

THE ART & INVENTION ERA -in the Early Evolution of Turfs 1830-1952

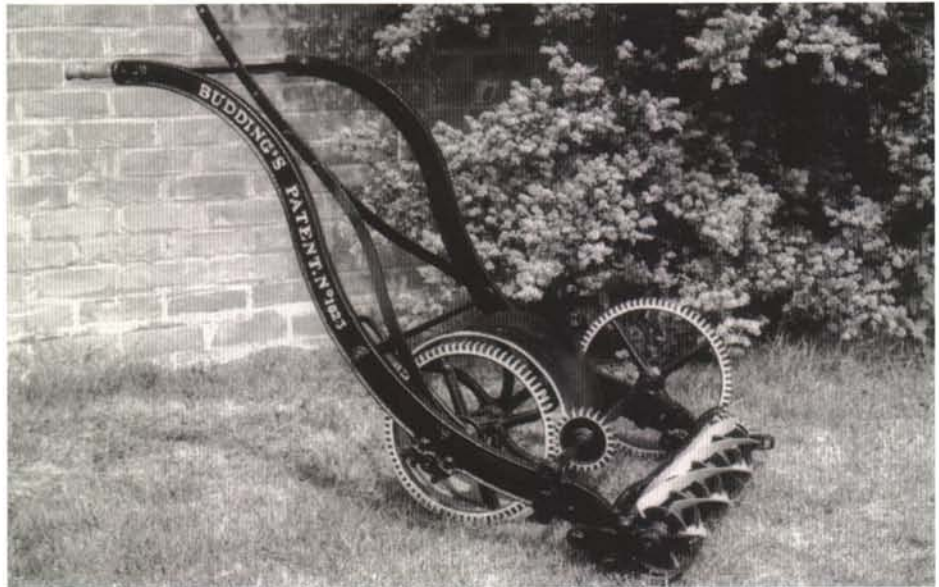
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Editor's note: This paper was presented by Dr. Beard at the 2004 Wisconsin Turfgrass and Greenscape Expo. He generously allowed us to share it with The Grass Roots readers, and we are indebted to him for that.

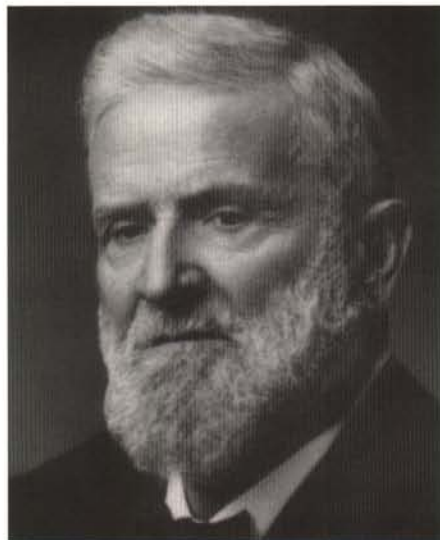
The evolution of turfs as we know them today occurred in association with animal agriculture in climates favorable for grass growth, especially rainfall and temperature. The earliest significant uses of turfs for lawns was in the United Kingdom, where rainfall distribution throughout the year is reasonably good and where the moderate temperatures favor the growth of cool-season turfgrasses, such as *Agrostis*, *Festuca*, *Lolium* and *Poa*. In addition, the grazing of sheep was a significant agricultural activity throughout the countryside even from 1800 to 1950. The key advances that furthered the use of turfgrasses involved inventions and developments achieved through trial-and-error activities which is termed the art of turfgrass culture. Twelve developments that highlighted the turfgrass discovery and invention era are summarized in Table 1 and are discussed in the following sections.

Development 1 - Reel Mower

For years turfed areas were cut to a relatively uniform height either by the hand scythe or by a hand cycle in the case of closely maintained turf areas that were cut more frequently. The leaves of grasses were best cut by the scythe or cycle when the grass was wet, such as during early morning dews or after rains. This was a very laborious, time-consuming activity. Thus lawns of even a reasonable quality were limited primarily to

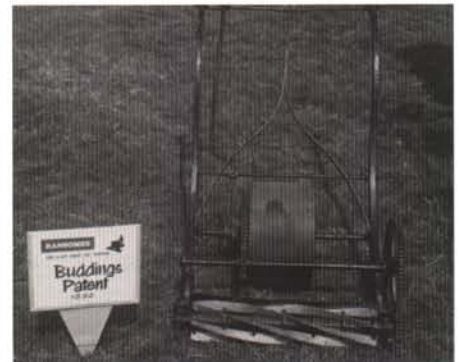


Edwind Budding's hand-pushed mechanical reel mower.



Edwin Budding, inventor of the reel mower.

wealthy estate owners. This started to change in 1830 with the invention of the reel mower by Edward Beard Budding in Gloucester, England. This first manually pushed reel mower was more cost effective, which allowed the opportunity for middle-class residents to maintain residential and village green turfs which enhanced their



Front view of Buddings 1832 reel mower.

quality of life. The original 1830 leaf cutting design of the Budding reel mowers continues to be used to this day - more than 170 years later.

Development 2 - Clay Drain Tile

Cylindrical clay tile sub-surface drains were developed in the United Kingdom in the c.1840s. This was the standard worldwide technique for sub-surface drainage of soils for over 100 years. During most of that period the clay tiles were installed by manual digging of the trenches. Thus, these sub-surface drains did not come into

widespread use until the development of the powered mechanical trenching machine in the early 1900s.

Development 3 - Weed-Free Grass Seed

The next major advance occurred in the 1880s involving the marketing of weed-free grass seed based on proper seed cleaning, processing and testing techniques as pioneered by Orlando M. Scott of Ohio, USA. Initially he utilized a manually-cranked, wooden seed cleaning machine that he had modified. Prior to that time grass seed was harvested from pastures that were typically contaminated with weeds and the resultant seed sold directly to turf users. There were no effective, selective controls for the weeds in seed harvest fields or in the home lawns and turf areas planted with the weed seed contaminate grass seed. Thus, the solution was the development of procedures to clean the weed seeds out of the grass seed. In addition, O.M. Scott pioneered seed testing procedures long before governmental agencies enacted laws requiring seed testing and labeling.

Development 4 - Earthworm Management

The next major advance in the 1890s was the development of an earthworm management control by Peter W. Lees of England, United Kingdom. Prior to this event the two main practices discussed in gardening books were rolling and mowing of the turf, with rolling listed first. This can be attributed to the disruption of the surface by extensive earthworm populations, particularly in England where early turf culture evolved. Thus, with the development of the earthworm management, rolling became substantially less important as a turfgrass cultural practice. In fact, rolling was eventually recognized in the 1920s



This photo shows earthworm irritant being watered in.



Earthworms emerge from putting green turf,



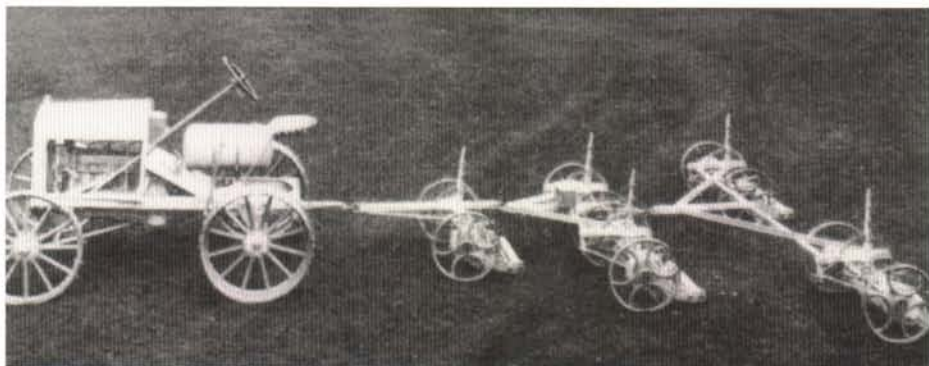
and are piled up.



Three wheel barrow loads are removed from the green.

as having negative effects in terms of soil compaction, especially on clayey soils. The procedure involved applying the irritant to the soil surface and watering it in with excess quantities of water. As a result the earthworms came to the surface, were raked into piles, shoveled onto wheel barrows, and physically hauled off the turf area. It also should be noted that prior to this event the game of golf and

golf courses had been limited principally to the coastal areas of Scotland and northern England, called linksland or seaside courses. Attempts to develop upland golf courses were relatively unsuccessful, principally because of the unplayable putting green surfaces caused by earthworms. The emergence and major expansion of golf courses on upland soils occurred at the same time, and could be



Worthington side-wheel drive, multi-wheel gang.



Scotts slow-release turf fertilizer.

attributed to the earthworm management procedure developed by Peter Lees.

Development 5 - Side-Wheel Drive, Multiple Gang Mower

The side-wheel drive mower on a multiple gang frame was developed in 1914 by the Worthington Company in Pennsylvania, USA. It was a major advancement and opened the economical mowing of extensive turf areas in parks, golf course fairways, sports fields, recreational areas, and other large turfed areas.

Development 6 - Slow-Release Turf Fertilizer

The first commercially produced, slow-release turf fertilizer was marketed in 1928 by the O.M. Scott and Sons Company in Ohio, USA. It was a natural organic product developed at Ohio State University through research funded by the O.M. Scott and Son Company of nearby Marysville, Ohio. It was marketed in a large cloth bag under the name of Scotts Turf Builder®. This branded slow-release fertilizer continues to be sold today-76 years later.

Development 7 - Turfgrass Fungicide

During the late 1920s and early 1930s two fungicides for the control of a number of turfgrass diseases were developed by Dr's John L. Monteith and Arnold S. Dahl of the USDA-USGA Arlington Turf Research Center in Washington, D.C., USA. The first truly effective



Turfgrass fungicide development by Monteith and Dahl.



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fungicide controls for the control of *Microdochium* patch, *Rhizoctonia* brown patch, *Sclerotinia* dollar spot, and *Typhula* blights involved the use of inorganic mercury and cadmium compounds, which continued in use for 40 years.

Development 8 - Rotary Mower

In the 1930s the first powered rotary mower was developed by Power Specialities Ltd. of Slough, England, UK. This resulted in the capability to mow minimal maintenance turfs at a higher height and a less frequent interval, which are conditions in which reel-type mowers are not effective.

Development 9 - Pop-up Sprinkler Head

In the early 1930s the first underground pop-up sprinkler head was developed by the Thompson Company in California, USA. This was a major advance compared to the numerous types of individual, fixed, hose-end sprinklers of the oscillating or rotating type previously available, as they had to be manually moved frequently for effective irrigation.

Development 10 - 2,4-D: Selective Broad-Leaved Weed Control

In the mid-1940s the first truly effective herbicide for the selective removal of broad-leaved weeds from perennial grasses was



Pop-up sprinkler heads, by Thompson Co.



Tom Mascaro's powered coring machine.



Tom Macaro's powered vertical cutting machine.

developed by Gretchen Fannie-Fern Davis in Washington, D.C., USA. Some of the earliest turfgrass tests were conducted on the turfed mall area between the U.S. Capital and Washington Monument. The development-use strategy for 2,4-D on turfgrasses was a major event. It remains a key herbicide in the management of quality turfgrass areas more than 50 years later.

Development 11 - Powered Coring Machine

In 1946 the first powered coring machine was invented by Thomas C. Mascaro in Pennsylvania, USA. A manual three- to four-tined coring unit was developed in England in the 1920s. However, it was not a widely used practice because of the very intense manual labor involved. It was not until the development of the

mechanically-powered, hollow-tined coring unit by Tom Mascaro that extensive coring of intensively trafficked turf areas come into widespread usage, and continues to be used.

Development 12 - Vertical Cutting Machine

In 1952 the first powered vertical cutting machine was developed by Thomas C. Mascaro of Pennsylvania, USA. Thatch had been a continuing problem on turf areas for a long time, and there was no truly effective way of selectively removing an excessive accumulation of thatch, other than the total physical removal of the turf-thatch profile with a sod cutter and re-establishment. For the first time in 1952 there was an efficient, effective method for vertical cutting into the turf canopy and removing the excess, dead organic

Year (circa)	Contribution/Invention	Contributor
(1) 1830	reel, mower, mechanical hand pushed	Edwin Beard Budding, England UK
(2) 1843	cylindrical clay tile drains	England, UK
(3) 1880	weed-free grass seed processing, testing and marketing	O.M. Scott, Ohio, USA
(4) 1890	irrigant for earthworm management/control	P.W. Leeds, England, UK
(5) 1914	side-wheel driven mowers on multiple-gang frame	Worthington Co., Pennsylvania, USA
(6) 1928	slow-release (organic) turf fertilizer	O.M. Scott & Sons Company, Ohio, USA
(7) 1930-32	turfgrass fungicide development	J.L. Monteith & A.S. Dahl, Washington, D.C., USA
(8) 1930	powered rotary mower	Power Specialities, Ltd., England, UK
(9) 1930-35	pop-up sprinkler heads	Thompson Co., California, USA
(10) 1945	2,4-D selective broadleaf weed control	G.F.F. Davis, Washington, D.C., USA
(11) 1946	powered coring machine	T.C. Mascaro, Pennsylvania, USA
(12) 1952	powered vertical cutting machine	T.C. Mascaro, Pennsylvania, USA

Table 1. 12-KEY EVENTS IN THE TURFGRASS DISCOVERY AND INVENTION ERA

material without totally destroying the living turf canopy. The basic design of the original vertical-cutting unit continues to be the standard in use to this day.

Summary

In our modern times of the 21st century some of these developments seem of minimal significance. However, at the time they were developed or invented these contributions were very major advances in improving the quality and lowering the cost of turfgrass maintenance. Modern turfgrass science evolved gradually based on these early inventions and art-dominated trial-and-error developments between 1800 and 1952. These pioneering individuals and companies need our utmost respect for their very important contributions.

A paper summarizing the key early inventions and art-related developments in the evolution of turfgrasses has not been addressed. Thus, over the past two decades this author has spent considerable time in the major libraries in the United States and

the United Kingdom, including the Royal Horticultural Society, Kew Gardens, British Museum, Victoria and Albert Museum, and various Sports Association libraries. Through extensive study of the limited literature from a large number of unrelated writings over hundreds of years, this author has assimilated and presents the following chronology of key turfgrass developments in the early years from 1830 to 1952. The criteria for their selec-

tion included the impact on all types of turf use and not just one segment such as golf turf.

This topic was first formally presented as a keynote address at the 9th International Turfgrass Research Conference in Toronto, Ontario, Canada, in July 2001. It is derived from a draft of a book on the history of turf being presented by J.B. Beard. ©2002 by James B. Beard, 1812 Shadowood Drive, College Station, Texas, USA 77840. ♣



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