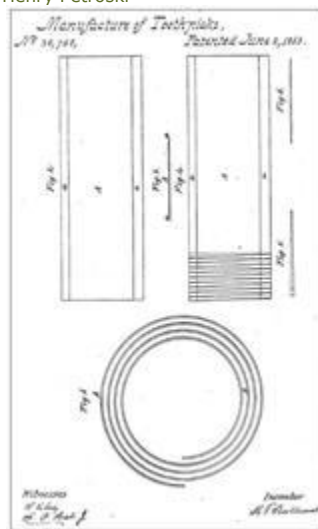


## The Simplest Thing

### The story of the humble toothpick provides a paradigm for nearly every manufactured thing

Henry Petroski



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Many of the most common things that we encounter in everyday life are also among the most elegant solutions in fitting form to function. Thus the familiar paper clip has long been widely admired by architects and designers for being a graceful loop-within-a-loop spring that silently does its job. The sewing needle, with its sharp, elongated point balanced by its soft oval eye, is a classic example of yin and yang united in a manufactured product. But such things, being made of steel, are many times removed from the mineral ore from which they begin. These are not things easily made from scratch by a single person. Small things made of wood are more organic, closer to nature and formable by an individual with little more than a sharp knife and a patient hand.

My vote for the simplest object of all goes to one that is made of a single material, has a single part and is intended (at least originally) for a single purpose, from which it gets its name: the toothpick. This humble tool, so familiar as to be generally unremarkable, can be made by an idle boy with a stick and a jackknife. Each example would bear the individuality of the whittler and the uniqueness of its circumstances. But in the latter part of the 19th century, toothpick making—like virtually everything else—began to be mechanized, producing a product whose shape could be reliably replicated.

Anthropologists believe, based on the existence of nearly 2-million-year-old hominin fossil teeth bearing distinct grooves, that picking the teeth represents the earliest use of a nonlithic tool and is mankind's oldest habit. The grooves may have resulted from the repeated and prolonged use of grass stalks containing hard silica particles. With the development of civilization, toothpicks began to be deliberately fabricated from other materials. In ancient times, metallic toothpicks were used and ostentatiously displayed by privileged classes and provided the principal means of caring for one's teeth. Even in modern times, a gold or silver toothpick kept in a case in one's pocket or purse has been a constant companion to some of the more fastidious.

The more common wooden toothpick, perhaps consisting of a splinter torn from a broken branch, was an *ad hoc* alternative to the metallic kind. The production of wooden toothpicks as a cottage industry dates from the 16th century, when it was begun in the Mondego River valley in Portugal. There, a community of nuns that made and sold a sticky confection provided wooden toothpicks to handle the sweets and to clean the teeth afterwards. The making of such toothpicks in the traditional way out of orangewood has continued to be practiced in the region. Still imported into America, they are sold as handcrafted alternatives to the machine-made domestic kind.

Orangewood toothpicks were introduced into the Portuguese colony of Brazil, where native Brazilians took up the making of them. The idea for a mass-produced wooden toothpick dates from the mid-19th century, when the Bostonian Charles Forster was working in Pernambuco, Brazil. He became obsessed with the idea of producing a machine-made wooden toothpick so efficiently in New England that it could be exported to South America to compete with the local product. Forster was an entrepreneur with a dream, but he was no inventor. For a machine to make wooden toothpicks, he looked to the mechanized shoe-peg industry.

## If the Shoe Fits

In the 1850s, the vast majority of shoes made in America had the soles attached to the uppers by means of wooden pegs. It was a very labor-intensive process to form the holes with an awl and then drive individual pegs by hand, so many inventors wrestled with the problem of devising machines to speed up the process. One such inventor was Benjamin Franklin Sturtevant, who had worked as a cobbler and knew firsthand how tedious a job it was to peg shoes. Sturtevant patented pegging machines but sold the rights to them to buy time to invent improved machines.

One of the things that needed improvement was the manner in which the wooden pegs were fed into the machines. Individual pegs were split from slats of wood as thick as the diameter of a peg, as wide as the peg's length and shaped on one edge to form the point. Unfortunately, it was often the case that a peg split from such a "comb" was irregular because the grain of the wood was. This lack of uniformity often caused a peg to jam the machine or to cause damage to the leather of the shoe. Sturtevant began to focus on devising a better way of producing pegwood, as the unsplit supply of wood was termed.

Instead of splitting or sawing the pegwood from prepared timber, Sturtevant cut veneer from a rotating log. He patented a lathe attachment that could produce a continuous ribbon of uncracked veneer as much as a hundred feet long. When this ribbon was beveled on both sides of one edge, it could be fed into a shoe-pegging machine to provide a supply of pegs with trouble-free operation. Sturtevant sold a variety of patent rights to his lathe attachment but retained for himself the right to make the shoe-peg veneers. This proved to be the foundation of the fortune he eventually accumulated.

By beveling not one but both edges of the ribbon of veneer, a blank for making double-pointed toothpicks was produced. That blank could then be fed into another machine that chopped off a toothpick at a time. Sturtevant patented this process and the toothpick it yielded, but he was not interesting in exploiting it himself. He was plenty busy and successful making shoe-peg blanks. The opportunity to mechanize the production of wooden toothpicks fell to Charles Forster, who through his wife-to-be, Charlotte Bowman, acquired the rights to Sturtevant's patent and some of his machinery.

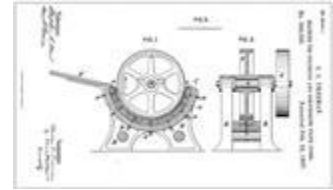
Not being very mechanically inclined himself, Forster had a difficult time getting the machines to work effectively. He tried different kinds of woods; some worked better than others, but none seemed to be ideal. One would dull the cutting blades very quickly;

another would gum up the works. In the mid-1860s, Forster convinced Sturtevant to take back the machines and produce toothpicks himself, for which Forster would receive a royalty. Sturtevant did this for only a brief period of time, after which he made available to Forster the services of Charles Freeman, a Sturtevant mechanic who would become the mechanical brains behind the Forster toothpick business.

## To Market, To Market

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By the late 1860s, the single most effective wood for producing toothpicks was found to be white birch, which grew in abundance in Maine. Since it was costly to ship large quantities of the wood to Boston, Forster moved his manufacturing operation to where the wood was. Birch was felled in winter, when the sap was not active, and carried by horse-drawn sled over snow-packed ground to the toothpick mill. It was soon possible to produce toothpicks by the millions daily, but to make a successful business of it more would have to be sold. Many Americans were content to whittle their own toothpicks as they were needed, so elaborate marketing schemes had to be devised.



A lot of the Forster story is sketchy and contradictory, but a common thread that runs through it is that he was not averse to using deception to get his product into the hands of potential users. According to one version, when Forster was unsuccessful in placing boxes of his toothpicks in retail shops, he hired people to visit those shops and ask for toothpicks. Shortly thereafter, Forster would revisit the shops and offer his wares. The proprietor would naturally want to stock what the supposed customers had been asking for. Then, the Forster shills would return to the store and buy boxes of toothpicks, which they gave back to Forster for recycling. Thus, he got his product placed.

According to another story, Forster wanted to get Boston restaurants to feel they had to supply toothpicks to their patrons. He is said to have hired Harvard men to dine at a restaurant and afterwards to ask for toothpicks. When the manager confessed that he had none, the students raised a ruckus and let it be known that they expected eating establishments to provide toothpicks. The story is repeated on the Web site of Boston's Union Oyster House, which makes the astounding claim that it was the place where "the toothpick was first used in the United States." In fact, handmade wooden toothpicks were imported and used in restaurants in the United States well before Forster was reliably making them.

As effective a tool as the toothpick is for digging an unwanted seed or stringy piece of meat out from between the teeth, its use has been embedded in a history of tolerance and intolerance for the practice. By the end of the 1850s wooden toothpicks, albeit imported ones, were commonly found in hotels and restaurants in New York, if not yet in Boston. With the growing availability of the disposable wooden toothpick there came a rise in voices about its proper place in society. There was no doubt of the efficacy of the thing, but whether it was to be used in public or private became the subject of debate that continues to this day.

Much of the early commentary on toothpick use had to do with the practice of young men chewing on them in public, especially when congregated on the steps in front of hotels. There was much speculation as to whether the toothpick chewers had actually eaten in a fine hotel's restaurant or were just trying to suggest that they had. The practice of carrying a toothpick in one's mouth became so widespread among dandies with high hats and walking sticks that groups of them came to be termed derisively "crutch and toothpick brigades." They even became the subject of songs from the 1880s, of which the chorus of one ran, "Close cut hair / elbows square / With my tooth-pick and my crutch." And it was not only young men who affected toothpicks; young women came in for even more ridicule and derision. In 1884, an editorial in the *New York Times* noted that women had recently taken up the habit and that "no lady at a watering place hotel seems to regard her toilet as complete unless she carries a toothpick between her lips, and it is said that some ladies have become so addicted to the habit that they cannot feel at ease on rising in the morning unless they consume two or three toothpicks before breakfast." This is reminiscent of observations about cigarettes that would be made years later.

However, there is little doubt about Charles Forster's contribution to establishing a viable manufacturing operation and effective marketing strategy. With the exclusive rights to Sturtevant's patent, Forster had enjoyed a monopoly through the 1870s, which enabled him to get a running start on any future competition. And competition did come when patent protection expired. Throughout the 1880s there was a flurry of inventing and patenting activity to come up with more-efficient manufacturing processes. Annual toothpick production by Forster in the mid-1870s was about 500 million. Over the next decade, yearly production from all firms amounted to about 5 billion. (Domestic wooden-toothpick production would peak at around 75 billion just after World War II, then drop back to about 20 billion in the 1990s due in large part to imports.)

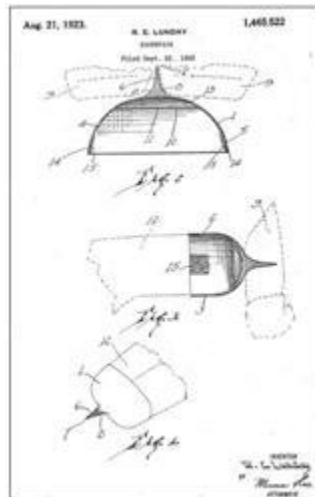
## Refining Simplicity

Virtually all toothpicks made through the 1880s were flat, a result of their being cut like cookies from a strip of veneer. When Forster's patent protection ran out, Charles Freeman began working on a new process to make a round toothpick. After much back-and-forth with the patent office, he finally received a patent in 1887 for a machine for polishing and compressing toothpicks, and in 1891 for the very toothpick produced by that machine, thus initiating a new monopoly. The compressed toothpick was revolutionary. As a splint resembling a match stick cut from a ribbon of veneer was fed into Freeman's machine and progressed through its annular space, its ends were shaped into fine points. Prior to this, the points on toothpicks were formed by cutting through the wood fibers, leaving a point that was full of potential splinters. Forming the point by compression was less likely to produce splinters. The toothpicks so made were marketed by Forster under the brand name Worlds Fair. As shown in the minimalist patent drawing, the overall shape of the toothpick was extremely graceful, with the round shaft tapering imperceptibly into the pointed ends. (This is in contrast to round double-pointed toothpicks made now: In these, there is a sharp distinction between shaft and points, with the latter looking like they were formed by a pencil sharpener.)

As simple and "perfected" an object as the wooden toothpick may appear to be, throughout its recent history manufacturers and inventors have looked for ways to produce it faster and more economically, often through the creative use of byproducts. The

traditional processes have always involved a good deal of waste wood, but this has typically been burned to produce heat and power for the plants. A dynamo was installed in a Forster toothpick mill at Dixfield, Maine, as early as the 1890s, and the excess electricity produced was used to light a nearby bridge. Years later, another Forster plant—at Strong, the "toothpick capital of the world"—used waste wood to produce steam and electricity, with the excess of the latter being sold to the New England grid.

One way of simplifying the process of manufacturing toothpicks while at the same time reducing the waste produced was to leave the center shaft square and make only the ends round. Such "square/round tip" picks were introduced by the Forster firm in the mid-1980s and hailed as "ideal" because, like hexagonal pencils, they did not roll off the table. It may be argued that they were a functional improvement, but they are an aesthetic abomination, having none of the clean lines of the classic round toothpick.



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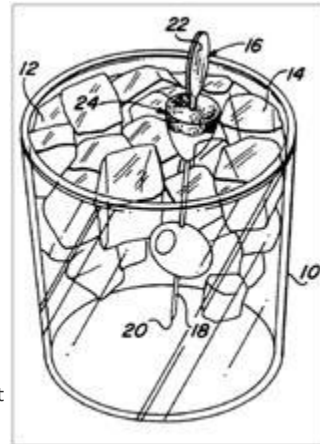
Inventors have not limited their creativity to improving the wooden toothpick itself. One of the greatest shortcomings of the straight toothpick is the difficulty of using it to reach crevices on the tongue side of the teeth. One inventor solved this problem by devising a prosthesis-like rubber device that could be held on the tip of the tongue by a slight vacuum. With the tongue fitted with the pointed prosthesis, the wearer could more easily work on the inside crevices of the teeth. As an added advantage, this could be done with the mouth closed. Different inventors have focused on other perceived problems, such as not having a toothpick when one is needed. Several variations on the theme of incorporating a toothpick into a plastic or wooden eating utensil have been patented. In one, the handle of a plastic spoon is scored diagonally so that it can be broken after eating to form two sharp-pointed picks.

## Simply Lethal

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Just as virtually anything found or made can be beneficial or harmful, depending on how it is used, so toothpicks have been the cause of many injuries, some fatal. During the period from the late 1970s to the early 1980s, toothpick-related injuries, many involving children, were reported at the rate of about eight thousand yearly in the United States. Among the most dangerous things one can do with a toothpick is to swallow it. The relatively long and sharp object can easily get wedged sideways in the digestive tract and can

puncture the intestines, leading to peritonitis. This happened in 1941 to the writer Sherwood Anderson, who was known to enjoy an olive in his martini. The tragedy might not have happened had the bartender employed something similar to the floating toothpick resembling a miniature buoy patented by the Miami inventor Terry Lane. Though his principal intent seems to have been to enable a garnish to be retrieved without the drinker's fingers getting wet, the larger and more visible toothpick would certainly be less likely to be accidentally swallowed. One late-19th-century autopsy revealed that an ingested toothpick had punctured the victim's colon. The doctor reported finding the toothpick bent back upon itself in the mode of a "greenstick fracture." The toothpick with one pointed end and one blunt was described as being Japanese. Such toothpicks have become fashionable, with the blunt end decorated with grooved bands. These seemingly non-functional flourishes are in fact meant to make it easy to break the end off a used toothpick to serve as a rest for the soiled point, thus at the same time signaling that the toothpick has been used and keeping its point from coming in contact with the table on which others are also eating. Japanese toothpick users, accustomed to such etiquette, have expressed surprise that American toothpicks have two points.



At one time 95 percent of all wooden toothpicks made in America were produced in Maine, with the Forster firm making the large majority of them. In the post-World War II years, with the decline in toothpick use, the company began to market a wider range of products, ranging from plastic toothpicks to maple syrup. Increasingly in the latter part of the 20th century, the domestic wooden-toothpick industry was threatened with foreign competition, especially from imports from the Far East. The last toothpick factory in Maine closed in 2003, and now the "splendid splinters," as they were once called, are made domestically only in Minnesota, by what used to be known as the Diamond Match Co., now called Diamond Brands. (Safety matches and toothpicks—both classified as wooden "splints"—have long been made by similar machinery.)

Over the decades in America, toothpicks used for their intended purpose of picking the teeth have fallen in and out of favor. It is the rare eating establishment that does not have a toothpick dispenser—or increasingly a small glass or bowl of individually wrapped toothpicks—available at the checkout counter or the reception desk, although the prominence of the display tends to depend inversely on the quality of the restaurant. Not all diners help themselves to a toothpick, of course, and these days one is not likely to encounter crutch and toothpick brigades standing on a hotel's steps or walking down the street of an American city. But the habit does persist.

Elsewhere in the world toothpicks have continued to be used as they have been for generations. In Brazil, where Charles Forster got his inspiration for an American wooden-toothpick industry, it is more common today to find a restaurant's table set with salt and toothpick shakers than with salt and pepper ones. In restaurants in Sweden, condiments on the table are customarily accompanied by a toothpick holder. On a recent visit to that country with a dozen or so colleagues, I noticed at a group dinner that a large number of us made use of the toothpicks while talking over coffee. We each had our own style of using the pick, with some covering the mouth and others finishing by breaking the pick in two to show that it had been used. This suggests to me that toothpick use is still widespread among Americans, but that it is done in private unless a clear indication is given that it is sanctioned to be done in public.

As small and simple a thing as the mass-produced wooden toothpick may be, its story is wide ranging and complex. It is a story infused with social and cultural origins, influences and implications. The technical story is full of successes and failures, of false

starts and elegant solutions, of mechanical genius and venal competition, of staggering numbers and human interest. In this regard, the toothpick is a paradigm for virtually any manufactured thing.

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