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From boardroom to bunker: How Fred Taylor changed the game of golf forever

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Abstract

Frederick Taylor devoted his life to establishing management as a profession with high standards of scientific accuracy. Rather than revisit Taylor's efforts to enhance workplace efficiency through improved management, this paper chronicles a little-known aspect of his personal life, his passion for the game of golf. In particular, it recounts how Taylor, building on his belief that there was 'one best way' to do everything, extended the principles of scientific management beyond the workplace to the world of sports and made contributions that continue to influence how golf is played today.

Keywords • Frederick W. Taylor • golf • scientific management • tennis

True history begins when the historian has discerned beyond the mists of ages the living, active man, endowed with passions, furnished with habits, special in voice, feature, gesture, and costume, distinctive and complete, like anybody that you have just encountered in the street. (Hippolyte A. Taine 1900, 2)

The story of Frederick W. Taylor's crusade against workplace inefficiency is well known, a standard topic in virtually every principles of management textbook. As the 'Father of Scientific Management,' Taylor's goal was to conserve resources and enhance worldwide efficiency by systematically eliminating waste (Taylor 1911, 5). In doing so, he attempted to show that the fundamental principles of scientific management were applicable to all realms of human endeavor, from 'the simplest individual acts to the work of...great corporations' (7). Unable to abide inefficiency in any domain, Taylor firmly believed that the same principles could likewise be 'applied with equal force to all social activities' (8).

Given Taylor's intended audience – engineers and managers of industrial and manufacturing establishments – it is perhaps understandable that little has been written about his attempt to extend the principles of scientific management beyond the workplace. Indeed, just as Taylor worked to produce a change in the way managers approached their work, he applied the same 'attitude of questioning, of research, of careful investigation..., of seeking exact knowledge and then shaping action on the discovered facts' to all aspects of his personal life (Majority Report of Sub-committee

on Administration 1912, 1137). Taylor's striving in this regard was perhaps the most evident in his effort to seek relaxation and success in sports while at the same time eliminating wasted time and energy. To date, no published account has broadly documented his zest for efficiency in the world of sports. The purpose of this paper is to chronicle this little-known aspect of Taylor's personal life by recounting his many contributions to the game of golf in the areas of golf-club design and fabrication, grass and soil development, and green construction. We illustrate how Taylor, building on his belief that *'there is a best way in doing everything'* (emphasis in the original; 1912, 36), extended the principles of scientific management from the boardrooms of the nation's leading corporations to the greens, fairways, and bunkers of the nation's leading golf courses.

The following discussion thus highlights Taylor's many contributions to the game of golf. We first explain how various aspects of Taylor's demeanor suited him well for the game, as well as draw attention to his fondness for other sports, including tennis. Third, we suggest that as Taylor's preoccupation with golf grew, his inventiveness was apparent, particularly in the area of golf-club design. Fourth, we describe how Taylor, drawing on his extensive experimentation in soil conditioning and grass growing, provided guidance and support to several country clubs in the northeastern United States. Fifth, despite his obsession and growing involvement with the game, we substantiate Taylor's primary interest in popularizing scientific management. We conclude by noting that it was through the application of the principles of scientific management that Taylor made lasting contributions to the game of golf.

A Passion for Golf

Despite much adoration and praise, Taylor has often been criticized and ridiculed. Indeed, he has been called a 'fanatic' and 'zealot,' and described as 'mildly insane,' if not 'crazy' (Dos Passos 1936, 23; Klaw 1979, 30; Wrege and Greenwood 1991, 255). Taylor was, admittedly, peculiar in several respects. Throughout his life he was tormented by a dream in which he was caught in the wheels of a giant machine and unable to rescue himself (Bromer et al. 1978, chap. 3, 14). In his younger days he had been known to take midnight runs through the Germantown (PA) streets, stopping under lamp lights to read (Copley 1923, Vol. 1, 128). Taylor's extreme personality was no less apparent in his passion for golf, as Copley, his otherwise forgiving biographer, describes Taylor as a 'golf fiend' (Vol. 2, 70). This passion reflected Taylor's widely recognized high need for achievement and competitive nature (Kakar 1970), what Copley (Vol. 2, 361; 215) euphemistically referred to as his 'extraordinary intensity' and 'spirit of earnestness.'

Pioneering motivation theorist David McClelland (1966, 20) described people with an inordinately high drive for achievement (*n* Ach) as 'habitually spend[ing] their time thinking about doing things better.' High achievers strive for excellence, set challenging goals, take moderate and calculated risks, and favor occupations and

recreational activities (like golf and bowling) that provide immediate and concrete feedback. They also prefer individual activities where personal responsibility and initiative are rewarded. In this respect, McClelland specifically singled out golf – during which a person earns an individual score and receives feedback following each shot – as naturally appealing to those with strong *n* Ach. Echoing this view, Al Barkow (2005, 31), former Editor-in-Chief of *Golf Magazine* and *Golf Illustrated*, notes golf's appeal as a hobby for those seeking individualized feedback and recognition: 'For those who want to play golf at the highest level, it is a game for loners. There are no teammates to coordinate with or cover a mistake you have made. The ultimate responsibility for your every action is yours.'

It is no surprise, then, that the hardworking, ambitious engineer Fred Taylor became obsessed with the game of golf. Moreover, as Copley (1923, Vol. 2, 215) recognized, 'the thinking stimulated by golf, having to do with the nature and use of tools, was all too closely allied with his customary thinking.' Whereas committed golfers are known to become absorbed with the particulars of their game, in Copley's (1923, Vol. 2, 215) words, 'it would seem that no game could have been better designed in general to arouse in Taylor his terrible spirit of earnestness.' For all of Taylor's competitive traits, Copley (1923, Vol. 2, 222) nonetheless portrays Taylor as a beacon of geniality and sportsmanship on the golf course. 'He did not swear when he fozzled, and never did he have any excuses.... He was most sympathetic with an opponent's bad luck. His courtesy was never failing, and with the duffer he was very patient.' Lastly, Taylor never gambled in the clubhouse but, indicative of his high need for achievement, preferred to determine outcomes himself, rather than leaving them to chance (Copley 1923, Vol. 2, 222).

Fred Taylor: Versatile Sportsman

Taylor's object in playing sports was to attain a 'proper balance between mental work and some form of out-of-door physical exercise and relaxation' (Taylor to S. Klyce, 1913, Taylor Collection). His intent in this respect foreshadows current thinking on the reciprocal relationship between life satisfaction and job satisfaction. As Taylor, commenting on his feelings about 'spend[ing] two or three hours chasing after a golf ball,' explained, 'once I get out on the links and begin my exercise in the open air somehow I...begin to cheer up and profit by the complete physical and mental change' (Taylor to S. Klyce, 1913, Taylor Collection). The extent to which Taylor's involvement in sports spilled over into his work is suggested in a remark made by his contemporary Charles de Fréminville (1925), who observed that Taylor learned through sports the 'value of the minute analysis of motions, the importance of methodical selection and training, the worth of time study and of standards based on rigorously exact observation' (32).

Taylor's efforts to find a balance between mental work and physical exercise not only involved golf, but extended to other sports such as baseball, rowing, skating, gymnastics, cricket, croquet, and tennis. As an accomplished tennis player, Taylor and

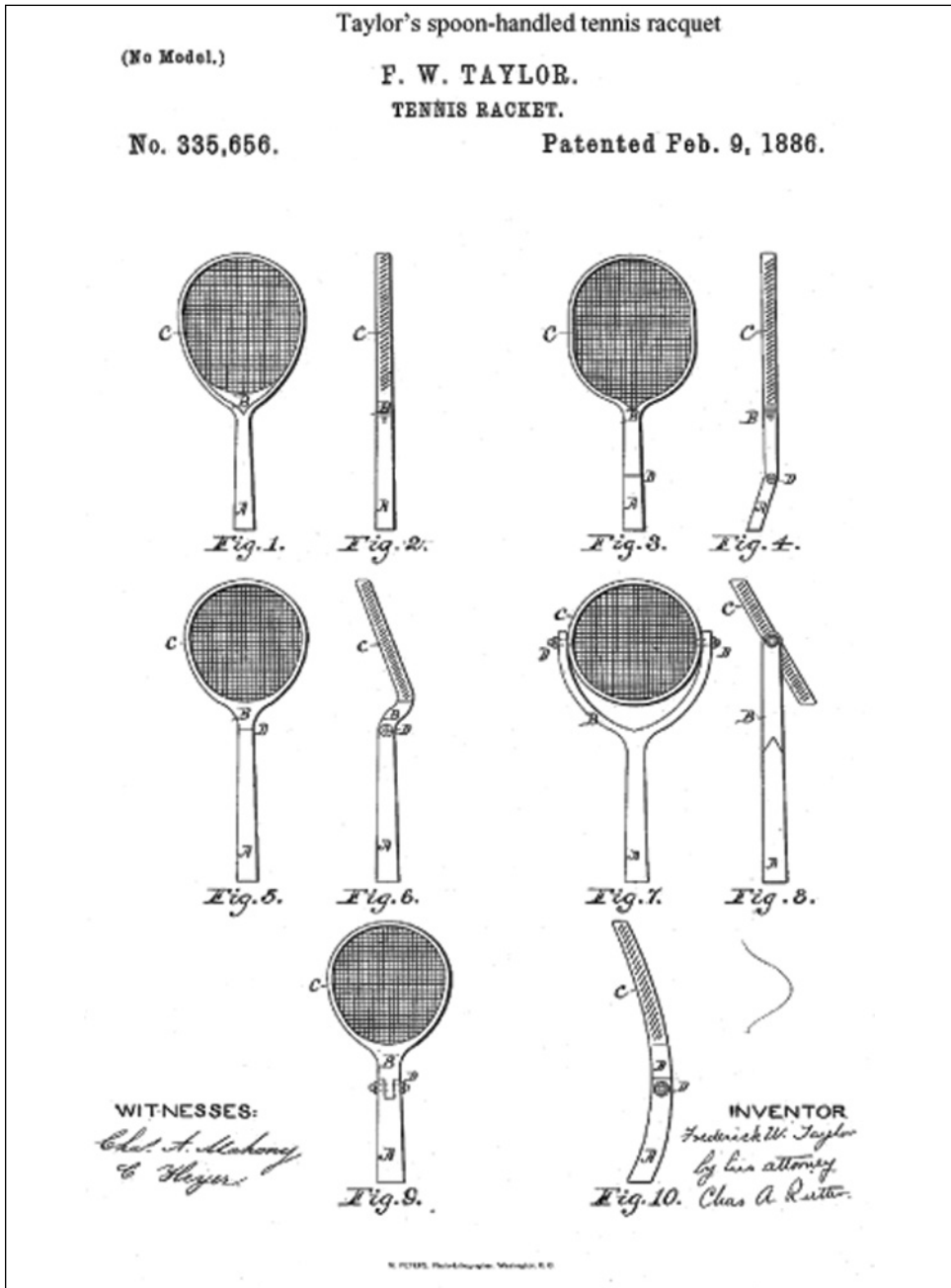


Figure 1 Taylor patented a spoon-handled tennis racket in 1886. Five years earlier, he and his brother-in-law, Clarence Clark, won the first US Men's National Doubles Lawn Tennis Championship at Newport, Rhode Island.

his brother-in-law, Clarence M. Clark, won the first US Men's National Doubles Lawn Tennis Championship at Newport, Rhode Island, in 1881. As described by an observer, Clark and Taylor 'cultivated an entirely different style' of play, in which one player remained close to the net to better volley short shots (Slocum 1890, 157). This contrasted with the traditional playing style of their adversaries who both took back-court positions. Using their unorthodox style, in the championship match, Taylor and Clark defeated Alexander van Rensselaer and Arthur Newbold in three straight sets, 6–5, 6–4, 6–5 ('Playing lawn-tennis,' 1881). Thus, just as Taylor was to produce a change in the way managers approached their work, he also changed the way doubles tennis was played on courts throughout the world.

Whereas Taylor's success at tennis was doubtlessly due to his skill, his penchant for eliminating unnecessary motions and improving the commonplace was equally obvious in three innovations which he patented. In 1886, Taylor patented a spoon-handled tennis racket that would allow players to more effectively return shots that either bounced low to the ground or above their heads (Baker 1911; see Figure 1). 'This racket...first curved backwards and then came forward again, like a table fork or coal shovel, bringing the plane of the playing surface at a slight angle forward from the handle' (Sears 1931, 28). Three years later, he secured a patent for a 'double-center' tennis net that involved a design that doubled the thickness of tennis nets in the middle, where they fray most quickly (Miller 1952). Still unsatisfied by the quality of tennis nets he patented another device seven months later – known as the Taylor Pole – for stretching tennis nets taut so that they did not sag in the middle and could be hung at different heights for singles and doubles (Slocum 1890, 13).

Fred Taylor: Golf-Club Designer

Taylor attacked golf with the same passion he displayed in becoming a world-class tennis player. True to his character, he once again looked to move beyond the conventional. He not only designed and patented his own clubs, but he pioneered in soil and turf experimentation, the development of irrigation systems, and the analysis of proper swing mechanics.

Decades ahead of his time, Taylor used an extra-long, large-headed driver that he crafted himself. Built with a thinner lower shaft for increased snap, the club was designed to provide greater swing speed and momentum, ultimately sending the ball greater distances (Copley 1923, Vol. 2, 221). In that his driver was also some ten inches longer than conventional models, he has been given credit for inventing the prototype of the modern-era driver (Klaw 1979). This added length, however, did come at a cost, both monetarily and, one can imagine for someone with high *n* Ach, with respect to Taylor's level of frustration. Taylor broke countless clubs, which not only were expensive to replace, but required a great deal of effort to reproduce according to Taylor's exacting specifications. Correspondence between Taylor and club makers such as Gimbel Brothers (of Philadelphia) and Wright and Ditson (of Boston)

details Taylor's repeated requests to fix, replace, and purchase golf clubs. Whether the thinner-shafted and longer clubs Taylor used were inherently weaker or he was a reckless golfer is unknown. Whatever the case, Taylor was likely one of the Gimbel Brothers' best customers. Though the Gimbels may have been pleased to have Taylor's business, they nonetheless may have grown weary of his exacting demands. Envision Taylor returning to Boxly, his 11-acre Chestnut Hill (PA) estate, after an invigorating round of golf, sitting down at his desk to write,

Gentlemen:

I forward you today by express a bundle containing a driver with a broken handle and brassy with a shorter handle which is not broken.

Will you please make me one driver exactly like the broken handle driver, and also two brassys' [*sic*] exactly like the broken handle driver, except that they are to be shod with brass? Please be particular that the length of the handle is exactly the same as that of the one with the broken handle in each case and also that each club, when the head rests on a pair of scales and the end of the handle is supported in the hand, weighs exactly the same as the present broken driver does. Please make the heads of the two brassys' [*sic*] and the driver of exactly the same shape and angle as the broken driver.

In addition to the three clubs above mentioned, please make me two brassys' [*sic*] exactly like the short-handled one; the same weight and shape of head and exactly the same length and angle of handle. Please send these as soon as possible by express to me at South Bethlehem, Pa., and oblige,

Yours truly,

FWT /s/

(Taylor to Wright & Ditson, April 3, 1899, Taylor Collection)

Other letters to the Gimbel Brothers list further specifications, extra club requests, and even a can of white paint for refurbishing golf balls. Today, Taylor's demands and meticulousness would seem reasonable. At the turn of the last century, however, golf was still in its infancy in the United States and clubs were crafted by hand. Unlike the manicured links of today, courses were open fields and pastures; 50 years earlier, sheep were the only lawn mowers (Taylor 1914). Taylor's search for precision in club design clearly presaged the idiosyncrasies of today's professional golfers who have ready access to club-fitting vans at each tournament stop.

Taylor's Thoughts on his Game

Despite his knack for breaking clubs, Taylor was fairly adept on the links. He played to an eight handicap and once shot a 76, extraordinary golf at the time. The Taylor Collection at Stevens Institute holds several first-place silver cups Taylor won in club tournaments (Hayward 1951). Taylor's search for the 'one best way' to improve his

game and lower his handicap even further – the Holy Grail of all committed golfers – was especially evident in his unusual golf swing. In a truly unorthodox fashion, when teeing off, he started his swing with his back turned to the ball. ‘By playing off his left foot and screwing himself up into a weird shape, he could get a terrific swing at the ball’ (Robert P.A. Taylor, quoted in Bromer et al. 1978, Chap. 3, 10). In addition, ‘the sole of his left golf shoe held a rubber ring, employed as a pivot,’ which, together with his extra-long driver, his unusual backswing, and ‘a 45-degree open stance with feet together...enabled him to drive the ball up to 250 yards,’ an incredible feat for an amateur club player (Phelps 1988, 403).

Taylor’s unique golf swing was a result of his never-ending quest to improve every aspect of his play. Not only intended to bring ‘into play muscles of the back and shoulder that are neglected in the conventional stroke of the professional expert,’ Taylor’s unconventional swing was also meant ‘to give him the benefit of an unusually strong right-hand wrist action, or one arising from an under grip or turning of the hand beneath the club’ (Copley 1923, Vol. 2, 221). It is said Taylor even experimented with his stride and gait to improve his efficiency when walking between golf shots (Miller 1952). All in all, however, Taylor remained modest about his playing ability, revealing to others a self-deprecating sense of humor. In December, 1910, Taylor was asked for a photograph of himself in golfing attire to be used in *The American Golfer*, the leading golf magazine of the day. Taylor replied to the editor, three-time US Amateur Champion and golf-course architect, Walter J. Travis:

I appreciate very much the kind thought in your letter of December 29th, in which you ask me to send you one of my photographs for reproduction in the ‘American Golfer.’

Unfortunately, my style in playing the game is so very bad that I have become more or less the laughing-stock of the game, and for this reason I avoid playing anywhere except where I have a good many friends who realize that I am not very proud of my style, and have adopted it for the lack of something better, not for the sake of either making an ass of myself or for notoriety.

I feel, therefore, that putting my picture in your paper would only result in reminding people of my golf peculiarities, of which I am in no sense proud.

(Taylor to W. J. Travis, January 9, 1911, Taylor Collection)

Golf: An Obsession

No longer the spry 25-year-old tennis champion of his youth, Taylor took up golf around the age of 40. At 43, he stopped working overtime, typically ending his workday by 4pm (Copley 1923, 453). Bitten by the golf bug, Taylor practiced his golf swing daily. ‘It is said that he practised before breakfast, during breakfast, and after breakfast’ (Copley 1923, Vol. 2, 218). Not even the weather could deter him,

as he often played in rain and snow, with the temperature as cold as 12° F (–11 Celsius; Copley, Vol. 2, 223, 446). Kanigel (1997, 323) relates how golf consumed Taylor's workday and how, on one occasion, he kept an assistant 'waiting, and boiling, while he gabbed with friends about the sport.' Others confirm Taylor's all-consuming passion for golf. Copley (1923, Vol. 2, 71) describes a scene in which longtime friend and colleague Carl Barth could no longer stand Taylor's incessant obsession with the game. 'Goddam your golf talk! I am here for business, and I want attention!' Golf was such a part of Taylor's life that Barth actually recounted this story, albeit using less colorful language, in the eulogy he delivered at Taylor's funeral (Barth 1972, 59). It is even alleged that golf was one of the reasons for Taylor's dismissal as a consultant at Bethlehem Steel. Meeting with Bethlehem president Robert Linderman, Taylor 'allegedly showed up a half an hour late, swinging a golf club, and insisted on talking about golf' (Klaw 1979, 30). Linderman informed the company co-founder Joseph Wharton, who promptly gave Taylor his notice. As strange as these stories may seem to non-golfers, the passion they convey is familiar to anyone who loves the game.

Pleased to be able to mix work with play, though at times to the disgruntlement of others, Taylor attempted to apply motion study while on the golf course. Once again reflecting his sense of humor, he wrote a friend,

I wish it were possible to convey to you an adequate impression of some of the beautiful movements that I have been working up during the past year. The only possible drawback to them is that the ball still refuses to settle down quietly into the cup, as it ought to, and also in most cases declines to go either in the direction that I wish or the required distance. Aside from these few drawbacks, the theories are perfect.

(Taylor to G. A. White, 1911, Taylor Collection)

Taylor's dilemma is known to all golfers who have analyzed and re-analyzed their games, only to find that their latest 'swing thought' worked in theory, but not on the course.

Taylor's Inventiveness

Aside from improving his swing, Taylor found other ways to enhance his game by applying scientific management. Already an acknowledged expert in the design of metal-tools (Neck and Bedeian 1996), Taylor built scores of prototype golf clubs. A natural-born inventor, Taylor held 46 patents, 5 of which applied to the game of golf (Miller 1952). To achieve what he deemed the proper balance for his clubs, he built a pair of weight scales accurate to an eighth of an ounce (Copley 1923, Vol. 2, 218).

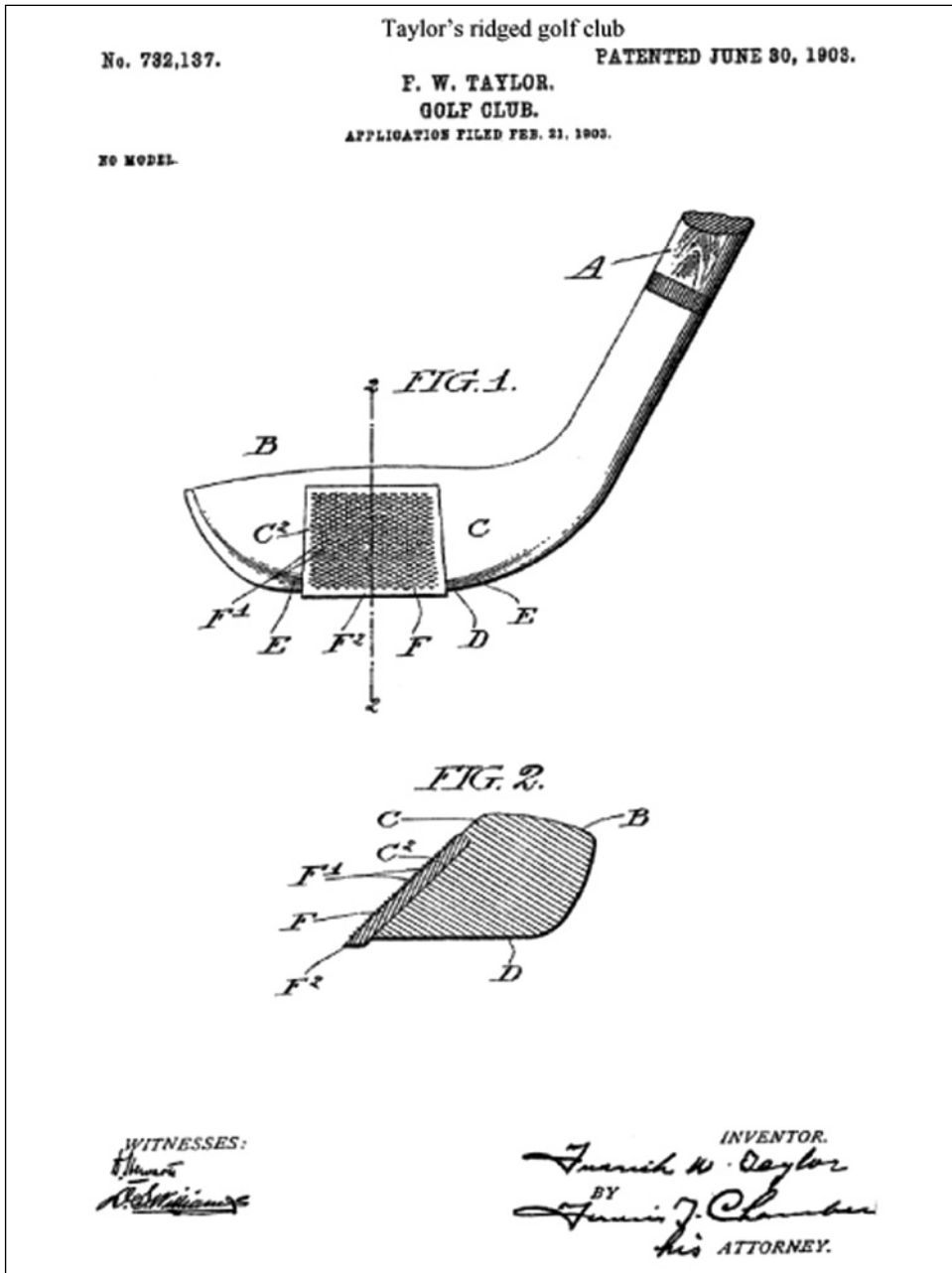


Figure 2 One of Taylor's patented golf clubs, which had a series of ridges on the face, allowed golfers to create backspin, but regularly tore the cover off the ball.

Baffies, Mashies, and Niblicks

In June, 1903, Taylor received two patents (732,136 and 732,137) pertaining to clubs 'known under the names of "baffies," "mashies," and "niblicks" – that is to say, clubs the faces of which slant backward...at an angle of fifty-five degrees or less' (US Patent No. 732,137, 1903; see Figure 2). Today these clubs are referred to as the 5-wood, the 5-iron, and the 9-iron, respectively. Unlike previous designs, Taylor's patents called for a series of ridges on the face of the clubs, which allowed a golfer to create backspin on a ball and, thus, hold when landing on a green. Despite the increased control this provided, the ridges regularly destroyed golf balls, a substantial expense at the time. A colleague, to whom Taylor lent one of his clubs, wrote,

I found the Club to be exactly what you stated; but found that it played the deuce and all with the balls, tearing the cover badly; in fact, each shot with that Club practically put the ball out of commission; and not being a millionaire and Haskell's [a reference to the Haskell Golf Ball Company] being expensive and scarce, I did not get a Club made like yours.

(T. J. Reid to Taylor, November 3, 1902, Taylor Collection)

Nevertheless, Taylor's idea for ridges on the face of clubs was both revolutionary and enduring, prefiguring later developments in golf technology; today, other than a putter, no club is made without grooves. Moreover, designers and manufacturers of golf balls took note of the destructive properties of Taylor's clubs, and, in part, owe Taylor thanks for their financial success, as the clubs prompted a change in the way balls were made. Once again, always looking for sensible solutions to practical problems, Taylor's inventiveness permanently changed the design of golf equipment.

The Y-shaped Putter

Perhaps the most famous of Taylor's sports-related patents, his Y-shaped putter, was the first center-shafted putter with forking arms (Copley 1923, 216; see Figures 3 and 4). Patented in 1905, the putter could best be described as outlandish; Taylor, however, swung the club between his legs like a croquet mallet, with excellent results (Klaw 1979). Though Taylor had regularly used the putter at tournaments, he did not seek approval for his new design until February, 1909. Taylor provided Edward K. Bispham, Chairman of the Golf Committee at the Philadelphia Country Club, a photograph of his unique putter and asked that it be forwarded to the Royal and Ancient Golf Club of St. Andrews (Scotland), which in conjunction with the United States Golf Association (USGA), maintains the Rules of Golf, 'to see whether they regard it as eligible under the present golf rules' (Taylor to E. K. Bispham, February 12, 1909, Taylor Collection). Bispham obliged, and in an effort to strengthen Taylor's case, added wording identical to the (then) current requirements. 'The putter does not contain any spring or other mechanical contrivance. The ball is properly struck, but the shaft is forked as shown in the photograph' (Bispham to R. C. Watson, February 15, 1909, Taylor Collection).

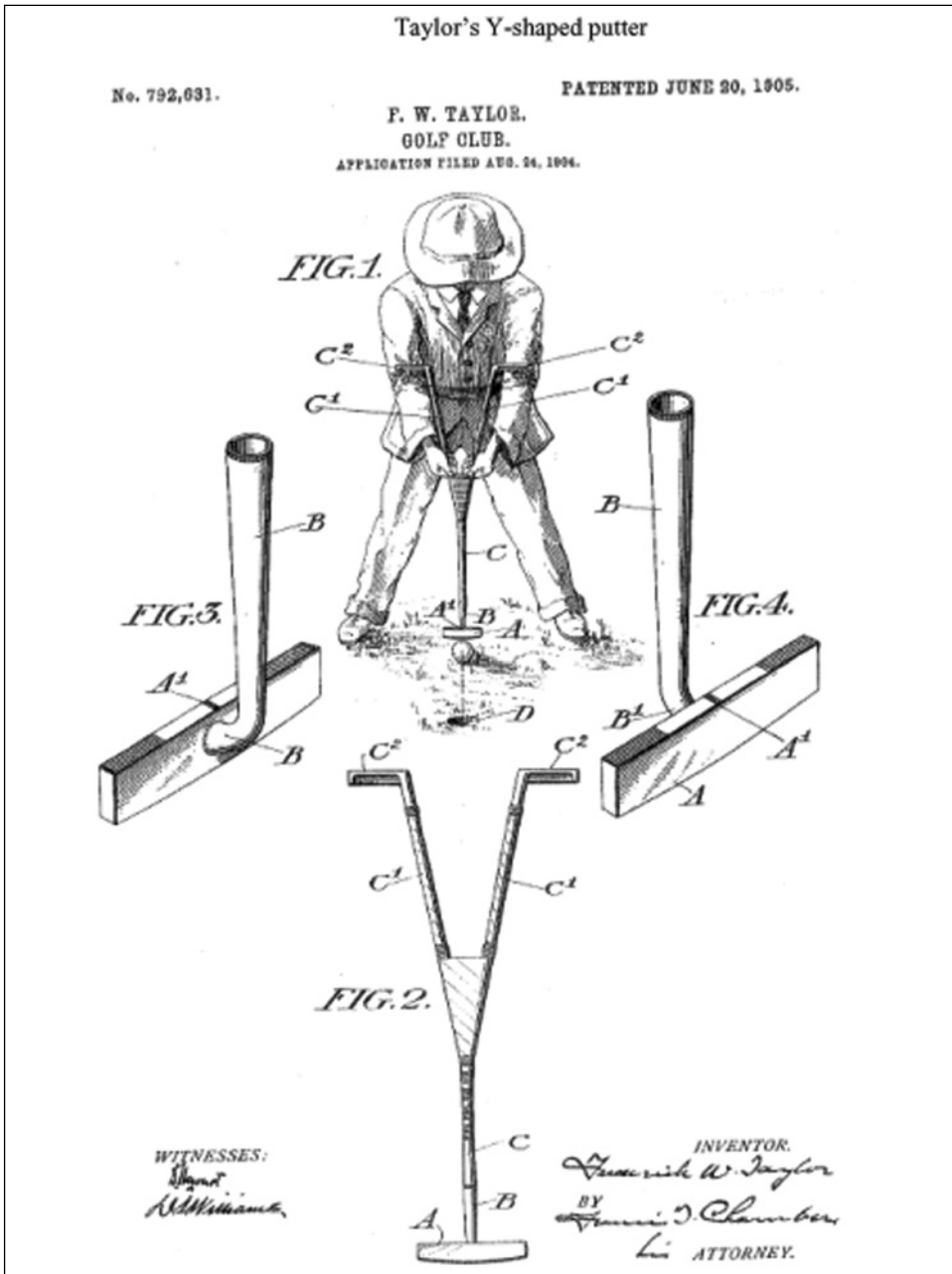


Figure 3 Ultimately banned by the Royal and Ancient Golf Club of St. Andrews, Taylor's unique putter was swung between the legs like a croquet mallet.



Figure 4 The only known photograph of Taylor playing golf, this picture originally appeared in *The American Golfer* in September, 1911. The caption read, 'Mr. Taylor does not putt in the orthodox manner. The ball is midway between his feet, and when putting he faces the hole, using a very heavy T-shaped putter. (Photo by R. C. Faber).'

Taylor received the long awaited (and fateful) news from the R&A Rules of Golf Committee in May:

Dear Sir:

The Rules of Golf Committee has carefully considered the photograph of a proposed form of Golf Club with the shaft made somewhat in the shape of the letter Y, and is of opinion that the club has not a plain shaft, and is inadmissible.

Yours faithfully,

Thomas Law, SECRETARY.

(Law to R. C. Watson, May 5, 1909, Taylor Collection)

Upon hearing the decision, Taylor wrote, 'It is, of course, a great disappointment to me, but after all the decision, according to the wording of the rules, seems to be entirely just' (Taylor to E. K. Bispham, May 20, 1909, Taylor Collection). Though outwardly magnanimous, Taylor was devastated. He was nonetheless unrelenting in his drive to enhance the game of golf. From this point on, however, his efforts would be redirected away from the individual golfer and toward the study of turf.

Taylor and Turf

An enormous amount of theoretical and applied research on golf greens in the United States began at the turn of the 20th century, corresponding with a boom in new country clubs throughout the nation (Mayo 1998). In this connection, 'Taylor had a reputation among horticulturalists and landscape designers for his contributions to perfecting large lawn areas for parks and gardens, and for his contributions to the growing and caring of roses' (James Hilty, personal correspondence, January 1, 2006). Following Taylor's lead, course designers and country-club founders began to rely more heavily on science and technology in response to agronomic problems. Specifically, certain areas of the country, like the Southeast and southern California, provided harsh conditions for growing turf for golf courses. As a result, 'it became clear that golf called for special types of grass' (Moss, 2001, 91). Taylor became a chief proponent of this movement and was one of the first to develop turf to be specifically used in constructing putting greens, which not too many years before had simply been a closely mowed part of the fairway.

In initial grass-growing experiments at Red Gate, his home in Germantown, and then, beginning in 1904, at Boxly, Taylor set out to 'construct a putting green that would produce with certainty a perfectly uniform and otherwise ideal turf and maintain it in excellent condition for an indefinite period with very little care and expense' (Piper and Oakley 1921, 14). He believed that this could be accomplished by applying the same standardization he employed in factories and machine shops under scientific management. In doing so, Taylor identified the essential properties of a putting green,

the most important of which was a soil that allowed the roots to grow deep below the surface (Taylor 1915a and b). The recipe that he developed became known as 'Taylor soil' (Hansen 1999). In true scientific-management fashion, Taylor believed that his putting greens would ultimately reduce labor costs by eliminating the need for a 'high class green keeper and an elaborate organization under him' (Taylor 1915a, 191).

Taylor and Sanford E. Thompson Collaborate

Along with construction engineer Sanford E. Thompson and civil engineer Harold Van Du Zee (1972), Taylor conducted extensive soil conditioning and grass growing experiments between 1909 and 1915. They were assisted in their work by Taylor's gardener, Robert Bender, who supervised a team of up to 30 men that worked exclusively on grass experiments (Hansen 1999). In 1910, Taylor purchased the finest turfs from the estate of James B. Olcott, a member of the first Board of Trustees of Storrs Agricultural School (now the University of Connecticut), who had maintained hundreds of creeping bent and red fescue plots. This turf became the basis for much of Taylor's subsequent grass-growing research (Piper and Oakley 1917).

Taylor's preliminary experiments yielded no extraordinary results. Not to be deterred, he decided to build a green that could not only tolerate inclement weather and heavy play, but be reproduced in any part of the country, using standardized materials. The turf Taylor developed was ideal, yet considered by some to be impractical due to its high cost (approximately US\$2,000 a green). Taylor justified the cost as the pursuit of perfection and the fact that compared to ordinary greens, a 'Boxly' or 'Taylor green' essentially required no annual expense for feeding and seeding, and required watering only once every two–three weeks. Reigning agricultural experts questioned Taylor's research (Piper and Oakley 1921) and dismissed him as an eccentric outsider. Yet, 'Taylor's monumental work did not go totally unnoticed, and several golf course architects borrowed ideas from the work he started,' including the renowned Scottish golf architect, Donald Ross (www.donaldrossociety.org; Hurdzan, 2004, 51). Golfers the world over may not realize it, whereas rolling greens shaped by the normal terrain have always been part of the game, Taylor is credited with having designed the first systematically mapped and contoured putting green in the country (Phelps 1988). This one innovation alone revolutionized the game as we know it today.

Despite early resistance, Taylor's turf experiments have likewise had a lasting impact on the golfing industry. In an effort to provide uniform and controllable moisture to a specific area, Taylor identified a perfect balance of air and water that could be maintained under a putting green (Hurdzan, 2004, 38). 'The germinating layer, as Taylor called it, embodied a new application of old principles to the seeding of putting-greens, and was, perhaps, the most important feature that developed from his investigations' (Piper and Oakley 1917, 216). Taylor's use of multiple textural layers is similar to today's USGA-approved rootzone structure (see Figure 5). Taylor was also one of the first to experiment with sand in constructing greens, as it provided both

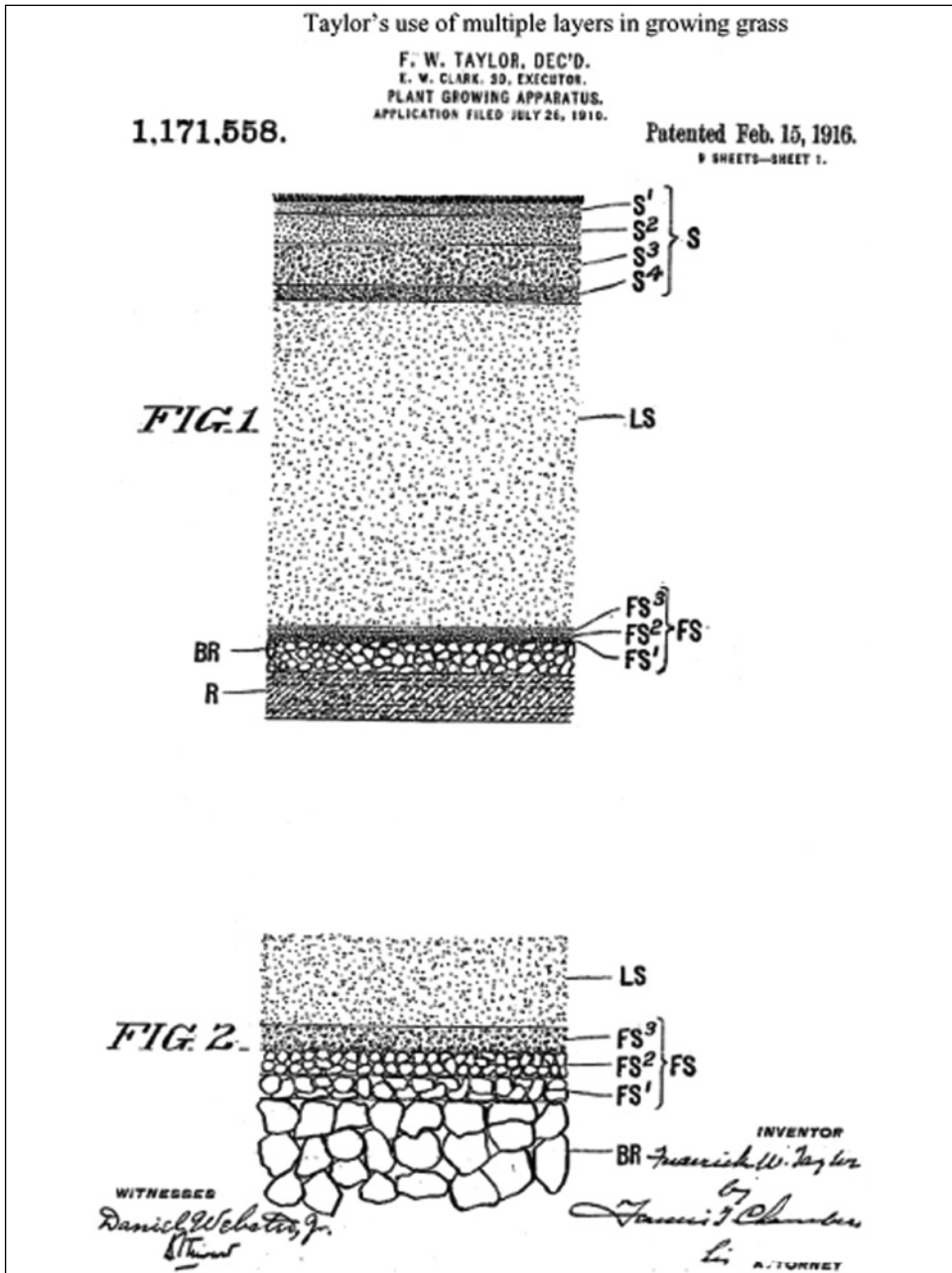


Figure 5 This patent shows Taylor's use of multiple textural layers in growing grass, which still serves as the basis for the USGA's recommended system for constructing greens.

adequate drainage and retention of water. Today his methods still serve as the basis for the USGA-recommended PURR-Wick™ system (Hurdzan, 2004, 38) for new greens.

What Taylor started as a simple experiment into grass growing turned into a 12-year endeavor of monstrous proportions. On the number of tests conducted, Thompson's assistant, William O. Lichtner, explained in a letter to Van Du Zee,

It is difficult to give the actual number of tests performed in connection with Mr. Taylor's grass growing experiments as they cover such a diversified field and a great number of duplicate tests were necessary in order to check results.... We tested in the vicinity of 50 sands, leaf molds, and soils of various kinds. These were tested separately and in combination with each other. There were at least 100 different tests made on the lifting power of sands and gravels, molds, etc., and these required constant testing to determine whether the minimum height had been reached. The number of moisture tests would probably reach into the thousands. On the determining of the variation of the temperature of the soil vs. lifting power of materials and percentage of water held, there were at least 1000 readings taken. The investigations at this end cover a period of several years and one of our men spent approximately half of his time on them, Mr. Thompson and myself also giving considerable time on them.

(Lichtner to H. Van Du Zee, October 5, 1915, Thompson Papers)

The Chairman and Vice-Chairman of the New Greens Committee of the USGA, two of the era's most prominent turf-grass authorities, described Taylor's efforts as the most remarkable investigations in the making of putting greens ever undertaken (Piper and Oakley 1917, 214). Even after Taylor's death, his experiments were continued, spurred by interest from the US Department of Agriculture. After visiting Taylor's estate, Thompson informed Van Du Zee of the possibility of continuing,

I was in Philadelphia last week, and visited Boxley [*sic*] in order to go over with Miss Mitchell [Taylor's secretary] some of the material in Mr. Taylor's office. She referred to the work on grass growing and the offer of the government people to make further studies. It seems to me offhand that this proposition is worth consideration as it would seem to be about the only way in which the data can be made available. I understand from her that they propose to work it up and turn over the results so that they can be published directly under the auspices of the Taylor family, and this I believe to be a wise plan. If any agreement is made with them I would suggest that you make it definite that nothing whatever shall be published by them without detail authorization from Mr. Taylor's heirs or their representatives. The work on grass is of such large interest that I believe it very important not only that it be brought more definitely to the attention of the general public, but also that it be handled in just the right way.

(Thompson to H. Van Du Zee, July 1, 1915, Thompson Papers)

Country Clubs

Because of his extensive research on golf greens, Taylor was frequently approached by country clubs, primarily in the Northeast, for advice on turf management. Additionally, he was a member of the Philadelphia Country Club, the Philadelphia Cricket Club, the Pine Valley Golf Club, the Plymouth Country Club, the Northampton County Country Club, the South Bethlehem Golf Club, and the Sunnybrook Golf Club, and he often shared his expertise with the greens superintendents of his home courses.

Philadelphia Cricket Club

Taylor was probably the only 'factory worker' in America to become a member of the prestigious Philadelphia Cricket Club, which is known as 'America's Oldest Country Club' (www.philacricket.com). He played regularly, and at times was selected to represent the club in tournament play (Kakar 1970). In September, 1902, he was chosen to play on the club's second team against the Huntingdon Valley Country Club (www.hvccpa.org).

As noted, aside from playing competitive golf, Taylor also provided recommendations for improving various courses. In a letter to the Chairman of the Philadelphia Cricket Club Golf Committee, Ira Williams, Taylor provided advice and ideas ultimately intended to generate revenue for the club. 'I know that [our course] is greatly criticized because of the high grass on each side of the fair grounds, and the front of many of the tees' (Taylor to I. J. Williams, August 24, 1908, Taylor Collection). Taylor noted that a low-grass policy, similar to the one implemented at the Philadelphia Country Club, would contribute to large increases in membership, as it had at the other club. It should also be noted that, true to character, Taylor abhorred the loss of time involved in searching for balls lost in high rough (Copley 1923, Vol. 2, 222).

Pine Valley Golf Club

In March, 1913, Fred Taylor was asked to subscribe as a founding member of the Pine Valley Golf Club, (www.pinevalleycountryclub.com; www.golfclubatlas.com/pinevalley1.html), located 'some fifteen miles from Camden, on the line of the Reading Railway, just below Clementon, N.J.' (H. W. Perrin to Taylor, March 3, 1913, Taylor Collection). Taylor was told that the club:

...is not a moneymaking scheme.... It is just the beginning of a plan, whereby a first class golf course can be built, near enough to Philadelphia, so that precious time isn't lost getting to it, and where, because of the character of the soil, we can get good golf during certain months of the year, when our own courses are not playable.

(Perrin to Taylor, March 3, 1913, Taylor Collection)

Questioning the club's prospects, Taylor convinced the club's primary founder, hotelier George Crump, to allow him to conduct a number of soil experiments. Content with the results, Taylor concluded, 'The more I think over your new golf course, the more I am impressed with its possibilities, and I feel that the whole golfing fraternity will be greatly indebted to you' (Taylor to G. A. Crump, May 15, 1913, Taylor Collection). Taylor became a shareholder and member of the club with a US\$100 investment (Taylor to W. Zebley, May 26, 1913, Taylor Collection).

Though an original shareholder of Pine Valley, for some reason, Taylor was left off the formal list of founders (MacWood, 2005). This omission seems all the more odd, in that Robert Bender – Taylor's gardener – built the greens at Pine Valley. Hansen (1999) expresses the opinion that, 'Bender's highly-contoured Taylor-made greens are one of the primary reasons' Pine Valley 'ranks number one on many lists of the greatest golf courses in the United States.' Bender eventually became one of golf's most sought-after builders of putting greens, installing Taylor greens at Whitemarsh Valley Country Club (www.whitemarshvalleycc.com; near Philadelphia) and at Pinehurst Resort (www.pinehurst.com; near Asheville, North Carolina).

Taylor's omission from the list of Pine Valley founders prompts speculation; did something happen to alienate him from Crump and the other founders? Economics and the outbreak of World War I may have been explaining factors. Taylor wrote to the President of Pine Valley, Howard Perrin, on two separate occasions, resigning from the club, citing financial pressures:

As a collateral result of this horrible war I find that a material proportion of the stocks from which I have received my income are not going to be able to pay dividends. It becomes imperative, therefore, for me to retrench to the minimum and I am very reluctantly obliged to resign my membership in the Pine Valley Golf Club. It is with most sincere regret that I do so but I feel that I must first make both ends meet.

Yours sincerely,

FWT /s/

(Taylor to H. Perrin, August 24, 1914, Taylor Collection)

In a separate letter a month later, Taylor again wrote to Perrin:

For the present it seems to me my duty to get my expenditure within my income and therefore I feel that I ought to resign from the Pine Valley Club, as I have from several others. I trust, however, that later when this war is settled I shall have the pleasure of joining again.

(Taylor to H. Perrin, September 23, 1914, Taylor Collection)

Sunnybrook Golf Club

In 1913, plans for developing the Sunnybrook Golf Club (<http://sunnybrook.org>) were underway. Donald Ross provided the plan for the club's course, but Taylor consulted with the club's founders on several occasions regarding watering, seeding, and drainage issues. In November, 1913, the club purchased 128 acres near Taylor's home in Chestnut Hill. As plans for the construction of the course progressed, Taylor wrote to the club's president, his brother-in-law Joseph S. Clark, concerned about the playing conditions of the greens.

Before your meetings of the members of the Sunnybrook Club at your dinner I should like to have a talk with you about the various propositions for making greens on the Sunnybrook course. I feel sure that it is going to be no simple problem, with the heavy clay soil which you have to deal with.

(Taylor to J. S. Clark, March 4, 1914, Taylor Collection)

As a result of his involvement with the club, Taylor was elected a member of the Board of Governors to serve for the club's inaugural year (Randolph to Taylor, March 14, 1914, Taylor Collection). Taylor was also appointed to the club's Grounds Committee (Randolph to Taylor, April 3, 1914, Taylor Collection). Not afraid to put his methods for green construction to the test, Taylor personally supervised the design of two greens.

It soon became apparent to Taylor that the remaining greens did not meet his quality standards. Possibly feeling as though all of his hard work was for naught, Taylor again wrote – rather sternly – to Clark regarding the superiority of the two greens built using his methods:

I want to make my position clear regarding the greens which are being built at Sunnybrook course. You will remember that I told you two things: First, what I believed to be 'the best way' to make a green. Second, what I believed to be the minimum that you could do in order to make a good green.

Only two of the greens at Sunnybrook will be in the first class. The others will belong to the latter class or will be even worse than this.

The ground which I take is that I am unwilling to accept responsibility without authority. This is one of the cardinal elements of the code of ethics of engineers. All that I am objecting to is that any features which are the result of experiments which we have been making for several years here, should be incorporated in a green which is below what I have called 'the minimum for a good green.'

...It is inevitable that the green will be branded with my name and I am unwilling to co-operate in any such scheme.... What I object to is, their [the Greens Committee] botching the things which I distinctly and personally stand for.

Yours sincerely,

FWT /s/

(Taylor to J. S. Clark, May 29, 1914, Taylor Collection)

Taylor's disapproval, in the end, would not matter. Fate intervened, as Taylor never had the chance to see the completed Sunnybrook course; he died on March 21, 1915, two months before Sunnybrook opened.

Golf versus Promoting Scientific Management

Many of the country clubs to which Taylor belonged raised money through bond subscriptions. Taylor subscribed at several clubs, but typically purchased no more than one bond. His priorities were clear. In a letter to his brother-in-law Herbert L. Clark regarding the Philadelphia Cricket Club, Taylor provides an explanation for his limited purchase.

I am sorry that I shall not be able to contribute very substantially toward the completion of the new Club House. I can assure you, however, that I am very greatly interested in the success of the Club.

...I have been out of business, that is, money-making business, for about nine years, and during this period I have devoted all of my spare time to the object of promoting modern scientific management. In this I feel I can accomplish much more than I could in any other way, because it has been practically my life's work; and I also think it is my duty to devote my time and money to this cause, for the reason that there is no one else in the country who is in a position to accomplish what I am able to do in this direction. Now, during all of these years I have spent every cent which could be spared from my income in furthering this cause and during a considerable part of the time I have been obliged every year to encroach upon my principal in order to carry on the work which I am doing. I feel that every dollar which I spend on this work will come back a thousandfold in the future to the people of this country. This work, you will realize, can in no sense be looked upon as a charity and I am entirely unable therefore to appeal for financial aid to any one. It is for this reason that I find myself unable to contribute, except in a small way, to other charities or enterprises in which I am vitally interested, and among these is the Cricket Club.

It is more than likely that you do not appreciate what is being accomplished by the introduction of modern scientific management in this country. I

suppose there are now about 50,000 men working under the new plan and among these there has never been a single strike. The workmen are being paid on the average more than 30% higher wages than are received by others at similar work all around them, and the companies which operate under this system are earning much higher dividends than their competitors. It is, however, the promotion of harmony between employers and their workmen that is my chief interest. The earning of large dividends for the companies is, of course, the great attraction to the manufacturing concerns, but is of minor interest to me and my associates.

I have gone rather fully into this matter because I wish you to realize why it is that I feel unable to contribute to your fund.

Yours sincerely,

FWT /s/

(Taylor to H. L. Clark, December 13, 1909, Taylor Collection)

Taylor wrote several similar letters detailing the progress made by scientific management, outlining his deep involvement with 'the cause.' Whereas Taylor's love for golf was evident, he would consider himself first and foremost a proponent of scientific management.

Despite his purported financial woes, it is hard to imagine Taylor's sizeable net worth was ever seriously in jeopardy. Indeed, Taylor came from an upper socio-economic class family and his industrial success surely only added to his wealth. Though a sweeping generalization, *Golf Magazine* Editor-in-Chief George Peper, writing in his book *The Secret of Golf* (2005), makes an observation that seems applicable to Taylor:

Golfers in American society...tend to be people who are used to getting what they want. Many were born into families of wealth and achievement. Many of those who were not are people who rose to positions of wealth and status because of ambition and hard work. They expect to master golf just as they've mastered everything else in life. If they are competing, they expect to win. If they swing at a golf ball, they expect to hit it well, every time. (292)

Conclusion

When Frederick W. Taylor took a swing at golf, the sport changed forever. Taylor's probing curiosity, coupled with his penchant for experimentation in searching for the 'one best way,' led to improvements in golf-club design and fabrication, grass and soil development, and green construction. Drivers would appear with larger heads and thinner shafts, and drivers as well as irons would begin to display visible ridges on their face. Soil mixtures would be introduced that allowed grasses to grow deeper roots, which made it possible for golf to be played year round in colder climates. Taylor's work in green construction, in particular, continues to provide a foundation for modern

standards in course design. At Taylor's passing, *The American Golfer* captured his 'spirit of earnestness,' and hailed his contributions to golf in the following words:

In short, he shed a flood of light upon a subject which no one had ever tackled before in such a profoundly scientific way.

The indomitable perseverance in the search of truth...the getting down to the bed-rock of things, so strikingly characteristic of Mr. Taylor in his business activities, manifested itself in his milder pursuits, notably in his particular hobby – the study of agrostology in relation to golf.

('Around the 19th Hole,' 1915, 473)

At the first conference on scientific management, held at Dartmouth College in 1911, Taylor (1912, 54) declared, 'Scientific management fundamentally consists of certain broad principles, a certain philosophy, which can be applied many ways.' He was committed to the belief that scientific management would lead to 'the development of each man to his greatest efficiency and prosperity' (Taylor, 1911, 140). In no circumstance is this belief more evident than in Taylor himself, whether he was seeking economy of energy when walking or swinging a golf club, or whether he was working to eliminate waste on the shop floor.

Not only did Taylor's system of scientific management revolutionize the world of work, it forever changed the game of golf. The legacy of his search for the 'one best way' can be seen wherever golfers strive to improve their games and course superintendents labor to create the perfect green. From boardroom to bunker, Taylor's unyielding pursuit of excellence continues to benefit all those who share a similar passion. In this respect, Taine's (1900) observation that true history begins with an appreciation that, regardless of one's time on earth or role in life, we are all both different and alike rings undeniably true.

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