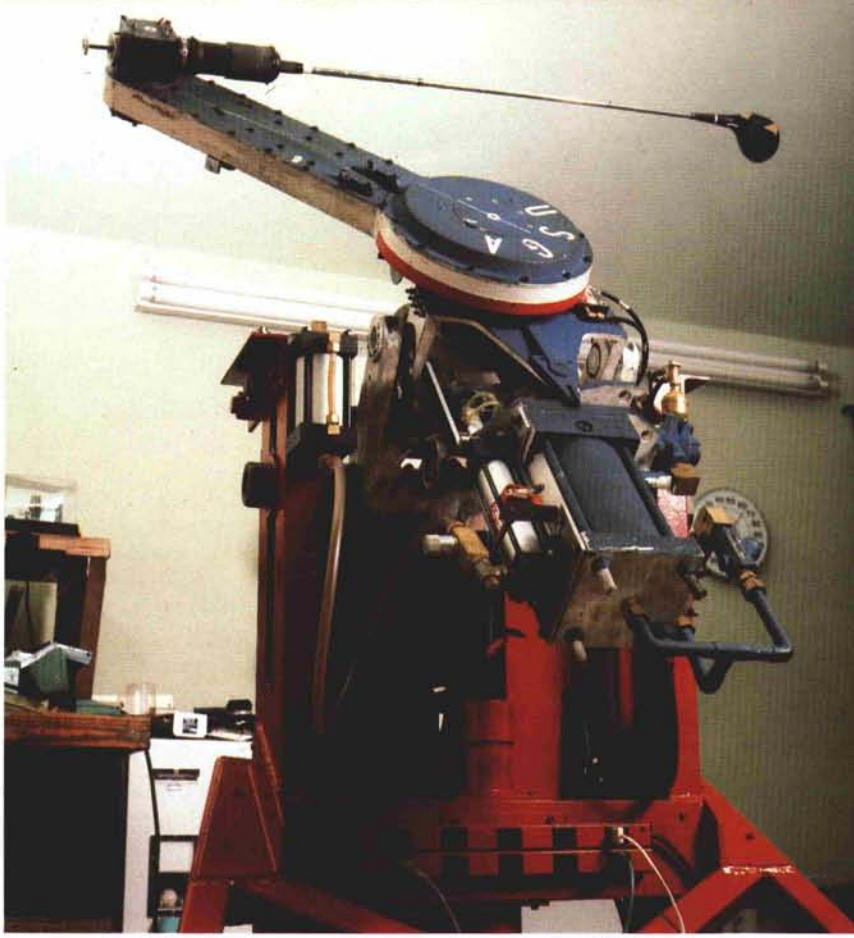
"Iron Byron" Sets Distance Standards



USGA's mechanical golfer "Iron Byron."

by FRANK W. THOMAS, Technical Director, USGA

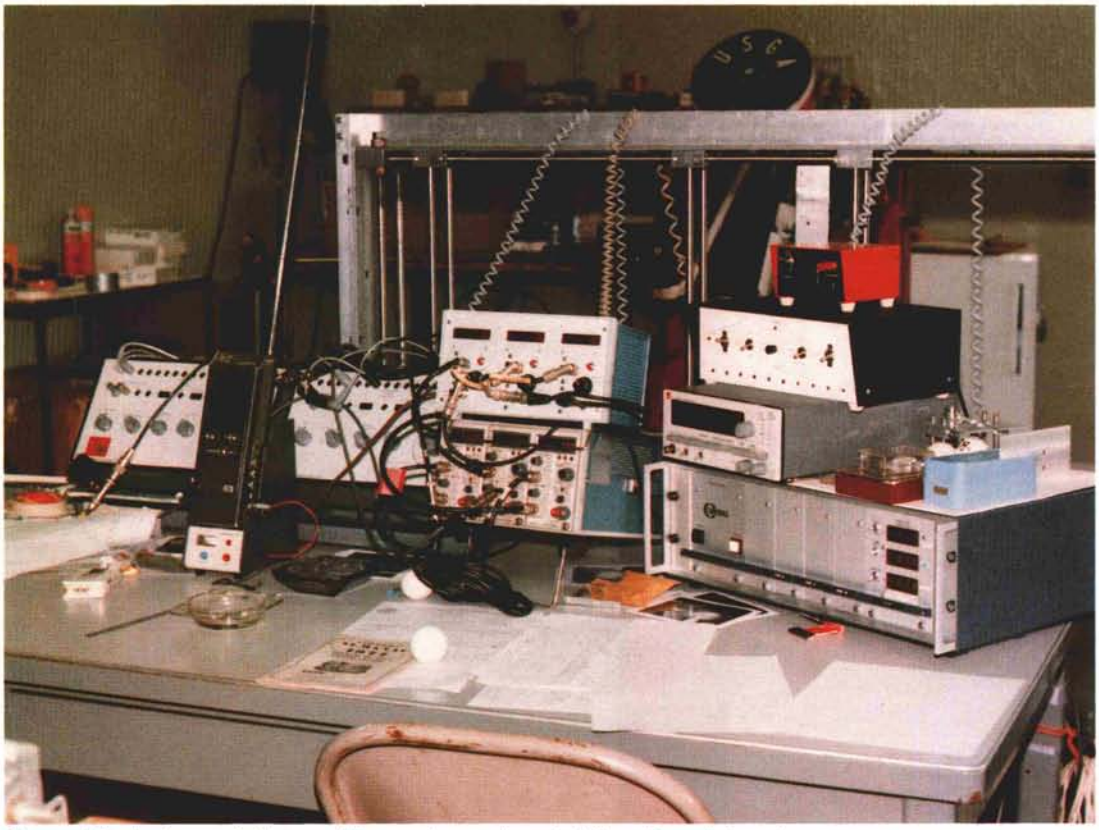
THE USGA IS the governing body of golf in the United States. Our generation is holding this responsibility in trust, so to speak, as generations before us, and, we suppose, as generations after us will do. The game, hopefully, will continue to be enjoyed for many years to come. However, the manner in which we handle this entrusted guardianship determines the destiny of the game and consequently the future pleasure of millions of people. By some estimates we have as many as 11 million golfers in the United States today and approximately 19 million in the world. With only moderate increases in participation during the next eight generations as an example, more than 150 million people will be affected by the action we take during our guardianship. A sobering thought! Perhaps this places our responsibility in perspective. Our mistakes will be corrected by future guardians. Some insignificant action taken now, however, could be the catalyst to a non-reversible reaction. With this in mind and the responsibility well defined, we see the obvious need for cooperation of everyone who is concerned about, enjoys or makes his living from golf.

It was in 1744 that the first 13 Rules of Golf were written, indicating the necessity to control the game for enjoyment and for fair play. The golfer's degree of skill would be his only advantage.

It soon became very evident that the type of equipment being used improved scoring and in most cases substituted for skill. For this, rules were drawn up to regulate equipment. These regulations developed into Rule 2 and Appendix II and III in the Rules of Golf.

More activity, both in research and in testing, is associated with Rule 2 than any other Rule. The USGA is spending more than $200,000 annually to monitor Rule 2 and develop new standards. This is necessary to keep up with technology and dramatic innovations in equipment. Innovations in equipment should never be stifled, however, because golf is not a stagnant game and never should be. Stagnation is sure to harm the game, but the acceptance of innovations must be controlled and limited to those which will add to, as opposed to take from, the game.

To this end, and as it relates to golf balls, the Rules require that a golf ball be no more than 1.62



Some of the instrumentation used to monitor and control "Iron Byron's" performance.

ounces in weight and no less than 1.68 inches in diameter and shall not exceed an initial velocity of 250 feet per second with a tolerance of two per cent when tested on USGA equipment. Neither shall a ball travel more than 280 yards with a tolerance of four per cent in carry and roll when tested under specified conditions using USGA equipment at the USGA test site. This is the Overall Distance Standard.

To monitor this standard and make the actual test is an extremely complex operation.

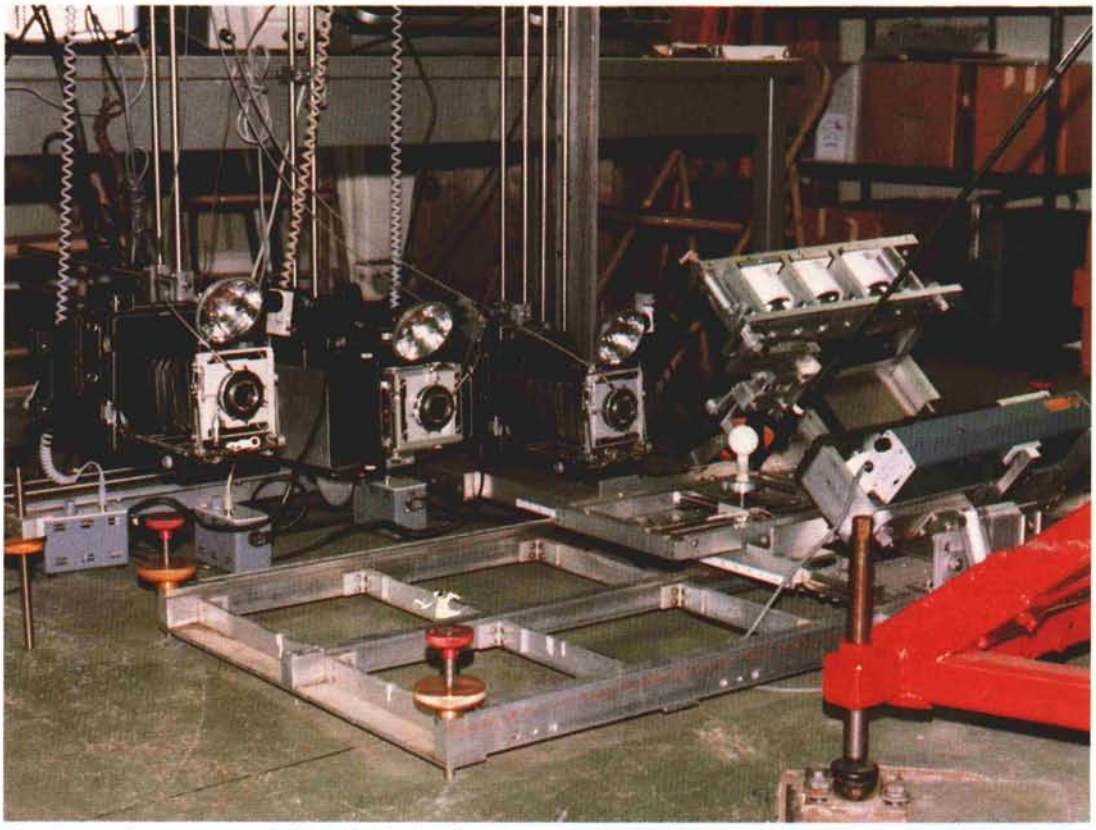
First we must launch the ball as a golfer normally would to obtain a drive of approximately 275 yards. To do this consistently requires the use of a mechanical man, "Iron Byron," a machine that is capable of driving a ball 350 yards dead straight, or, just as easily, hooking or slicing without showing any emotion (something I am trying to learn to do).

In maintaining a set of standard conditions we must first control clubhead velocity and limit it to 160 feet per second, or approximately 109 miles per hour. This is equivalent to the head speed of a reasonably long-hitting professional golfer. To monitor this we have developed a laser beam measuring device which is capable of measuring every two inches of the last 12 inches prior to impact. The measurements are accurate to within ± 1 millionth of a second.

Obviously the way the ball flies depends on how the clubface is presented to the ball. Therefore, such things as dynamic loft angle, spin loft and clubhead direction are also accurately measured.

The collision at impact is dramatic, however, lasting only about 450 millionths of a second and the clubhead and ball remain in contact for approximately three-quarters of an inch. There are two major phases to impact — compressive phase and recovery phase. During the compressive phase the ball is flattened to nearly two-thirds of its original diameter. It does not leave the tee and the front of the ball does not move; in fact it has not yet begun to react. Thereafter the clubhead and the ball move together for a little more than one-quarter of an inch while the ball is kicking off the clubface. It is considered that during the recovery phase is the time when the forces are reacting to create the spin of the ball. The ball does not slide or roll up the clubface (by our usual definition of the word roll).

The ball will leave the clubface at approximately 235 feet per second, or 160 miles per hour, spinning at a rate of approximately 3,300 revolu-



System used to measure clubhead velocity, face presentation at impact, clubhead direction, ball velocity, ballspin, launch angles, duration of impact, etc.

tions per minute. The force required to do this is in excess of 1,700 pounds.

The ball speed, spin, and launch angle are all measured. This ball then flies through its normal trajectory. The peak angle of the trajectory is measured and also how far left or right it may have strayed in reaching this peak. A counter indicates how long it remains in flight, and during this flight period the wind velocity is measured in the three directions, including vertically.

The point of impact with the ground is marked, along with the spot where it stops rolling. This provides the data as to distance of carry, distance of roll and distance from the intended center line.

Temperature of the ball affects its performance characteristics and is therefore controlled by keeping the balls to be tested at 75 degrees Fahrenheit and using them not more than 30 seconds after they are removed from the incubator. The barometric pressure, temperature and humidity are also recorded.

A number of samples of each brand of ball tested are randomly mixed with calibration balls and at the conclusion of the test all data is analyzed and compared to the Standard. The analysis will show that no two types of balls perform in the same manner. In some cases, where the final resting place may be the same, the path they took to get there may be dramatically different.

The spot where the ball stops rolling depends on a number of variables, such as approach velocities, angles, etc. Once the ball makes contact with the grass, we then find a number of other conditions which must be controlled. To obtain the effect of resiliency on the impact, the moisture content of the soil must be measured. A turf tester is also used. This launches the ball approximately 25 yards with a little backspin. The bounce and roll are measured to establish whether or not appropriate test conditions prevail. If not, water can be applied and/or cutting height reduced. We therefore have several immediate steps which can be taken to control conditions. However, annual programs are also important and will have long-range effects.

Various other standards need monitoring and new ones are being developed, some potentially as complex as the Overall Distance Standard. This is, however, the price we have to pay to keep up with the advances being made in technology. The USGA has only one goal in mind and that is to protect the game and so fulfill our commitment as the governing body.