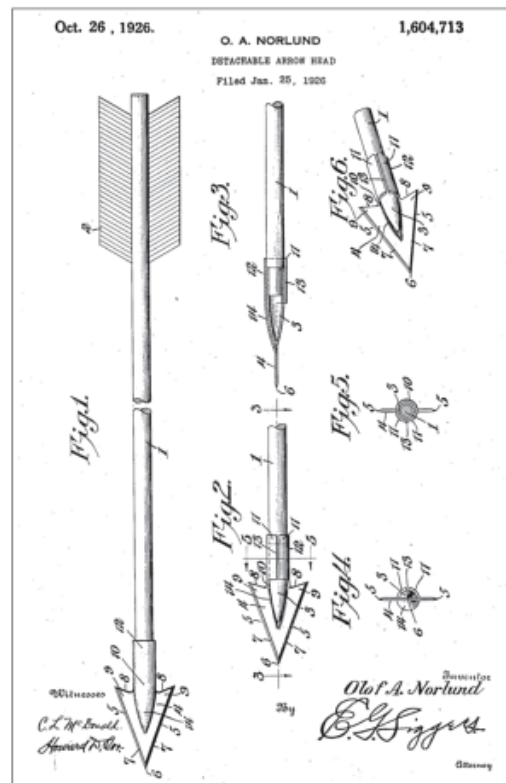


VIII. Broadheads: The Business End of the Arrow

Broadheads have been around since what seems like the dawn of time. Early broadheads were called arrowheads. In the Stone Age, people used sharpened bone, knapped stones, flakes, and chips of rock as weapons and tools. Such items remained in use throughout human civilization, with new materials used as time passed. As archaeological artifacts, such objects are classed as projectile points without specifying whether they were projected by a bow or by some other means, such as throwing.

Arrowheads can be found worldwide as early civilizations developed weapons simultaneously. Arrowheads were handmade using naturally occurring materials like rocks (i.e., flint, obsidian, and cherts). Early arrowheads fashioned of bone and metal have also been recovered.

A team of scientists from the University of Witwatersrand published a report in August 2010 on stone-projectile points dating back 64,000 years that were excavated from layers of ancient sediment in Sibudu Cave, South Africa. Examinations led by a team



◀ O. A. Norlund's patent was the first issued for a modern broadhead.

Patented Oct. 26, 1926.

1,604,713

UNITED STATES PATENT OFFICE.

OLOF A. NORLUND, OF WILLIAMSPORT, PENNSYLVANIA, ASSIGNOR TO PHILLIP ROUNSEVILLE, TRADING AS THE ARCHERS COMPANY, OF PINEHURST, NORTH CAROLINA.

DETACHABLE ARROW HEAD.

Application filed January 25, 1926. Serial No. 83,974.

This invention relates to arrow heads, and has for its object to provide a metallic head, formed, preferably, of hardened sheet steel, and so shaped and proportioned as to be readily applied to the nose end of ordinary arrows used by archers for target shooting and amusement, to convert said arrows into weapons for killing game animals, etc.

Another object is to provide a detachable arrow head for the above purpose which has the necessary penetrating point, cutting edges along the flaring sides thereof and the usual retaining hooks or barbs, and which may be readily formed of a single piece of sheet metal, suitably cut and pressed into a form having means for frictionally engaging the said nose end in a manner to rigidly hold the same in position during use of the same, and which may be as readily removed when it is desired to use the arrow again either for target practice or as a weapon with another head applied.

A full and complete understanding of the invention may be obtained from a consideration of the following detailed description, taken in connection with the accompanying drawing forming a part of this specification, it being understood that while the drawing shows a practical form of the invention, the latter is not confined to strict conformity with the showing thereof, but may be changed or modified, so long as such changes or modifications mark no material departure from the salient features of the invention, as specifically pointed out in the appended claims.

In the drawing, in which similar reference characters designate corresponding parts throughout the several figures:—
Figure 1 is a side elevation of an ordinary archer's arrow having the improved arrow head applied thereto.
Figure 2 is a reverse side view of the nose end of the arrow and the head.

Figure 3 is a longitudinal section on the line 3-3 of Figure 2.
Figure 4 is a front end view of the device.
Figure 5 is a transverse section on the line 5-5 of Figure 2.

Figure 6 is a perspective view of the head applied to the arrow.

Archers, in ordinary target shooting, generally use an arrow such as shown in the drawing and which comprises a staff 1

formed of suitable strong and tough wood of light weight and having at the trailing end, opposite feathers or other thin webs or fins 2 to guide and steady the arrow in its flight. At the front end the staff is usually provided with a thin metal ferrule or nose 3, which may be provided with a rounded or tapered end or striking point, the said ferrule being set into the staff and frictionally held thereon, so that the outer surface of the same is flush with the surface of the staff.

The improved, detachable arrow head comprises a body member 4 formed of thin, flat, hardened steel and is of triangular shape, having its opposite tapering side edges 5 converging towards the front, at an acute angle to each other, to provide the sharp penetrating point 6. The side edges 5 are bevelled on each side to provide cutting edges 7 for facilitating the entrance of the arrow into the object, and the rear edge of the triangular arrow head, at either side of the staff 1, is inclined forwardly as indicated at 8, to provide opposite side hooks or barbs 9 which serve, in the usual manner, to prevent the arrow head from being easily removed from the wound.

Projecting from the rear edge of the body portion 4 is an extension 10 which is normally provided with side wings 11, and the said extension is bent or formed into concave form longitudinally thereof, and the said wings are accordingly bent to complete the circle and provide a tubular sleeve or extension 12, joined integrally with the body member, the said sleeve having the longitudinal slit 13, co-extensive therewith, and formed by the abutting outer edges of said wings, to provide an expansible sleeve to be forced on over the nose end of the arrow, and to exert a constant pressure inwardly to frictionally retain the head in position thereon.

The concavity of the extension 10 is extended on into the body member 4 and tapered to a point somewhat in advance of the center of the head, to form a half-round seat 14 for the tapered nose or ferrule 3 of the arrow, and it will be noted that, when the latter is fully seated therein, the outer end of the sleeve or tubular extension 12 overlaps the open end of the ferrule or nose and clamps also on the wooden staff 1, so that the frictional engagement of the nose

from the University of Johannesburg found traces of blood and bone residue and glue made from a plant-based resin, which was used to fasten the points to wooden shafts.

Modern broadheads, as they have come to be known, get their name from their "broad" appearance. If we fast forward to the 1920s, archery was becoming a popular sport in the United States. However, while it increased in popularity, there were few archery manufacturers in the twenties. During this time, archers would fashion the majority of their equipment by hand, including their broadheads. As one can imagine, the level of complexity in design and manufacture was directly commensurate with the archer's ability to design and build these components.

During this archery era, homemade broadheads were all flat, two-bladed heads fashioned from flat stock. In most instances, the materials used were anything archers could get their hands on, as raw materials were scarce. Broadheads routinely weighed anywhere from seventy-five to a whopping three hundred grains. Most were two-piece designs, with a soldered, brazed, or welded ferrule fastened to the flat blade. Empty bullet casings were popular means of attaching the blades to makeshift ferrules.



▲ Krieger's Special Triple Blade Metal Arrowhead is credited with being the first broadhead with three blades. Interestingly, it was molded of aluminum into a one-piece design. The manufacturing process was considered very advanced for the time period. Credit: Don Williams.

Interestingly, even though manufactured broadheads did not yet exist at this time, the first commercially built broadhead was a tie-on model sold via mail order by the Peck & Snyder Corporation of New York. The year was 1878. In 1923, a very large barbed broadhead built by the California By-Products Company was made available to the public.

In 1925, the O. A. Norlund Company of Williamsport, Pennsylvania, offered their Yeoman No. 1. It retailed for a mere ten cents and was the first broadhead to receive a patent from the US Patent and Trademark Office. It was filed on January 25, 1926 and issued on October 26, 1926 (US Patent 1,604,713).

In the 1930s, several landmark improvements to broadhead design were made. J.H. Mahler of New York created the Mahler Interchangeable broadhead. Mahler's design was the first to incorporate a threaded ferrule that could be unthreaded and swapped out for another head.

In 1938, the Krieger Manufacturing Company of St. Clair Shores, Michigan, introduced the first American three-bladed broadhead via their Krieger Special Triple Blade Metal Arrowhead. The Krieger head was molded aluminum, a real technological advancement way back in the 1930s.

The most popular of the first mass produced broadheads was the skeleton ferrule design of Pearson Archery. These flat-bladed broadheads featured a ferrule that had cut outs. These cut outs did not have any functional purpose; however, the design was easily mass produced at a greatly reduced cost to the consumers. The design was an overnight success and Pearson sold literally tens of thousands of the broadheads in various blade configurations.

Meanwhile, Cliff Zwickey of Minnesota was experimenting with a new broadhead design that would bear his name. Zwickey longed for a quality-made head that featured good steel and would hold an edge unlike the modern broadheads of that era. In 1939, Zwickey introduced his new "Black Diamond." Mr. Zwickey's broadheads enjoyed tremendous popularity. Not one to rest on his laurels, in 1942 Zwickey punched two small areas in his blade and folded the tabs perpendicular to the main blade surface. The result was the first broadhead with four blades introduced in the United States. Zwickey named his new creation the Eskimo. Zwickey's Eskimos are still manufactured today and are the longest running broadhead mass produced in the United States.

By the 1940s, wind-planing had become a real issue with flat-bladed broadheads as bow speeds increased. Mr. Earl Hanson of California began tinkering with the idea of eliminating some of the surface area of a broadhead to limit the wind-planing effect. In 1944, Hanson introduced his "Hanson No-Plane Arrowhead" to the general hunting public.



▲ The Mechanical Killer and the Hinged Fang mechanical style heads were some of the first introduced to the bowhunting community. However, the invention of the compound bow, with sufficient kinetic energy to open these heads efficiently, was almost two decades off. Credit: Don Williams.

During the 1950s, W.W. Rice of Leeds, New York, introduced a very important broadhead. Mr. Rice's "Bo 'n Arrier Rocket" broadhead featured a ferrule design with slots milled into it. The slots would accept four razor blades. These razor blades were then held in place by screwing a conical-shaped tip onto the front of the broadhead ferrule. Thus, the first interchangeable bladed broadhead was introduced. As a practice point, the "Bo 'n Arrier Rocket" could even be shot without the blades in it.

Meanwhile, Fred Bear of Bear Archery was developing a new head that featured replaceable blades much like the Rice head. However, the new Bear broadhead was capable of being shot only using two or four blades. In 1956, Bear introduced his new Razorhead.

The 1960s came and went with little in the way of major improvements. However, in 1972, Dick Maleski of Connecticut introduced his Wasp broadhead to the archery community. Maleski was a machinist by training and was thus able to experiment with different shapes, configurations, and designs. The basis of his design was a machined aluminum ferrule with a hardened steel tip and three highly modified Shick Injector razor blades. The blades were held in place with steel spring locking collars.

The new Wasp broadheads created a dramatic stir in the archery industry and the design proved to be an overnight success. Maleski literally worked day and night to manufacture enough Wasps to keep up with demand for his new and greatly improved broadhead design. In fact, he ran 24-hour shifts and still couldn't produce enough heads.

Since the early 1970s, broadhead designs have made limited progress. Most of the improvements have come in the form of improved materials. Ferrules that were once machined are now metal injection molded (MIM) for better structural integrity. Blade steel has gotten much better and now holds an edge no matter how rugged its use. Advanced manufacturing techniques have led to consistency between heads, with each weighing nearly the same.

Looking ahead to the future of broadheads and their design, it is hard to imagine any real significant advancements will be made. But then again, such was the thought of the Peck & Snyder Corporation of New York in 1878 when they introduced their tie-on broadhead.

Antique Broadheads

BROADHEADS FROM THE LARRY WITTEN COLLECTION.

► **Bear Razorhead:** built by Bear Archery of Grayling, Michigan, in 1956. Some referred to it as the "Bubble Head." It's one of the most successful broadheads of all time.



► **Bigas Big Game Missile with cutting ring:** Built by Norm Bigas of Alpena, Michigan, in 1956. Built until 1969. Achieved very limited commercial success.



▲ **Blood Trail:** built by John Hauch of Stephenville, Michigan, in 1956. The design was limited to the bow it was shot from. It required a very powerful bow to drive the head in deep enough to harvest an animal due to the odd shaped tip with the cringing section.

▲ **Ben Pearson 666 Skeleton Barbed:** built by Ben Pearson Archery of Pine Bluff, Arkansas, in 1942. Very inexpensive head used for big game and bow fishing. This is just one of twenty-three models Pearson Archery made using the skeleton design from 1937 to 1965.



▲ **Ben Pearson Forged #734:** built by Ben Pearson Archery of Pine Bluff, Arkansas, in 1953. One model of seven produced between 1953 and 1957. Not a real successful head.



◄ **Blow 'n' Arter Shop Rocket:** built in Leeds, New York, in 1955. One of the first "take apart" broadheads with replaceable blades. The screw-in design made it possible to change to field point or blunt for hunting.



▲ **Ben Pearson Deadhead:** built by Ben Pearson Archery of Pine Bluff, Arkansas, in 1964. Ben Pearson Sr. used the prototypes of this head to harvest a world-record polar bear and grizzly in the same year.



▲ **Browning Serpentine:** invented by Lou Browina of Grand Junction, Colorado. Built by Browning Firearms of Ogden, Utah, in 1973. Although a very novel design, archers had a particularly difficult time getting the head sharp as the blades were curved. The Serpentine led in many states enacting the "all cutting blades must be in the same plane as the arrow shaft" regulation as this head would not penetrate.



► **Case Kiskadee:** invented and built by Roy Case of Racine, Wisconsin, in 1926. Roy Case made and sold broadheads from 1926 until 1953. Numerous models in both finished heads and in kit form were sold worldwide. Mr. Case was known as "The Dean of Broadhead Collectors." The Case Kiskadee was adopted as the logo of the American Broadhead Collectors Club (ABCC).



▲ **Mohawk Survival Arrow:** invented by Walter Vance of Hyla, Ohio, in 1956. The impact of the arrow would force blades open. It was designed specifically for small game as the amount of energy needed to open this head was staggering.



▲ **Three Vent Gossamer:** invented and designed by Perry Mecham of Salt Lake City, Utah, in 1953. It was a very unique broadhead in the day due to the auxiliary blades that deployed on impact. Five models were made between 1957 and 1959. Ultimately, the head saw limited use as it was very difficult to drive the head through the animal with bows of the day.



▲ **Spitzer:** invented and designed by Fred Musher of Grand Rapids, Michigan, in 1940. There were ten different models built in the 1940s and were named after the after World War II fighter plane.



▲ **Hawkeye Nylon 2:** built by the Hawkeye Feather Corp. of Salem, Oregon, in 1959. It was designed as a small game head. Molded of nylon, it had threads inside the ferrule so it could be screwed onto wooden shafts.



▲ **Krieger:** invented by Ralph S. Krieger of Saint Clair Shores, Michigan, in 1938. A cast head way ahead of its time. Ultimately, exorbitant manufacturing costs would cause its demise. A very sought after broadhead by collectors.



◄ **SR100:** built in Minneapolis, Minnesota, in 1960. It has a very large three blade built in two models. Very rare broadhead with one selling at an auction for \$2,125.



▲ **Stemmler Big Game:** designed by L.E. Stemmler of Queens Village, Long Island, New York, in 1917. Stemmler produced over a dozen different heads. All are very rare and very collectible.



▲ **Terrible Terry**, invented by Ken Moore, co-owner of King Moore Archery in Los Angeles, California, in 1945. There are six total cutting edges on this unique head.



▲ **Barbed Zwickey**, designed and built by Cliff Zwickey of St. Paul, Minnesota in 1939. One of the most sought-after heads by collectors. The laminated head was very strong in the day, and the heads are still built by Cliff Zwickey's son today. The Zwickey is the longest continuously produced broadhead. For years the barbed heads were outlawed in many states and fell out of favor with manufacturers. In 2010, Jack Zwickey reintroduced the Barbed Zwickey after most states lifted the ban. It is again a popular head. Zwickey's motto is "the sun never sets on a Zwickey head"

The Advent of Mechanical Broadheads

In 1948, Beryl H. Steinbach had grown tired of ill-flying broadheads. He designed a new style of head that was capable of expanding on impact. His broadhead had small wings that would deploy the blades when pushed backward. Mr. Steinbach applied for a patent that same year. On September 18, 1951 he was issued US Patent 2,568,417 for his "Arrowhead Assembly." The Steinbach patent is considered by broadhead collectors to be the original mechanical broadhead.

Subsequently, in the 1950s, several other mechanical heads were introduced. Early mechanical designs were riddled with operational problems. Some failed to open due to their radical design. Large wings required enormous amounts of kinetic energy to open and the stick bows of the time were incapable of producing enough speed to open these monstrosities.

Also during the 1950s, several mechanical heads were introduced by manufacturers. These heads seem to be ahead of their time, as they would require the power of a compound bow to operate correctly—an invention that was almost two decades away. The mechanicals from the fifties included the Star Point, which was designed, manufactured, and distributed by the Red Bow Manufacturing Company of Vermont in 1953. The Mechanical Killer was introduced in 1955, the Mohawk Swivel Action in 1956, the Geronimo in 1957, and the Hinged Fang in 1960. Because of the day's inefficient bows, mechanicals died a slow death

as they proved ineffective when shot from recurves and longbows.

Blueprint of a Bow Kill

A strategically placed arrow dispatches animals quickly. But how is it exactly that a well-placed arrow proves lethal to an animal? I am often intrigued by hunters when they recount the tracking of an animal that proved unsuccessful. Most often the story goes, "I found plenty of blood, like it was pouring out of them, but no deer."

But how much blood does it take for a shot to be lethal? A thimble? A cup? More? And what does it take for an animal to expire when hit in the lungs? What physiologically happens to an animal after being shot? Oddly enough, these are questions that have remained unanswered for decades. Well, here's both the logistics and the how-to behind the shot.

Biology Meets Ballistics 101

Living tissue is composed of about 60 percent non-compressible water. For hunters using high-powered rifles, they rely on extreme muzzle velocities to put game on the ground. Modern rifles can generate muzzle velocities from 2,000 to more than 4,000 feet-per-second, placing the projectile in the supersonic range (objects traveling in dry air of a temperature of 68 °F (20 °C) at a speed exceeding around 343 m/s, 1,125 ft/s, 768 mph, or 1,235 km/h). These velocities create the violent impact and resulting

shockwave that radiates throughout the surrounding tissue of an animal.

A bullet creates a bludgeon point when it comes in contact with incompressible tissues. As the incompressible tissue slows the bullet by friction and hydraulics, a hydraulic shockwave is created. This sends out a shockwave that radiates throughout surrounding tissues, organs, and nerves, inflicting irreparable damage. This immense pressure wave of destruction is called *hydrostatic shock*.

The Broadhead Equation

Low-velocity broadheads, however, travel at top speeds of maybe 400 feet-per-second (i.e., out of a select few crossbows). This speed is classified as *subsonic*. Subsonic speeds are those that fall below 343.2 meters per second (1,126 ft/s) in dry air at 68 °F (20 °C). Arrows and their broadheads are lethal for a dramatically different reason than high-velocity bullets; an arrow's lethality lies in its ability to cleanly sever arteries and veins and rupture vital organs.

To understand just how a broadhead harvests an animal, think of an animal's circulatory system as an elaborate, pressurized plumbing system—one that runs throughout the animal's body. A broadhead's job is then to compromise the system and spring a leak somewhere in the plumbing.

When a broadhead compromises the system, the circulatory leak leads to an abrupt loss of blood. When blood is lost rapidly, blood pressure drops quickly, halting transport of oxygen-rich blood to vital organs (like the brain). A fatal condition called hemorrhagic shock is induced.

Experts generally agree that animals must lose one-third (33 percent) of their total blood by volume to die from hemorrhagic shock. Whitetail deer have approximately 1 ounce of blood-per-pound of body weight. So a 200-pound whitetail deer carries 1.56 gallons (5.91 liters) of blood. Mathematically speaking, a loss of 0.52 gallons (1.97 liters) would lead to its demise.

Now consider for a moment that you are given a half gallon of blood to disperse along a trail. You would soon find that there would be an incredible amount on the ground. Give that some thought next time you're trailing an arrowed animal.

By the Numbers

Physiologically speaking, as blood loss reaches 10 percent (0.243 gallons for a 200-pound whitetail deer), the heart rate dramatically increases. This is an

autonomic response by the body to attempt to maintain the system's equilibrium. The increased heart rate is attempting to elevate the blood pressure back to normal.

At the 20-percent mark (0.312 gallons for a 200-pound whitetail deer), the heart loses its prime and is now unable to keep pace with the ever-increasing loss of blood from the circulatory system. At this point, the animal's blood pressure begins to drop.

At the 30-percent mark (0.468 gallons for a 200-pound whitetail deer), the animal begins showing the dramatic signs of hemorrhagic shock: low blood pressure, loss of consciousness, and loss of *perfusion*. Perfusion is the process of delivery of blood and oxygen to a capillary bed in the biological tissue.

Faulty Jets

An automobile's carburetor mixes fuel with air. The human lungs function in much the same manner. As oxygen is inhaled into the lungs, it is infused into the blood. This life sustaining cocktail is passed throughout the body via the circulatory system.

The lungs are housed in the pleural cavity where the pressure is slightly lower (during inspiration) than that of outside air. The expansion of the chest wall keeps slightly negative pressure in the pleural cavity which, in turn, maintains the expansion of the lungs. This negative pressure holds the outer walls of the lung tissue against the chest wall, while the elasticity of the lung tissue keeps air passages open.

When an arrow compromises this space—that of the lungs—air rushes into the pleural cavity from inside the lungs and through the chest wall, breaking the vacuum and collapsing the lungs. With the lungs collapsed, oxygen cannot be mixed with the blood—this condition is medically referred to as *pneumothorax* (the prevention of the transfer of oxygen into the blood). The subsequent oxygen starvation of the brain leads to hypoxemia. *Hypoxemia* is generally defined as decreased partial pressure of oxygen in blood, sometimes specifically as less than 60 mmHg (8.0 kPa), or causing hemoglobin oxygen saturation of less than 90 percent.

Hypoxemia results in a loss of consciousness, while the oxygen-starved heart begins beating abnormally. The process is called *dysrhythmias*. Oddly enough, a whitetail hit in the lungs may succumb to suffocation (hypoxemia) before it has a chance to bleed to death. The result of a lung shot is the motor (muscular system) running out of fuel (oxygen).

The Ethical Shot

Quartering-Away

Shots to the chest cavity—those that damages the liver, diaphragm, lungs, and heart—are highly effective. In this quartering-away shot, the arrow passes through the animal diagonally, entering through the thin abdominal wall and passing forward into the chest cavity. The lethal disruption of any number of vital organs, as well as both the blood and oxygen delivery systems, occurs.

Remember: always use the opposite front leg as your aiming point.

Broadside

This shot offers the highest probability of a pass-through. Geometrically speaking, a broadside shot is the shortest distance through an animal.

Remember: Your aiming point should be right behind the front leg, one-third up from the bottom of the chest cavity. To avoid hitting the heavy bones of the shoulder, wait until the animal presents itself with its leg forward.

Abdominal Cavity

The large abdominal cavity houses the stomach, kidneys, liver, and small and large intestines. While

Why Mechanicals Require More Kinetic Energy

We've all heard that mechanical-style broadheads (those with blades that are fixed in the closed position during launch and flight that deploy when they strike the target) consume considerable energy when opening, but I can't recall seeing an explanation of this phenomenon anywhere.

As any broadhead-tipped arrow enters a target (in this case, an animal) its momentum begins to decay as a function of friction. This friction comes from both the broadhead blades, as well as the arrow shaft. As we have seen, animal flesh and tissue is comprised mostly of incompressible water. As a fixed-bladed broadhead (i.e., a broadhead with blades mounted and exposed at all times) enters an animal, it begins as the rearward swept blades pass through flesh. Since the blades are already "deployed," no additional energy is used. Fixed blades also have a significant mechanical advantage over mechanical-style designs.

A *mechanical advantage* is defined as a measure of the force amplification achieved by using a tool (i.e., a broadhead). Our fixed-bladed broadhead offers a mechanical advantage as it concentrates the energy into a sharp point and the rearward sweeping blades.

In contrast, as a mechanical broadhead hits an animal, the blades begin to be forced open. At this moment, the friction system (rubber band, slip-cam, spring, o-ring) that holds the blades shut must be overcome. Overcoming this friction system consumes energy. After the target has been struck, the arrow shaft has continues to move forward, leaving the blades stationary as they pivot open.

Once they are deployed, they again begin to move forward, jolting the arrow as it is forced to drag them through the target. This instantaneous shock, or application of drag, slows the arrows forward progress considerably, robbing yet more energy from the arrow. It is much like a dragster deploying a parachute at the end of a drag race. Additionally, dragging the deployable blades, which in most cases are placed at acute angles to gain large cutting diameters, robs yet more energy from the arrow.

Arrow Shafts. I cover arrow shafts comprehensively in Chapter Six. For argument's sake, when searching for the perfect hunting arrow, remember that arrows are, like all other compound components, governed by the laws of physics. As such, when looking for the perfect hunting arrow, general rules apply. First, the larger the diameter of the shaft, the more fluid drag it has when entering and passing through a target.

For the best penetration, you should choose the smallest diameter shaft you're comfortable shooting. I also recommend that you choose an arrow with the smoothest finish. The finish contributes directly to the amount of surface friction an arrow has. The smoother the finish, the less surface friction it generates, and the easier it slips through a target. In all cases, the diameter of the arrow shaft must not exceed that of the broadhead's ferrule diameter. If you are shooting an arrow/broadhead combination that demonstrates this, you are decreasing your penetration by some 30 percent.

an expansive target, avoid it at all costs. Shots here are mostly lethal, yet recovery rates are dramatically low. Usually there's little bleeding, but the stomach or intestines are cut, and their contents seep out into the animal's abdomen. Massive infection, called *peritonitis*, results. Death can take up to twelve hours.

Facing-To or Facing-Away

Neither of these shot angles present a high-percentage of success and should not be taken. In either case, heavy bones and muscle lead to minimal shot penetration.

Quartering-To

For much the same reasons not taking facing-to or facing-away shots, quartering-to shots should be avoided. Heavy bones and muscle of the shoulder shield the chest cavity.

Spine

While spine shots make for some spectacular video, they almost never work. The upper third of the body contains the bones of the spine and the heavy muscles of the back. It's unlikely an arrow will penetrate through this mass to the vital organs.

The Perfect Hunting Arrow and Shaft

Much has been written and much has been debated over the perfect broadhead design and the "best" hunting shaft. While there are plenty of both to choose from, few possess all the right stuff for optimum performance. As with many facets of the archery game, there are numerous old wives' tales and misinformation surrounding the perfect hunting shaft. We will dispel several of those here.

As you have seen previously, a hunting shaft's lethality is dependent on its placement. A poorly placed arrow, no matter how fast it was shot, will not kill the animal if it doesn't compromise one or more of the animal's life support systems (i.e., circulatory system, respiration system, etc.). Here are some tips on getting the most out of your hunting rig.

Maximize the Machine

As we have seen, compounds are amazing machines. They're capable of sending arrows to their intended target with incredible speed. To maximize the efficiency of the compound, select an arrow heavy enough to make use of all the bow's mechanical advantage. As the weight of an arrow increases, so does the mechanical efficiency of the compound. To do so, you'll need

to shoot varying weight arrows through a chronograph and compare arrow speeds to arrow weight. At some point, the bow will begin to lose mechanical efficiency as it attempts to push an arrow that's too heavy.

Achieve Perfect Arrow Flight

A bow that is not shooting arrows with perfect flight is not functioning at peak efficiency. An arrow that is porpoising, fishtailing, minnowing, etc. is dissipating precious kinetic energy to do so. A perfectly tuned bow that shoots perfect arrows is using all of the available kinetic energy in the correct manner.

If your arrows aren't flying perfectly, or if you suspect they aren't, shoot your bow through paper to check its tune. If you don't know how to do this, visit a local pro shop and have them do so for you. They can easily correct any problems and maximize your arrow's flight.

Spine, Spine, Spine

To shoot the perfect arrow, you must select the perfect arrow spine. Selecting the proper arrow spine for your compound is a relatively simple task. Arrows shot with the wrong spine significantly decrease your bow's mechanical efficiency.

Which Broadhead is Best?

Broadheads are available in three styles: cut-on-contact, fixed-blade, and mechanicals.

For those who shoot low poundage (forty to fifty pounds), I recommend cut-on-contacts. Cut-on-contacts penetrate best because the tip is a sharpened razorblade. Cut-on-contact broadheads begin their cuts the moment they engage the animal. The tips cut as they enter and lead into the animals via lacerations. This is in contrast to chisel points, which lead with a blunter point.

For those shooting heavier poundage (sixty and above), fixed-blades are an excellent choice. Fixed-blades are durable and fly true if you take the time to set them up correctly. Typically, fixed-blade style heads have the aforementioned chisel points. While they require a bit more kinetic energy to penetrate than cut-on-contact heads, chisel points are more durable and less prone to bending.

Mechanicals, while getting plenty of ad time as of late, require additional kinetic energy when deploying their blades. Mechanicals are at a disadvantage when presented with a quartering shot—typically deflected shots and disappointment are the norm. Mechanicals do shine as they require little or no tuning to get them to fly field-point true.

Perfect Broadhead Flight

Weigh-In

Arrow-to-arrow consistency is absolutely necessary for tight, repeatable groups. With a digital grain scale, weigh your arrows. Shoot only those that are the exact same weight (within a few grains). Be sure all your broadheads weigh the same, too.

Wobblers

Believe it or not, not all carbon arrows are straight. With an arrow spinner and a field point, spin-test each arrow making sure it's straight. Cull those that are not.

Shooters

Once your arrows weigh the same and are straight—shoot them with field points. Take note of the ones who fly consistently. Set those aside from the group that don't.

Sharp Shooting

Once you've culled down your arrows, install your broadheads and start the process over. It's best to do this over several shooting sessions. Don't rush. After a couple sessions, you'll have a handful of perfect flying arrows.

Attitude Adjustment

On occasion, rotating the knock a quarter turn can transform an underachieving arrow into a standout. Rotate it until it flies better. If it won't, delegate it to the off-season practice range.

Keep 'Em Separated

Mark your best flying arrows. Put one dot on the cock vane of your best flying broadhead arrow, two dots on the next best flying arrow, and so on. Never shoot an ill-performing arrow at an animal.

The American Broadhead Collectors Club (ABCC)

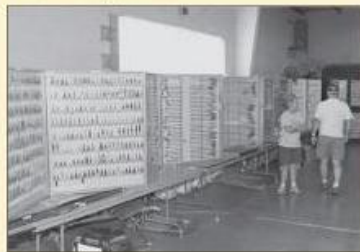
The American Broadhead Collectors Club (ABCC) was established in 1974 by a small group of archery enthusiasts. Today, members are located in all parts of the world. The goal of the Club is to record and preserve the history of broadheads and fish points.

The ABCC has assembled a master list of all the commercially made broadheads from 1927 to today. The broadhead master lists are divided into categories: tie-ons, glue-ons, and screw-in broadheads. To date, the master list contains some 4,500 broadheads and fish points.

A large number of broadheads listed are from New Zealand and Australia. Fish points were added to the master list several years ago, with more 400 known commercially made fish points.

Once a year, the ABCC holds an annual meeting and its members can attend and bring their collections to put on display and trade for others.

The ABCC prints a quarterly newsletter with articles on old and current broadheads. Several books on broadheads and fish points meant for identification purposes have been printed under the ABCC's supervision.



▲ ABCC members display their collection at an ABCC meeting.

IX. Accessories That Make the Hunt

Anyone who has spent time in a tree stand, in a ground blind, or spot-and-stalking knows the right accessories can make or break a hunt. Whether it's a great backpack or a quality rangefinder, the right accessories can mean the difference between success and failure.

Treestands

Taking to a lofty perch for the day can be very exciting. Being prepared for the long sit can make the hours spent motionless almost bearable. There are plenty of styles and models to choose from. The trick is to select the one that's right for you, your hunting style, your physical ability, and your limitations. Here's how to pick the one that's right for you.

Climbers

Nearly four decades ago, James Baker and Fred Walters teamed up to create the first climbing tree stand. The "Baker" planted innovative seeds of thought leading to contemporary climbers. Modern climbers are alloy light and cleverly compact. Hunters are privy to ascenders capable of sending hunters up considerable distances and into remote areas.

I.J. Westad of Minnesota received credit for the original climbing tree stand, which differed from and heavily influenced Baker and Walters's work. In 1911, Westad patented a "Rope Climbing Device" that allowed users to ascend rope easily (US Patent 983,335).

▼ A bowhunter is filmed by a friend while elevated in treestands.

