

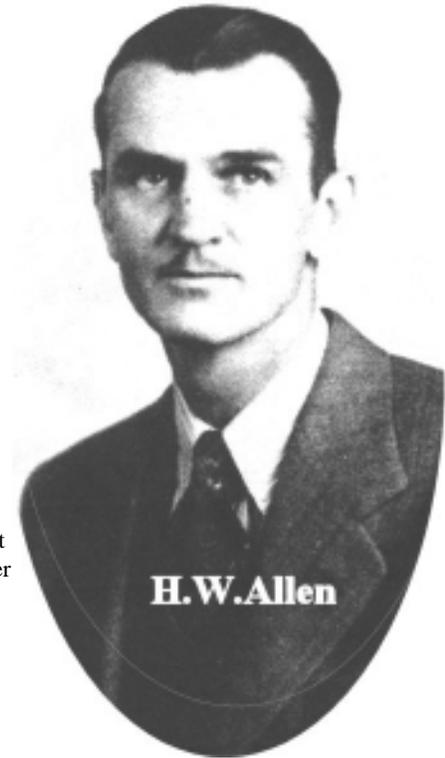
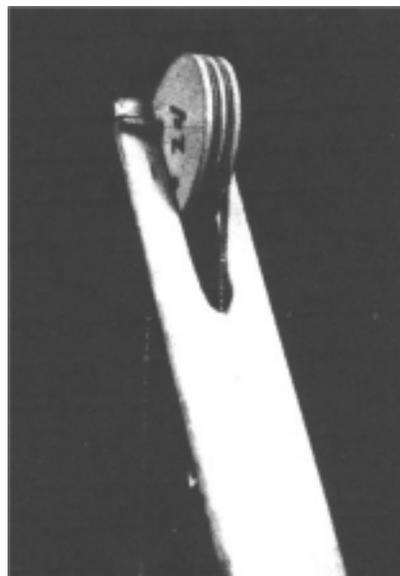
Invention Of The Compound Bow

By Douglas T. Allen

THE MAN and his youngest son were deer hunting along the Grand River country near Chillicothe in northern Missouri, the fall of 1965. As they headed back to camp after an unsuccessful morning in the tree stands, they saw several deer jump from a borrow ditch and run into a nearby thicket. The man drew back and shot but the arrow flew behind the doe a few inches, losing itself in the underbrush. The deer had moved a couple yards forward and again stood broadside to the hunters. The son drew and released, with both the arrow and the deer repeating their respective performances. The man took another arrow from his quiver and sent it to join the others, the son following close behind.

This sharp shooting minidrama repeated itself many times, with the deer moving forward a few yards at each shot, never more than twenty yards away. The hunters began talking to one another, trying to arrive at a plan to outwit the deer. They decided to shoot at the same time, one hunter aiming just behind the shoulder and the other aiming slightly in front of the doe.

The man pulled the last of his six arrows out of his quiver, nocked it to his bowstring, and with great deliberation, drew to his anchor point. Realizing this was his last chance, he took careful aim and released. The arrow grazed the inside of the doe's heel. The doe jumped up and ran into the brush, obviously shaken but otherwise unhurt.



How in the world could they have missed? This was the main question c the man's mind as they drove back home, near North Kansas- City, Missouri. A he kept considering the event, it began t dawn on him that neither he nor his so were that bad at shooting a bow. He the carefully considered what the deer had done. Why, they hadn't missed! The deer had dodged their arrows! At ten yards?! Impossible!! That doe' movements weren't that hard to follow. The arrows were too slow! About thirty, feet, the bow shoots about, oh, 160 feet per-second, so that makes it about one fifth-second. Too slow!

H.W. Allen had been dissatisfied with bow performance since he had build and shot his first longbow and footed arrows in the early 1920s. When Missouri opened its archery deer season in the early 1950s, he built a recurve laminated with fiberglass rovings which he bonded to the limb core with epoxy.

Always A Problem Solver, H.W. Allen Built The First Compound Bow In Two Days After A lot Of Thought

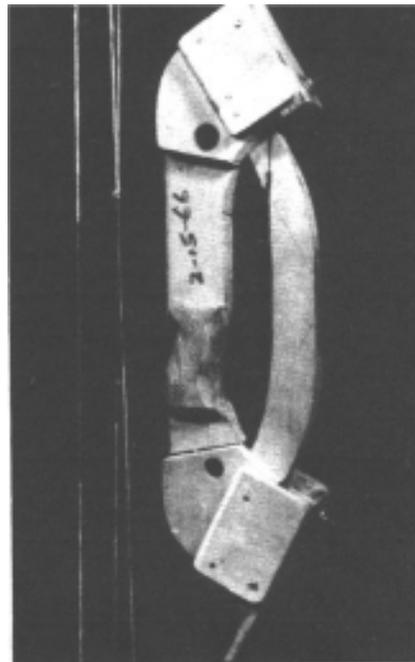
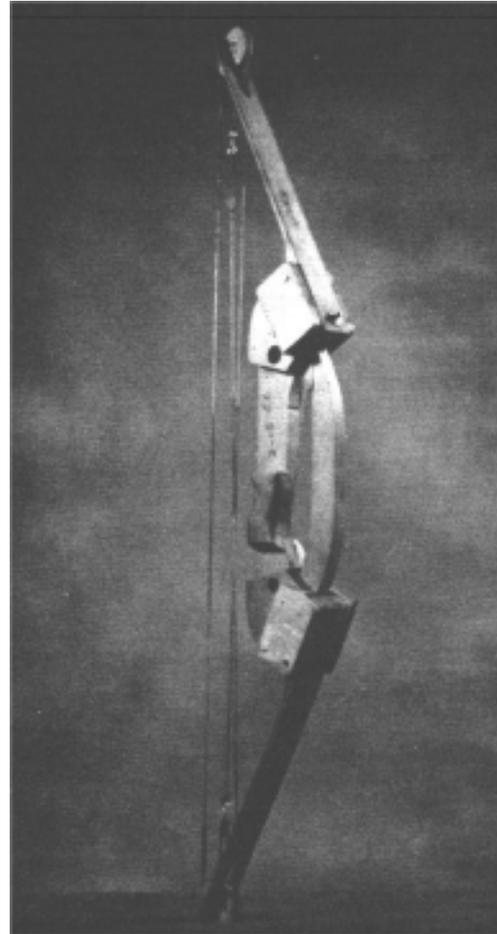
Original hand-built compound bow is now in the possession of inventor's son, Douglas. Construction is crude by today's standards but the bow proved principle of the off-center wheel.

The bow gave him much better arrow velocity but his first two deer showed that the bow still left quite a bit to be desired. The first deer jumped the string at thirty yards and the arrow luckily severed the femoral artery. The second was a straight down shot in which the arrow did not fully penetrate. I can remember some of the ideas he tested many years ago. One was a long handled bow with short, extremely recurved limbs, which did not improve arrow speed at all. He also tried a short arrow shot down a track, which gave him some more speed but less penetration; it also broke his bow. Those early experiments, although not done with serious intent, gave him some insight into the dynamics of a bow. The serious search for increased arrow speed began in earnest after that Chilicothe doe.

As I remember, Dad borrowed a high school physics book from a neighbor and studied the section on mechanics, paying particular attention to one basic formula: $K.E. = \frac{1}{2}mv^2$, which states, "The energy of a moving object equals one half of the mass of the object times the square of its velocity."

His experiment with the arrow track taught that even though he reduced the weight of the arrow by more than half, he had gained only a relatively small increase in speed. Something else was using the energy. He reasoned that when shooting a bow, everything that moves will absorb some of the energy stored in the limbs: the arrow, the bowstring, and the bow limbs. Since the arrow weight didn't mean too much, and the bowstring couldn't weigh that much, it was the bow limbs that must be absorbing more of the energy.

Referring back to the formula, Wilbur Allen realized that in order to have a significant increase in arrow speed, he had to store a lot more energy. But how to do it? At this point, I think it best to convey some degree of understanding of the extent of Wilbur Allen's ingenuity, his determination to solve problems, and his love of building things. I can best do this by relaying two of his solutions to situations which had confronted him. There were many, many more.



Handle of Allen's first compound was made of pine boards and glue

The first was when I was in Boy Scout camp and he was one of the counselors. A rumor started that the white bass fishing was excellent on the Osage River and he had left all his fishing gear at home. So, not to be denied, he drove to Osceola and purchased a forty-nine cent fishing rod, some ten-cent lures and a small spool of fishing line. As he already had his regular gear at home, he did not want to spend \$15 on a new reel. Instead, he went to a local hardware store and bought an egg beater for thirty nine cents, and combining it with an empty coffee can back at camp, fashioned a closed-face spinning reel. It worked like a champ. I never forgave him for throwing it away when the family moved to Billings, Missouri.

The second of his solutions was a machine, Dad was manufacturing wire baskets to hold paper mache pots. These were sold to floral distributors who in turn sold them to flower shops as wedding and funeral stands. The machine was a wire-straightening machine. Starting with a two hundred-pound coil of steel wire, the machine oiled the wire as it entered, straightened the wire, cleaned it, and cut it off to any length required, automatically. It was built from the transmissions and motors from two washing machines, two solenoids, one sheet metal beading tool, twelve steel bars, some pulleys, V-belts, switches, electric wire, assorted boards, nails, and screws, and several pieces of tungsten carbide he bought for fifty cents apiece from an Army-Navy store. Total cost was, I believe, \$40, which was a considerable reduction from the then (early 1950s) \$30,000 for a commercial machine. It has been thirty years since he built that machine, and it is still running.

One evening in late January of 1966, Dad was studying his drawings of the pulley bow, looking for what to change to give him more stored energy. As he looked at the pulley, he thought of positioning the pivot hole off-center. Imagining what it would do, he became aware that it would result in a much more rapid increase in pull weight early in the draw.

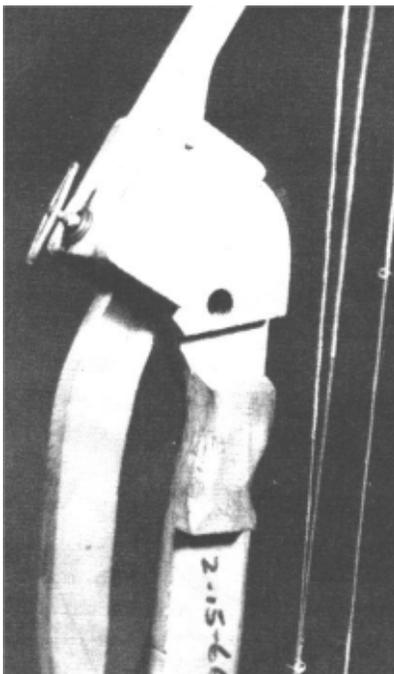


Wilbur Allen was an avid fisherman, archer and problem-solver. He always looked for ways to do things cheaper and easier than before. The bow Allen is shown drawing above is a more advanced version of his invention.



When he visualized that the pull weight would decrease further along the draw, he became excited; so excited that he could not sleep that night.

Early the next morning, he began to build the first compound bow. He cut limb cores and fadeouts of oak flooring and wound epoxy-saturated fiberglass rovings end-to-end on them. The handle was made of pine boards held together with Elmer's glue. The limbs were mounted on pivots and he welded some T-bolts to mount through the limb butts to the handle for draw weight adjustment. The eccentric pulleys were wood, and he made a long bowstring to reeve it all. A handmade turnbuckle attached to the axles on the limb tips adjusted the bowstring to balance the bow and change the draw length.



Draw weight adjustments of Allen's bow used pivots and welded T-bolts through limb butts. Original bow, above took two days to build.



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The eccentric pulleys were wood, and he made a long bowstring to reeve it all. A handmade turnbuckle attached to the axles on the limb tips adjusted the bowstring to balance the bow and change the draw length. The bow took two days to build. His first test was to stand newspapers on edge in a cardboard box and shoot into the side of the box. The arrow from the compound penetrated twice as far as the same arrow from his recurve. The test that really created the excitement was when Dad shot the bow in the backyard at a target about forty-five yards away. Being used to his recurve, he held his elevation where he normally would and the arrow flew two feet over the bales. Dad and Greg (his youngest son) looked at one another in disbelief. When the next arrow also flew two feet over the bales, they whooped up such a commotion that Mom was sure one of them had been shot.

In today's world, the accomplishments of the individual are often not attributed to him. They are generally associated with large corporations. Witness the compound bow, the laser beam, and even the weed string trimmer. However, it is the individuals who invent them, the people who believe that there must be a better way and have the determination to keep trying. I sincerely hope that such spirits always arise, for they are the movers of the world.



Before his invention, H.W.Allen was a bowhunter in Ohio. His dissatisfaction with long bows lead to his study and research.