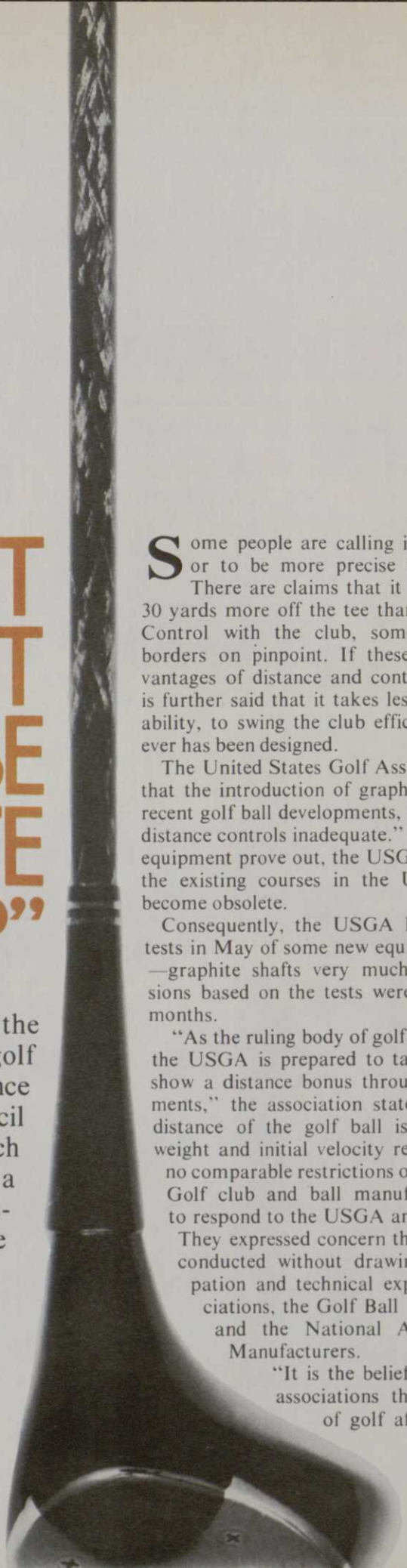
by JOE DOAN

"WHAT ABOUT THOSE GRAPHITE SHAFTS?"

This is the common opener to the hottest topic of discussion in golf circles today. Probably not since the discovery of the lead pencil has graphite received so much attention. GOLFDOM takes a comprehensive look at the present and future state of the market



Some people are calling it the "wonder" club or to be more precise the "wonder" shaft. There are claims that it will give as much as 30 yards more off the tee than steel or aluminum. Control with the club, some professionals say, borders on pinpoint. If these newly-wrought advantages of distance and control aren't enough, it is further said that it takes less energy, maybe less ability, to swing the club efficiently than any that ever has been designed.

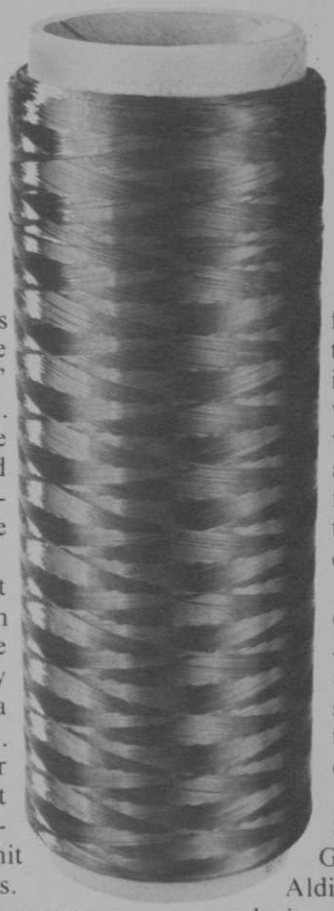
The United States Golf Assn. has expressed fear that the introduction of graphite shafts, as well as recent golf ball developments, "may render existing distance controls inadequate." If claims for the new equipment prove out, the USGA feels that many of the existing courses in the United States would become obsolete.

Consequently, the USGA launched a series of tests in May of some new equipment developments —graphite shafts very much included. No decisions based on the tests were expected for a few months.

"As the ruling body of golf in the United States. the USGA is prepared to take action if its tests show a distance bonus through the new developments," the association stated. "At present, the distance of the golf ball is controlled by size, weight and initial velocity restrictions. There are no comparable restrictions on clubs."

Golf club and ball manufacturers were quick to respond to the USGA announcement of tests. They expressed concern that the tests would be conducted without drawing upon the participation and technical expertise of their associations, the Golf Ball Manufacturers Assn. and the National Assn. of Golf Club Manufacturers.

"It is the belief of the club and ball associations that the current rules of golf afford reasonable and



adequate control in maintaining golf's character and the integrity of the game and the courses on which it is played," the combined association statement said. "We will view with alarm any rule changes hastily arrived at that could seriously affect the enjoyment that millions of golfers receive from golf and the equipment they select . . ."

The manufacturers of the new shaft —the graphite, of which you have been hearing so much in recent months—are emphatic in stating that it is not they who are making claims for all that extra yardage or that "laser beam" control. But they do say that graphite is easier for everybody to swing than any club that ever has been made. And, it is a "forgiving" club; it tolerates or suffers mis-hit shots to a larger degree than do other clubs. The shaft of the graphite is approximately one ounce lighter than its steel counterpart. The weight that is saved is put in the clubhead. The shift in weight is what makes the difference as far as the energy factor is concerned. The combination of heavier head and lighter shaft enables older golfers along with women and others not so muscular to more closely approach the swinging efficiency of stronger and more athletic players. This, however, doesn't come automatically. Learning to swing the graphite requires an adjustment in tempo, however large or small, for most players. Because the new graphite-shafted club is said to be well-balanced, this adjustment is not difficult to make. Or, at least, that is what the manufacturers are saying.

Toney Penna, a leading Professional Golfers' Assn. tournament player from 1935 to 1950, who turned to clubmaking after retiring as a competitor, is among those who are enthusiastically endorsing graphite shafts. "They are what we've been looking for all these years," says Penna. "Put them down as one of the great advances in clubmaking. Now we can put more weight points in the clubhead—exactly where they should be. Weight in the shaft alone means little or nothing. It's the faster recovery factor that counts and this is the secret of the graphite-shafted club."

Penna. who founded and now is president of the Toney Penna Company in Jupiter. Fla., says that he can't get nearly as many graphite shafts as he'd like. The shafts have been in production for less than a year, and supply lags far behind demand.

Until recently, only two companies, Shakespeare/Plymouth Professional Golf Div., Plymouth Meeting, Pa., and Aldila, Inc., a small San Diego firm were producing the shafts, but now Fansteel has entered the field and at least a couple of others are rumored to be getting ready to start production, including a leading shaftmaker.

By putting more mass into the clubhead and lightening the shaft so the club can be swung faster, as is done with graphite, there is a threefold, step-up in the kinetic energy that is imparted to the ball. The additional mass and increased swing velocity (combined, they are known as the moment of inertia) account for the larger part of the added energy input. Then, too, the fact that graphite clubs can be swung faster than ones shafted with steel or aluminum gives rise to another force that favors the new material. It comes from the increased angular momentum that is converted to linear motion in the hitting area. The result of these added forces produces more clubhead speed and a more direct hit.

That these different forces have been more effectively harnessed than ever before could result in the

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GRAPHITE *continued*

over-all reduction of club weight, says one clubmaker. Possibly by as much as one ounce. This could be beneficial to the senior golfer or the woman player. Both of the latter have always needed a lighter club that gives more clubhead speed with a lower expenditure of effort.

Swing weight and balance readings naturally have to be closely checked when a pro fashions a graphite club for one of his members. A few professionals, incidentally, are doing quite a bit of this. When the new shaft is installed in a driver, the swing weight is reduced by about five points, from a D-0 to a C-5, for example, and so it is necessary to put compensating weight in the clubhead to restore the balance reading. This is usually done with tape, on a trial and error basis, with the clubhead being built up to the player's feel. As one professional says, this is customizing at its best.

The Shakespeare/Plymouth company started experimenting with graphite shafts about five years ago. It was an outgrowth of the company's production of fishing rods and bows, both of which are now widely marketed. Extensive studies of stress patterns and torsion properties, worked out with a computer, were made before the three flexes, in which the golf shafts are available, were decided upon. The stiffest shaft is the Sigma X, an all-graphite model.

Slightly less stiff, but heavier, is the Sigma S, a blend of fiberglass (10 per cent) and graphite. The heaviest shaft in the group is the Alpha, which is composed of 25 per cent fiberglass and 75 per cent graphite.

Shakespeare was the first to introduce graphite shafts, displaying them for the first time at the 1972 PGA Merchandise Show. In the last year or so the company has increased its production of the shafts fourfold, and as of May 1 had a six-week order backlog.

The other manufacturer of the shafts, Aldila, Inc., has been producing them for about one year. It builds the shafts in 15 flexes—the higher the number, the stiffer the shaft. Typical flexes are: No. 3, soft; No. 6, regular; No. 9, medium stiff, etc. One professional who has used the No. 13 flex, says that it is altogether too much club for him even though he considers himself a reasonably strong swinger. Most of Aldila's production is in the 7 to 9 flex range.

James Flood, president of Aldila, is said to have gotten the idea for a graphite golf club shaft while using a graphite fishing rod. It is not known if the rod was a Shakespeare model, but at least there is no dispute between the two companies as to which originated the graphite club. Aldila is an Italian word meaning "far beyond," which might imply that a shaft of the same name propels a ball well beyond the limits of other materials. But like the Shakespeare people, those at Aldila disavow claims to an extra 25 or 30 yards for their woods. What they call attention to is the "universal" shaft, one that everyone may be able to swing effectively.

Fansteel is one of the larger industrial conglomerates with divisions that make primary metals, forgings, castings and sheet metal. It already is known in the golf field for investment cast stainless steel clubheads. The company's advanced composites engineers in Newbury Park, Calif., have developed a series of graphite shafts with stiffnesses equal to and labeled the same as the present steel shaft. They are in increasing order of stiffness: L-ladies; A-soft; R-regular; S-stiff, and X-extra stiff.

Fansteel will only supply the shafts to club manufacturers; it will not get into the club business.

Dave Fernandez, general manager of Fansteel's Recreation Products Group, says that the company first seriously got interested in graphite shafts last fall. "However, we are also interested in graphite in general—there is a large market here in such products as skis, bicycle frames and other sporting good applications where weight is a factor. We believe there will be a substantial reduction in cost for all products utilizing graphite once these markets are developed."

Although Fansteel currently is offering the standard flexes described above, Fernandez says they have the ability to supply "in-between" flexes if a club manufacturer requests them. He added: "Should a customer require greater or lesser torsional stiffness than normal throughout the range of flexes, he can have it. Put another way, we have the capability of producing a shaft with more flex, but still retaining torsional rigidity."

Fernandez says that Fansteel has a new testing machine that has proved the durability of their shafts against fatigue failure. This is highly significant because many golfers have asked about the durability of graphite.

Other clubmakers in the graphite market are Ram, Pedersen and Northwestern, and by publication time there could be more new entrants.

Ram is producing a graphite-shafted driver only right now. However, president Allen P. Hansberger, says the company is looking at possible production of graphite-shafted 3-, 4- and 5-woods. The driver is being sold individually or can be ordered as part of the company's top pro-line set, Ram XS-1000. But 95 per cent of sales have been individual. The suggested retail on the driver is $150, and Ram has shipped several thousand drivers since the first of the year when the company introduced it, according to Hansberger.

Northwestern is offering graphite-shafted clubs in all 15 Aldila flexes, but the majority of orders are for three stiffer flexes—Nos. 7, 8 and 9. The graphite shafts are available in Northwestern's top models. Suggested retail for a wood is $160. Irons are sold as a set, 2 to 9, plus a pitching wedge, at a suggested retail of $1,080. However, the majority of orders are for a driver only. Some of those who have bought a driver were back two or three weeks later for a 3- and 4-wood, according to marketing manager Al Wiswell.

The latest clubmaker to enter the field is Pedersen Div. of O.F. Mossberg & Sons, Inc. Ronald E. Miller, vice president, said the division will pursue a complete marketing program in graphite-shafted clubs. It plans to produce 1,000 clubs a month with the new shafts, both stock specifications and custom.

Only one of the Big Three club manufacturers is known to be testing

continued on page 24

GRAPHITE *from page 22*

graphite. The head clubmaker at this company says he is impressed with the material, but is far from convinced that everyone can handle the new shaft. "Some sweeping statements are being made in this respect," he says. "The good swinger will adapt to graphite without much trouble, but there is no assurance that it will be of much help to the hacker. Regardless of what a club is made of, the golfer has to learn to swing it."

Another reason why this company is not rushing into market the graphite is that it isn't at all sure golfers in large enough numbers are willing to pay the $85, $100 and $150 or more quoted retail prices of a single graphite wood. (However, Shakespeare's Alpha, made of 75 per cent graphite, retails for $42 per wood.) This company also may be guided by the reasoning expressed by the Midwest sales manager of another of the Big Three firms. Influenced by all the talk he has heard about how much greater distance the new club gives, and not by its supposedly inherent control qualities, he wonders if it isn't strictly a hitter's club. "A player may be willing to pay $100 a piece for graphite woods," he points out, "but is he willing to buy graphite irons? Imagine a set that is priced at $1,200 or $1,400, or even $600 or $700, if they are able to cut the graphite price in two. Who is going to pay these prices? I have a hunch that the market for graphite clubs is going to be restricted to woods and not too many companies are going to get in it."

Why are graphite club prices so high? Beyond research and start-up costs, the manufacturers are dealing with a space age material that isn't yet being produced in quantity. Hence, its cost is still stratospheric—from $55 to $200 a pound. Union Carbide, which has been processing graphite for about a decade, originally sold it to the aerospace industry as a cloth for reinforcing plastic heat shields, rotor blades and various hardware items. In these applications, it serves as a cement as well as a cooling agent, enabling plastic to withstand extremely high temperatures.

Graphite is produced also as a yarn. Union Carbide extracts it from rayon, which is heated to 3,000 de-

continued on page 27

GRAPHITE *from page 24*

grees F., so that the organic matter is cooked out, leaving a residue of pure carbon or graphite. The material is then drawn out as a yarn, which looks exactly like the yarn in a charcoal gray sweater. Then the yarn is wound on spools for delivery.

In the construction of the shaft, the yarn, which is impregnated with epoxy in the heating phase, is laid on a mandrel or tapered shaft from two directions to give a double ply effect. If fiberglass is used in the construction, it is applied at this time. Overlaying the mandrel with the yarn is a meticulous job and accounts to some extent for the high price of the graphite shaft. The final step in the process is heating the yarn covered mandrel under pressure to a temperature of about 300 degrees. After cooling, the mandrel is withdrawn and the shaft, which has no step-downs and is about 5/1,000 of an inch smaller in diameter than a lightweight steel shaft, is ready for installation in the clubhead.

Production at Union Carbide in the last few years for other than aerospace application has been steadily increasing, and by the early part of 1974 it is expected that the yarn will be reduced to the $10 to $50 per pound range. That, of course, will result in the price of graphite shafted clubs being brought within reach of many more golfers.

Hercules, Inc., of Wilmington, Del., has been producing graphite fibers for aerospace applications, under a licensing agreement with Courtaulds of Coventry, England, for the past seven years. Last year, the company began production of graphite for club shafts for Aldila. Hercules produces its graphite in tape form, three to 12 inches wide, which can be provided in continuous lengths.

Charles. E. Jordan, manager of advanced composites at Hercules' Industrial Systems Department, points out the phenomenal effect the sporting goods market already has had on the United States consumption of graphite. "In 1970, it was 5,000 to 6,000 pounds, in 1971, it went to 10,000, in 1972 it was 20,000 and in 1973, with increased production of graphite-shafted clubs, consumption is expected to reach 100,000 pounds." Of this quantity, Jordan says, the club market is expected to account for 60,000 to 70,000 pounds.

The result of this increasing production has had an advantageous effect on price for the buyer. Three years ago, graphite was going for $350 to $500 a pound. At Hercules, it now ranges from $50 to $150, according to Jordan. "In the next two or three years, we expect it could be $25 to $50 per pound," he notes.

The graphite in golf shafts is basically the same material as is used in lead pencils, only in a more refined state, with all the hydrocarbons cooked out. Diamonds, too, are of the same chemical substance and when they are heated to 3,452 degrees F. they turn to graphite.

Some professionals who were interviewed by GOLFDOM are just as enthusiastic about the graphite shafts as clubmaker Toney Penna. Besides its easy swinging qualities, already alluded to, they recommend it because of its low torque and vibration, solid flex and recovery qualities. These account for the control factor. Pros Gene Shields of Preston Trails, Dallas; Mac Hunter, formerly of Riviera in Los Angeles, and Earl Puckett of Northmoor, Highland Park, Ill., can't understand why Shakespeare and Aldila are playing it coy by not emphasizing the added distance a graphite shafted club gives. What, after all, does a golfer want besides distance coupled with control? If these professionals have any complaint at all it is because they aren't able to obtain more than the 30 or 40 shafts or clubs that have been allotted to them.

According the Shields, everyone from 12 handicappers down whom he has fitted with graphite drivers are getting at least 20 yards more off the tees than they did before. About the only adjustment the better players have had to make is in their timing, but it is his observation that this has been done rather easily. Mechanically, says Shields, the clubhead seems to straighten out faster than with other shafts and this, undoubtedly, cuts down on sprayed shots. Earl Puckett is most impressed with the control aspects of the club, pointing out that as big a penalty isn't paid for balls that are struck off the heel or toe of the clubs or that are generally mis-hit. This is probably due, he says, to the fact that there is less torque in the graphite shaft, and clubhead and the shafts have a strong tendency to stay together throughout the swing.

In the opinion of Mac Hunter, the premium hasn't suddenly been taken off the good swing with the introduction of graphite. But due to the lightness of the club and better weight distribution, more poor players have a better chance of improving their swings. Actually, he says, it is not due so much to the lightness as to the improved balance.

"There's a lot of psychology in it," Hunter explains. "When you first pick it up, the club feels better than anything you've ever had in your hands before. Everything about the club, the fact that it is easier to swing because of its good balance and the way it is hung together, does a lot for a player's confidence. It should help everyone, from the professional to the high handicapper, but it can't be forgotten that it takes a good swing to get the most out of it."

Two conclusions reached by Hunter after doing quite a bit of fitting with the new club: swing weights might be reduced slightly for many players who use graphite—such as from D-1 to C-9—and woods with the new shafts might be built with slightly more loft.

Like Toney Penna, another professional cites the "recovery" aspect of the graphite club; the club snaps back much more quickly from the flex position, giving the hit a solid, compact ring.

Another quality of the graphite shafted clubs, cited by this professional, is the reduction of vibration. This can be detected by giving the club the cold-hand test. On a cold day there is considerably less sting in hitting a ball with a graphite than a steel one. As for vibration, everyone knows it causes power to splutter just a little. It may not amount to much in a golf shot, but neither is it adding anything. Finally, there is that "forgiveness" factor, mentioned earlier. In a game where practically everyone has to endure a preponderance of mis-hits, the pro says, it is nice to know that a club has been found that can effectively neutralize them. □