticeable distance from the center line. If such tracks are large and not quite so pointed at the toes, the chances are that it was made by a large, fat buck.

Section 10. Tracks of a deer on the trot. These tracks appear farther apart than those of a walking deer; they are directly on the center line.

Section 11. Here, we see a decided drag leading to and from the tracks. These were probably made by a buck but not during the mating season.

Section 12. Tracks of a buck during the mating season. He seems to have thrown caution to the wind and to have forgotten his usual pride as we see a continuous drag from track to track.

If the student will get these general track principles well fixed in his mind, he will be able to pretty well size up the situation when he finds deer tracks on the trail. He will also be able to closely estimate the time that has elapsed since the tracks were made if he knows the signs.

A fresh track will show a sharp impression with a decided glaze on the outer edges. Older tracks will loose the glaze and, if exposed to the sun, will show drying cracks where the soil was tightly pressed. Overnight tracks will reveal tiny dew drops, frost, or water on the bottom. If it is raining, a fresh track will be very distinct, but if water has collected in the track, it is probably a few hours old. Tracks in the mud in a stream will contain muddy water if fresh, if it is filled with clear water, it is some hours old. Tracks in moss and mulch are sharply defined for a short period of time.

Tracks made in the snow are subjected to rapid changes. If it is snowing, the tracks soon fill up. If the snow is powdery and a wind is blowing, the tracks will soon be covered by drifting snow. If it is not snowing and there is no wind, fresh tracks in the snow will have ridges of soft snow ringing them.

Signs, such as droppings, can reveal much to the hunter. If the spore is perfectly shaped and glazed, it has not been long since a deer was present; if it is steaming, get ready to shoot as the deer cannot be far away. The amount and condition of this sign seen in and around the bedding grounds will give the hunter an idea as to how much the section is used. It is, also, a barometer that tells much about the feeding grounds and the amount of traffic on the trails.

TRAILS

The primeval highway engineers were deer. Deer, like people, are prone to seek the course of least resistance. If there is a saddle or gap in a mountain ridge, the deer will not climb the steep mountain; he will go through the saddle. He follows the grades of streams and generally seeks the easiest route to the place he wants to go.

The explorer followed deer trails; the trapper followed the explorer; the homesteader followed the trapper—brushing the trail a little wider for his wagon or sled; the township made it into a country road; the county put on it a hard surface; the state covered it with a wide sheet of concrete. Thus, the engineers that blazed the original trails were deer.

Deer usually travel in small bands of 3 to 6 and, sometimes, more. They have a certain place to bed down, places to secure salt, places to water, and places to feed. After this band has passed from one of these places to another for a number of times, a well defined trail will be made. The more the trail is used, the more distinct it becomes. If a herd uses these trails season after season, a path will be made; it will be so well worn that vegetation does not grow on it.

There are usually main trails, especially leading through a saddle in the ridge, from which less worn trails branch off. Some of these branches lead to a watering place, some to bedding grounds, and some to feeding grounds. These secondary trails, also, have branches that usually lead to seasonal feeding ranges.

There will be times when main trails cross. There will be times when one sees a confusion of many trails. It is the hunter's job to learn these trails, when to expect the deer to use them and, if possible, why.

PREPARATIONS FOR HUNTING

We said in the introduction that "There are no real secrets in hunting deer with the bow." All one has to do is to get

within 40 yards, or less, of a lordly buck; at this distance no good archer should fail to score a well placed hit.

But, there seems to be a hitch to this simple formula. Bow hunters find many barriers that block the way, many obstacles that must be overcome—obstacles and barriers to which the deer make generous contributions. In order to overcome, surmount or bypass these obstacles, the hunter must be either a master woodsman or be on very good terms with that fickle old character, Lady Luck. But, Lady Luck is a Delilah; the hunter cannot pin all his faith on the law of averages; he must stake all his wits and all his knowledge against the buck's bag of tricks. He must, also, bear in mind that very long odds favor the deer.

Yes, the bow hunter, in order to be successful, must be a better woodsman than his brother with the rifle. The rifleman needs only to get within 75 or 100 yards of the deer; the bow hunter must approach three times as close.

The bow hunter must know many things which include how to dress, how to walk, how to look, how to listen, how to stand still, how to recognize deer tracks, how to read signs, how to trail, what the deer feed on, know the country where he hunts, know wind directions, know where he is, have a sense of direction, how to read a compass and many other things. The things just mentioned are important enough to rate further discussions.

One of the essential things in successful hunting is to know the country you are to hunt. Most all the firearms hunters belong to some camp or club and have hunted over the same territory year after year. They know every stream, every ridge, every stand of pine or hardwood; they know all the main game trails and all the deer crossings. If such a group should decide to use the bow in the pre-season for bow hunters, that group would have much in its favor.

The bow hunter, who does not know the country he intends to hunt, would do well to pick out a good place and

learn as much about it as possible before the season opens. It would pay that hunter to visit the hunting grounds as many times as he conveniently can and find where the deer feed, on what they feed, where they bed, the trails leading from the feeding ground to the bedding places, locate the crossings and get all the information he can about the place. If it is not possible to make these periodic trips, then the bow hunter should get to the hunting ground a day or so before the season opens in order to find out as much as possible during that time.

How to dress for a hunting trip will depend on the weather and the time of the season. In Pennsylvania, Michigan and Wisconsin, the season is mid fall when the weather is expected to be mild. Since the big herds of deer are located in these states, we must assume that more hunters will be out in mild weather than in cold weather.

No canvas clothing should be worn by the bow hunter because it makes too much noise. A hunter wearing the conventional canvas pants or breeches cannot help making a noise when one leg passes the other while walking. Canvas coats, when brushed against a tree or a bough, will create a noise that can be heard for some distance. These are unnatural sounds.

Wear woolen clothing with either a brushed nap or a soft weave; this is, perhaps, the best material for quietness and comfort.

The ideal color is something neutral such as forest green or somber brown. But, since the bow hunters are getting numerous, some attention should be paid to safety. *Red* is the traditional safety badge although it is not the easiest color to see in the woods. The conventional black and red plaid is far from a safety factor as a hunter clad in one of these traditional suits cannot be seen beyond one hundred yards in the forest. Yellow or orange can be seen much better. But, since hunters are looking for red, it is best to honor the custom, for the

present at least. One should not overdo the job of wearing bright colors as deer can also see them and may consider them as unnatural.

Therefore, one should wear a red cap, a red safety vest over the coat or, if the weather is mild, a red shirt will do.

The coat should fit rather snugly. The left sleeve should be split and cut to fit the arm and secured by a zipper. The reason for this alteration of the left sleeve is to prevent bulkiness where the arm guard is worn.

Pants or breeches may be worn but the hunter will find breeches less comfortable than pants. Pants without cuffs, if the bottoms are lapped over the ankles and pinned with safety pins, are, perhaps, the best form to wear. There is the style known as the "zouave," regular pants with a knitted cuff at the bottom, that is comfortable and practical if boots not over 10 inches high are worn.

Footwear is important and should be given a lot of thought. No man can walk quietly when wearing heavy leather boots with heels. In the fall, if the ground is dry, there is nothing better than basketball shoes; these give the feet desired protection and make it possible to walk noiselessly. Moccasins with soft soles are also good. If the weather is wet or cold, then light weight rubber boots are, perhaps, the best. Do not wear boots that are over 10 inches high; anything higher will bind the calf.

Watch the men you meet on the street and see how they walk—you walk just like them. The leg is thrown forward and, when the step is made, the *heel* is that part of the foot that strikes first. The heel strikes the pavement with a thud and makes a noise. If a hunter wears boots with heels and walks through the woods in his natural manner, a man can hear him for quite a distance and the deer can hear him a lot farther away. Wear rubber or soft leather soled shoes without heels and learn to walk by putting the soles of the feet on the ground first, turning the toes slightly inward—pigeon toed or

Indian style. By doing so, one can learn to walk with silence. Avoid stepping on dead branches as they will break and make a noise; such a sound is unnatural and will cause deer to be alerted.

WIND

Since deer depend on their sense of smell for one measure of protection to the extent of forming inherent and established habits, it behooves the bow hunter to pay a lot of attention to wind directions and wind behavior.

We have morning winds, evening winds and prevailing winds. During normal weather these winds have about the same directions. There are atmospheric disturbances caused by thermal elevations and drift that are unpredictable. Wind velocities can be summed up as storms, gales, breezes, variables and drifts. Storms may be denned as having velocities above 50 miles per hour; gales from 20 to 40 miles; breezes from 10 to 20 miles and drifts up to 6 or 8 miles per hour.

One should study winds and be able to pretty well judge their velocities. One can usually outwalk a drift and, in such instances, can travel down wind with safety; not so with a breeze or a gale. The most aggravating of all winds are the variables, those winds that seem to blow from all directions. There is not much the hunter can do under these conditions except to sit down near an active trail and wait it out.

There are a number of ways to tell in what direction the wind is blowing. One can feel a gale or even a breeze on the face; one can see the swaying of branches, the flutter of leaves, the pointing of thin grasses, etc. Drifts are, however, a little more difficult. We have all heard of the old favorite way of wetting a finger and holding it up; there will be a cold feeling on the side of the finger against which the wind is blowing. If the morning is cool or frosty, one can exhale the breath which forms a visible vapor and watch the direction in which it floats. Spider webs are very sensitive to the slightest drifts.

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The hunter may be in a valley where it appears to be in a perfect calm. In such a situation, one should spot some tree located on a ridge and watch it for a few minutes. There are usually winds blowing on the ridges and the hunter, in most instances, can discern the general wind direction by watching the trees on the ridges.

DIRECTIONS AND LOCATIONS

The bowhunter should, at all times, know where he is and about how far he is from camp or from a road. When I was going to school I learned geography by watersheds. No teacher ever taught it to me; no one ever told me about it; neither did I ever read about it. It was just one of those things that grew on me. This has been the best training I have ever had, and it has given me a more comprehensive picture of the geography of any area that I have traveled than anything else.

The hunter should locate the main stream in the country where he hunts as well as the tributaries. He should note the direction in which they flow. If he can get this picture well fixed in his mind, there is little danger of his getting lost or confused. It is a good idea to carry a compass; one will probably never have to use it but, in the event that one doubts a direction, the compass will be reassuring. If one uses a compass, one must learn how to use it, which, for the purpose of hunting, is very simple. For the hunter as well as for the survevor, there must be a starting point and a reading made of the direction one intends to travel. Pick out an easily distinguished landmark somewhere in the distance and work toward that mark. If it is found necessary to change directions, pick out another landmark and take a reading on its direction. From the two readings and the two directions one can closely estimate the reading necessary to take one back to the point of departure. A compass is no good unless it is used with intelligence.

Directions should not be difficult if the sun is shining. Any

intelligent person should know the direction of the sun at any given hour of the day. It is at night and on cloudy days that one is liable to become confused or lost. Under these conditions a compass comes in very handy.

I was never lost but once. It was in Canada, in the lake country where every acre of ground looks the same and all unknown lakes look alike. It was a cloudy day with scarcely a rift to break the solid overcast. I had, however, noted the wind and cloud directions in the early morning. I took a .22 rifle and went out for a few grouse, going in a southerly direction. I did not see any birds for sometime. I had traveled about two miles from camp before I located a covey. I shot three, gathered them up, and started in what I thought was the direction to camp. I traveled for, perhaps, a half mile before I suspected something was wrong; the forest, rocks and the general contour of the ground were not familiar.

I knew the clouds were coming from the southeast, but I could see no break in the clouds to verify their direction.

I sat down with my back to a tree, my elbows on my knees and my face in my hands for steadiness of vision. I sighted over the dead limb of a tree for a base of observation and waited for some irregularity in the cloud formation. Finally, I detected a slight rift and watched it move very slowly past the dead limb. I scratched a mark on the ground indicating the cloud direction. I was so confused that I had to scratch the face of a compass on the ground and, from the then known direction, mark the positions of North, East, South and West before I could establish the direction that would lead back to camp. I had to *make* myself believe that I had been traveling in a direction exactly opposite to that of camp. I reversed my direction, and it was not long until I was in familiar territory.

I once got confused at the corner of Wood Street and Fifth Avenue in Pittsburgh, not 100 yards from where I had worked for years. At that time, a drug store was on one of the corners of this intersection. It had an entrance from Wood Street and

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another from Fifth Avenue. I went in from the Wood Street entrance, made a purchase and went out of the Fifth Avenue entrance. When I emerged on the street, I subconsciously turned to my right, which would have been the right movement to make in order to reach my place of work had I gone out the way I had entered. For a moment I was lost. I could recognize nothing familiar and a strange sensation ran over me. I saw a clock at the other end of the block, its hands pointing to a quarter of one. Then I realized that it was Kaufmann's clock, a landmark on Fifth Avenue. I think I spent the next five minutes trying to convince myself that I had not gone crazy and wondering what I would have done had I been in an unfamiliar forest.

Getting lost is a state of mind caused by not being able to tell where you are or how to get back to camp. If a hunter will observe cloud and wind directions, water courses, ridges and landmarks, he will know where he is and know how to go where he wants to go. Be direction conscious at all times.

If, however, a person is hunting alone when darkness overtakes him and he realizes that he is lost, it is best to stop, make himself as comfortable as possible under the conditions and wait until daylight, unless a searching party finds him. The signal for help with firearms hunters is three shots from the rifle. But, since bow hunters may not carry firearms, he must do the next best thing. There is no law against carrying a whistle. All bow hunters should carry a whistle and should have a prearranged code of signals.

FEEDING AND BEDDING

The bow hunter should acquaint himself with the feeding and bedding habits of deer.

Like all ruminants, deer fill their paunches and then retire to safe cover where they finish the process of mastication by chewing the cud.

Since the hunting is done in the Fall, the bow hunter need

only to study the food eaten by deer at that time of year. Autumn is nature's time of harvest. Fruits, vegetables and nuts are ripe; tubers are mature. Deer seem to pay less attention to browsing and are prone to seek out the more fattening foods such as nuts and grain.

Some of us old timers can remember when the chestnut tree was the staff of life for squirrel, turkey, and deer. It was a sad time for wildlife when pests wiped out these wonderful trees. It was not so very long ago at that. Go to any forested section and you will see the white skeletons of dead chestnuts still standing hither and yon throughout the woods. Many of the old hunters will tell you that venison is not nearly as sweet now as it was when deer were fattened on these highly nutritious nuts.

Since the death of the chestnuts, deer have had to change their eating habits. They substitute acorns for the lost nuts. So, deer may be found in the Fall around stands of oak timber. The beech tree has a three cornered nut that is excellent food and very pleasing to the taste. It is, however, quite small in size. Deer will be found in the beech groves when there is a good mast. The deer hunter should locate these stands and note the trails; these trails will lead to water and to bedding grounds.

In Pennsylvania, especially, there are many farms that border the marginal wooded sections. Some of these farms are in use and some have been abandoned. On almost all of the abandoned farms, the orchards are still there and bear fruit. This fruit may be worm eaten and dwarfed in size from lack of care, but it is fruit nevertheless and deer love apples. Deer eat the fallen fruit and pick it from the trees as high as they can reach.

They do not confine their agricultural raids to abandoned farms alone; they have no objection whatsoever to making forays on farms where people are trying to make a living. One of the staple crops of the mountain farmer is buckwheat. If



D£EK

An excellent shape.
Ditto when strung 6 inches.
The correct bend when drawn 27 inches.
A reflexed bow, and one that bends in the hand (bad).
Reproduction of an authentic English long bow taken from Ford's "Theory and Practice" written in 1856.

deer like anything better than chestnuts it is buckwheat. In some sections it is all but impossible to harvest a crop of buckwheat because of the deer raids. Deer also like winter wheat. They will strip a shock of corn of all the outside ears. They will actually dig potatoes, using the front feet as hoes—and they can do a complete job of it. The finest, biggest and fattest deer are found in regions adjacent to farms.

The bow hunter should locate these old orchards and find out what farms are being raided as these are the places that deer are most likely to be found.

The normal feeding time for deer is late evening and early morning. If their feeding grounds are disturbed at these times, they will change their dining hours and feed at night. Therefore, the feeding time should be noted.

After paunches are well filled—be it buckwheat, apples, corn, acorns, beechnuts, browse or whatnot—they retire to the bedding grounds for rest and the completion of their digestion. These bedding grounds are selected with care which are always found in good cover—usually on ridges or on a side hill with a commanding view. There are, usually, well defined trails leading from the feeding grounds to the places where they bed down. The bow hunter must have all these things well fixed in his mind.



Right across the big sea water, Sprang with speed the deer before him. Hiawatha

CHAPTER FOUR

Hunting

ALL the preceding discussions lead up to and culminate in this chapter.

I am convinced that no one man is capable of telling exactly how deer hunting should be done in the various sections of our great country. Up to the present writing, hunting deer with the bow has been a rather haphazard process. The sport is too new for tried and true rules or an accepted standard of hunting technique. Perhaps, the future will reveal secrets not

now known to the bow hunters. The best we can do at present is to relate ways that deer have been taken with the bow and to lay down some general rules that should be of some help in successful hunting.

The author has been fortunate in getting opinions and experiences of some successful hunters. Two of these have contributed to this work.

Roy I. Case, a nationally known hunter of Racine, Wisconsin, has contributed a chapter that tells how bow hunters go about taking deer in the pine and lake countries of Michigan, Wisconsin, and Minnesota.

Jim Ramsey of Lincoln, New Mexico, has contributed a chapter on how the job is done in the Southwest. Jim is an excellent writer and a very successful hunter. He knows his way around.

The writer, with the help of many friends, will attempt to tell how to go about the business of hunting deer in the mountains of Pennsylvania, New York and West Virginia. Exactly the same principles apply to the entire Appalachian chain.

We believe that these three articles will give the reader about as much information on bow hunting as is known up to this writing.

DEER HUNTING IN THE EAST

Deer hunting in the East may be done in four ways: still hunting, hunting in pairs or small groups, watching, and drives.

No matter what form of hunting the archer decides to use, he should be prepared to start out adequately equipped with hunting gear. He should see that his broadheads are sharp, that his bow is in good condition, that he has extra bow string or strings, that he has not forgotten to take along the various articles that have been previously mentioned. He should see that he is properly clothed.

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STILL HUNTING

I think that I am correct in saying that every bow hunter wants to bag a deer by the lone wolf route. It is, therefore, natural to expect that the hunter will want to try his luck at still hunting first.

The still hunter has the task to perform of getting within bow range of the deer and, in order to make this approach, he will have to apply all the knowledge he has been able to get. He must at all times be on the alert and he must concentrate on ways to prevent the deer's getting his scent. One of the best ways to cover up the human smell is to get rid of as much of it as possible.

The human sense of smell is far from being sensitive., that is by comparison with that of deer. My nose is about average when it comes to smell, yet I can detect the presence of a person who has just had a beer or who has eaten fish or onion. I do not happen to smoke; therefore, I can smell a pipe, a burning cigarette or a cigar for quite a distance. Well, deer do not smoke, drink beer, eat bacon or fish and they don't like onions. If I can smell these things with my dulled olfactory nerves, I am convinced that deer can smell them at a considerably greater distance. On the strength of this argument, I advocate refraining from smoking while hunting. If one must have tobacco, chew it-deer are not likely to smell it in that form and, besides, tobacco juice will not start a forest fire. Avoid eating foods with strong odors. The healthy human body is always in a state of perspiration and deer are very apt at detecting human B.O. If one is unable to take a bath before starting out on the hunt, he should, at least, put on clean underclothing each morning, especially sox. Dr. Pope records that Ishi could smell a white man at 100 yards if the wind was right; and that he said a white man smelled like a horse, made a noise like a horse, but did not have horse sense. Some people go to the extreme of bruising certain leaves and smearing

them on their clothing, thus trying to add to their person a woodsy smell. Anything the hunter can do to eliminate or subdue the human odor will be greatly in his favor. It must be remembered that wild deer consider man as his worst natural enemy, which he, in truth, is.

The bow hunter should carry a pair of small binoculars. These glasses should be about 6 x 24 or not over 6 x 30. The "six" means the power of magnification and the "24" or "30" means the diameter of the objective lense in millimeters. Roughly, 24 m/m is about 1 inch and 30 m/m is 11/4 inches. These cannot be worn resting on the chest as hunters usually wear them. In this position they are in the way of the bow string when a shot is made. They may be suspended from the hunter's left side or, better yet, carried in the coat pocket. I could never do anything with my hands while binoculars bounced on my chest. I once saw a picture of Arthur Young, made while hunting in Africa, which showed his glasses on his chest but tucked in an improvised pocket that was sewed on the front of his shirt. This might work out, but I believe even this would interfere with the bowstring.

I believe that, in discussing my interpretation of hunting with the bow, I can best illustrate the theories by using hypothetical cases rather than relating actual experiences. There are, however, some outstanding experiences that give us much needed information that I will use.

So, for a while, we will follow the adventures and conquests of one John Q. Bowhunter, an imaginary soul who thinks he is adequately prepared to outsmart very smart deer. We will call time out, from time to time, to analyze his actions and to point out what he should or should not have done and why.

All right, John Q. Bowhunter started out from camp to still hunt, alone. It was very early in the morning—hardly light enough to travel. Mentally, he went over his equipment. Yes, he had his hunting bow; he could shave with anyone of the eighteen broadheads that were in his quiver; he had all the

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nicknacks such as spare strings, string wax, first aid kit, whistle, flash light, small belt ax and what not; his glasses were in the right pocket of his hunting jacket; he had on basketball shoes; he was clothed in wool; he had a red safety vest over his jacket and he wore a red cap; he had a clean body and clean clothing; he had eaten no smelly foods for breakfast. He had been taught that he should take no lunch—the idea being to reduce scent to the very minimum—but he liked to eat. He compromised by putting a bread and butter sandwich and two chocolate bars in a cellophane bag and stowed this, together with two apples, in the game pocket of his jacket which already contained a 10 foot length of soft sash cord.

Yes, he knew where the deer were feeding. He knew just about when they would begin to drift over the trail to the bedding grounds because he had watched them from a strategic position through his glasses for the past two days. He knew that this group consisted of two fawns, three doe, and a pretty good buck.

He knew that the feeding ground was an old orchard located on a bench at the head of Mink run. They would probably feed there for several days as there were plenty of apples both on the trees and on the ground. He knew that they would feed there until around 9 o'clock. So, he had planned to try to sneak up to them and try for a shot at the buck.

There was not much wind. There was frost on the ground. He blew his breath and watched the vapor drift in the general direction of the orchard. He noted this and was not too well pleased. He would have to go on down to Otter Run, up that stream, climb the ridge and approach them from the rear in order to have the wind in his favor.

It had rained some the day before yesterday and the forest floor was damp which made for quiet walking. He traveled at a good clip until he turned up Otter Run. Here he braced his bow, adjusted his arm guard and finger tab, nocked an arrow

and started up the stream. He was on the alert and executing the Indian style of walking which he had been practicing all summer. He was pleased with his speed and his supposed quietness. He blew his breath again and watched the vapor drift up the run. This was not good if a deer happened to be in this valley. He had, very cautiously, just turned a bend when he heard a snort and the stamp of a foot. He looked up to see a white flag fade in the woods. Had the deer gotten his scent or had it heard him in spite of all his caution?

Comment: The deer had heard him for some time and may have, also, gathered his scent; the deer was alerted and on the watch and saw John the instant his red cap showed around the bend.

The hunter's actions, in this instance, cannot be criticized. His purpose was to reach the orchard in a favorable position which job he was correctly doing. Under the conditions, there was nothing else he could have done. That a deer saw him first and ran was merely incidental.

He eased up to where he had seen the deer and saw where the leaves were disturbed. He followed the direction the deer had taken and saw tracks fifteen feet away which were bunched together. Twenty feet beyond these tracks was another disturbance in the leaves; he examined the place and found the tracks bunched again. He knew the deer was frightened and on the run; there was no use to follow these tracks now. He didn't know whether it was a buck or a doe anyway.

He continued up the run and, when he thought that he was opposite the old orchard, he climbed the ridge. He stopped when he reached the summit where he rested and looked around for the old orchard which he soon located not far away. He tested the wind again and found it favorable. He then began a careful stalk toward the feeding ground. Every step was made as noiselessly as possible; he took advantage of every bit of cover; he avoided all thickets and wind falls, selecting a course that offered the most quiet approach. He

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was in no hurry but kept on the move until he reached the edge of the orchard. He selected a place where he could watch yet he was well screened. He removed his cap and crept to the base of a tree where he eased his head around it and surveyed the feeding grounds. The six deer were there; they were about 50 yards away. He took the glasses from his pocket and looked the buck over; he was legal, a six pointer. He decided to wait; perhaps they would move up his way and give him a better chance to shoot as the buck was partially behind an apple tree. A blue jay saw him and began to scold. The deer were alerted; the buck started to trot across the orchard, thus putting him in the clear with a broadside exposure. John drew, led the deer about two feet, and loosed. The arrow flew well but fell behind; he had not made proper allowance for the speed the deer was traveling. Before he could nock another arrow and shoot, the deer had reached the thick cover.

He knew they had not seen him, but he also knew they were suspicious—they had learned that when the blue jay puts on a show, all is not well. He could not immediately follow as they were probably watching from cover. If he would remain still they might come back, or they might, from curiosity, circle him to find out what was wrong. He moved cautiously to a position where he had a view of the orchard and also a view of a clearing just back of him. He would wait and keep an eye on both places.

While he waited, he analyzed the shot he made. His arrow had the proper elevation, but it just missed the hind quarters, not enough lead.

We will take time out to say something about the speed of the various gaits that deer travel and how much the archer must lead a moving deer at these various speeds in order to score a hit.

About the only way the hunter can estimate how fast a deer is moving is to observe the gait in which he travels. I have looked up estimates given by several authorities and have

taken an average of their findings which are listed below:

When walking, the speed is $31/_2$ miles per hour;

When trotting, the speed is 7 miles per hour;

When loping or bouncing, the speed is 11 miles per hour;

When running in the woods, the speed is 18 miles per hour;

When on a dead run, the speed is 40 miles per hour. The authorities from which this data was computed differed somewhat in their figures. Deer do not all travel at the exact same speed any more than people walk or run at the same speed. It is quite obvious, therefore, that a definite rate of speed for all their gaits cannot be established, but the figures given above approximate these speeds.

Assuming that the average velocity of a hunting arrow is 150 feet per second (there are great variations in arrow speeds), we find that it requires

1.2 seconds for the arrow to travel 60 yards

1. second for the arrow to travel 50 yards

.8 second for the arrow to travel 40 yards

.6 second for the arrow to travel 30 yards

.5 second for the arrow to travel 25 yards

.4 second for the arrow to travel 20 yards

.2 second for the arrow to travel 10 yards

From the preceding data I have computed a table showing how far a deer will travel in feet at the various gaits and at stated distances in the time required for the arrow to reach the target. These figures represent the distances the archer must lead a moving deer.

	60 yds.	50 yds.	40 yds.	30 yds.	25 yds.	20 yds.	10 yds.
40 miles per hour							
Dead run in the open	70	58	46.6	35	29	23.3	11.7
18 miles per hour							
Run in the woods	31.6	26.4	21.12	15.9	13.4	10.6	5.3
11 miles per hour							
Bounce or lope	18.6	15.5	12.4	9.3	7.8	6.2	3.1
7 miles per hour							
Trotting	12.36	10.5	854	6.18	5.15	4.12	2.6
3.5 miles per hour							
Walking	6.	5.	4.	3.	2.5	2.	1.

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These figures apply to broadside or right angle shots. If the deer is moving quartering from the hunter, the lead should be a little over half the distances given in the table and a little more elevation given to the arrow. If it is a quartering shot with the deer moving toward the hunter, the lead should be a little under half the distance given in the table and a little less elevation given to the arrow.

In analyzing this table, one sees the futility of shooting at a running deer at distances greater than 20 yards. While the necessary lead on bouncing deer is not excessive up to 40 yards, it would be difficult to hit because the deer will be 8 feet in the air at one second and on the ground at the next. In order to score a hit, the best thing to do would be to try to connect as the deer hits the ground—a difficult shot for an archer. One can risk a 50 yard shot on a trotting deer with reasonable expectation of scoring. Walking deer do not present difficult targets; a good archer should be able to make regular hits.

The above table is useful in preparatory practice and will help the archer to develop a "sixth sense" of lead. I, for one, doubt that I could remember all these figures when a deer is on the move, and the shot must be made instantly. It seems, however, that the human mind operates in such a way that knowledge is applied without actual thought.

The reader will be impressed with what we mean by "a twenty to one chance" if we make a comparison of the velocities of firearms with those of the bow. We have taken 150 feet as the velocity of a hunting arrow. Most deer hunting rifles are in the 2250 ft. sec. class; this includes the ever popular 30/30, 32 Winchester Special, 35 Remington and 30/40 Krag. A rapid computation reveals that the bullet is traveling fifteen times as fast as the arrow; therefore, the rifleman needs only to lead his moving deer one-fifteenth as much as the bowman. We are listing below the same table with the necessary leads when using a 30/30 rifle.

	60 y	ds. 50 yds.	40 yds.	30 yds.	25 yds.	20 yds.	JO yds.
40 miles per hour							
Dead run in the open	4.9'	4.08'	3.27'	2.45'	2.04'	1.64'	.82'
18 miles per hour							
Run in the woods	2.2'	1.8'	1.46'	1.1	.9'	.7'	.35'
11 miles per hour							
Bounce or lope	16.3"	13.6"	10.9"	8.2"	6.8"	5.5"	2.8"
7 miles per hour							
Trotting	10.34"	8.62"	6.9"	5.7"	4.31"	3.5"	1.75"
3.5 miles per hour							
Walking	5.05"	4.21"	3.37"	2.53"	2.11"	1.69"	.85"

Now, when John shot at the trotting deer in the orchard, we find that he should have led it 10.3 feet whereas, if he had been using a 30/30 rifle, the lead would have been only 8.62 inches. Any condition shown in the above table should be an easy shot for an experienced rifleman; with the bow, over half of these conditions is impossible. To add to the bowman's woes, there is the element of arrow deflection caused by striking twigs or boughs. The bullet will plow through these obstacles unaffected.

John waited for a half hour and, when nothing happened, he decided to follow their trail. He knew where the buck entered the woods, but he did not see where the doe and fawns left the orchard; they had just faded away. He saw the disturbed leaves where the buck had moved along; a broken spider web and other leaf disturbances established the direction the buck had taken. There was a small marsh a little farther on; there he found tracks filled with muddy water. He knew he was on the right trail. The wind was still in his favor and he followed on, using all the caution and trailing technique that he had ever learned. He kept his eyes focused well ahead. He did not look for a whole deer; rather he was looking for a patch of gray that did not exactly fit the bushes, or a light colored fringe under another bush. He was watching for these things rather close to the ground. He kept his mind strictly on looking for deer, not wandering around on other things. He watched for the shaking of a bush or an unnatural movement. He listened intently for any sound that

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could be made by a deer on the move. He kept slowly on the move, stopping now and then to verify the trail and to look and listen. He came to a place where trails crossed; there were tracks leading in three directions. He studied these tracks; some were old, some had been made the night before and some he recognized as being fresh. He followed the fresh tracks which now was on a definite trail which led in the direction of the bedding ground. He knew that the group had gotten together again. When the trail crossed some soft, damp ground, the tracks were visible and fresh. Big tracks appeared over smaller ones; the buck was traveling true to form, always bringing up the rear. There were fresh droppings, very fresh. He stopped again and really searched all cover with his glasses but could see nothing. Cautiously, he moved on. All of a sudden there was another whistling snort and a crashing of bushes on the side of the hill to his left. He looked around just in time to see the buck bounding away. There were, also, sounds further down the trail that indicated the rest of this group were on the run. Disappointed, he continued to follow the trail for about a hundred yards; there he found where the buck had left the trail and had circled back, evidently to watch.

What mistake did the hunter make this time? We cannot find fault with his tracking and trailing; he seems to have done a good job on both scores. His mistake was that of strategy rather than tactics. A better hunter would have reasoned that the deer were disturbed if not alerted, and since the deer had been in the orchard since before dawn, they probably had their paunches filled and were about ready to begin ambling back to the bedding grounds. The good hunter would have gone back the way he came—down Otter Run—circled the deer and taken a stand on the trail he knew they would use. By so doing, he probably would have had a good shot.

John knew that this group was thoroughly alerted and that

there was no use trying to trail them any longer at that time. He drank from the brook, sat down on a log, and rested for about an hour. Then he followed the main trail for a while until he came to a place where it forked; one trail led in the direction of the bedding ground and the other in the direction of an oak grove on the point of another ridge. He knew that deer had been feeding on the acorns and speculated that, perhaps, another group might be feeding there. He, therefore, followed that trail until it crossed the brook at a marshy spot. Here he looked for tracks. The tracks were not hard to find; the marsh contained a profusion of tracks. Some were old and some, made in the water, seemed quite fresh. Close examination revealed that the water in the tracks had not entirely cleared up; they were probably made early that morning and they pointed in the direction of the grove. He tested the wind; it was quartering from the right and was favorable. He decided to ease up the trail and, perhaps, intercept the deer as they would, more than likely, soon be returning. He noted, here and there, a maple shoot that had been recently bitten off. He saw the tracks now and then and noted that larger tracks were, sometimes, made over smaller ones. This indicated a buck was in the group. He kept a sharp lookout and examined the forest with his glasses. He stopped frequently and listened. He came to a place where the trail led through a clearing of some half acre in area; here he listened again. He heard the stamp of a hoof. He stepped back in a thicket and waited. Two doe approached the clearing from the left and stopped at the edge of the clearing where they wiggled their noses testing the air for scent. Satisfied that all was well, they trotted across the clearing, then followed a course parallel to the trail. John waited and looked; presently, he saw a certain bush take on the shape of a rack. Then eyes seemed to add themselves to the picture. Yes, it was the old, cautious buck which, at that time, decided that no danger existed and started to trot across the clearing. John's bow was in position

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and the arrow was partially drawn. He whistled; the buck did not hesitate until he had crossed the clearing. He stopped at the edge of the clearing, and from behind a maple bush he turned and looked—frantically testing the air for scent. The buck was about forty yards away and presented a quartering exposure. The hunter eased back the string to full draw, aimed well and loosed. The arrow sped true toward the mark but, when it arrived, the deer was not there; he was bounding through the brush.

Comment. What happened? The arrow passed the exact spot where the deer's heart had been less than a half second before. It was now past mid morning and the sun shone brightly; it shone on the hunter and his bow. The bow had a beautiful varnish finish. When he loosed the arrow, the limbs of the reacting bow reflected a flash of light. The deer saw the flash; his reflexes were so swift that he bounded away during the .8 seconds required for the arrow to travel the forty yards that separated the hunter from the buck. Under the conditions, the deer may have seen the reaction of the bow even though it had been painted in the best light absorbing manner. The deer exercised his inherent instincts which, in that case, outmatched the training of the hunter.

John was beginning to understand just what was meant by the expression, "A 20 to 1 chance." If he were armed with a rifle, he could have easily killed both bucks. He was not discouraged; he seemed to be enjoying his experiences and learning by the hour.

He followed the trail back to where it forked; there he cautiously moved on in the direction of the bedding grounds. He selected a nice spot to eat his lunch, a position that gave him a good view of the trail. He watched and rested for about two hours and then decided to stalk the bedding ground; he reasoned that the first group he saw would now be bedded down.

The bright sun and the breeze were drying the leaves along

the trail. He was exceedingly cautious. The wind being none too favorable, he circled to a position which would enable him to approach the bedding ground upwind. He was successful in approaching the place where he had seen fresh beds the day before. Here he used every precaution and glassed the area foot by foot, bush by bush and log by log. He was easing forward toward a better position when he again heard the stamp of feet and a snort which came from across a gully some seventy-five yards to his left. He looked up to see a sight that was becoming familiar, erect flags and bounding deer.

Comments. What was wrong this time? There were two things wrong. Since he had noticed the leaves were drying (which made walking more audible) he should not have attempted stalking at that time of day. Again he had erred in strategy. When deer are bedded down they are most difficult to approach. As explained in a previous chapter, deer are on the watch and are so situated that all approaches are guarded. He had forgotten that while deer usually bed in the same locality, they never use the same beds more than once.

Under the conditions, I believe he should have taken a stand along the trail and waited for them to start back to the feeding ground.

On this day, John had twice failed to use good strategy. While speaking of strategy, I will tell of an experience that netted a nice buck for an old archer friend. He was still hunting one morning when he heard and then saw a group consisting of three doe and two bucks moving along a ridge. They were out of bow range and were traveling down wind. He knew that something was amiss as traveling downwind is something deer very seldom do. He reasoned that the deer would not travel far in that direction; they probably had some definite thing to do, such as going to water, and would return as soon as the errand was accomplished. He made his way to the ridge as quickly and as quietly as possible and concealed himself where he could watch the trail.

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His hunch was right. It was not long until the deer did return, the doe leading as usual. He let the doe pass. He was alert and at half draw when one of the bucks, a six pointer, came into view. My friend waited until he had a broadside shot and loosed the arrow, which passed through the deer's heart.

John Q. Bowhunter was now in a quandry; he knew that he had alerted the first group three times within eight hours and that they would be very cagey for the rest of the day. It was getting on toward 4 o'clock. The wind was not right for trailing them. They would not go back to the orchard until after dark, so he decided not to molest them again then. He would go back and see if he could pick up the trail of the second group and see what luck he would have.

It was after four o'clock when he finally picked up the trail of the second group. The tracks seemed to follow a general direction toward a gap in the ridge. He followed for a while and lost the trail. He hunted the ridge as he made his way toward camp which he reached about an hour later.

When he reached camp, the first thing he saw was a nice, eight point buck hanging from the rack. Henry Archer had bagged it early that morning. He got the full story from Henry that evening.

Henry had, also, arrived two days before the season opened and had looked the country over carefully. He had spotted a field of buckwheat about two miles away, located on a bench, high on the ridge across the main creek that drained the area. He had scanned the territory and visited the field; he noted deer had been feeding there recently. He was an experienced hunter, having taken many deer with the rifle; he knew his way around. He had examined signs and tracks and had noted some large tracks with rather rounded toes and had come to the conclusion that a big buck was with the herd that fed there. This field was his objective when the season opened.
Henry left camp that morning shortly after John had gone. He crossed the main creek, tested the wind—which he found favorable—and proceeded with caution to the bluff overlooking the field. He saw three deer which he appraised through his glasses. There were a doe, a fawn, and a fine buck. The field was triangular in shape and occupied an area of five or six acres. It was bounded on one side by the bluff and on the other two sides by woods. Some clumps had grown up along the boundaries and some stumps were in the field. Weeds and bushes were growing around some of the stumps.

The doe and the fawn were feeding in a depression at the lower edge of the field while the buck was located much nearer the center. Henry was a good 250 yards away from the buck and knew he had a job on his hands to get within range. He noted one of these stumps, with its clump of bushes and weeds, was located about 40 yards from the deer. He knew that his only chance was to ease his way around the edge of the woods until the stump was directly between him and the deer. There was safe enough cover for this approach except for one place; here he would have to negotiate some thirty yards with scarcely any cover. He was a good stalker. He removed his red cap and jacket, in order to become less conspicuous, and made his way with the silence of an Indian until he reached this open space. Luckily, the doe and fawn, down in the depression, were not in view and would not betray his position. He studied the situation and concluded that he would have to risk an open stalk. When the buck lowered his head to feed, Henry eased his way forward and watched for a flick of the tail and the head to start upward for a look around: then he would freeze like a statue. This went on for several minutes. The deer took no notice. He was in the buckwheat now; it was nearly knee high. When the deer lowered his head again, Henry dropped to a crawling position and repeated his tactics of moving when the deer's head was down and freezing when the head was raised. He

was greatly relieved when he finally crawled behind the cover of the stump.

He got in a shooting position where he could see the deer through an opening in the tangle of bushes, weeds and briars that grew around the stump. He waited until the deer's head was down. Then he drew, took a careful aim and loosed. The arrow was low; it seemed to brush the hair on the underside of the deer's chest. The buck flinched, turned around and looked at the arrow. He smelled it and even struck the arrow with a front foot. He sniffed, he looked around, and then went on about the business of feeding. Henry nocked another arrow, corrected his aim and shot again. He saw the arrow strike behind the shoulder. The deer clamped his tail between his legs, staggered forward, and then leaped and bounded away toward the woods.

Henry waited. He glassed the place where the deer entered the woods and marked it in his memory.

Henry went out to where the deer had been when hit and found his bloody arrow; it had gone through. He noted the time, 8:15. He moved back to the woods, found his cap and jacket and then went through the agonies of waiting until 9 o'clock. He knew the deer was hard hit; when a deer clamps his tail, he is usually mortally wounded. He knew that if such a deer is immediately followed, it will keep on going as long as it has the strength to move. But he also knew if it is not followed, it will travel a short distance, lie down and not get up again as long as it is not disturbed.

Henry was sure of this deer. He knew what a broadhead would do. Even though he had not made a heart shot, the deer could not last long. Any shot in the chest cavity is fatal. If an arrow passes through the lungs, the lungs will collapse and, besides, great veins and arteries are bound to be severed. Hemorrhage soon drains life away. So, he mused and waited.

At 9 o'clock he picked up the trail where the deer had entered the woods. The trail was not hard to follow. Blood

appeared on the bushes about two feet from the ground. A little farther on, the tracks indicated that he had quit bounding and had begun to walk. The trail circled around. Henry followed on, losing the trail now and then. When he lost the trail, he would circle until he picked it up again. The trail led back toward the field where Henry found the dead deer not fifty feet from the edge of the field.

Henry dressed and hung the deer. Then he crossed the ridge to a farm house where he engaged the farmer to haul his deer back to camp.

Comment. This writer can find no criticism to offer. Henry did a splendid job all the way through. He had made the proper preparations; he had reasons to believe a buck would be in the buckwheat; he made the proper approach; he correctly sized up the situation; he made a masterly stalk; while he made an error in judging the distance, his second arrow was correctly delivered; he was correct in waiting nearly an hour; he did a good job of trailing the stricken deer; he was correct in dressing the deer; he used his head and saved his back by getting the farmer to haul the deer to camp.

WATCHING

John, of course, wished that he, too, had bagged a deer that day but he was satisfied with his experiences. He had had a wonderful time and had learned many things. He was in excellent spirit.

When he awoke next morning it was raining—not hard, but a steady drizzle with some wind. He decided to get on a good trail and watch.

He left camp early. He put on a slicker and moved on toward the trail that led from the old orchard to the bedding ground. There was one place where the trail crossed a low ridge through a saddle or gap. Deer passing that way could not wander far from the trail, so he decided this was the place to take his stand. When he arrived, he could find no suitable

cover and it was still raining. He examined the trail but could not make much of the tracks because of the rain. It was still early and he knew he had plenty of time to construct a blind before the deer would be returning from the orchard.

He saw two saplings growing about three feet apart around which grew a cluster of honeysuckle, but these bushes were only about waist high. He lashed a branch from one sapling to the other and another branch to a bush in the rear. He draped his slicker over this framework and covered it with brush. He walked up and down the trail and looked it over; it looked natural enough. This gave him shelter as well as concealment. After making some final adjustments so that he had an opening through which he could watch and shoot, he got in a position to wait.

He knew that deer pay far more attention to moving objects than they do to ones that are stationary. He knew that a deer's sight is very sensitive and can very readily detect unnatural movements. He had been schooled in the art of being still when on a watch. He knew that the state of being still, as applied to situations like this, was to make no movement; it did not permit squirming around, quick movements of the head, swift movements of the arms or shifting the body; it meant being still in the manner that a stump is still. He remembered reading a book on deer in which the author claimed that a deer can see a person bat his eye at thirty feet. He realized that, in this blind, it probably was not necessary to exercise such extreme caution, but he decided it was good discipline and tried his best to be still.

He waited, looked and listened. Rain was still falling and the wind caused leaves and branches to fall; these disturbed his concentration on listening; he knew that he was unable to hear the approach of a deer—could not distinguish the sounds that might be made by a deer from those made by the falling leaves, the patter of the rain or the rustling of wind blown branches. He, also, knew that these same sounds caused

by the rain, while being recognized by deer as natural, prevented them from detecting sounds that were unnatural. Perhaps a rainy day favored the hunter. Then he remembered having read that a rainy day was the best kind of a day to still hunt and watch.

He realized that deer do not always walk down the middle of the trail; they often strayed some distance from it but usually followed the general direction of the trail. If they were in a hurry to get to a certain objective, they would travel directly in the trail but, if they were leisurely browsing along, they would move at some distance away where the browse was more plentiful. So, he watched both sides, noted every movement, studied every suspicious bush and kept his mind on looking for deer. He knew that a deer was only three feet high or less and that they, usually, sneaked along with heads down. So, instead of looking for a big animal high above the ground, he searched low—looked for something the size of a big dog or a sheep.

It was then around 9 o'clock and he knew that if the herd was to use the trail that day, he should see something soon. The weather might have disrupted their timetable, but he was gambling that it had not.

Presently, he saw a movement on the opposite side of the trail; he was not sure just what it was but he was on the alert. A doe came browsing along followed by the two fawns. They passed his blind and did not notice the hunter. Two more doe went by. They were followed by the buck, sneaking along with head down, about twenty yards on the other side of the trail. John picked out an opening through which his arrow could pass without interference and came to half draw. Just as the deer entered the opening, John loosed the arrow. He saw it strike low on the chest, just behind the shoulder joint and ranged a little forward. He thought that he was too low, so he nocked another arrow. The deer reared upward. When his fore feet struck the ground, he went down

on his knees, then bounded feebly away for some thirty yards, came to a halt and lay down. John waited for a while. He could see the deer through his glasses. He saw its head go down. He watched it for some time and concluded it was dead. He stalked the stricken animal with caution until he was within 20 feet of it. He drew an arrow to the head and whistled. The deer did not move. He approached it closer but. with extreme caution until he could see its eyes; they had put on the glassy stare of death.

John dressed the deer and examined the wound. He found that his broadhead had all but cut the heart in two; it had ranged forward and completely severed the aorta. The arrow had contacted heavy muscular and bony structure in the opposite shoulder; it had not gone completely through.

Comment: John used his head to good advantage all through this venture. He did take a chance on constructing the shelter. This structure could have been detected but, since the deer were traveling some twenty yards off the trail and since it was raining and the wind blowing, it turned out. well. The hunter was not sure of his knowledge of deer anatomy. He had made a perfect heart shot but he thought that his arrow had struck too low.

Many experienced hunters do not know exactly where a deer's heart is located; many of them will tell you that the heart lies about midway between back and belly at a point about four inches back of the shoulder joint; this is incorrect. The heart lies low in the chest, well up toward the forward section of the chest cavity. Actually, the heart is between and protected by the lower portion of the shoulders or the upper portion of the front legs. See sketch No. 40. You will note that just above and slightly forward of the shoulder rear joint the heart is protected only by muscle and ribs. A broadhead or bodkin will shear these ribs and pass on through the heart. You will also note dotted line circling the chest cavity; this section contains the lungs and many major blood vessels. An

arrow placed within this section is fatal. When a lung is pierced it collapses. A broadhead can hardly pass through this section without severing some major vein or artery. Such a shot will cause hemorrhage both internally and externally which will produce death within a few minutes. A shot through the abdomen will cause a hemorrhage that will produce death but the animal will live much longer than if shot



FIGURE 40—Location of a Deer's Heart.

in the chest cavity. A paunch shot is to be avoided if possible as it means a lot of trailing to recover the game.

When facing a deer, you will note a depression just where the shoulders roll in and the neck starts forward; this is called the sticking place. An arrow directed to this spot will range through the heart and on into the lungs; this is a deadly shot, one to be desired but one that requires accurate shooting.

HUNTING WITH A PARTNER

When two or more bowmen are hunting together as a team, at least one of them should be well acquainted with the country. It would be better, of course, if all concerned knew the conditions. But there may be times when a bowman will want to take along a friend who may be a novice and there may be times when he would like to take another hunter, who has had experience in hunting but has not had an opportunity to become familiar with the terrain in which they are to hunt.

The first thing a team should consider is to devise some means of communication that will not alert the game. The human voice is one of the most unnatural sounds that can be produced in the forest; therefore, the hunters should refrain from talking or shouting directions or positions. One very clever chap solved this problem by the use of crow calls. The call of a crow is a natural sound in the woods and, if properly done, deer seem to pay such sounds no heed. A prearranged code of signals can be worked out whereby the crow call can be used with very satisfactory results. It must be borne in mind that an excessive use of this call may defeat its purpose and that one should become proficient in using the call before trying it out in actual hunting.

A team, each of which knows the country, can work to a good advantage in some instances.

We have pointed out that a lone hunter has a slim chance of successfully stalking a bedding ground; a team has a much better chance.

We will assume that John Q. Bowhunter and Henry Archer have teamed up to hunt the area mentioned earlier in this chapter. Both of them know the country, the feeding grounds, and the bedding places as well as water courses and trails. Both are experienced hunters; they know about wind, directions, and distances, etc.

It is past mid morning and they know that deer are bedded

at this time of day. They first establish wind direction and then plan for John to approach the bedding ground upwind while Henry circles the objective to a position where he can advance downwind. They know the approximate distance and know about the time required to reach the grounds. They establish a timetable and plan for John to arrive at 10:30. Henry, in the meantime, will have advanced to a position where the wind will carry his scent in the direction of the deer. John blows his call, making three casual notes, which is the signal that he is ready for Henry to advance.

The deer, having gotten Henry's scent, are alerted; they will probably rise and be on the lookout for danger. Henry carefully advances until he is seen by the deer; the deer will, no doubt, retreat in the direction of the place where John is watching thus giving John an opportunity to make a good shot.

This same strategy could be used on deer when feeding or on trails where deer are in the habit of passing.

A team, no member of which is acquainted with the hunting area, will probably have better success than if the members were hunting alone. I want to point out that without some knowledge of the territory, a hunter's success can be attributed mostly to chance and that, in bow hunting, the laws of averages do no favor the archer. I cannot think of a better way to waste time and energy than to go blindly into the woods and wander aimlessly around, hoping to run across a nice buck; the chances are thousands to one that one will not.

In the event that John and Henry have a couple of days off and decide to go deer hunting and have not had an opportunity to learn anything about the area in which they are going to hunt, there are certain general principles they may apply that will add greatly to their chances of success.

They will probably drive as close to the area as possible, park their car, and prepare to hunt. No doubt, they will have

driven in the night before and will have caught forty winks in the car. It is early morning and all they can see is hills and woods. Being experienced hunters, they recognize the necessity of climbing the nearest hill and studying the territory through their glasses, locating and noting the valleys, ridges, saddles, etc. They try to locate a stand of oak or a beech grove. They scan the benches for signs of an abandoned farm or a glimpse of a field of buckwheat.

Thus, they form a fair idea of the terrain. They know that deer bed on side hills and ridges in good cover; that they feed in the stands of oak, beech groves or the abandoned farm; that the trails will be in the valleys and through the saddles.

' It is still early morning. They have located no farms, but have spotted a stand of red oak at the head of a hollow. They decide to stalk the stand of oak as the deer will probably be still on the feed. They get the wind direction and use the team strategy of one advancing upwind to position and the other then approaching downwind. If no deer are there, they examine the ground for tracks and signs. It may be that deer are not feeding there.

They then try the same procedure on a beech grove that they had marked. Beechnuts may not be mature and they find no deer sign there.

They descend to the valley and find a good trail that shows signs of recent use. Closer examination reveals fresh signs and tracks. They read these signs and conclude that the tracks are a few hours old which indicate that a group had passed that way around daybreak or before; that this group is feeding somewhere. They reason that the deer will soon leave the feeding grounds and browse along toward where they bed. The wind being favorable, they follow the trail, as the tracks indicate the presence of a buck. They are convinced that deer are active in the vicinity; the big question is, where are they?

The rutting season is starting and they know that an un-

attached or bachelor buck does not travel with doe because a stronger buck has taken over, one who will brook no interference. So, John and Henry keep eyes open for a stray buck as well as being alert to a possible interception of the returning group. They do not travel directly in the trail; they stalk slowly along, one on either side, some twenty-five yards from the runway.

Further on the tracks leave the main trail, showing that the deer had taken a less used trail which leads in the direction of a stand of scrub oak. At this stand they find plenty of sign which satisfies the hunters that deer had been feeding on acorns that morning.

Very fresh droppings indicate that they had been there not over twenty minutes ago. They search to find which way they had gone and find that they had taken cover along no recognizable trail; something had disturbed them. Possibly the deer had detected their approach.

They reason that the herd will circle around and take the trail back toward a bedding ground, the location of which is not known to the hunters. Since the wind is no longer favorable, they decide that Henry will circle by the way of a ridge and cut the trail about a half mile farther back, hoping that he can beat the deer to this position. John remains where he is until he hears the call of a crow which will be the signal that Henry has arrived and that he is ahead of the deer. Thirty minutes later John hears the signal and follows the trail some four or five hundred yards where he sees very fresh signs. He is then satisfied that the group is between him and Henry. John follows on; he makes a little noise, now and then, by shaking a bush and emitting a low whistle; he follows slowly. His purpose is to make the deer suspicious rather than putting them on alert; he wants them to pay more attention to their back trail than to the trail ahead. This strategy works. Henry is in good cover; he hears the deer approach. He sees a doe pass his opening; then a buck

comes into view. The buck turns his head and looks backward sniffing the air as if suspecting danger. It is in this instance that Henry looses a broadhead that results in the death of the buck.

Comment. These boys knew how to hunt and, by teaming up and using their heads, they entered unfamiliar terrain, succeeded in locating game, and bagged a trophy before noon. If either of them had been hunting alone, that hunter probably would not have been so successful.

DRIVES

As long as men have hunted they have made drives. The Neanderthal boys may have started it; Cro-Magnon man probably improved the technique; our own Indians had the drive well in hand; our forefathers added dogs, having got the idea from Europe; now, the modern hunter still maintains these traditions with more finesses but minus the hounds.

Bowhunters may resort to drives in a final effort to secure a trophy. Timid or inexperienced hunters may wish to use this method, hoping that their chances of success will be greater. In some sections, drives are the standard method of hunting.

The principles of all forms of drives are the same. They do differ in details of execution in various parts of the country. The methods used in drives made in a swamp and lake region are somewhat different from ones made in a mountain country. There is no difference in principle between drives made by firearms hunters and ones made by archers except that the bowhunters will not make so much noise.

In the state of Pennsylvania, this form of hunting has evolved into a pattern that has state-wide recognition. The typical Pennsylvania drive is a well organized affair. It requires a number of hunters; six seems to be the minimum for a successful drive while ten or twelve is more nearly ideal.

The hunters meet the evening before the venture for the purpose of organizing, electing a captain, deciding on the exact area to be driven and a general briefing on procedure.

Someone must know the region to be hunted. Such data as trails, crossings, streams, saddles and possible "stands" must be known and a map or sketch drawn up with this important information marked down. Usually, in a club that owns a lodge, there are men who have hunted the area year after year and who, by virtue of this experience, know the details of the topography of the region.

A captain is elected or chosen for the day. The captain is chosen because of his knowledge of the ground, his experience as a hunter, his ability to handle men and his horse sense. The captain is vested with authority and his orders must be obeyed. The next day a captain is chosen again; it may be the same man who served the day before, or it may be another person. But, whoever is captain, his word is law. It will be decided how many of the participants will be "watchers" and how many will be "drivers." Lots are usually drawn to determine who may watch and who must drive. Or, it may be that some members, by reason of age, health or physical handicaps, will be voted or appointed as watchers. After all details are agreed on and all members know their positions and their duties, they retire.

The cook gets them up next morning two hours before daylight. After a quick breakfast, the hunters move to the area to be hunted and halt near its border. The captain gets the watchers in a group and assigns them to their posts. If they know the position of the watches, they go directly to them; if they do not, the captain escorts them there. The watchers are thoroughly briefed in keeping very still and making no noise. Talking is tabooed. They are told to be on the alert, see everything and not to shoot in the direction of other watchers. The watchers must not, under any conditions, wander from the post. A violation of this rule usually results

in the expulsion of that member or a severe reprimand. The captain then returns to the drivers and places them a hundred yards or so apart where they wait for the signal to begin the drive. They are all law abiding citizens and will not start the drive until the arrival of the hour prescribed by law.

When this hour has come, the captain gives the starting signal, which may be a blast from a whistle. The drivers start their march with shouting and, otherwise, making as much noise as possible. The theory is that deer that may be in the area will be frightened and will start moving toward the watchers. It is assumed that the deer will follow the runways and make for the crossings that lead to the next valley or the other side of the mountain or the valley.

But, all deer are not so cooperative. There are many among them that have gone through previous drives. Instead of dutifully bounding down the trail to be shot by the watchers, some of them sulk in thick cover; then, when the drivers have passed on, they go in the opposite direction. Often the experienced eyes of the drivers will spot one of these sulkers which will give that hunter an opportunity to shoot.

Neither do all the deer, being driven forward, follow the middle of the trail; they have a habit of cutting in between the watchers—sneaking by with such stealth that the watchers do not see them—and using various other tricks that get them past the watcher. Deer, like people, have various degrees of intelligence; some are dumb enough to trot down the middle of the trail to be shot by the watchers.

When the drivers have advanced to the line of the watchers, that drive is over. Some camps plan and make as high as six or eight drives in a day. This procedure will be repeated, day after day, until the hunt is over for the season.

Drives made by archers are the same in organization and technique as has just been described. The main difference is that the bowhunt drivers will advance more cautiously and without noise; they do not want to frighten the game; their

purpose is to get the deer alerted and on the move. They want to keep the herd on the sneak rather than on the run. The drivers are spaced closer together because they must be within bow range of sulking deer.

WHEN THERE IS SNOW

This chapter, so far, is written on the premise that the hunting is done during the fall before the snows come. I believe that, with so many states having special bow hunting seasons during the mid fall, fully 85% of the hunting will be done during that time. There are, however, some states that have not favored the bow hunter with a forward season. In these states the bow hunter must take his chances with firearms hunters, and the seasons for gun hunters are much later, usually in early December. We can expect snow at that time of the year, especially in those regions lying north of the Mason Dixon line. New York's bow season is the two weeks prior to the firearms date, during which some snow is to be expected. Archers may also hunt in Pennsylvania along with the riflemen, which is early December. Michigan has a very long bow season, which extends into the time of year that snow can be expected.

Snow means cold weather and cold weather is not complimentary to archery. Bows as well as muscles stiffen up, fingers get numb, and much of the romance is taken out of archery when the temperature falls below 15^0 .

On the other hand, snow often has its advantages. Tracking is no problem in the snow; a wounded deer is easily followed. One can walk very quietly on a soft snow. If, however, there is a crust on the snow, a deer can hear a hunter a mile away. One can see a deer better if there is snow; the deer can, also, see the hunter more plainly.

But, be that as it may, the general principles we have been discussing can be applied when snow covers the ground. There will be a difference in the feeding habits; deer will be

browsing more at this time of the year; they will not be traveling over as much territory.

If a blizzard and deep snow come, deer will yard up in thick pine clumps or other places that offer shelter. Their feeding range will be limited to a small radius around the yarding ground. No hunter, be he rifleman or archer, should take advantage of deer during these distressing times; the good sportsman will want to go in on snowshoes and carry food to them.

WOUNDED DEER

The Northwest Mounted Police has a slogan: "Get your man." This famous slogan has become a legend and, to the members of that splendid arm of the law, it has come to be a religion. The mountie will follow his man, hound him over trackless wastes and pursue him down treacherous rivers; hunt him in summer by canoe and in winter by snowshoes and dog team. The officer never relents; he keeps doggedly on until the culprit is run down.

The true sportsman has the same inner conviction when he has wounded a deer. He feels that it is his responsibility to track down that wounded animal, come hell or high waters.

The bow hunter can usually see where he hits a deer. If it is in the chest cavity, he has nothing much to worry about. The victim is doomed to die within a few minutes from hemorrhage and lung collapse; it should not be hard to find. If, however, he sees his arrow enter the abdomen, he knows that he has a job on his hands. The victim may require a long time to die; it is capable of traveling a long distance before it succumbs. Hits in the brisket, legs, or haunch usually mean clean flesh wounds that will heal without any bad lasting results.

When a deer is hard hit, it has various reactions. If hit in the chest area, the deer will clamp its tail and rear upward, then start out on a run. If hit in the hind quarters, the deer usually gives a vicious kick and then starts to run away. A

badly wounded deer will not run very far if it is not chased. It usually slows up and lies down when it is satisfied that it is not being followed; here is where it bleeds to death.

The archer should wait for an hour; he should be just as still as if he were on a watch. During this hour's wait, the wounded animal will either die, become so weak from loss of blood that it is unable to move or become so stiff, sick and sore that it can only make feeble attempts to travel farther.

The next thing to do is to mark the place where the deer was standing when it was hit. This can be done in a number of ways; there may be a very tall tree, a dead chestnut, or a clump of pines—any of which can be spotted as a marker. Or, one can hang up his red cap or tie a handkerchief to a limb.

If the animal has been hard hit, there will be blood; more blood than if the victim had been hit by a bullet. There will, also, be tracks and disturbances on the forest floor. One great woodsman has said that no animal, the size of a deer, can travel through the forest without leaving evidence of its passing. The well trained eve can detect a disturbance of the leaves where a foot has tread, though there are no tracks. There will be broken spider webs; there will be misplaced leaves on the brush where the animal has ruffled them; then, there will be blood. Blood signs can tell a story. If smears appear on leaves about two feet from the ground, it is evident that the deer is bleeding from a wound in the chest or abdomen; if the blood seems to be frothy and sprayed on the leaves, it is evident that the deer has a lung shot, that arteries have been severed, and that the animal is spraying the blood through the nose; if there are blotches of dark blood on the bushes and on the ground, the deer has probably been hit near the liver; if there are smears of bright colored blood, it indicates a hit in the heart region.

The archer should advance with caution, be on the alert, and be at partial draw. In most instances the hunter will not have to trail the wounded animal over one hundred yards. But

there will be times when the animal is not so vitally hit and will travel greater distances. It may lie down, hear your approach and get up and travel again. This is where the hunter must use all his trailing technique. The hunter may lose the trail; in such an event, he should return to the place where he last saw signs and mark that spot as a secondary base of operations. Make a fifty foot circuit of this last position. If unable to pick up the trail, make a wider circuit and keep the eyes open and the mind on the job; the deer or its trail is somewhere within that circle. Keep on hunting until one or the other is found. It may be that darkness will overtake the hunter before he has been able to locate the animal. In that event, all the hunter can do is to leave his identification marks so he can pick up the trail the next day. Keep hunting until the deer is found or until you are satisfied that it is not wounded severely enough to die.

DRESSING A DEER

We will assume that the hunter is alone and that he has come up to the deer he has killed. We will further assume that it is October and the weather is rather warm; there is a possibility that some blowflies are around. The hunter has the task of hog dressing the deer, hanging it, and protecting it from decomposition and blowflies long enough to get help in removing the carcass to camp.

Under such conditions, the first thing to do is to locate a sapling that is standing in a shade. This sapling should be of such a size that the weight of the hunter's body can just bend it down.

There is no point in sticking the animal; it has died from hemorrhage, and there is no blood left in it.

Earlier in this book we made reference to the metatarsal glands. Some authorities believe that the failure to remove these glands from the shanks of the hind legs immediately after the animal has been killed is the reason that some deer

have a noticeable strong or wild taste. One of these experts advises the careful removal of these glands and to make sure that they do not come in contact with the carcass. Authorities do not agree concerning the removal of the genital glands. To be on the safe side, it is well to remove both the metatarsal and the genital glands.

The next thing to do is to get the deer on its back. We will break the chain of thought long enough to emphasize the necessity of having a sharp hunting knife. When we say sharp, we mean a blade that has been properly ground and honed to an edge that will shave hair from the arm. The knife need not be of sabre proportions, but it should be of a good grade of carbon steel and be properly tempered. A stainless steel knife is worthless; it will not hold an edge. Make an incision in the belly, being very careful not to puncture an intestine. Insert the first and second fingers of the left hand in the incision, using them as a safety guide while the incision is extended forward to the breast bone and backward to the vent. Now cut around the rectum until it is free; draw it, with the attached intestine, out a few inches and tie it with cord; this is to prevent excrement from contaminating the carcass. Next, the chest cavity is opened by cutting the ribs loose from one side of the breast bone; the belt ax may be used in this operation. Now cut the diaphragm loose from the chest walls. Then reach far up in the chest cavity and sever the wind pipe and the esophogus.

Roll the deer over with belly down hill, if possible, and roll the intestines out; they will clear the carcass without much force. Drag the carcass near the sapling previously located. Bend the sapling down, trim off the limbs and cut off the top. Attach the antlers to the sapling; the resistance of the bent pole will raise the carcass partially off the ground.

Cut two poles, about as thick as the forearm, and trim the branches but leave a fork or Y at the upper ends. Place these forks under the bent sapling, near the deer's head, thus form-

ing a tripod. By alternately lifting one prop then the other, the deer can be raised high enough to clear the ground.

There has been a lot of controversy concerning the method of hanging a deer. Some say that the deer should be hung with the head down, and others say the head should be up. Newsom, the famous naturalist, hunter and author, says the head should be up. I agree with Newsom. The animal will drain better and, if it rains, the hair will shed the water better while the chest cavity will not collect water.

Let the carcass drain for a while; then dry it out the best you can with leaves, moss or what other agents can be found. Cut a stick to a length of some 12 to 15 inches and sharpen both ends. Spread the carcass open and insert the stick in such a manner that the inside walls do not touch. This will allow free air circulation and will assist in drying the inside walls.

Blowflies are a problem in instances like this. The thoughtful hunter will have prepared a shroud made from mosquito netting which could be draped around the carcass, making it immune to flies. I know of no repellent that would be safe to use. Decomposition, caused by bacteria, can be delayed by spraying with a certain preparation that has recently been put on the market and sold at reliable sporting goods stores.*

Get the deer back to camp as soon as possible and hang in the shade. By the next morning, it will be chilled through. If the weather continues warm, it would be best to look up the game warden and have it legally cleared; then, it may be wise to skin and butcher the deer in camp and not try to haul the carcass exposed to the sun over a long journey home. When you reach home, take it to a cold storage locker at once or prepare and pack in a deep freeze.

If it happens to be very cold the carcass will freeze as hard as the proverbial board and this very definitely improves the meat for human consumption.

^{*} This product is called "No Ice".

PREPARING THE HEAD FOR MOUNTING

If the head is a good one and hunter desires to have it mounted, there are certain things to consider.

Too many hunters do not leave enough of the neck skin or cape when they skin and remove the head. First, an incision should be made around the shoulders (line A in Fig. 41) and extend it down the sides of the shoulders to the brisket. Second, make an incision along the back of the neck and extend it to the skull (line B, Fig. 41). Third, make diagonal incisions



FIGURE 41—How to Skin Out Head for Mounting.

from point B to each antler (lines C and D, Fig. 41). Fourth, begin at lines A and B and skin off the cape up to the skull, around the ears, and as far down the jowls as possible. Fifth, sever the head at the base of the skull; this is not difficult. After the tendons and muscles have been cut, twist the head back and forth, and it will part with the neck bone.

The cape should be cleaned of flesh and fat, dried off, and salted. See that all blood is cleaned from the hair.

The following section by Mr. Roy I. Case of 1755 South Main Street, Racine, Wisconsin, may be applied to the lake countries, not only of Wisconsin, but of Michigan and Minnesota also.

Mr. Case is an experienced bowhunter. He is an authority on archery tackle and is a good man to know if you need any information concerning broadheads. The author hopes that the reader will get much information from this section and that he will enjoy it as much as this author did.

Bow Hunting m Wisconsin

by ROY I. CASE

THERE are two methods of hunting deer, still hunting and driving. Still hunting has several variations which might be considered separate methods. There are the runway or feeding spot watchers who often build blinds, the stalkers, and yes, the road or "car" hunters, a modern form of stalkers.

These various still hunters kill more deer in Wisconsin than the drivers, for there are more of them, but I believe more deer are killed in proportion to the time and effort spent by those that hunt by driving. Much of Wisconsin is well suited for driving. It is not too hilly and has sufficient roads, fire lanes, lakes, streams, and swamps which tend to form boundaries of drivable areas.

This is particularly true of Vilas County with more lakes than any other county. Vilas County has produced more arrow killed deer than any other county since the Necedah Refuge was opened to rifle hunters and thus taking that honor from Juneau County. A good proportion of the deer killed with the bow and arrow in Vilas County are killed on drives, and this article will be about driving as practiced by bow hunters in Vilas County plus plenty of observations on how the writer thinks it should be done.

The first deer killed in Wisconsin by modern archery was killed on a drive in Vilas County. This was in the rifle season in December 1930, six years before the archers were given a season before the rifle season. We were a party of five including our Chippewa guide, John Devine. John had fished, hunted, and trapped this area for more than 50 years and his forebears before him. He did most of the driving by himself, and I have since marveled that he got any deer through to us. The woods were full of "red coats" with rifles. One or more of them usually messed up our drive by just being in the middle of it. We had to pick the tough spots, usually in the swamps. If we could circle and find the positions he wanted us to guard—perhaps one was some obscure runway by a certain windfallen tree near a draw (what is a draw, anyway?)-then we were confident that this was the time when the bow would come into its own and we could hold our heads high when the next sarcastic red coat quizzed us on just what we thought we were doing in the woods with those things. Too often we couldn't find the runway, or the tree-not even the draw. A whispered consultation: "Was the draw to the right or left of the hill?" It was so plain on the map John had drawn in the snow. "To the right, Roy, I'm sure, but where is the hill?" I was supposed to know for I was an old timer; I even have a cabin up here and had rifle hunted two seasons with John.

John always found us even if we were not in the right spot, and he always had another drive in mind after the one just completed. We did not operate from cars those days, for there were not many roads in northern Wisconsin back in 1930. The walk to get into position seldom took as much as 30 minutes, and we usually welcomed the walk in order to get warm again. Most of the drives were dry (no deer), but he put deer through enough so that we were keyed up and only disappointed when darkness ended the hunt.

The first thing John drilled into us was the necessity for quiet. No talking by the posters on the way into position, and

no breaking of branches or dead twigs to improve the shootability of one's position. If we found it necessary to do a little clearing or blind building, we should do the clearing or cutting with a knife and cut our way through. A dead branch even cut with a knife gave a noisy crack if the cutter worked too fast or didn't cut both ways.

The drives were usually short and deer might be closer to the posters than to the drivers. A deer could hear a voice a long way, or a cough or a sneeze. These and the cracking of twigs would be plenty warning to a deer to keep away from that area.

John also impressed upon us the value of concealment. On this matter deer hunters differ. Some say (mostly rifle hunters), "Just stand perfectly still and the deer won't see you even if you are in the open." This might happen occasionally in the case of a driven deer spooked by a fusillade of rifle shots. A wily old buck or doe forced down wind against his or her will uses eyes to good advantage. Even such a smart one might mistake an immovable man for a tree stub if there were other tree stubs in his vicinity. That man from then on tells of the poor eyesight possessed by deer.

A deer may fail to "see" an immovable man, but the bowman has to move before shooting, and the deer must come closer to him than to a rifle hunter. He must raise his arms to draw his bow. If he is in the open the deer will see this movement, and will make a sudden change in course or speed that will likely spoil the bowman's chance for a hit. The movement of a rifleman is less and the deer's reaction less important to the man with a gun. So why not seek concealment wherever possible? It seldom happens that some kind of a blind can't be improvised especially if the hunter can shoot from a kneeling or sitting position.

John would never make a drive up wind. A deer wants to run up wind to smell out danger and avoid it, but they will not run down wind far if they can avoid it. Deer driven up

wind smell the posters and run out the sides of the drive or break back through the drivers rather than face the hidden danger. A cross wind drive needs a stiff barrier such as a lake shore or a wide river to keep them from running out the upwind side. Lacking the barrier, the up-wind side has to be covered by the posters as well as possible.

John always drove quietly with us, though he made no special effort for silence. His intention, I believe, was to nudge the deer gently toward the posters. A deer might saunter down wind away from that human who smelled so strongly of cigarettes and who did not seem to be tracking him or trying to drive him.

We used this casual method of driving for several years after we got a pre-rifle bow and arrow season. The old Indian's legs would no longer carry him, but operating from cars now, we often took him along as expert adviser. By the casual method, I mean we had few drivers and went through without the shouting and barking associated usually with deer driving. The drivers carried sticks (seldom bows and arrows). The sticks were used to tap on trees occasionally and thus signal the location of the tapper on the driving line. When a hunter had tagged his deer he became a permanent driver and left his bow and arrows at camp. I have found that a bow and a quiver full of arrows is a real detriment to a good job of driving. A man hesitates to plunge into a thicket, a likely place for a smart old buck to hide, if he has a quiver full of brand new arrows on his shoulder. With quiver and bow it is often difficult to force one's way through some of these places, but a good driver goes through these places. Also a good driver tries to push the deer through to the poster and will shout and run to head off any animal that tries to sneak back through the drivers.

To put away his bow after he has made his kill should be part of the creed of the bow hunter. It is a violation in Wisconsin to kill another deer "for the party," although there is

nothing to prevent the resident archer from carrying his bow, for the season is usually open for some other game such as bear.

The non-resident bow hunter at this writing is permitted to shoot only deer on his bow and arrow license, and he would therefore have no legal right to carry a bow after tagging his deer. Many riflemen make a practice of hunting for the partyafter tagging a deer, and it is not unusual for one man to kill all the deer for his party. This practice by the riflemen is overlooked by the Conservation Department, but at the start of bow hunting several arrests were made of bow hunters who had killed too many deer or had taken a deer not killed by themselves. I regret that now many bow hunters in Wisconsin continue to hunt after having tagged their deer.

Our driving parties became larger as the years went by, and we had more standers than were needed to cover some of our drives. Choosing the drivers before starting each drive we found wasted time. So at the start of each day the party was divided into two equal parts, the odds and the evens, and each group took its turn at driving. There were often green drivers, beginners who had never been in the woods before, but with a large group it was easier to keep a line. The drivers were making plenty of noise, which kept up the courage of the timid ones who might be afraid of becoming lost. Most drivers now carried their bows, and more of them were getting shots while driving than when we drove quietly. The reason for this may be that the deer learned a noise that meant a drive was on and were more anxious to run out of the area. Some drivers, too, would hang back a bit on the line and keep quiet. The deer trying to sneak back through the drivers would pick this quiet spot. The hunter seeing it coming would hide and let it come.

This kind of hunting may seem devoid of skill. There certainly is less chance to use one's skill in large groups which may have in it many novice deer hunters or certainly less skill-

ful hunters. Little use to walk quietly, ball of foot touching before the heel, if others are clumping along in front and behind you, kicking rocks and cracking sticks. Perhaps little use to build a quicky blind if your fellow posters, so close to you, are standing restlessly in plain view, their too vivid clothes conspicuous to man and beast.

It is not necessary or desirable to throw up a brush pile or erect a bivouac when taking position on a drive. Whatever camouflage is added should change the appearance of the vicinity as little as possible. Very little trimming is needed to destroy the hunter's outline and cover up small movements.

A deer hunter is nearly 50% concealed if he gets down. He is more like a stump and less like a man. The right clothes helps too, in spite of the fact that deer are probably color blind. Our biggest giveaway is our white faces. Some of the real serious bow hunters paint their faces after having found that a face mask is a nuisance and hindrance. In the early 30's we carried strips of canvass to sit or kneel on because of the snow. We seldom had them very long for we would walk away and forget them, and would then resort to cutting a few balsam boughs to put on the stump or on the ground.

Kneeling is tiresome business. Few archers can keep quiet for as much as 10 minutes on the knees. My record is probably less than that, but I found, in 1936, a folding stool 13 inches high that weighed just under 1 1/2 pounds and the blind problem was solved. The folding stool has been a standard piece of bow hunting equipment for some time in Wisconsin, and I guess archers in other states enjoy sitting too. It fits in the pocket of the hunting coat or hangs on a hook on the quiver strap.

Sure, archers fall off their stools just at the crucial moment, and some archers just can't shoot sitting down. I really seldom shoot from my stool. I sneak one foot back of the stool and get the knee on the ground when I am expecting to get a shot. When I make my draw I put my weight on that knee and I am

in standard kneeling position with very little discernable movement.

My favorite blind material is hazel brush and "ferns" known as bracken, both so common in Wisconsin. The brush, cut about 3 1/2 in. high, is stuck in the ground in front of the archer, if it isn't already right where you need it. The ferns are cut too (not pulled) to avoid noise and probable cuts on hands, for the stems are tough and sometimes have sharp edges. These ferns, dry and brown by early October, are draped carefully on the interlacing branches of the bushes. Other brush will do to hold the ferns, or any small windfallen tree or tree top perhaps right where you need it, and ready for only a few ferns to be your blind.

Scrub oak boughs with the red brown leaves still on them are good blind building material in Wisconsin, but more difficult to obtain quickly and quietly. The oak boughs are tough to cut and the leaves rattle and rustle. Small evergreens make fine blinds. Often they are right there where needed and just require a little trimming or one more stuck in the ground to complete the job.

A right handed archer tries to find a location for his blind to the right of the runway. He faces the direction from which the deer are expected and should hold his shot until the deer is passing at his side. If the archer shoots at the deer coming toward him, his blind is in his way, and he must either rise or shoot through it. Also an oncoming deer is a small target, but more important, the deer is more than likely to change pace and direction so quickly that the shot will be ruined. If the archer can refrain from movement until the deer is nearly broadside to his shooting side, the deer is then not looking in his direction, and will likely hold the same pace and direction.

A frontal shot is risked if the deer should happen to stop and look back offering a broadside shot. Care must be taken to make not the slightest sound as you prepare to shoot. I have

lost two perfect chances because the arrow sliding on the bow was heard by the standing deer which jumped before I could release, or even finish the draw. I now use a well lubricated leather arrow rest and arrow plate.

A large group is difficult to manage in a drive even if the shooting positions and the lay of the land are pretty well known to most of the hunters. The job of placing the shooters takes a diplomat or a thick skinned individual. The fellow that does not see deer come his way feels put upon, and will likely crab about it.

Six or eight archers that have hunted together for a season or two will avoid most of this and have better success than driving with a large party. The small group may have more deer sneak back or go through unguarded positions on the shooting line. So what? A man can be only in one place and, with a small group, he has more opportunity to pick the place he wants. A small group will complete a drive and be on the way to another before a large group can gather the stragglers and put an end to the post mortems on "how I flubbed my chance that time."

Most Wisconsin resorts now cater to bow hunters, but it was not always thus. Resort owners and residents of the deer counties were, at first, definitely against bow hunting. "Too many deer running around with arrows in them." Their pet peeve was "road" hunting—archers cruising slowly up and down the roads in their cars looking for deer to shoot at. These hunters were killing or wounding their roadside deer, and roadside deer along with musky fishing are the main tourist attractions in the north country.

Those opposing our sport managed to get a game regulation that put a crimp in the road hunter's fun. Deer hunting was prohibited within an area 200 feet each side of the center line of all federal, state, and county roads. That left only township roads for the road hunters. A few bow hunters were arrested each season because they shot from the wrong road. Part of

these no doubt were unintentional violations. There seem to be more road hunters each year, but there are also more "Bow Hunters, Welcome" signs and more advertisements by Wisconsin resorts in the archery magazines.

Most of my hunting since '39, when the first northern area was opened to bow hunters with a pre-rifle season, has been with the guests of a resort located across the lake from any cabin. During the long summers spent at our cabin, I studied the deer trails and then made blinds on some of the best drives. These blinds were mainly of the "fox hole" type-chair height deep and about 4 feet in diameter. The dirt was piled in front of the hole. Any brush cut to open up the shooting lanes was piled on top of the dirt. A couple of poles laid across the hole close to one side gave the hunter a dry seat and one that enabled him to get one foot under for a better shooting stance. The deer soon became familiar with these blinds. They were old stuff and unsuspected by the time the season opened. I have seen tracks in one of these holes the day after I dug it. Such a blind puts the hunter even lower than the folding stool, and he can't fall out of the hole as easily as off the stool. Hunters, of course, can stand in such a fox hole.

The caravan of cars heading for the first drive would leave the resort about 8 o'clock. Most of the guests, though, had been up at dawn for some still hunting either afoot or by car and back for a 7 o'clock breakfast. The drivers piled into the leading cars, and each of the cars containing drivers had a poster along to pilot the car back to the shooting line. Thus there was no doubling back to pick up stranded cars at the end of the drive.

A posting captain will find a full suit from an old pack of cards a handy means for deciding by chance the respective location of the posters on each drive. More cards of course if more than 13 posters. The posters drop off into position in rotation as indicated by the card drawn. Ace first, King last. Thus each poster will have an equal chance for favored

positions. Little if any conversation is needed on the trail in, and the captain is relieved of responsibility.

The larger the party the fewer drives were made. Those that had shots are looking for arrows. The alibis for misses or self recriminations for lost chances must all be thoroughly expounded. This all takes time, but is part of the fun.

Often an archer is not sure whether or not he has made a hit. The arrow must be found or a thorough search made to be sure there is no blood trail before leaving the spot. Twice I have thought I missed running deer only to find the blood trail when looking for the arrow.

One of the best known and most competent bow hunters in the midwest had a 40 yard running shot at a fine buck on one of these same drives. The arrow couldn't be found but he did not look too long as he had not the slightest idea that he had made a hit, but two days later the drivers stumbled onto the dead deer with his arrow in it just a short distance from where he had shot. A regrettable loss of meat, but a trophy obtained. A picture of this hunter and the deer happens to be the only archery deer picture in a fine book, "A History of Wisconsin Deer," by Ernest Swift, Wisconsin Conservation Director. Any archer who believes that there can't be too many deer should read this book. Copies, I believe, are still available from the Wisconsin Conservation Department.

There are many cases where the archer is sure he hit the deer and subsequent search discovers the arrow void of blood or hair. The deer jumps or flinches just after the arrow is released, and the hunter is convinced that he has made a hit especially if the arrow cannot be found. Our sport was greatly harmed in the early days by such hunters back at the resort or in the taverns babbling about the deer they hit but didn't get.

When sure of a hit our hunting parties put an end to all hunting until the deer was found or the trail could no longer be followed.

In connection with this matter of determining a hit and

trailing wounded deer, I write in favor of brightly colored arrows. Bright arrows no doubt would handicap the stalker and, to a lesser degree, the runway watcher, but very little the archer positioned on a drive. If I can find my arrow or a piece of it I can determine whether I have made a hit, and from a bloody piece I can quite often learn something of the nature of the hit. I would rather run some chance of not getting a shot because the deer saw the flash of my arrow than to lose one that I had hit because I could not find the arrow or piece thereof.

We in Wisconsin have found that the ladies should not be overlooked when it comes to trailing a wounded deer. It is well known that they have better color perception than men, and they generally have more patience on a task of this nature. It was during the first or second season when the bow hunters had that bow hunters' paradise, the Necedah Refuge, that a man and his wife were hunting together on the refuge when the husband hit a deer. They started to trail it. The trail was faint and he decided to go for a pal whose experience as a trailer was greater than his own. The wife kept on hour after hour and he had not come back. At times she nearly gave up. Once the deer crossed one of the deep old drainage ditches, but she got across on a beaver dam farther down and picked up the trail again. Again she nearly lost it across a dry hay marsh with nearly waist high hay, brush and weeds. Here she got down on hands and knees, and specks of blood marking the shoulders of her tan hunting shirt proved she had not lost the trail. Finally she came upon the deer lying down, and put another arrow into it as it scrambled to its feet. She was busy cleaning the deer when hubby and pal finally found her. The husband showed up with an expert, but he had a sprained back and could not help transport the deer to the car.

Who got the Wisconsin Bow Hunters gold award pin? The husband!

The following section by Jim Ramsey, of Lincoln, New Mexico, tells us how still hunting with the bow is successfully done in the mountain and desert country of the South-West. This can be applied to any similar country in the Rocky Mountain area.

Jim really gets down to earth in this chapter; one imagines one can smell the pine and sage, feel the sting of cacti needles, see the vast mountains and desert expanse and hear the sighing of western winds as one reads these pages. Jim seems to have captured the secrets of the Red man of yesteryears and has told us about their secrets in this chapter. We believe that the reader will have a richer knowledge of hunting and a greater love for all of Nature's wild creatures when he has finished reading this article.

Hunting with the Bow and Arrow in the Great Southwest

by JIM RAMSEY

LINCOLN, NEW MEXICO

HAVING done a considerable amount of hunting with the bow in various areas of the Southwest during the past thirty-eight years, your writer will endeavor to set down here the treasure of hunting craft thus acquired.

I will deal particularly with deer hunting in different areas of the Southwest and the varying hunting conditions as they exist, since deer is the big game animal that most bow hunters seek. All in all, these methods and tricks of the trail may be applied, in a general way, to any similar locality in any section of the country.

First and foremost, the bow hunter should see to it that he is able to handle his bow properly before going off on a hunt

for big game. Every bow hunter should make it a point to practice shooting from various positions, whenever he has the opportunity, as he is likely to get shots from every conceivable position. It is certainly a very good idea for every bowman to practice until he can shoot reasonably well with either hand. Out on a hunt, it is occasionally necessary to shoot left handed when one is unable to move into position for a right handed shot without exposing himself to the game.

It is an advantage to make the arrow plate t>y fitting a piece of soft, fluffy buckskin about the handle section of the bow at the proper location, either sewing or gluing it in place; this deadens the sound of the arrow's passing the bow. A bit of fluffy buckskin, wool yarn or fur fastened about the bow immediately below each nock where the string strikes will muffle the snap of the bow cord there. The little round bush buttons provided for bow hunters are excellent for this purpose—these will also prevent twigs and weeds from catching under the bow string and hindering quiet movements through the woods.

Every bow hunter should see to it that his broadheads are good and sharp. Now, just how sharp should an arrowhead be to be game killing sharp? When one has brought his broadhead to such an edge that it will readily and cleanly slit a fresh deer hide or neatly slice off a piece of deer steak, like a sharp carving knife, it is in fit shape to try on deer or bear.

Just about the best way to sharpen a broadhead is to use a six inch, fine mill file. The final strokings with this file creates fine serrations along the edge of the blade that provides the best possible meat cutting qualities.

The quiver for carrying big game hunting arrows should be provided with individual compartments at the bottom so that each arrowhead will be held separate and apart in its own place to prevent its keen edge from being dulled by rubbing against the other broadheads. In bushy country, the bowman should use a quiver that will not emit a noisy, scraping or

drummy sound, should a stiff twig strike or scratch against it-It is advisable to cover, temporarily at least, any stiff leather quiver with a tanned, flexible fur pelt of some smallish animal. The fur will effectually deaden the sound made by any stick or twig that may scrape against the quiver. Soft sheepskin leather with the wool trimmed short, much used for lining of coats and jackets, is ideal for this purpose, too.

Many have learned, through many years of hunting, that six or eight arrows are, ordinarily, enough for a day's hunting, except perhaps, when shooting at turkeys when usually about fifteen are carried.

It is advisable to get right out in the country where one intends to hunt, and camp out a few days before the hunting actually starts, living close to nature. This gives the bowman an opportunity to make leisurely reconnaissances of the area and appraise hunting conditions. Besides, if he is from a lower country, it allows him a little time to become accustomed to the higher altitude before arduous hunting commences.

Also, above all else, one should try to get himself freed, as much as possible, from the unnatural odors of civilized man's way of living—odors that contrast harshly with the outdoor scents of the haunts of the game he intends to hunt. In other words, he should give himself a general airing-out. An equal effort should also be made to get the hunting clothing rid of these odors also. It is an advantage to have one's clothing well scented with the natural odors of that particular hunting area.

The hunter should try to blend in, as much as possible, with his outdoor environment. He should, for the time being, strive to become—in a way—just another creature of the wild places; this is something the serious bowman should really take into consideration, even if it does seem a bit far fetched. This advice is prompted by the experience gained on many hunting trails. The usual person comes into the hunting area in a closed car. His clothing, hair and person reek with the odors of food, tobacco, gasoline, motor oil and, very likely,

the perfume of soap and cosmetics. Naturally, the hunter does not notice these odors much; he is probably unaware of their presence. But, from the standpoint of wary game, what a horrible contrast it is to the pure and natural ozone of the haunts of the deer he is after! How quickly and how far it is noted by these denizens of the wild places! It all adds a serious handicap to hunting.

When not in use, it is a very good idea to keep the hunting clothing placed on evergreen bushes or other fragrant vegetation common to the area. Even laying them on the ground or covering them with dead leaves or pine straw, provided there is no dampness to harm the equipment, helps a lot.

I prefer to sleep on the ground on a bed of leaves, pine straw or tips of evergreen branches. A comfortable bed can be made this way and one's blankets and clothing soon take on the fragrance of the bed material.

Before starting the day's hunt, it will help a lot more than the usual person would ever imagine, to take a good bath. But care should be taken as to the kind of soap used as some brands will impart warning odors that will defeat the purpose one wishes to accomplish. After the bath, or in any event, the hunter should dress from skin out in clean clothing and sox that have been perfumed with evergreen branches as previously suggested. Soiled, sweaty or blood stained clothing is a dead giveaway to game. Clothing that has been slept in is bad, too. If one must sleep in garments that will be worn when hunting, it will help if one sleeps on a bed of pine boughs and air and sun one's blankets in the daytime.

It is preferable to wear outer clothing that blends with the natural surroundings and they should be of such material as wool with the nap left on; stiff twigs will not jab into them readily and yet they will not give forth warning sounds.

A person's trouser cuffs are bad about catching on snags and brush. It is a good idea to draw the trouser legs down, fold the lower part of each snugly around the outside of the leg
and pin them with a safety pin at the back. This prevents their flopping and catching on brush.

Many good hunters prefer to wear rubber soled, strong tennis shoes unless there is much snow on the ground. Such foot wear permits the bowhunter to sneak about as silently as a panther and to scramble over rocks with the ease and security that no other shoes permit. With such shoes one can sense twigs underfoot before he puts enough weight on them to snap them and, perhaps, warn the game.

It is advisable to refrain from eating meat of any kind the day before and on the mornings one goes hunting for deer. The eating of meat causes a person's body to exude an effluvium that is quickly discerned by these woodland creatures. To a deer and other nonmeat-eaters, the scent of meat-eaters means danger. Instead of meat, it is preferable to eat only plain vegetables, fruits, and nuts which identify the bodily exhalations as those of a vegetarian. I have found it helpful to wash out the mouth and then chew some aromatic vegetation such as spearmint, pinon pine needles, water cress, etc., to give it and the breath a clean, fresh scent.

As soon as I am located in the hunting grounds and the camp is rigged up for the stay, I get out and scout around in the area. It is valuable to know where the various stock tanks and water holes are located and which canyons and draws have springs or streams in them.

Ranchmen, if properly approached, will give one this information. The bowman should cooperate with ranchmen by not making his camp so close to the watering places that it will deter his livestock from freely coming in to drink.

A careful check about the water reveals if deer have been coming there to drink, and with about what regularity. In some places where water is scarce, as is the case in the more barren hills and mountains, the deer may follow canyons and washes for several miles, sometimes even out on the plains, to drink at some windmill tank.

In making a reconnaissance of my intended hunting territory, I especially note the ridges, slopes and flats where there are plenty of buckbrush and patches of shinnery oak, particularly those that still have plenty of green leaves on them, and other vegetation that deer prefer to feed on. A lookout is kept for places where there may be pinon pine nuts, scrub oak mast or alligator juniper berries that deer may be feeding on. Any little alfalfa field or other patch of green, cultivated vegetation or apple orchard in the little mountain valleys is located if possible. All such places are checked as soon as convenient to ascertain if game is feeding there. This can readily be determined by the tracks and dung signs as well as by where the vegetation has been recently snipped off. In an apple orchard where deer have been coming in to feed, if windfall fruit is plentiful on the ground under the trees, a person usually finds many of the apples with just a dainty bite snipped from one side of each.

In scouting the hunting area I also note the more timbered sections and the brushy canyons and the rocky, thickly overgrown places where the more experienced members of the deer tribe are likely to hide out during the daytime.

The watering places, feeding grounds and hideout retreats are all carefully considered in their relation to one another. If the incoming and outgoing tracks of deer feeding in a particular orchard or field follow a certain canyon or come down and go back up a nearby hill, the animals are pretty apt to be lying out in a suitable bedding place not very far away, as a usual thing, unless they have been much hunted by gun hunters, in which case they might go back a mile or so from such choice feed to hide during the day.

In doing the preliminary scouting of a hunting area, as well as later on when actually hunting, I keep on the lookout along the little canyon streams and any deer trails, as well as in the thickets and other likely places, for buck rubs, which are bushes, saplings and young trees that have the bark

skinned off by bucks rubbing velvet from their antlers and polishing them. The number of buck rubs in a given area is a fair indication of the number of bucks thereabout, and is also a sort of gauge as to the size of the animal making a particular rub.

The bowman should be sure that any buck rubs he may be regarding as an aid to his hunting are recent ones. Those made weeks ago will be of little or no benefit to him in his quest for deer. The fresher the rub the more moist the exposed wood will be, but it must be considered that the sun and wind may dry out the wound quicker in some areas than in others.

Deer depend largely on their sense of smell to warn them of the presence of an enemy in the vicinity. When traveling or feeding, *deer always move into the wind*. If danger suddenly threatens on the windward side, they will run off a ways with the wind, then circle around and get the wind in their faces again. So, in order to successfully still hunt and stalk such alert and cautious creatures, it is very necessary that the bowman hunt into the wind.

With this important factor definitely in mind, the writer, when intending to hunt in a territory with which he is not familiar, learns, just as soon as he is able, the direction the wind usually blows in the various canyons and across the flats and mesas and the different slopes in the cold of the mornings, during the warmer hours of the day and the chill of the evenings—and its relation to the direction in which the sun rises and sets—so that he can judiciously plan his hunting accordingly for any particular day.

Always try to hunt against the wind, except on some occasion when it is more to your advantage to slip into some brushy draw or canyon head and work along with the wind in order to flush game out of thickets and up on to more open surrounding slopes affording better shooting.

In the mornings and the evenings, if the bowman can work

around so as to keep the wind in his favor, it is much better for him to hunt with the sun to his back. From actual experience it is proven that this offers the hunter a decided advantage in stalking game. It is just as blinding to an animal to look towards a bright sun as it is to a person. A low sun shining more or less in a hunter's face will often hinder him from spotting game in time to get in a good shot, and it may even bother him to the extent that he cannot do any proper shooting at all.

For several very good reasons, from the standpoint of successful still hunting and stalking game, I usually prefer to hunt alone. If alone, one can reasonably attribute any rustling of leaves, or snapping of a twig, or other like sounds in the thickets about, to some woodland creature and will be more inclined to make a cautious investigation. Also, when alone, there is no inducement to do any talking, and talking, even in low tones, can be heard a long ways in the thin, dry air of many hunting areas.

Early in the mornings and late in the evenings are the best times to find deer out and on the move, especially after gun hunting season has opened. Doe and some of the younger bucks do occasionally poke about and browse in the daytime during hunting season, if there is not too much gun shooting going on in the country about. But the big old bucks with the great spread of antlers, that they have accumulated by surviving hunting season after hunting season, seem to have learned from experience to lie pretty close during the day in their retreats. Along about sundown they leave their beds and wander to water, usually feeding leisurely along as they go, provided there is suitable feed along the way.

Deer usually move about a great deal during the night, and do much of their feeding then, especially if the moon is bright, and may be seen in the early morning coming in to water from their feeding grounds or leaving drinking places and going to where they prefer to bed down for the day.

Here, in the Southwest, the deer that are usually hunted are the mule deer, Virginia White-tail and the Arizona Whitetail; the black tail and the sandhill white-tail deer are also sometimes hunted.

I always walk just as silently as possible when actually still hunting and stalking game, putting the toes down first, then easing lightly down on the feet, the while leaning slightly foreward in a somewhat crouched position. Your author walks with his feet nearly in a straight line, not toeing out, but rather toeing in a bit. The placing of the feet on the ground in this position keeps all the toes pointing straight ahead, rather than off to the outside, so that they press down and seem to grasp the ground directly ahead of the heel instead of off at an angle to it. This way of walking is a great help at night when one is obliged to walk in the dark and is unable to discern what is underfoot and may unexpectedly step off into a depression. The toes, being lowered to first search out and touch the ground, touch the bottom of the depression which eases the jar considerably as the heel comes down.

Remember, it is not walking about on tip-toes: after the toes touch the ground, the weight of the body eases lightly down on to the whole foot, but mostly on the ball of it; this is the silent, stealthy step the Indians used to use.

The wearing of tennis shoes aids in feeling any little sticks that might be stepped on so that one can ease up and move his foot before he has put enough weight on them to cause them to break and give off a snapping sound. It is remarkable how sensitive and searching a person's feet can become with training in this sort of thing. They seem to almost get eyes in them, so that they can, in a way, search out a spot to make a silent step.

In a hunting country, it is a very good idea for the bowman to always be expecting to see game at any moment and to be alertly on the lookout for it at all times, regardless of where he may be, when he is actually out hunting. Realizing

how important it is to count on the unexpected when hunting, which usually happens when one is unprepared for it, the writer tries to be on the lookout for deer wherever he may be, even if it does not appear to be a likely place for one.

From time to time, as I come upon them in my hunting, I crush and rub my clothing with various aromatic plants growing in the locality to help tone down and camouflage any body odor.

If there is the opportunity to secure oil from the metatarsal glands from a deer freshly killed, rub plenty of this musk on the trouser legs. It seems that the tufts of hair surrounding these glands act as radio sets for the deer, by which they send out warning scents to one another when danger is suspected.

Between the toes of a deer, close up at the base, another oily musk of disagreeable odor is exuded. I usually rub some of this musk on the trousers too, and dribble some of the urine from its bladder on trouser cuffs and shoes. Even fresh deer dung may be smeared on the trousers also. Being redolent with such deer odors, if a deer does chance to scent the bowman, the animal will also get a noseful of these natural scents of his kind, which may perplex him to lingering about a bit while he tries to puzzle out the conflicting smells, and thus afford the hunter a good opportunity to get a shot at him.

Wherever there are old wood roads, trails and more open and well defined deer runways traversing the area, I cautiously follows one or another of them so long as they lead into the wind or in the direction I desire to go. By using these woodland travel ways, which are often much more open and cleaner underfoot than it is off of them, the hunter is able to proceed along them more quietly and with less interference from branches and fallen timber than if he picked his way elsewhere through the vicinity.

Deer very frequently travel along these trails and old roads through the brush and in the canyons; a bowman, carefully still hunting along them with the wind in his favor, runs an

excellent chance of getting some good shots at the animals, especially in the early mornings and late in the evenings.

Deer runways from thickets and brushy draws and canyon prong bottoms, where the animals often bed down for the day, frequently cross these more open roads and trails. By traveling those that show much recent use and stationing himself in an appropriate location, the hunter can create for himself a fine opportunity to bag his game.

A deer, when it comes out of cover to one of these more open trails or old wood roads, nearly always stops at the edge with little more than its head showing, and cautiously looks all about. If satisfied that no danger lurks near, the animal will then come out and cross to the brush beyond or turn and follow the woodland alleyway.

Wherever these travel ways go through scrub thickets or among rocky, brush-overgrown places or dip down across draws and canyons, the hunter should proceed along very slowly, squat down every few yards and search under the cover with his eyes for deer bedded or standing.

I make it a special practice to hunt along the little streams in the canyon bottoms early in the mornings and late in the evenings, against the wind as much as possible, always keeping a sharp lookout ahead along the water for deer drinking or feeding on the lush, aquatic vegetation there.

When hunting along these streams keep on the lookout, up and along the surrounding slopes, for deer coming down to water, and all trails cutting in from draws and side canyons should be carefully watched.

As a rule, I prefer to proceed quite slowly when earnestly still hunting, covering no more than one-half mile an hour and, in some places and under certain conditions, considerably less. In picking my way along, I try to keep the approach concealed as much as possible by bushes, rocks, trees, and logs or anything else convenient that will screen me from any game ahead.

Besides utilizing such cover as one can in still hunting and stalking, it is also important that a good background be kept behind the hunter at the same time—one against which his form will so blend that it will not leave an easily discernible silhouette of his body.

As I pick my way along, I closely watch everything visible ahead as well as to either side. All stumps, chunks, log ends, or sizeable stones that bear any resemblance to deer, or to any portion of a deer, are carefully and cautiously investigated to ascertain if they are really animals or not.

Although deer are frequently discovered first by getting more or less open views of the animals, I have learned from rather sad experience that the entire form of one is not what to expect or to look for. Often it is the movement of the animal's ear with its lighter edge that is seen in the shadows of the brush. Sometimes it is the flick of one's tail that is noticed. Again, it might be an antler that draws attention to a buck. If it is still warm enough for flies, deer lying down often betray their presence by flapping their ears and swinging their heads in fighting the annoying insects.

Every few yards it is sound to squat down and thoroughly search the surrounding country under the overhanging branches of bushes. If a deer is standing up, one usually spots the animal by noting the reddish or brownish legs contrasting with the darker stems of bushes and trees.

Not only do I try to use my eyes to their fullest ability when hunting, but I also keep ears straining to the utmost to catch every sound, however faint, that might betoken the presence of game. Whenever any suspicious sound is heard, I remain perfectly quiet and, with eyes thoroughly searching over, around and under the surrounding cover until, if possible, the cause of it is discovered. Experience has proven that the slightest rustle might be caused by a deer getting up from its bed. The barely audible scraping or snipping of a twig may be the only sound made by a deer browsing daintily on a near-

by bush, or the faint rattle of a pebble the sole warning that a wary buck is moving stealthily about trying to locate the hunter or else is slipping quietly away. A deer can get up cautiously from its bed with scarcely a sound at all, or it can come bounding up from the ground with enough racket to scare the wits out of a person, especially if it lets out a loud snort to-boot.

The hunter should be careful, whenever going over a rise, to stoop down and very stealthily creep or crawl up to where he is able to see over the top, the while keeping his head well screened by whatever cover is convenient. He should then very carefully search out the immediate vicinity for any signs of game, looking sharply for any unusual spots of color, stationary or moving, watchful for anything that does not have the right appearance, checking the bushes to ascertain the reason for any slight agitation. When satisfied that no game is lurking close by, the intermediate and then the more distant visible country should be looked over just about as carefully.

When hunting through or among thickets and I hear a deer bound up with a snort, or apparently go dashing off with several noisy jumps and then all becomes quiet again, I remain perfectly silent, watching sharply and listening intently. Sometimes the deer sneaks quietly away, but very often the animal is not at all certain as to what alarmed it and is curious to find out, especially if it scents any deer musk or buck lure with which the hunter has perfumed his clothing. So, it stands back in the brush, looking and listening and sampling the air or else slips stealthily about trying to see the bowman or pick up his scent on the breeze. Feeling pretty sure that the deer is doing just this, it is best to crouch down and watch closely under the bushes for sight of legs, besides keeping a sharp lookout all about higher up for at least antlers to appear. Especially should one watch in the direction toward which

the breeze may carry scent nearest to where the deer was last heard. This bit of hunting craft often brings its reward.

When the bowman has crept out on a point or the edge of a rocky canyon brim—or the like—directly overlooking thick brushy cover where he suspects deer may be bedded down and is unable to see any, it is a good idea to pitch down a sizable stone or two. Such a maneuver may often cause one or more deer to get up and stand looking about trying to discover the reason for the disturbance. Thus, they offer fine, open, downhill shots. Sometimes they may run a little way in one direction, then back the other way, worried and undecided just where to go. They do not seem to see as well up above them and, being below the hunter, they cannot so readily scent him.

Another good bit of hunting strategy is for the bowman to stealthily work his way through thickets in rocky draws and canyons a bit below where they head out on rather barren slopes. When a deer is gotten up it usually has to go up a slope or come down past the hunter. If one does take to the mountain side, it will generally run but a short distance, then stop and look back down to try to discover what it was that disturbed it, thus offering a good shot up, out of the brush, into the open.

But the archer must remember that his arrows do not have the same force on uphill shots as they do on downhill ones. His shaft is apt to fall short of its mark when shot at a deer up on a slope above him, yet the same arrow, when driven down at one in a canyon below him, may overshoot the animal.

If a doe, either bedded down, up and browsing, or moving about is discovered, carefully look over the vicinity to see if there is a buck with her, should the hunting be for buck only. If some doe are scared and they run off a ways then stop and begin slipping about trying to see or wind danger, remain perfectly quiet and not only keep your eyes on them, but watch sharply all about among the trees and bushes to see if there is a buck lurking nearby. Usually a buck is more cau-

tious and will stand back in cover and allow the doe to risk investigation. If there is another deer close by that the hunter has not yet seen, the doe will usually betray it by occasionally turning her head to look in the direction of her companion. When stalking a deer, care should be taken to keep on the watch for any other deer, off to the side, that might spot the hunter and warn the one he is after.

In many of the mountains of the Southwest, particularly the old Capitans, the canyons far up branch out into narrow, timbered, brushy prongs rising steeply between barren rockslide slopes-areas of broken and jumbled granite rocks with seldom a tree or brush growing from them. A deer will not attempt to cross such insecure and dangerous places. But down in the timbered strips of the canyon prongs, where it is filled in among the rocks with an accumulation of decayed leaves and woodland trash of the centuries, the footing is better for hoofed animals. These dark, gloomy, remote fastnesses, seldom encroached upon by hunters, are favorite retreats for giant old bucks-those old mossbacks with great sets of heavy, many pronged antlers— the deer hermits that have been ostracized from the society of the doe that seem to prefer the company of younger bucks. Often, too, during the press of gun hunting in the lower areas of the mountains, younger bucks and doe take to such places to hide out for the time being.

When I find a suitable canyon prong of this sort where tracks down to water and back cause me to believe there might be a deer, I very stealthily work my way up among the rocks, bushes and towering fir trees near the center of the bottom. Once I start up such a place, it does not matter particularly in what direction the wind is blowing. If I can come upon a deer and get in a shot without the animal being aware of my presence, well and good. If I do alert one, the animal must either come down past me or retreat further up the ever-narrowing strip of timber, since he cannot travel out over the treacherous rock piles at the sides. By working my way

carefully along, I can finally hem the deer in at the upper end of the timbered prong and get my shot—that is, usually. But occasionally a wary old buck will sense the situation and, rather than allow himself to be trapped, will come bounding and crashing head on, down the narrow place toward the hunter, bent on escaping from there if possible.

Once I was following a big buck up such a place at the head of Santa Rita Canyon in the Capitans and knew that he was hemmed in. Up near the end of the timbered strip was a patch of brush such as the Apaches used for arrows, not more than a few yards across and but little over waist high.

Knowing the deer was aware of my coming, and fully expecting to see the animal standing or moving along beyond, I edged over to one side and passed by the patch of gravish "arrow bush" without paying it any attention, my eyes being fully occupied in searching the canyon ahead. I proceeded and was nearing the end of the diminishing strip, but still could not see the game. Suddenly I was startled by hearing the "thump, thump" of a bounding deer down back of me. Whirling about too late to get a shot, I glimpsed the buck disappearing among the firs, headed down canyon. A bit of investigating disclosed where the sagacious animal had turned back from the upper end of the wooded strip, when he had evidently realized he was being hemmed in, and had cunningly flattened himself down in the patch of brush to wait till his enemy had passed him before dashing down canyon away from there.

In many localities, where the hills and mountains are rather barren and without sufficient vegetation for good cover, the deer, particularly the bucks, frequently bed down in sandy spots and depressions among boulders at the bottom of the canyons, ravines and deep, narrow washes. In hunting these places, I prefer to sneak stealthily along the beds of them into the wind, stepping from rock to rock and keeping concealed as much as possible by boulders, occasional bushes and the

banks of bends and turns. All the while I keep a sharp lookout ahead for game. If the wind is strong in my favor I often can come right up on deer bedded down in such hiding places, and such shots usually are short range ones.

Sometimes, in such country, the deer bed down up on the open slopes wherever there is anything to offer slight cover. Then it is difficult to approach close to them and practically all shots made must be at long range. They do bed down a lot at the bases of cliffs, since there is usually a bit of brush at such a place to afford slight cover. If the bowman can locate a deer bedded down at the foot of a cliff or under a canyon rim, he can work his way carefully around so as to come out above the animal and may thus get a good down hill shot at it.

A pair of good field glasses or binoculars will come in handy on any hunting trip, and here in the Southwest where distances are so great and much of the country such that one can often see a long way, every bow hunter will find an instrument of this kind a great help in his quest for game, and frequently the means of saving him many weary miles of tramping for nothing.

When trailing deer in the snow, or even on bare ground, it is sound to use the trail only as a general guide and really still hunt by proceeding stealthily and searching every bit of cover on either side and ahead. Deer are tricky creatures in many ways and have a very dismaying habit of traveling into the wind until about to bed down. Then they will usually go through a thicket or cross an open place and circle around so as to work back with the wind a ways and then lie down in suitable cover somewhere near the trail they have just recently made so that they can watch it.

An inexperienced hunter, depending on trailing alone, will usually fail to spot the deer off to the side and may pass right by it. Then, when he is well beyond, the wily animal will quietly get up and sneak off before the hunter can follow the trail on back to where it had bedded down. Or else the deer

will leave when it hears him working through the thicket or sees him tracking it across the open space.

Some days are much better for hunting than others. Still, dry days are bad in a country strewn with dry leaves, twigs, pine straw and cones, if there are no clean trails to follow. But much of the Southwest is usually rather dry during hunting season. In such localities, windy days, if the wind is blowing consistently in one general direction, are good days for still hunting, especially since the sound of the wind through the trees and bushes usually drowns out any little rustle or snapping of twigs and the like the hunter might make. By working carefully into the wind at such times, much of the chance of game scenting the bowman is avoided. But, on those windy days when the air currents are shifting about-every which way-up and down the canyons, over the slopes and across the flats, the bowman will find it hard to do any real still hunting or stalking. Then it is usually only by chance that he may come upon a deer, or else a deer trying to evade some other hunter blunders into him.

Rainy days, in just about any area, are excellent days on which to hunt, provided the bowman is prepared for such weather. It is necessary at such a time that he be dressed in proper clothing and have the fletching of his arrows protected either by his quiver or by being treated so that they will not wet down to the extent of being incapable of guiding the shaft straight and true.

A person can slip about through the woods very quietly when it is raining, as the rain softens up the leaves and twigs underfoot, rendering them almost soundless, and any slight sound the bowman might occasionally make is muted by the patter of raindrops and the drip drip of water through the trees and bushes. Deer do not seem to see as well during heavy rain as they do at other times. Probably, this is because they have to keep their eyes about half closed to keep out the rain. The droplets of moisture that collect on their eyelashes

further restrict their vision. Under such conditions the bowman who is careful as to wind and cover in his stalking, runs an excellent chance of getting his deer. One should not get the impression that just because it is pouring down rain deer will not be out moving about. They are just as apt as not to be browsing right out in the open. Though it is usually rather dry in many of the Southwestern hunting areas, it does sometimes pour down rain all day long in the hills and mountains during hunting season.

Fine days to hunt deer in these Southwestern mountains are those when pellets of a dry kind of snow almost like small hail, or a dryish sort of sleet, are rattling down through the trees and bushes from an overcast sky. The rattling going on all about through the forest drowns any slight sound the bowman might make, so it is usually easy to get quite close to deer by working into the wind.

Sometimes it snows quite a bit during hunting season in various areas of the Southwest. Often the country is still rather warm when the snow falls, and this creates just about made-toorder deer hunting weather, for the big, soft, sticky, semifrozen flakes of snow come floating thickly down all about. This sort of snow muffles sound and the big damp snowflakes floating by, readily indicate from which direction the wind is blowing. The bowman can readily determine the freshness of any game tracks he comes across by the amount of snowflakes that has settled into them. Not only do the snowflakes settle on the hunter's clothing and gear to form a fine camouflage but they also collect on a deer's evelashes and hinder its vision. Since the hollow hair of a deer is a nonconductor of heat, the wet snow will just as readily cling to it as it will to the bowman's clothing, and may make it harder to distinguish the animal from its surroundings. Of course, on such days, the bow hunter should have the fletching of his arrows so protected that the feathers will not be wet down to the point of inefficiency.

When the hunter happens to scare up deer and they start

running off, he usually makes some cry or other sound that he thinks might cause them to delay leaving the immediate vicinity. Sometimes he bleats like a deer, or snorts like one. Again he may moo as a cow or calf. Such sounds may deceive a deer into stopping to decide whether he was mistaken as to what had alarmed him. Squalling like a bobcat, whinnying like a horse, or barking like a squirrel may also do the trick.

Whenever the writer hears a red squirrel barking and fussing noisily off in the forest, or a bluejay squawking and scolding something, or ravens calling to one another in their strange raven talk, he usually makes a cautious investigation to learn what it is all about. These woodland busybodies can give a hunter valuable information, provided they are not too busy telling all the forest folk about his intruding into their haunts. Sometimes it is a coyote or bobcat that is being scolded. Or maybe it is a deer or bear that is being told what is what. Ravens are particularly apt to be concerned about a dead or wounded deer.

When the hunter discovers a deer at a distance, out of suitable bow range, that is unaware of his coming, he should stealthily work his way up closer, the while keeping himself well concealed by the best cover available. Where he finds it necessary to pass around a tree or other piece of cover he has been sneaking up behind, he should do so by crawling flat on the ground so that the animal being stalked will not be so apt to see him. As he closes in on the deer, he should try to plan ahead as much as possible and work to get himself in a position where he can best make a clear, close shot from concealment. Meanwhile he should try to keep on the lookout for any other deer that might be in the vicinity and discover him and warn the one he is after into running off. All too often hunters have lost fine chances to shoot deer by having their presence betrayed by other deer in the vicinity.

When peeping from cover at a deer being stalked, especially when looking out from behind a tree trunk or over a

log, I usually do so, close to the ground or through a screening of twigs, leaves, or a bunch of grass.

When I have finally crept up to the place from which I intend to shoot and am in a favorable position, I check to make sure there is nothing in the way for the bow to strike against or to deflect the arrow. If kneeling or crouching, I make certain that the lower end of the bow is free of the ground.

When ready, I watch for a great chance and try to make the shot when the deer is not looking. If I miss and the animal does not run away, I watch for another opportunity to shoot without its seeing me. By keeping very quiet and not exposing myself to the animals' view, I have, as an experiment, sometimes gotten in as many as 8 or 9 shots before a hit was registered, or the deer became suspicious and left by, usually, quietly sneaking away. Naturally, this is more apt to happen when making the longer shots at game.

Sometimes the bowman may catch sight of a deer standing and watching him. When this happens, he should have the presence of mind not to stop or look directly at the animal, as to do so will let it know that it has been seen. Rather, the hunter should keep right on walking in a perfectly unconcerned manner, the while watching the deer out of the corner of his eye. As he keeps on, he should gradually veer his course so as to pass the animal on his bow arm side, if he can do so without arousing the deer's suspicion. To walk directly toward watching game would probably put it to flight before the hunter could get within suitable shooting distance. As the bowman comes to a good clear place within proper range, he should slowly raise his bow and start the draw, still walking, and gradually turn to shooting position. Just as his bow comes up to full draw and into aim he should stop on that step and let fly. With a little practice a person can get good on this trick.

Sometimes the hunter can see definitely that he hit his

game, or that he missed it. Unless he is positive he has made a miss, the thing to do, after the deer has run off, is to go quietly and cautiously out and find the arrow and examine it carefully to see if it has pierced flesh. If no such signs are apparent at first, the bowman should look the missile over more closely. It is possible for an arrow to pass completely through a deer without leaving a bit of blood on it.

One day I made a poor shot at a big buck and hit it in the paunch. The arrow passed entirely through the animal and hit the ground several yards beyond. After a few jumps the deer began spilling blood copiously from both sides and died within a couple of hundred yards of where he had been shot. Close examination of the arrow revealed not the slightest trace of blood. But adhering to the base of one of the feathers, about midway of its length, was a tiny bit of the contents of the paunch. Also barely discernible on the bright clean broadhead, when held at a proper angle in the light, was a thin greasy film from the fat cut through on either side of the buck's body.

Even though the bowman's arrow does not reveal any signs of having hit game, it is a good idea for the hunter to follow the trail of the departing animal for a ways, at least, to see if any blood can be found.

No bow hunter should make the mistake of thinking that, because a wounded animal is not spilling much blood along its trail, that it is not badly wounded. Sometimes a mere flesh wound will bleed freely for a time. On the other hand, a mortal hit may leave only a few drops of blood now and then along the trail, but the internal hemorrhage often is great. If the wound is through the lungs or through the neck, so that the trachea is severed, the spillage of blood will be of a light color, frequently with blobs of foam. Blood from a paunch wound shows a brownish, yellowish, or greenish mixture, depending on the animal's feed.

Just because a wound that has been bleeding freely finally

stops leaving blood signs is no sure indication that the animal is not badly hurt. Time and again wounded animals have quit leaving blood signs, yet hunters have found them somewhere beyond quite dead.

In much of this Southwestern country, where it is rather open and the ground is fairly bare, trailing wounded game is not very hard. But in some areas, where there are more brush and grass, and signs are few and faint, the bowman must use great care in his trailing, or else he will lose his game. Then he must scrutinize closely for each additional track, broken twig, dislodged pebble or disturbed stick marking where the wounded animal has gone. He must watch sharply for spots of blood on rocks and leaves, and for smears of blood, foam or bits of paunch contents on bushes, weeds and grass blades. Where the wounded animal is really hard to follow, he may have to creep along on hands and knees, with face close to the ground, picking out each faint sign. All the while caution must be used not to move along right in the trail, but rather a bit to one side of it, so that the trailer will not blot out any faint game signs by his own tracks. Every little way, as he comes to a blood spot or other sign that definitely shows he is still on the right trail, the bowman should thrust a stick in the ground or place a stone on top of another to plainly mark the way, so that if he should get off the trail altogether, he can readily see where to go back and make a fresh start. Sometimes the trail may abruptly turn off yet, because of other tracks, it may look as though it kept right on. So when the trailer does not see any more blood signs, he should go back to the place where he last saw signs and search along closely until he finds where he missed the trail. If it comes to the point where the bowman is unable to find any trail at all to follow, then the only alternative is to search the country thoroughly in everwidening circles in the hopes of finding his game.

When unable to find a wounded animal, the hunter should pay attention to the actions of ravens, magpies, crows and jays

in the vicinity. These birds often point out lost game by gathering where it is. Ravens, especially, will circle about in the air above a kill, croaking to one another, before dropping down to feed on it. The bowman should follow any coyote, bobcat or fox tracks he finds in the snow in the vicinity of where he has lost a wounded deer. These predators can smell blood and flesh a long way and, if one should happen to pass by and get scent of the dead animal, it will be almost certain to go up to it, to at least scout around, if not to eat of the carcass.

In closing, the writer would like to caution each and every bow hunter to be especially careful of fire out in the hills and mountains. Build your campfire only in a cleared and safe place and be certain it has been put entirely out before you break camp and abandon it. Soak it out with water if possible but, if you must cover a fire over with earth, be sure it is mineral earth that cannot burn and not just top soil or vegetable earth that has material in it that may heat up and ignite and spread into a forest fire. If you smoke, do so only in safe places and, when you are through, be sure to crush out your cigarette butt and put it in your pocket until you can dispose of it in your own campfire or at home. Treat the matches you use to light your smokes the same way. Be careful, yes, be careful with fire out in the forest!

Remember Smokey, the now famous bear whose picture appears on the Forest Service fire prevention posters? Smokey —they named him "Hot-Foot-Teddy" at first—was rescued when just a little cub from the great forest fire that swept the northward side of the Capitan Mounains here in New Mexico in 1950. The little fellow's tiny paws were painfully scorched from the hot ashes of the burning forest.

This writer fought for many days on that raging, roaring hell of burning forest and found many of the luckless mountain creatures that had been burned to death. Time and again, as the fire fighters tramped those scarred and hideously

blackened slopes, deer were to be seen wandering miserably about the devastated area with one or more of their hooves scorched off, the hair singed from their bodies and their ears burned to twisted, pitiful stubs. Again, always be careful with fire out in the forest.

Always leave a clean and sanitary camp site. Make sure you are not leaving a lot of tin cans and refuse scattered about to annoy the next person who would like to camp there.

Review

 I_{known}^{N} THE LAST chapter we have touched on most of the known ways of hunting deer with the bow. The reader will note that all these discussions point to strategy rather than prowess.

As a rule, the bowman does not just stumble on a deer; neither does he bag one by making long shots at running animals. In view of these statements and all that we have said concerning ways and methods of hunting, I think we can lay down the following fundamental law:

SOMEWAY, SOMEHOW, THE ARCHER MUST WAYLAY, SURPRISE OR OUTTHINK A DEER IN ORDER TO GET WITHIN KILLING RANGE OF IT.

All that we have said on the subject is built around that theory.

So, in leaving this subject, we will sum up the ways and methods o£ hunting with the bow in the following twenty points:

- 1. One must learn all he can about archery equipment.
- 2. One must master the fundamental principles of how to shoot the bow.
- 3. One must become a good field archer.

- 4. One must learn to judge distance under all normal conditions.
- 5. One must know much about deer; their nature, their anatomy, their tracks, their feeding and bedding habits.
- 6. One must be able to recognize deer tracks and to judge about when they were made.
- 7. One must be able to trail a deer.
- 8. One must know the country where one hunts; the water sheds, the ridges, the trails, and the feeding grounds.
- 9. One must know winds; the prevailing winds and their behavior at given times of the day.
- 10. One must eliminate, as much as possible, all human odors from the person, the clothing and the equipment. This is most important.
- 11. One must learn how to walk quietly when hunting; ball of the foot first then ease down the heel with toes pointing slightly inward.
- 12. One must learn how to be silent; avoid talking, coughing or making any other unnatural sound when watching or on the move.
- 13. One must learn the art of being still when on the watch.
- 14. One must learn the science and art of stalking.
- 15. One must know how to hide and stay hidden from a deer.
- 16. One must know the proper clothing to wear; this will vary with the weather. The shoes should be without heels and have soles of rubber or soft leather.
- 17. One must learn to be patient—leave the nerves at home.
- 18. One must learn to love nature and all her wild creatures.

- 19. One must know how to trail a wounded deer and be able to keep after it until it is recovered.
- 20. One must be careful with fire; see that any fire is out —dead out—before leaving camp; see that matches and smokes are under careful control. Forest fires are the greatest disasters that can happen to wild life.

So, with these remarks, we place you in the custody of the red gods and wish you all the joys that attend successful hunting with the good bow and shaft.



From an oak-bough made the arrows, Tipped with flint, and winged with feathers, And the cord he made of deer-skin.

Hiawatha

C H A P T E R F I V E

How to Make a Bowstring

THE ARCHER who shoots a great deal will find that the item of greatest expense is bowstrings. A well made, double looped string sells for around \$1.50. Since bowstrings wear out with distressing rapidity, the frugal archer will think of making his own.

I had not intended to go into tackle making, but because of importance and economy the bowstring is included.



By trial and error, which process extended over a long period of time, the author has evolved a process of making double looped strings that seems simple enough to him. It may be, however, that the tyro will think otherwise before he "gets his hand in."

There are two materials that make good strings; these are linen and fortisan. Linen needs no definition as it has been a staple fibre for centuries. Fortisan is a rather recent creation, being a product of rayon. There are differences of opinions, among experts, as to which makes the better string; the verdict seems to be that a linen string is easier to make while a fortisan string may last longer. The writer advises the beginner to work with linen first. The details of making are the same with either product.

A double looped string is, more or less, tailor made to fit a given bow. Since the length of a string cannot be changed over $1/_2$ inch or so after it is made, it follows that measurements must be pre-determined and accurate. It is, therefore, necessary to have some kind of a device that will assure a constant measure of accuracy; the string board meets these requirements. See Fig. 42.

A string board is very simple to make; all that is required is a board 5 inches wide and 29 inches long, one small cotter pin and a few headless nails. The board should be of a close grain wood such as poplar, birch or mahogany. It should be dressed and sanded smooth; the corners and edges should be rounded.

Draw a center line down the board. Set dividers at 1/4 inches; place one point on the center line, at one end of the board, mark positions on both sides of the center lines and mark them A and B. Do the same at the other end of the board and mark them C and D. Place a square 21/2 inches from

the end of the board and draw a line across it; do the same at the other end of the board. You now have laid out a rectangle $2 \frac{1}{2}$ inches wide and 24 inches long on the board.

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Set the dividers at .4 inches. Begin at point A and mark positions down the left line until 13 have been so marked; do the same, beginning at point B, with the other side. Select a drill a little smaller that the headless nails and drill holes 1/2 inch deep down each line at the marked positions—26 holes in all. Drive cotter pin at point A, cut off the head, and see that the slot points across the board. The reason for the cotter pin is that it makes a tension clamp to hold the thread; the thread may be pushed into the slot, an operation that does away with tying the thread at that point. Drive headless nails in the drilled holes. See that the nails stand up straight and that they are of a uniform height—5/8 to 3/4 of an inch. Drive headless nails at point C and D. From where center line crosses line D-C, measure up the board 133/4 inches and mark this position. Make a notation on the board with a pencil, 5 feet 8 inches point E. Set the dividers at 1/2 inch. Begin at point E (the 5 feet 8 inches position) and mark points up and down the board and drill at these positions-along the center line. Lay out and mark the lines and numerals with ink as appears at the top of the sketch. Do the same at the lower end of the board. Make a cut out on left side of board as shown in sketch. The cut out is for the purpose of making it more convenient to get the finger under the threads at this point. Clean off board and varnish. When the varnish is dry, the board is ready to use.

I might suggest that 21/2 inches thin finishing nails, cut down to 1 1/2 inches long and with the cut ends smoothed up, make good nails for this board.

Go to your shoemaker and get a 4 ounce ball of Barbour's No. 12 shoemaker's thread. This is a rather fuzzy white thread and will test about 6 pounds. It is packed in a round, red box with the end of the thread coming out of a hole in the lid. Do not let them sell you the No. 12 twisted thread which is put up in one pound cones. Go to your sporting goods dealer and get a cake of bowstring wax and a spool of 6 thread,

white, cutty hunk fishing line. This is all the materials you need.

Drive three 16 penny nails, about 12 inches apart, in a basement joist, if you are working in the basement, otherwise the nails may have to be driven in a door frame. Appropriate a 10 quart pail and fill it with soil, clay, or any other material; this is for weight only. Make an S hook and attach it to the handle of the pail. We are assuming that you have a vise. You will need a knife, a pair of scissors, and a comb. We are now prepared and ready to make a string.

1. Measure the bow from nock to nock on the back side; we will assume that it is 5 feet, 8 inches long.

2. Set pin E at the 5 feet 8 inch mark and drive it in the board.

3. Free the end of the linen thread and push it in the slot at point A. Run the thread across the board, around point B, down to point C, up to point E, down to point D, and up to the first pin below point A which is at line 1. Make another round of pegs and cross at line 2; another round and cross at line 3. Repeat this operation until the board is crossed at line 10. Bring the thread around from line 10 and cross it over the 10 strands at the cut out.

4. Grasp the 10 threads with thumb and forefinger of the left hand at the cut out. With a sharp knife or scissors, cut the cross threads from line 10 all the way up along the center line.

5. Grasp the threads at E—which is the middle of the skein —lift the skein from the board and hang it on the left nail that is in the joist. Make another set of strands exactly the same way and hang this set on the middle nail. Make a third set and hang on the right nail.

6. Grasp one of these skeins 12 inches from the endmeasure it—and wax well; do the same with the other two sets. You will note that the ends of these skeins taper to a point; each thread is .4 inch shorter than the one next to it.

Arrange the ends of the three waxed points so that they are together and exactly even. Measure from the end of the points back a distance of 71/2 inches and mark with the thumb nail. Fold a piece of heavy paper over the 30 threads which is now the major skein, slide it up to the 71/2 inches mark and hold this position. Put this in the vise so that the $71//_2$ inches mark is even with the jaws. Fig. 43.



FIGURE 43—Placing Major Skein in Vise.

7. Wash your hands. Begin to lay a cord by twisting each of the three waxed ends to the RIGHT. As you twist, bring one strand up and over to the left, the next down and under to the left. After a short time you will note a three lay rope with a LEFT hand twist take form. Keep this up until the twisted section is 21/2 inches long. Measure it. It will require

some patience before you get the knack of laying this cord. There will now be 41/4 inches of each of three waxed ends exposed. See Fig. 44.

8. Remove from vise, straighten out the ends by removing

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any twist beyond the end of the lay. Form the lay into a loop and match the three ends with the three sections of the main strands. Fig. 45. Make a preliminary twist of each of these strands to the right. Fold paper over the loop and put back in the vise. The three long, primary skeins now face the operator and fall to the floor. Fig. 46.



FIGURE 45—Forming the Loop.

9. Begin to lay a cord by twisting these primary skeins to the RIGHT, just as you did in step No. 7. You will soon see another rope with a left hand twist take form. Twist these skeins very tightly at first, twisting to the RIGHT and laying the cord to the left. You will note the lay taking form and

diminishing in diameter; this taper is resulting from the absorption of the tapered waxed points (as shown in Fig. 47) into the general lay. As the taper of the general lay diminishes in size, relax the tension of the twist slightly. Run the long, primary skeins through the right hand, occasionally, to prevent tangling. Stop operations when this general lay has progressed



FIGURE 46—Placing Loop in Vise.

to or slightly beyond the place where the waxed points have been completely absorbed. Make a temporary wrapping at this point. See Fig. 47. The upper loop is now formed.

10. Place this loop over the center nail in the joist, permitting the three primary skeins to hang down; they will each be slightly twisted, so they will not tangle if gently handled. Grasp the left skein near the top, spread and separate the strands and fit them in the teeth of an ordinary comb. Pass the comb down the length of the skein; this will take the slight twist out of the skein, leaving the strands straight and paralleling each other. Now, grasp the skein 11 inchesmeasure it—from the lower end and thoroughly wax to the end. Hold the skein at this 11 inch position and twist the

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long skein to the RIGHT 24 revolutions—count them. Place the skein over the left joist nail, securing it by making a couple of turns around the nail (Fig. 48). Take the skein that now hangs to the right, repeat the operation just performed and hang it to the right joist nail. Do the same with the center skein and, when these operations have been per-



FIGURE 47—The Finished Upper Loop.

formed, hold it between thumb and forefinger. Remove the other two skeins from the nails—be sure that the twist is not altered—and see that none of them have crossed the others. Bring the three tapered points together and pull until you are satisfied the tension is the same on each skein. The secret of making a good string depends largely on this operation. The strength of the string depends on the uniformity of the tension on each strand. Measure 6 inches from the end of the waxed points and mark with thumb nail. Fold paper at this mark and place in vise so that the 6 inch mark is even with the jaws, the same as Fig. 43 except that the points are 6 inches long instead of 71/2 inches.

11. Wash your hands again. Repeat the operations given

in step 7. Instead of twisting the lay 21/2 inches, stop when the lay is 11/2 inches long—measure it. Form the loop and wax in the tapered points as shown in Fig. 45.

12. Put loop in vise and repeat operations given in step 9. When the lay has been twisted until the points are absorbed,



FIGURE 48—Forming the String.

you will be pleased to note that the 24 revolutions previously given to each of the skeins have now disappeared; all the 30 threads of the major skein are now parallel.

13. Place the upper loop over center joist nail. Comb the 30 threads until they are straight and parallel. Place the S hook, that is on the handle of the pail, in the lower loop of the string. Rotate the pail to the LEFT. Fig. 49. While the pail and string are turning, use both hands in assisting to round the string. When you notice that the strands of the

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string make one complete turn in a distance of about 21/2 inches, stop the rotation. Push a chair against the pail to prevent further turning.

14. Remove the temporary wrapping shown in Fig. 47 and wax the string thoroughly from one end to the other. Rub



the string vigorously with the right hand; this will produce enough heat to soften the wax and drive it into the fibres of the strands. Rest a few minutes (you will need it) until the wax has cooled.

15. Take off the pail and remove the string from the nail. Fit the string to the bow. You will note that the upper loop is large enough to slide over the nock easily; the lower loop,

however, will be much smaller and will fit the nock very snugly. Brace the bow and see if you have a fistmele; this will indicate whether or not the string is the proper length. If the bow is not strung high enough, remove the string, hang it back on the nail, attach the pail and twist some more. Then, try it on the bow again. If the string is a little short, take out some of the twist. When you are satisfied that the string is the proper length, brace the bow, place it in the vise and prepare to serve it.



FIGURE 50-Marking off String for Arrow Nocking Point.

16. Lay an arrow across the bow and square it with the string; mark this position. See point A, Fig. 50. From this mark, measure 2 inches toward the upper loop and make another mark on the string. Point B, Fig. 50. From point A, Fig. 50, measure 3 inches toward the lower loop and mark the string. Point C, Fig. 50. The 5 inches space between points C and B is the area to be served.

17. Cut a 5 foot length from the spool of cutty hunk fishing line and wax from end to end; this will be the serving cord. Cut another piece of the fishing line about 8 inches long, double it and twist slightly so as to form a loop; this we will call the "pull through."

18. Lay one end of the serving cord at point B on Fig. 50, make five turns around the bow string and over the end of the serving cord; then trim the end of the serving cord close to the wrapping; this secures the upper end of the serving, point B, Fig. 50. You now have the rather monotonous task of whipping the serving cord around the string, time after time, until the 5 inch space between points B and C, Fig. 50,

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has been served. As the wrapping is being done, keep pressing the turns against the serving with thumb and finger of the left hand. When the serving has reached point C, Fig. 50, hold the cord and place the pull through on the bowstring with the loop pointing toward the lower nock and make five turns around the string and over the pull through. Put the end of the serving cord through the loop of the pull through and pull the pull through back toward point B. This will place the serving cord under five turns of wrapping which,



FIGURE 51—Making the Arrow Knocking Point.

when pulled tight, is sufficient to secure the lower end of the serving. Fig. 51.

19. Fit an arrow on the string and carefully square it with the arrow plate—use a square or a card board that you know is square. Mark the string on each side of the arrow nock; then remove the arrow. Wax a length of the No. 12 shoemaker's thread and wind a knot at each of the marks just made; this forms a nocking station that will assure you of a constant nocking position. Fig. 51.

The string is completed.

If you want to make strings for bows of different lengths, measure the bows and set pin E on the numerals indicating these lengths and proceed as described in this chapter.

The string board has enough nails to make a 36 thread string; if a heavier string is desired, one may cross the board at any position from No. 12 on up. If a heavier string is to be made, the pin at point E will have to be moved up 1/2 inch because more of the length of the threads is consumed in twisting a greater bulk.

The operator will have to make a few strings to know just where to set pin E for any given length of a string.


Til he saw two antlers lifted, Saw two eyes look from the thicket, Saw two nostrils point to windward, And a deer came down the pathway, Flecked with leafy lights and shadows.

Hiawatha

CHAPTER SI X

Game Laws

A LL the states that have special laws regulating the use of bows and arrows as deer hunting weapons are listed below. I have contacted the various Game Commissions through which I have been able to tabulate this pertinent information. The Conservation Departments of all these states are cooperative and are sympathetic toward bow hunting, for it is now regarded as an important sport.



ALABAMA

Alabama has no statutory bow laws. The Director of Conservation may, at his discretion, designate certain areas where the bow hunters may hunt prior to the regular or firearms season. For the past few years a special season has been so designated. It has been conducted in the Bankhead National Forest in the northern part of the state. For further information write to Department of Conservation, Division of Game and Fish, Montgomery 4, Alabama. Ralph H. Allen, Jr., Biologist-in-Charge, states that no game law violations or accidents caused by archery shooting have been reported.

ARIZONA

Arizona accepts the bow as a legal weapon. Bows must weight 50 lbs. or over and arrows must have broadheads 1 inch wide. There are no special bow seasons, but the bow may be used anywhere in the state during the regular firearms season. A special permit is required in addition to a hunting license. For further information write to Director, Arizona Game and Fish Commission, Phoenix, Arizona.

ARKANSAS

Arkansas has a special bow season of one week which opens two weeks prior to the firearms season. Cross bows are prohibited. Bows must weigh 40 lbs. or over; broadheads must be not less than 7/8 of an inch wide. Resident bow hunters must secure special tags which are free to those who have a hunting license. The non-resident bow hunter may hunt deer and turkey during this special season upon payment of \$5.00 for a permit. If the non-resident hunter is successful in bagging a deer, then he must purchase a transportation tag at a fee of \$20.00. (This seems to be a most fair regulation.) Archers must obtain full information and secure the proper permits before they may hunt; these are secured from the Arkansas Game and Fish Commission, Little Rock,

Arkansas. One may get detailed bow hunting information by writing to the Arkansas Bow Hunters Association, 2nd Floor Hall Building Annex, Little Rock, Arkansas. No violations or accidents reported.

COLORADO

Colorado has no special archery season as stated by law. Bows that weigh 50 lbs. or over and arrows with broadheads at least 1 inch wide are accepted as legal weapons. In 1949 a small area was set aside for hunting with bows only. In 1950, there was an extended season in the area of Denver Mountains Park for bows and shotguns only. The Secretary of Education Division of the Colorado Fish and Game Commission states that "It is very probable that the Game Management Division will recommend to the Commission that an area be set aside for archery hunters." For further information write, Colorado Game and Fish Commission, Denver, Colorado. No violations or accidents reported.

CALIFORNIA

California has two special bow seasons. Quoting from the California hunting regulations, it reads as follows:

"Deer Hunting Seasons: Central and south coastal areas, except San Diego County: July 25 to August 3, inclusive. Bag limit: 2 bucks. Balance of state, including San Diego County: September 3 to September 12 inclusive. Bag limit: 1 buck. Special archery deer tags are required for the taking of deer only during the archery season as described above. No cross bows or devices consisting of bow affixed to a stock may be used for taking game." A hunter, who elects to hunt with a bow during these special seasons, may not hunt during the regular season. The archer may, however, forego the special season and hunt during the regular season. A total of

1329 archers took out special deer tags in 1951. No accidents or violations reported. For detailed information, write D. C. Lawrence, Secretary of California Bowmen, 101 Carmel Street, San Francisco 17, California.

GEORGIA

Georgia has no special bow season. For the past few years the Game Commission has conducted managed hunts. For 1952, this hunt will be November 12 to 16. It will be conducted in the Chatahoochee National Forest. Regulations read: "Bows and arrows suitable for killing deer." There is a special \$5.00 fee for this hunt. Non-resident hunting license is \$5.00; therefore, it will cost an out-of-stater \$10.00 to participate in this "hunt." Those interested must have their applications in not later than October 15. Apply direct to Georgia Game and Fish Commission, 412 State Capitol Building, Atlanta, Georgia.

INDIANA

In regards to small game hunting, archers are subjected to all the rules and regulations affecting gun hunters with the following exceptions: Archers may hunt small game on Sundays as well as weekdays; firearms may not be used on Sundays. Archers may hunt in Tippecanoe and Brown County State Parks. No firearms are allowed in these parks. The first deer season in 58 years took place on November 1, 2, and 3, 1951, in seventeen counties; archers were permitted to participate. 8600 acres of Brown County Park was opened to deer hunting with the bow only. Archers must secure a license, cost \$5.00. A total of 117 archers expended 1555 man hours; two deer were killed. It is not certain at this writing that there will be a deer season for 1952. For further information write, State of Indiana, Department of Conservation, Indianapolis, Indiana.

MICHIGAN

Michigan has a special season for hunting deer with the bow in 37 counties and regions from October 1 to November 5. Special season in Alagan County is from October 1 to December 15. Special season for bear, October 1 to November 5. Deer or bear may not be shot while they are in the water. Cross bows are prohibited. If a bow hunter is unsuccessful during the special season, he may procure a license to hunt with firearms or a bow during the regular season. Residents' bow license is \$3.50; non-residents' is \$10.00. Bow hunters may not have any firearms in their possession during the special season. Bows must be unstrung while traveling in a car. In 1951, there were 20,000 bow licenses issued; the estimated kill is 2000 deer. Mr. E. E. Tucker, Assistant Chief Field Administrator, reports as follows:

"The meat hunter is showing up among the bow hunters in increasing numbers. There was a sharp increase in the number of violations during the 1951 season, with those having to do with 'shining' leading the way." No accidents are reported. Bag limit, 1 deer—either sex.

MINNESOTA

Minnesota has a special deer season for bow hunters: October 1 to 31. Bag limit: 1 deer—either sex. The season for firearms, during which archers may hunt, is November 10 to December 1. Archers are not permitted to possess firearms during the special bow season. Cross bows are prohibited. Poisoned and explosive tipped arrows are prohibited. Broadheads not less than $7/_8$ of an inch wide or greater than 11/2 inches long may be used. "Shining" is unlawful. Resident bow license is \$3.50; non-resident bow license, \$10.25. There have been no reports of any violations or accidents.

NEW YORK

New York has a special bow law which permits bow hunters to hunt during the 14 days preceding the regular firearms

season. The special bow permit costs \$5.25 in addition to the regular hunting license. Hunting license, residents, \$2.25; non-resident, \$5.50. The law specifies a "long bow" not less than 45 lbs. Baiting and shining are illegal. A total of 1648 special bow permits were issued in 1951; 54 legal deer were reported killed. Bag limit, 1 deer with antlers not less than 3 inches long and 1 bear not less than one year old. Archers who are unsuccessful during the special season may hunt with bow or gun during regular season. No accidents or violations were reported.

Any person desiring to hunt deer and bear in New York state should write, State of New York, Conservation Department, Albany 1, New York, for detailed information as the dates in different areas differ. The hunting areas and their boundaries may be confusing to hunters who are not thoroughly familiar with these conditions.

NEW MEXICO

Bows and arrows are legal weapons. There is no law regulating the kind of archery tackle to be used; the Game Commission, however, has the authority to make such regulation if and when it is deemed advisable. There has been no special areas set aside for bow hunters in recent years. Archers may hunt deer and small game during the regular open season. For further information write, State of New Mexico, Department of Game and Fish, Santa Fe, New Mexico.

OHIO

Ohio has special reserves for small game where they may be hunted with the bow. There are no special reservations for bow hunting only. There was a deer season in 1949 and 1950 during which deer could be taken with shotguns using slugs or with the bow. There was no deer season in 1951. Whether or not there will be a deer season in 1952 will depend on the results of a "deer count" now in progress. The

special deer license is \$5.00. For further information write, Ohio Department of Natural Resources, Ray M. White, Chief Public Information and Education Secretary, Columbus, Ohio.

OREGON

Oregon has special seasons for bow hunters in specified areas. Mt. Emily game refuge, September 8 to September 23; Canyon Creek refuge, Grant County, September 8 to 21; Tillamook, Tillamook County, September 8 to 23; Crow Creek game refuge, September 8 to 23; Clatskanie, Columbia County, September 8 to 23. Bag limit in any of these areas is one deer of either sex. Hunters must have permits with them while hunting. No extra charge is made for these permits to persons holding a regular hunting license and deer tag. Bows must be 40 lbs. or over; arrows must weigh 1 oz. (437 1/2 grains) ^{or} over and equipped with barbless broadheads not less than 7/8 of an inch in width. For further information, write: Oregon State Game Commission, Information and Education Department, Box 4136, Portland 8, Oregon.

PENNSYLVANIA

In 1951, Pennsylvania passed a law that amended Section 5 of the Game Code so as to give the Game Commission authority to establish a special deer season during which bows and arrows only may be used. The Commission, in 1951, declared such a season, setting the date as October 13 to 27. The date for 1952 will be approximately the same. There are, also, two reservations of 1000 acres each—one located in Forest County and the other in Sullivan County— in which bows and arrows only may be used. If the archer is unsuccessful, he may hunt with either firearms or the bow during the regular firearms season which comes early in December (dates are set by the Commission). Bag limit: one buck. The Commission has the authority to declare an antler-

less deer season of one or two days after the close of the buck season. In the event such a season is proclaimed, the archer may hunt during this special season. Bow hunters must procure a hunting license—residents \$3.15, non-residents \$20.00 —and a special archer's permit which costs \$2.00. If any archer elects not to hunt during the special season, he need not procure the archer's permit to hunt during the firearms season. There were 5680 archery permits issued in 1951 during which 37 deer were killed. This poor showing is attributed to the fact that only a few of the 5680 hunters had ever shot a bow. A few technical violations were reported, sins of omission rather than commission. No accidents were reported. The only bow regulation is that cross bows may not be used.

TENNESSEE

Deer, bear, and wild boar hunting with the bow is confined to a special managed hunt that takes place around the 20th of November of each year. This is held in the Cherokee National Forest. Permits are \$5.00 each in addition to regular hunting license. A non-resident's three-day hunting license is \$6.00. It, therefore, costs the out-of-stater \$11.00 to participate in this hunt. Bows and arrows "suitable to kill big game" are required. Bag limit: one buck, one bear and/or one boar. Applications with remittances must be in not later than September 19; they are to be sent to Director of Game and Fish Commission, 166 Eighth Avenue North, Nashville 3, Tennessee. Those interested should write early for application blanks. The only accident reported was one man who fell and broke his leg. Reports are that this is a gala affair.

UTAH

There are no statutory regulations regarding bow hunting. The Game Commission may, from time to time, proclaim

certain areas to be open to bow hunters only. This Commission may, also, declare a pre-season for archers. Those interested should write to State of Utah, Fish and Game Commission, 1596 West North Temple, Salt Lake City. Utah.

WEST VIRGINIA

The bow and arrow hunting regulations are as follows:

(1) Deer of the hunter's choice (either sex) may be hunted with a long bow during the special deer hunting season, September 15, 1953 to October 14, 1953, inclusive, and November 11-28, 1953, in all territory that is open to deer hunting during the regular gun season for hunting deer.

(2) A long bow may be substituted for a gun during any hunting season for which hunting with a gun is approved. *It shall be unlawful, however, to have both gun and bow in the field at the same time.*

(3) The use of a cross-bow is unlawful.

(4) The bag limit set elsewhere by regulation shall apply to all types of hunting, including bow hunting.

(5) The bow weight shall be not less than 30 pounds.

(6) The minimum width of sharpened broadhead arrow points shall be not less than $7/_8$ of an inch. Multi-bladed arrow points are legal.

(7) The use of barbed arrows, or having barbed arrows in possession while hunting, is prohibited.

For details on bow hunting, contact West Virginia Bow Hunters Association, c/o H. C. Tustin, 2639 Bard Avenue, St. Albans, West Virginia.

WYOMING

Special area for bow hunting on lands belonging to the Soldiers Home in Johnson County, October 17 to November 30. Hunters must be accompanied by a guide. Special deer permits, \$10.00. Resident license, \$5.00; non-resident deer

permit (special) \$20.00. Bows must weigh not under 60 lbs.; broadheads must be not more than 1 inch wide. Owing to the high price of hunting in Wyoming, the bow hunters have not been very active.

WASHINGTON

Washington has no special bow license but the bow hunter must have a regular hunting license. The bow may be used anywhere that firearms are permitted. By proclamation the Commission can designate certain areas, from time to time, in which the bow only may be used. For the past two years Nason Creek Game Reserve, located west of Wanatchee, has been given over to the archers. For information, write Glenn St. Charles, 19807 First South, Seattle, Washington.

WISCONSIN

Wisconsin must love the bow hunter. The entire state is open to the bow hunters for a period of 50 1/2 days. The season begins at 1 P. M. September 22 and lasts through November 11. The archer may, also, hunt through the regular firearms season. Bow must weigh 40 lbs. or over; arrows must be equipped with broadheads not less than $7/_8$ of an inch wide and 11/2 inches long. Cross bows and poisoned or explosive arrows are forbidden. Bow hunters may not possess firearms of any kind while hunting deer. Shining is unlawful. Archers may not carry braced bows while traveling in cars; they are not permitted to shoot from cars while moving or parked; they may not shoot from positions less than 200 feet from the center of any state or county road or highway. Bag limit: one deer of either sex and of any age. Non-resident's bow license is \$10.00, resident \$2.50. Full returns are not yet tabulated on the number of permits issued but it is estimated that there were between twelve and fifteen thousands bow hunters during the 1951 season. During the sixteen years of bow hunting in Wisconsin, there have been no accidents reported.



Then upon one knee uprising, Hiawatha aimed an arrow; Scarce a twig moved with his motion; Scarce a leaf was stirred or rustled. *Hiawatha*

CHAPTER SEVEN

Indian Archery

WHILE this chapter may be interesting to some, it has been found necessary to reserve it as a conclusion because an earlier use would have interrupted the sequence of the chain of thought.

When the white man first landed on our shores, he found the natives armed with bows and arrows. No one seems to know how long the Indian had known the bow,



but it must have been a very long time. We have made reference to Folsom man—whoever he was—and his arrow points that were contemporary with the mammoth, the giant sloth and the sabre tooth tiger; but, for lack of space, we will have to pass him by, also the Basket Weavers, the Shell Mound men and the Mound Builders, interesting though they be, and confine our remarks to those tribes known to our fathers.

The Indian was far advanced in neolithic culture when we first knew him; he was on the verge of the age of metals. Many tribes knew agriculture but, except for the dog, they had not domesticated animals. His major weapons consisted of stone tipped spears, stone axes or tomahawks and bows and arrows.

The red man had reached a state of great efficiency in making archery tackle. He incorporated many of the fundamental principles which are used by our best bowyers; he had, in some instances, made and used glue. He had reached a high degree of efficiency in pressure flaking by which he was able to produce some excellent arrow points. He had mastered the principle and the art of fletching, using three feathers to the arrow. His proficiency in working wood was hampered by the lack of adequate tools but he managed to fashion bows that were serviceable, bows that incorporated some of the technique that our fathers had known in Europe.

It is most difficult to find an old Indian bow. All old wooden items have a way of disappearing. Of the hundreds of thousands of bows used in England, when the bow was a weapon of war, only two authentic specimens are preserved today. It has not been very long ago—within the lifetime of men still living—that the Indian was making and using bows. Yet, when one tries to find a genuine Indian bow he has a difficult task. The Department of Anthropolgy of the University of California has the best known collection. Eastern Museums are sadly lacking in these old weapons. But, from the meager available supply, we are able to give a fairly ac-

curate picture of the bows and arrows as used by the red men when this land was being colonized.

INDIAN BOWS

Bows made and used by the Indians were very short in comparison to the English long bow; they were from 42 inches to rarely ever longer than 48 inches. They were made from such woods as their region produced. In the East, hickory and ash were their choice; the Plains tribes used osage orange; the mountain and desert tribes used juniper and mesquite; the western tribes used various woods common to that region which included some yew.

As a rule, a sapling or a limb was split and allowed to season after which it was fashioned into a bow with wide thin limbs. Some extra wood was left in the region of the handle but not enough to give the bow rigidity at that point; they all seemed to bend in the handle section which made them sluggish in cast and a harsh bow to shoot. On the other hand, if their bows had been rigid in the handle region it would have been necessary to make the bows longer.

Notches were formed on the ends of the bow to contain the string; these notches were often in the form of an abrupt shoulder terminating in a pin over which the string was fitted. Some tribes were so advanced in technique as to apply a sinew backing. This backing was produced by pounding or chewing deer sinew until it was separated into fibres; these were dried and stored for future use. In applying a sinew backing, fish skins and heads were boiled thus making a glue; the sinew fibres were then carefully placed on the back of the bow and set in the glue. After the glue was thoroughly dry, the back of the bow was smoothed with sand or sand stone after which the bow was liberally greased with bear grease.

Sometimes they reflexed their bows by bending them over heated stones. They were often painted in various designs.

The string was made from deer sinew; they had a loop at one end that could be fitted on and off the upper nock at will; the lower end of the string had an attachment of buck skin with which the string was bound to the lower nock.

Dr. Pope, in his "Hunting with the Bow," pages 14 to 17, describes in detail how the last wild Indian, Ishi, made a bow.

Dr. Pope seems to have been greatly interested in the Indian bow; he made more outstanding, scientific tests of these implements than any others of record. These tests were made for the Anthropology Department of the University of California; the records are now on file at that seat of learning. These tests give us a picture of the distance the Indian bows would shoot.

The same arrow was shot out of each bow and the distance was carefully measured. All the bows were shot by the same person; none of the bows were spared; they were brought to full draw and shot at an angle of 45 °. The following tabulation is the result:

Tribe	Bow Weight	Distana
Alaskan Bow	80 lbs.	180 yds
Apache	28 "	120 "
Blackfoot	45	145 "
Chevenne	65 "	156 "
Cree	38 "	150
Esquimaux	80 "	200 "
Hupa	40 "	148 "
Luiseno	48 "	125 "
Navajo	45 "	150
Mojave	40 "	110 "
Osage	40 "	92 "
Sioux	45 "	165 "
Tomawata	40 "	148 "
Yurok	30 "	140 "

Yukon	60	125 "
Yaki	70 "	210 "
Yana	48 "	205 "

A flight arrow weighing 310 grains was used in this test. As a comparison, the same arrow was shot with an English type yew bow weighing 75 lbs. which shot a distance of 250 yards. A modern flight bow will shoot a 31 o grain arrow well over 400 yards.

INDIAN ARROWS

The Indian reached a high degree of finesse in making arrows. He, of course, had no scales to weigh them or a spine testing device to determine stiffness. He did recognize the value of comparative measurement both for length and diameter. Again, the natural products of his region were the materials he used in making his arrows. Sprouts of trees such as sourwood and witchhazel were used. In regions where forms of cane grew, he used reeds. These reeds and sprouts were gathered and seasoned; they were then matched for size and straightened by heating; they were often footed with a tougher wood. The footer was attached with resin or glue after a tapered hole had been drilled in the shaft with a bone drill and the foreshaft had been shaped to fit. The shafts were then sanded to shape and size with sandstone. The Indian apparently had not learned the value of self arrows rived from the bole of a tree or they did not have the necessary tools to produce shafts in this manner.

Feathers from the hawk, eagle, goose or turkey were used in fletching. The feathers were stripped, cut to length and bound on with thin sinew thread. While the feathers were properly placed on the arrow, they appear not to have glued them in position. Their feathers were from 4 inches to 5 inches long and, as a rule, were not trimmed to any shape or pattern. I have seen some Seneca arrows that had the feathers trimmed to shape; Ishi did trim his feathers.

The arrow nock was a deep and well formed cleft. The forward end of the footer was fashioned with a notch to receive the stone head.

ARROW HEADS

Arrow heads were made mostly from flint and obsidian (volcanic glass). They were made by shaping thin pieces of these materials by pressure flaking. Where they learned this art, no one knows. The Neanderthal boys invented the process a hundred thousand years ago; Folsom man used it in America 25000 years ago. It could have been that the art was carried eastward where it was adopted by the progenitors of the mongoloids from whom the Indian is believed to have sprung. Anyway, the Indian culture of pressure flaking had reached a stage of development comparable to the Magdalenian period of prehistoric Europe.

The style of the Indian arrow heads seem to be of a pattern peculiar to the red man. None of the Old World points had notches chipped at the rear; the Indian had developed this feature to extreme in some cases, such as the Yana points. We note, however, that the Folsom points do not have notched shoulders but do contain a feature not found in any other head; this is a flute or series of flutes which appear on the sides of the arrow point.

The process of pressure flaking is simple although it does require a great deal of skill. No doubt that they, being humans, varied in their talents the same as we do. I do not believe that every Indian brave could chip out a beautiful head any more than every American citizen can draw a picture. They, also, had their artisans—the arrow makers, who were most important.

The arrow maker would locate a ledge of flint or a bed of obsidian from which he would knock off small pieces with a heavy stone which he used as a hammer. From these fragments he would select slivers of the proper size from which to make arrow points and other implements.

The arrow maker sat on the ground. He fashioned a piece of heavy buckskin to fit the palm and wrist of the left hand; this was done for protection. He selected a piece of material which he placed on the buckskin and held it in position with all four fingers. The right hand operated a tool made from deer horn and lashed to a wooden stick. This flaking tool was brought in contact with the material against which enough pressure was exerted to chip off a small flake. This process was repeated, time after time, with great patience and skill, until the arrow head was "sculptured" into shape.

The arrow head was fitted in the slot of the foreshaft and held in position with pine pitch after which it was lashed with sinew. See Fig. 53.



FIGURE 53—Indian Arrow Head Showing how it was Fastened on the Shaft.

Arrow heads of stone are fragile; they will break if they strike any solid object. They have, however, amazing penetrating power. Scientific tests have shown that they will penetrate deeper in animal tissue than the best steel broadheads. The reason for this penetration is said to be that these heads have serrated edges. A knife with a serrated edge will cut bread better than one that is razor sharp. The Indian could and did shoot entirely through the bodies of big game including buffalo.

The Indian had a number of forms of release; these included the assisted primary release, the Mediterranean release, the Mongolian release, and the Sioux draw. The assisted primary release is accomplished by grasping the arrow between the thumb and forefinger—the same as we did when we were kids—then assisting the draw by placing the second and

third fingers under the string. The Mediterranean release is the same that modern archers use which needs no further definition here. The Mongolian release is performed by hooking the right thumb under the string and locking it with the first and second fingers. The Mongolians—also the Turksused a ring to protect the thumb but there seems to be no evidence that the Indian ever used a thumb ring. This form of release makes it necessary to shoot with the arrow on the right side of the bow. The Sioux draw was performed by resting the bow string on the ends of all four fingers, using the thumb to hold the arrow on the string. Compton learned this release from the Indians; he taught it to Pope and Young who used it through all their shooting.

The short bows were well adapted to shooting from horseback. After the horse was adopted by the red man, it became an indispensable part of his hunting and warring equipment; the horse made it much safer and easier to kill buffalo. They would ride up to a herd or a group of buffalo and shoot them at will at very close range. When they attacked emigrant wagon trains, their strategy was to circle the caravan, riding around and around, then dashing in for a shot and as swiftly dash away.

In still hunting, the red man had many tricks. He was a master woodsman; he knew the habits of all species of game, where and when they fed and where they bedded down. He knew all the trails and the location of the salt licks. He knew the language—so to speak—of all wild creatures and was able to imitate their calls. The Indian never depended on making long shots; he rarely ever shot at distances greater than 30 yards. Where he shone as a hunter was his ability to stalk the game until he was close to it. But even the Indian did most of his hunting by some form of ambush or surprise.

With all his cunning and his equipment, the red man was a poor marksman by our standards. Beyond 40 yards he was lost. While his individual arrows were often very well made,

his quiver of arrows were not matched as we reckon matching. The best score made by an Indian in the American round was shot by Ishi under the tutorage of Dr. Pope. It was as follows:

30 arrows at 60 yards 10 hits score 32 golds o30 arrows at 50 yards 20 hits score 92 golds 230 arrows at 40 yards19 hits90 arrowsTotal492234

The possible score in the American round is 810. Unless a modern archer can shoot a score of 700 or better, he does not get even honorable mention.

No doubt that an Indian could have shot as well at the large, brightly colored target as the white man if he had had the white man's equipment and his target training. The red man's training was shooting at small targets at short distances; at this, his game, he was an excellent shot.

The Indian was not slow at recognizing the limitations of his armour; he discarded his bow the instant he could procure a firearm.

We all want to remember the Indian with his bow and to think of him as leading a nomadic life in a land where the forests were primeval, the streams unsullied or polluted and the wild creatures as his friends; to sing the song of Hiawatha and wish that we, too, could have a role in that drama of dreams.