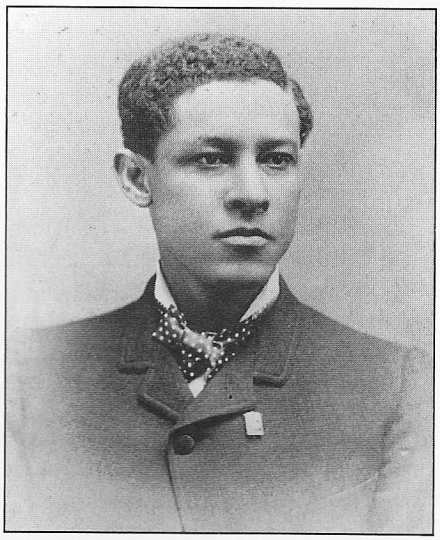
AGAINST ALL ODDS

Jan Matzeliger, a poor black immigrant, struggled alone to become an inventor and in the early 1880s succeeded in devising a machine that revolutionized the industry

by Dennis Karwatka

If most nineteenth-century American inventors are forgotten today—which is undeniable—black inventors are especially obscure. Almost none of them were known even in their own times, and few books about technological history ever mention a black inventor. Jan Earnst Matzeliger is one of those who have been left behind. A solitary black immigrant, he invented a machine for use in manufacturing shoes that helped transform an industry, build a great corporation, produce several millionaires (himself not among them), and create work for thousands of Americans. Here is his story.

Matzeliger was born on September 15, 1852, in the Dutch colony of Surinam, on the northern coast of South America. His father, Carl Earnest Martzilger, was an educated white Dutch engineer who ran the government's machine works in the capital city of Paramaribo; his mother was a black slave on a plantation outside the city. Little can be learned about Matzeliger's earliest years, but it is likely he was initially reared by his mother. When he was still very young, the boy went to live with his father and a paternal aunt. Since blacks outnumbered whites fourteen to one in Surinam, culturally mixed households were not unusual. Matzeliger never mentioned his mother, and he probably never saw her after his earliest childhood. His father arranged for a machine-shop apprenticeship for the boy when he was ten, and it continued until the lure of the sea drew him from home at nineteen. Matzeliger left Surinam forever. He took with him a single memento: a small jar of nutmegs and coffee beans preserved in alcohol, which he kept all his life.



BOTH PAGES: LYNN HISTORICAL SOCIETY

One of two known portraits of Jan Matzeliger.

After two years of service on a merchant ship, the Dutch-speaking youth landed in Philadelphia in late 1873 or early 1874. At the time, Philadelphia was the intellectual mecca for black Americans. It had a black-owned and -operated hospital, black newspapers, several of the largest black churches in the country, and some of the foremost black musicians, artists, and entertainers in the world. Blacks made up about 4 percent of the population, more than in any other big Northern city. It was also a leading manufacturing city.

Nonetheless, the skilled twenty-one-year-old machinist found himself handicapped by his race, his foreign heritage, and his inability to speak much English. Competing with others who better understood the dynamics of racial interaction in America, and having arrived amid the severe economic crunch of the Panic of 1873, the soft-spoken newcomer was unable to find employment.

He developed no close relationships in Philadelphia; the people he lived among were mostly freed slaves with cultural backgrounds alien to his. But his acquaintances did eventually help him locate a series of unremarkable jobs that he held until he secured an apprenticeship in a shoemaking shop. The most important piece of equipment Matzeliger learned to operate was a McKay stitching machine. One of the first devices to bring automation to a part of shoemaking, it sewed the outer soles of shoes to the inner soles.

The five-year depression that followed the Panic of 1873 was one of the worst in American history. Eighteen thousand businesses failed, half a million workers lost their jobs, and by

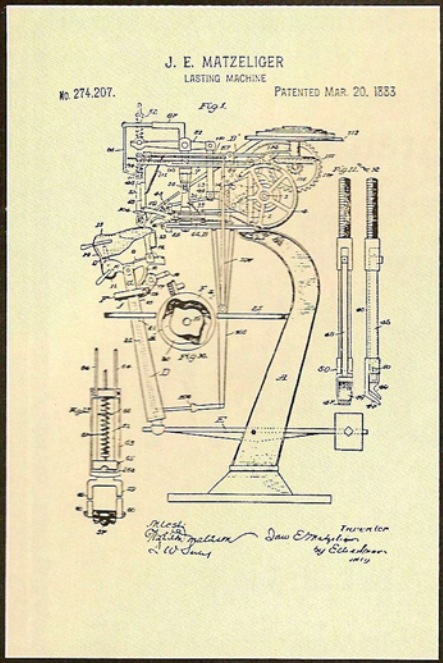
1876 black unemployment in Philadelphia stood at 70 percent. Matzeliger probably was caught in a squeeze. In 1876 or 1877 he left for Lynn, Massachusetts.

He may have been inspired to move there by the 1876 Centennial Exhibition, held in Philadelphia. One of the dignitaries present at its opening was Frederick Douglass, a former resident of Lynn and the most influential black man in America. Whether or not Matzeliger heard Douglass speak, he almost certainly visited the shoe and leather exhibits that showcased Lynn as the shoe capital of the world.

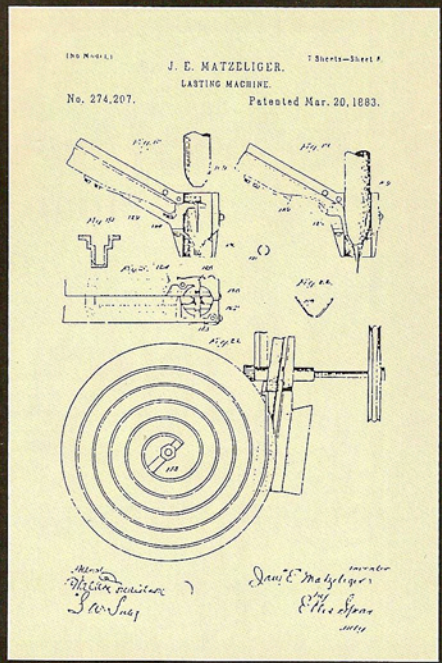
Matzeliger arrived in Lynn almost empty-handed, but he had little trouble finding work. He had a plan of action. The city had too few trained shoemachine operators, so rather than look for a machinist's job, Matzeliger took a job running a McKay stitching machine, at the M. H. Harney Company. He rented a room at the West Lynn Mission on Charles Street, in the black section of town, and enrolled in night school to learn English. Eventually he learned to speak the language with almost no accent. On October 29, 1878, he became a naturalized citizen. To further educate himself, he invested in a six-volume set of books titled *Popular Educator*, a five-volume series called *Science for All*, and a secondhand set of drafting instruments. These were very expensive items for him and certainly not casual purchases; he so highly regarded the books and drafting instruments that all three were specifically mentioned in his will.

As Matzeliger prepared himself to make the most of his opportunities, he tried to join three local white churches, Roman Catholic, Unitarian, and Episcopal. They all turned him away, and he never forgot the rebuffs. When asked about his background, he would only say that he considered himself a citizen of the United States. He was not interested in racial ties and never tried to join the only black church in town, the African Methodist Episcopal Church. In a community of

The machine in this 1896 advertisement was based upon Matzeliger's second patent.

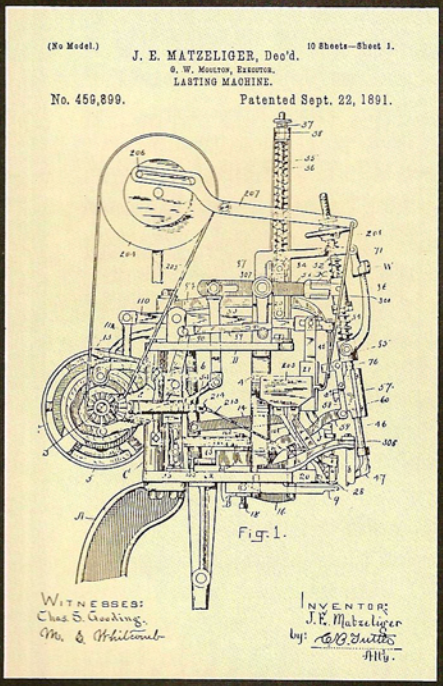


Matzeliger's first patent was so detailed . . .

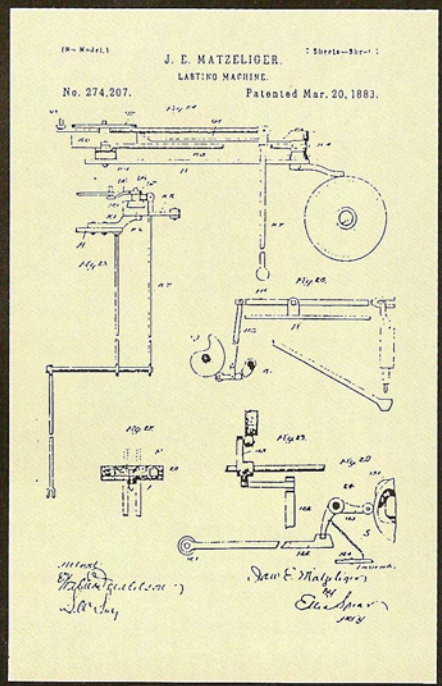


. . . that examiners needed him to explain it.

ALL: LYNN HISTORICAL SOCIETY



A posthumous patent refines his earlier ones.



Additional details from the original patent.

One might sooner expect Matzeliger's detailed patent application from a large corporation than from an unproven young machinist.

35,000, 7 percent black, Matzeliger was a man in a cultural limbo, searching for recognition in a white world that would not accept him while rejecting a black world he could not understand. He found comfort in his evening technical pursuits.

He worked on several potential inventions, and there is evidence that he developed an automatic railroad-car coupler design that was stolen from him when he sought his employer's financial assistance. True or not, Matzeliger later solicited financing with caution, and he was careful to keep his inventions secret.

Shoe manufacture was still far from fully mechanized in the 1870s. Labor was divided so that shoes moved from person to person through the several rooms of a small factory as they were assembled. Stitching, or leather-sewing, machines had been introduced in the 1840s and were the most automated part of the process. The most successful one, on which Matzeliger had been trained, was named after its promoter, Gordon McKay, who owned the patent rights and manufactured the machine. It could stitch the outer sole to the inner sole on eighty pairs of shoes in the time a skilled worker needed to complete a single pair with awl and thread.

Factories increased their production by continually reducing the manufacturing process to simpler and simpler steps, but one intricate operation continued to defy mechanization: lasting, or fastening the upper part of a shoe to the inner sole. Shoes took on their final appearance while being shaped by hand over a wooden model of a foot called a last, and much manipulation was required to accurately form the leather around the last, especially at the heel and toe. Lasters were the aristocracy of shoe workers, both skillful and well paid.

A laster would place a leather inner sole, or insole, over the steel sole of an otherwise wooden last, then position the leather upper section of the shoe (the upper) over the last and care-

fully tug, shape, and wrap it around the insole. Tacks driven through both layers bent over and clinched when they hit the steel sole, and a McKay machine then stitched on the outer sole, or outsole. An efficient laster could process only fifty or sixty pairs of shoes a day, so shoe parts made by machine piled up while waiting for his attentions. This bottleneck kept shoes expensive.

Gordon McKay was a pioneer of early attempts to devise lasting machines and in 1872 organized the McKay Lasting Association to promote their improvement. He wanted to build a machine that could form, shape, tug, pleat, hold, and tack like a human laster. His company spent $120,000 developing one and an additional $130,000 fighting an alleged infringer for four years before dropping the case and joining with the competitor. But while the resulting Copeland-McKay lasting machine was fairly effective with heavy shoes and boots, it was useless for pointed toes or the thin leather used in fine women's shoes, the mainstay of Lynn's factories. It would take the black immigrant Jan Earnst Matzeliger to succeed where McKay, his engineering organization, and a quarter of a million dollars had failed.

Lasters liked to boast that no machine would ever replace them, for no machine could ever have fingers. Matzeliger must have heard the oft-repeated assertion within days of starting work in Lynn. He decided to think about a lasting machine—and embarked on a six-year struggle. He was doing more than merely rising to a challenge; he was skilled, intelligent, inventive, and ambitious, a potential mechanical genius, and he saw inventing an impossible machine as his path to recognition. Feeling the professional excitement of the chase, he invested too much of his nine-dollar-a-week wage on books and instruments, but that investment would ultimately pay dividends to everyone who wanted well-made, inexpensive shoes.

Matzeliger watched the delicate, complexly coordinated manipulations of lasters as they pulled the edge of an upper around an insole with a pliers-like pincers and tacked the rolled-over edge to the insole, a nail at a time; they cut slots in the rolled-over edge of the upper at the heel and the toe so that the leather could lie flat on the insole. One shoe took five or six minutes to last.

Before automation, lasting was painstaking handwork that required a skilled laborer.

Every night after his ten-hour workday, Matzeliger thought over and drafted his ideas. Since he had no family or friends, his encouragement came only from himself. By 1880 he had built a model mechanical laster out of wooden cigar boxes, elastic, and wire. It couldn't do any useful work, but it convinced him he was on the right track. He kept the details of the design secret, but several people learned of the project during the six months the model took to prepare. One of them offered him fifty dollars for the model sight unseen. Matzeliger rejected the offer but considered it all the proof he needed that he was making progress. The next step was to fabricate a far more ambitious and expensive working model.

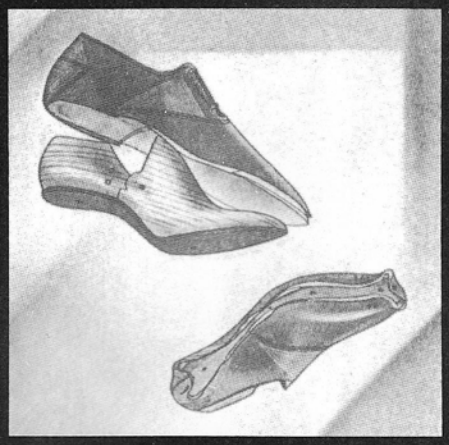
A metal model would require greater working space and access to machine tools. Matzeliger knew how to get both. He capitalized on his mechanical abilities to get a job at the shoemaking factory of Beal Brothers, where he was given a secure working area for his project and permission to use the company's machine tools.

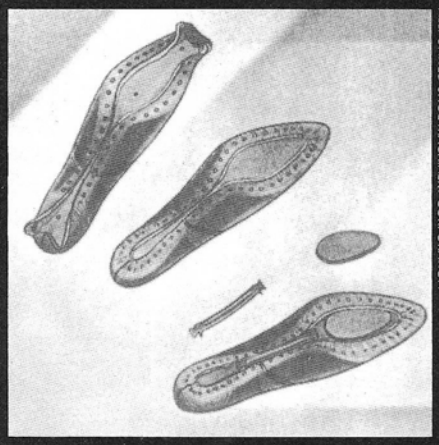
He scrimped on food to have more money for the working model. Occasionally he got supper at a local restaurant in return for sweeping floors, but his staple was cornmeal mush. He took a part-time job driving coachloads of young people to a recreation area known as Raddin's Grove, near the Saugus River, and became good friends with two white women he met at the park: Bessie Lee, who operated a buttonhole machine at a shoe factory, and Enna Jordan, who worked at a restaurant. Seeing the slender Matzeliger grow thinner and certainly realizing why, they shared their meals with him; he in turn gave them dishes on which he had painted landscapes, and he made several toys for Bessie's younger brother. When Enna married, he gave her a large watercolor of a ship as a wedding present. The two women were the closest friends he ever had.

Matzeliger searched through junkyards and factory dumps for good parts from broken machinery—forgings, gears, pulleys, levers, and cams—and spent long hours altering existing parts to fit his requirements. It is scarcely surprising that he had some battles with depression and at times became extremely discouraged. He was, after all, trying alone to fabricate with parts cannibalized from broken equipment, a phenomenally complex machine that defeated able men who commanded all the machining talent money could buy.

Modification worked only up to a point; Matzeliger had to make several specialized parts using his employer's machine tools. After two years of unaided effort, all the while denying himself proper food, rest, and warmth, Matzeliger had completed his second machine.

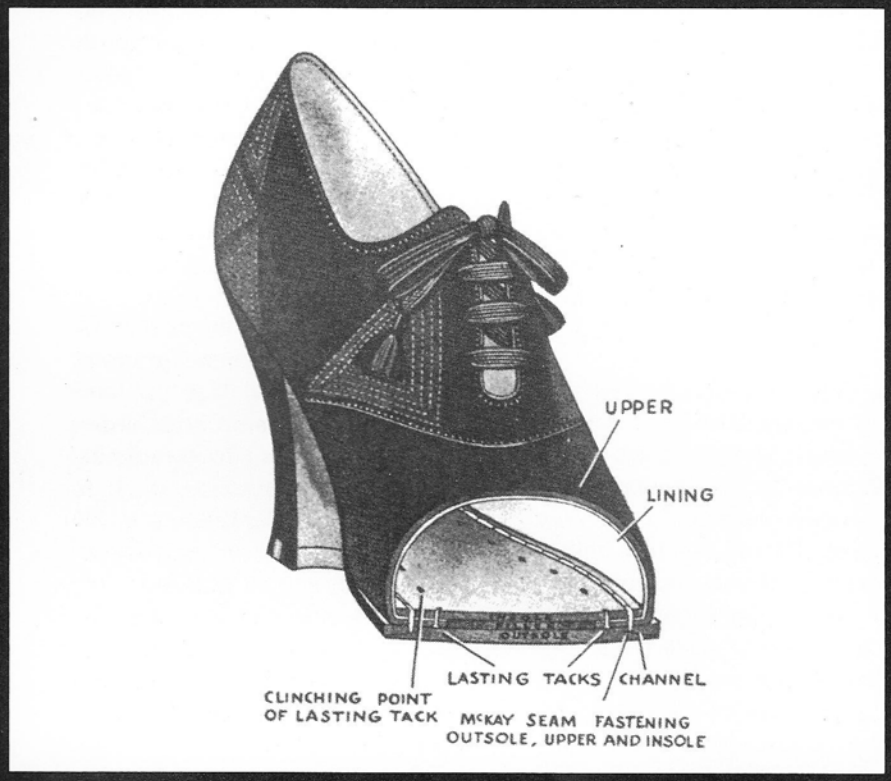
It was a crude prototype, but it was quite capable of pleating the leather around a toe, the most difficult lasting task. He knew the model could not possibly withstand a severe factory test, but its success encouraged him to file for a patent, on January 24, 1882. A





ALL: UNITED SHOE MACHINERY CORPORATION

Illustrations from a 1936 pamphlet show stages in the making of shoes. At left, the upper, last, and insole before assembly; at right, the pieces have been fastened with tacks.



Cross-section of a finished shoe. The foot's irregular contours frustrated early inventors.

The Matzeliger laster became so popular that for forty years after 1885 nearly every shoe factory in America had one.

production model would be so simple to operate, he claimed in his patent application, that it would require "only the service of a boy or girl or other unskilled labor to attend the machine."

By one account, the officials at the Patent Office could not understand Matzeliger's complex text and drawings, and an inspector had to visit him to have the invention explained. The story is believable. Even by modern standards the fifteen-page patent is complex; one might sooner expect it from an engineering group at a large corporation than from a self-supporting and unproven young machinist working alone.

As always happens sooner or later with inventions, financing became a major issue. Time and money would be needed for a model durable enough to prove itself under factory conditions. It would require precision parts made in a professional machine shop. Matzeliger cautiously sought investment capital. His reputation as a machinist preceding him, he found help from two local businessmen, Charles H. Delnow and Melville S. Nichols. The price for their assistance was steep: they would fully support him in return for two-thirds of all eventual profits. Matzeliger agreed. His first lasting-machine patent was issued on March 20, 1883, and includes the names of Delnow and Nichols as assignees.

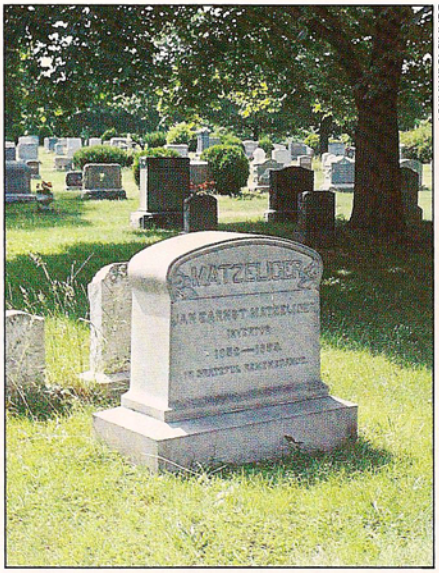
Matzeliger took three years to build an experimental machine and in the process made various engineering changes that would be reflected in his second patent several years later. The machine was finally ready for its first demonstration on May 29, 1885. Its main working component was a single pincers resembling an ordinary pair of pliers with the jaws thinned and bent. A worker placed an insole and an upper on a last and positioned the last on the machine. The machine drove a tack, turned the shoe, pleated the leather, drove another tack, and continued until the shoe was finished, exactly reproducing the technique

used by hand lasters. The job took one minute.

Those who saw it could hardly believe their eyes. Working five times faster than a human laster, the device perfectly lasted seventy-five difficult pairs of women's shoes. Other machines had performed parts of these operations; this was the first to combine so many complex steps and produce shoes indistinguishable from handmade ones. And it could handle all shoe styles and any grade of leather.

Delnow and Nichols lacked the capital to set up a factory and a distribution system, so they joined with other investors to form the Consolidated Hand-Method Lasting Machine Company (CHMLMC). The company's name reflected an improvement incorporated in Matzeliger's second patent, which he filed for on August 14, 1885. The first model had used a gear drive to rotate the last; now it was supported and fed by the hands of the operator, making possible variations and corrections in the positioning of the upper. The improved machine also had a knee-operated control to adjust the pincers for different leather characteristics. As a result, it required so much skill to operate that the CHMLMC had to establish a training school. But Matzeliger's failure to meet his goal of being able to rely on unskilled labor was more than compensated for by the machine's high rate of production.

Around 1885 Matzeliger sold the company all rights in his patents for stock worth more than $15,000. By the next year 225 workers were manufacturing lasting machines at a plant in Beverly, Massachusetts, and could not keep up with the demand. The Matzeliger laster became so popular that for forty years after 1885 nearly every shoe factory in America had at least one. In the hands of a competent operator, it could last as many as seven hundred pairs of shoes a day, although two to three hundred was a more typical production rate. Shoe prices dropped by half.



DENNIS KARWATKA

Matzeliger's tombstone at the former North Congregational Church, Lynn, Massachusetts.

In 1899 the CHMLMC would merge with forty other companies to form the United Shoe Machinery Corporation. Thanks largely to Matzeliger's patents, the firm would become a virtual monopoly and earn fifty million dollars over the following dozen years. But by then Matzeliger would be dead, his name fading from memory. As so often happens with inventors, nothing had even been named after him. That would change only in 1984, when a Jan Earnst Matzeliger Bridge was dedicated in Lynn.

In 1886 Matzeliger bought a house on Albany Street, where Delnow and Nichols, his original backers, were his neighbors. He rented the house to the couple with whom he had previously boarded and continued to board with them there. His personal life had taken a turn for the better. Bessie Lee and Enna Jordan were members of Lynn's North Congregational Church and had spoken to officials there about membership for Matzeliger. Partly because of his gentlemanly demeanor, the church accepted him in 1884, and he immersed himself in its activities—attending services, teaching Sunday school, instructing in oil painting, and participating in church fund-raising bazaars.

Matzeliger earned but a fraction of the money realized by some of his financiers, but his happiest years were the few that remained after he gave up control of his patents. He enjoyed pleasant surroundings, good friends, financial security, and local recognition. Not all successful inventors have been so fortunate. He filled his days by working on an improved tack-delivery system for shoemaking and a final design for his second machine. He was granted five patents in all, three of them posthumously.

His years of self-deprivation had taken their toll on his health, and in 1886 he was diagnosed as having tuberculosis. Despite extensive medical treatment, he died on August 24, 1889, just a few weeks shy of his thirty-seventh birthday.

Matzeliger had signed a will four months before he died. He was generous with his friends but harsh with those who had spurned him. He left about a third of his estate to the North Congregational Church, requiring that "it shall not knowingly be given or expended for any member of the Roman Catholic, Unitarian or Episcopal churches." His books went to two young church members. Enna Jordan was remembered with two watercolors, a Bible, and some shares of stock; Bessie Lee also received a small amount of stock, and her brother was given his drawing instruments. A few Matzeliger artifacts remain in the possession of Lynn's First Church of Christ, which merged with North Congregational many years ago, but most have been lost to history.

For his part, Gordon McKay willed six million dollars to Harvard to be used for "the great subject of mechanical engineering in all its branches and in the most comprehensive sense." Harvard's Gordon McKay Laboratory of Applied Science provides facilities for research in solid-state physics, electronics, and physical metallurgy.

The jar of nutmegs and coffee beans was never accounted for. ★

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