



## How the modern ball evolved

*The little round pill has come a long way since the "feathery" and "gutty" days.*



"Feathery" ball

By F. P. KOEHLER

Product Manager, Royal Golf Equipment Sales

**T**he story of the evolution of the present day golf ball is one that may never really be told. The truth is buried beneath legend, romance, a few facts and maybe a little fiction.

We do know that the Romans at the time of Caesar played a game called *paganica*. Opposing teams, armed with club-shaped branches, tried to hit a ball against their opponents' goal, a post positioned several hundred yards away from the one they were defending. What is significant perhaps, is that they used a *feather-stuffed* ball.

When the Romans overran Europe, crossed the Channel and occupied parts of England and Scotland, they brought their game with a ball and stick with them. Between that time and the first documented mention of golf as we know it lies a period of some 1,500 "lost" years.

In 1457, James II of Scotland passed a statute prohibiting the game of golf because it was interfering with the practice of archery. (But, as any golfer's wife will tell you, it was foolish to believe that little things like Royal statutes and maybe even a few heads chopped off would stop the game of golf.)

That opposition to golf was a bit weaker by 1505 is borne out by the fact that at that time the Royal High Treas-

urer set up an account to take care of the money spent by King James IV for golf balls. There was still some opposition though even after this, because in 1592 the Town Council of Edinburgh passed an ordinance prohibiting the game of golf on Sunday.

In spite of all this, the game of golf persisted and grew in popularity. The introduction of gunpowder near the end of the 15th century was also a factor, as it lessened the importance of archery for defense.

The golf ball of that day consisted of a leather cover stuffed with a hatful of feathers. The specification was a hatful of feathers per ball. We don't know what kind of feathers were used and we don't know much about what the clubs of those days looked like except that they were essentially straight.

**H**ere's a description of how the "feathery" ball was made taken from the Illustrated London Almanack of 1845: "The golf ball is about the size of an egg, and is made very firm. It is composed of stout leather, which, having been previously soaked in boiling water, allows of its being first very firmly sewed, and then turned inside out, leaving a small opening only by which it is very forcibly

Continued on page 44

## MODERN BALL

Continued from page 42

stuffed with feathers. The leather being yet wet, it contracts into a ball of the dimensions stated, but nearly as circular as that used in the game of cricket. It is subsequently painted over with several coats of white paint, in doing which it is requisite that the white lead used should be pure, and exceedingly well ground down; as well as that each coat laid on should become perfectly dry and hard before another is applied."

**T**he first real improvement in the golf ball came in 1848 when some enterprising Scotsman introduced what was known as the gutty ball. This was a perfectly smooth, solid ball, molded from gutta percha. Gutta percha is a tough thermoplastic gum extracted from the bark and leaves of Palaquim trees native to Java. The ball was a real improvement over the feather ball because it was more stable in the wind and was less affected by dampness on a rainy day. You can well imagine what happened to a feather ball when it got caught in the high wind or became water-soaked. It was sometimes necessary to use a new ball at each hole at a cost of about one dollar each. That was a lot of money in those days.

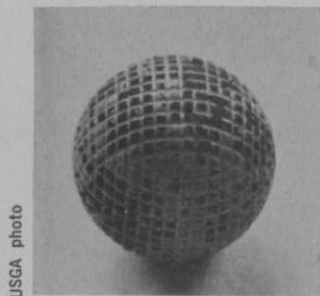
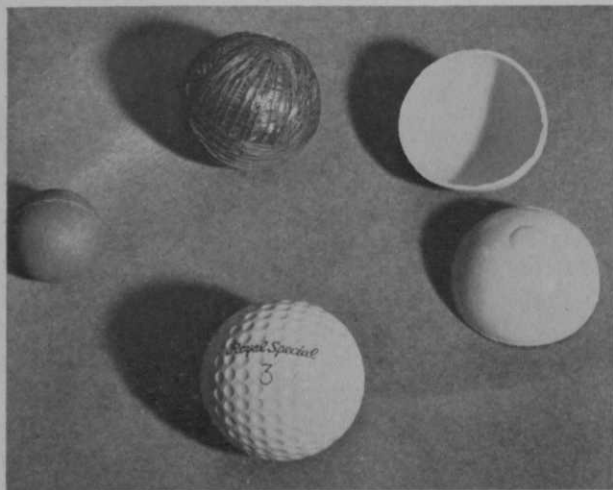
Along with the gutty ball, science got into the act. Someone noticed that a new gutty ball would fly about 125 yards then duck and fall rapidly. However, after the ball was cut up a bit, the flight was longer and the ball behaved better in the wind. The record doesn't show that anyone seriously tried to explain this phenomenon at the time, but the observation did lead to a line of hand-hammered balls. Probably there was a whole series of designs, depending on the maker of the ball and the customers' desires.

In general, the gutty ball was easier to play and more durable but for some unknown reason it did not give as much flight as the feather ball.

The present day golf ball had its origin in 1899 when a gentleman by the name of Haskell in Cleveland invented and patented a new ball made by starting with a live rubber center and putting on a winding of rubber bands. This was then covered with a gutta percha or balata shell. The general idea of these three components still persists to the present.

The United States Golf Association which makes and enforces golfing rules in this country, sees to it that all golf balls look about alike. They have set up tournament ball specifications which say that the ball must be at least 1.68" in

Continued on page 46



USGA photo

"Gutty" ball. Used  
c. 1850-1900.

Clockwise from l.:  
core containing  
center; core with  
thread around it;  
two parts of cover,  
and finished ball.

## MODERN BALL

Continued from page 44

diameter and weigh not over 1.62 ounces. In addition, the ball must not have an initial velocity of over 250 feet per second when tested under standard conditions on a special testing machine maintained by USGA. These specifications are for the American ball. The English ball is slightly smaller, being 1.62" in diameter and weighing 1.62 ounces.

Operating within these limits, golf ball manufacturers supply a whole line of balls suitable for the needs of all types of golfers from the very worst "hackers" up to the leading golf professionals.

At UNIROYAL, we've been making golf balls for 51 years and the processes have changed completely several times since 1915 when we began. Here is how a modern golf ball is made.

The innermost part of a golf ball is called appropriately, the center. Most all golf balls used by golf professionals and low handicap golfers are made with "liquid centers." These centers are made by encasing a liquid in a relatively thin-walled rubber covering. The liquids used by the various manufacturers range from water to fairly viscous pastes. The materials used are usually trade secrets as are the methods of manufacture.

After the center has been made it is wound with rubber thread into a "core." The winding is the real heart of a golf ball and must be done carefully with the very best of materials.

The winding thread is practically pure natural rubber. There are just enough ingredients added to produce a vulcanized rubber composition having the property of absorbing the energy delivered by the swinging golf club and returning it very quickly with very little loss. This characteristic makes the ball go.

If you were to unwind a top quality golf ball you would find in your hands about 30 yards of thread. In winding a ball the thread is stretched about eight times its length. To illustrate this, imagine the 30 yards of thread stretched out to about 240 yards—the length of a good long drive.

During the winding operation a lot of energy is stored up in the thread as it is stretched. There is enough potential

energy stored in the thread to lift a 150 pound man two feet off the ground.

During the winding, the center in the ball is put under very high pressure. This effect can be illustrated by winding a rubber band around your finger. One turn is tight. If you build up several layers it continues to get tighter and tighter. This same thing happens to a golf ball center. The pressure on the center actually builds up to about 2,500 pounds per square inch, or in other words, the center as a whole is sustaining a total pressure of about from 7,000 to 8,000 pounds.

During the winding it is very important that the tension on the thread be kept constant. This is necessary to make the ball structurally sound and to make all the balls of a particular brand as nearly alike as possible. One of the best ways to accomplish this is with what is called electronic tension control.

To accomplish this for the ROYAL Golf Ball, we use winding machines of our own special design. In these machines the thread is stretched between two supporting rollers while it is being wound. The tension of the thread is constantly watched by an electronic eye which immediately corrects for the slightest variation and thus maintains uniform winding tension throughout the ball.

After winding the core, we take two accurately molded hemispheres or shells of especially compounded balata and put them around the wound core. The whole assembly is next put into a mold and given a short heat treatment, to knit the cover to the ball and form the surface markings.

After the ball is molded, it is cured or vulcanized at room temperature to toughen the cover and make it more resilient.

After curing the ball is painted, branded, given a final inspection and then packaged.

There are over 85 operations that go into the making of a single top quality golf ball. Each ball is inspected at 14 of these points along the process to make sure that it is perfect in all respects. In all, over 50 tests and inspections are performed in the manufacturing process.

Now that we have the ball made, let's see what happens when a good golfer hits it. On a nice even, fast swing off the tee,

Continued on page 49

## MODERN BALL

Continued from page 46

the club is moving at a velocity of 162 feet per second or about 110 miles per hour. It hits the ball and the club velocity is quickly reduced to 125 feet per second or about 85 miles per hour. While the ball is being hit, it is given an initial velocity of about 250 feet per second, or about 170 miles per hour.

This is another way of explaining the scientific fact that the kinetic energy of the club is transferred into potential energy and then kinetic energy in the ball. You might think that a heavy club would be better and that would be true if you could swing it fast enough. As you may know, the kinetic energy is one-half the mass times the square of the velocity ( $\frac{1}{2} MV^2$ ). Since the velocity or speed is squared it is the most important factor and should be as large as possible to give high energy to the ball.

When the ball is hit it tends to roll up on the face of the club. This imparts a rotation of about 5,000 revolutions per minute to the ball. This is what you call a back spin and is what you get when you hit the ball correctly. If you hit the ball like many a week-end golfer does, instead of straight back spin, you will also have some spin around a vertical axis which causes the ball to slice or hook, instead of going 5,000 revolutions in one direction you will have 3,000 revolutions per minute back spin and 3,000 revolutions per minute side spin. This chases the ball right off into the rough.

We said earlier that a smooth ball would go only about 125 yards. This is to be compared with about 240 yards obtained with the same blow using the regular dimple marked ball. To explain why the marked ball goes further, let us imagine that as the ball rotates, it carries a layer of air around with it. At the bottom of the ball the rotation is such that air is piled up under the ball. The rotation of the ball carries the air away from the top of the ball. This creates a pressure under the ball and a sort of vacuum over the top of the ball in much the same way as a vacuum is created over the wings of an airplane. This vacuum holds the ball up during the flight so that

the ball is in the air longer than it would be if there were no lift effect due to the vacuum over the ball. The amount of lift is very critically dependent on the design of the cover markings. If they are changed by as much as one thousandth of an inch, the flight of the ball will be changed.

In addition to giving longer flight, you know that the back spin is what keeps the ball from running off the green on approach shots.

The game of golf has changed considerably since King James tried to outlaw it in 1457, and in this country golf has come a long way from the day in 1888 when the first game was played on the meadows that became New York City's Central Park.

In 1966, it is estimated that 8,333,250 golfers will play a minimum of 15 rounds or more; and, it is estimated that the number of golf courses will reach an all-time high of 8,781. As you can see, golf keeps increasing in both the number of participators and the number of facilities available. •

---

## Indian Archery buys Kunkel golf cart business

Indian Archery, Evansville-based manufacturer of bows and arrows for hunting and target shooting, is expanding its operation into the field of golf, President Robert E. Griffin has announced.

They have purchased the business, patents, designs and inventory of Kunkel Industries, Inc., of Chicago. Kunkel Industries is among the top five producers in this country of golf carts.

James F. McNeely, v.p.-sales, said Indian Archery will sell the golf carts through the same retail outlets that now distribute its bows, arrows, and accessories.

Manufacturing equipment from the Kunkel Industries plant in Chicago will be moved to Evansville as soon as a location for the plant has been selected. Bill Kunkel, one of the founders of Kunkel Industries, will continue as general manager of the plant when it is established in Evansville.