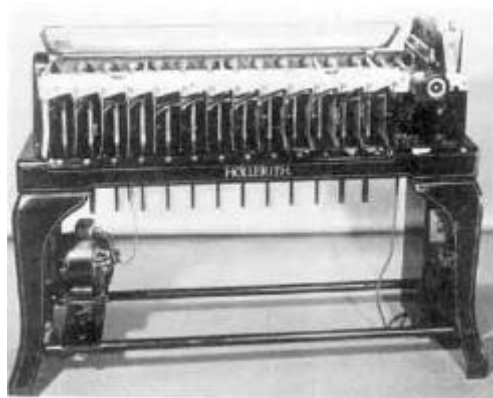


**A Biography of  
Herman Hollerith  
By:  
Zaid Tarawneh  
March 22, 2001  
Dr. Bergin  
The History of Computing**



Illustrations taken from [www-groups.dcs.st-and.ac.uk/~jistory/Mathematicians/Hollerith.html](http://www-groups.dcs.st-and.ac.uk/~jistory/Mathematicians/Hollerith.html)

Humanity's need for innovation is infinite and forever growing. As societies expand and evolve, new technologies arise in order to satisfy the needs of the society. Such a need existed at the end of the 19<sup>th</sup> century when the country found itself incapable of completing the Census in an adequate time. It was then that Herman Hollerith, with his electric tabulating machine, was able to revolutionize the way people conducted statistics research and polling. Using his machine, the Census Bureau was able to cut its costs by \$5 million and its time by 2 years (Biles 605).

Herman Hollerith was born Feb. 29, 1860 in Buffalo, NY. His parents were German immigrants who migrated into the country in 1848. His father died when Hollerith was at the age of seven. As a child, Hollerith was a loner and a free thinker greatly because of his father's death (Austrian 3). Hollerith had some trouble early on in school even though he was smart. "Herman is said to have been a bright and able child at school, but had an inability to learn spelling easily. His determined teacher made his life miserable to the extent that he used to avoid school whenever possible and run away when his teacher showed renewed effort to improve his spelling" (O'Connor 1). So, Hollerith was taken out of school and the family's Lutheran minister tutored him (O'Connor 1).

He was accepted in the Columbia School of Mine in 1875; and there he sought out close relationships with his professors. Geoffrey Austrian thinks that Hollerith looked for close relationships with his professors because he did not have a father figure growing up. Hollerith graduated Columbia University in 1879 with a solid record (O'Connor 1). His relationship with professors proved to be fruitful. One of his professors, Professor Trowbridge, was appointed Chief Special Agent at the Census Bureau and asked Hollerith to work with him at the Census office (Austrian 4).

Herman Hollerith revolutionized the way data processing is conducted when he invented his electric tabulating machine. There are several stories as to how he discovered the idea that punched cards could be used for data processing. One story goes that he thought of the idea when he saw how train conductors use punched cards to identify passengers on the train (Austrian 605). Whenever Hollerith was asked about how his invention came about he would smile and say “Chicken Salad” (Austrian 5). This chicken salad story occurred on a boat club in the summer of 1881. Hollerith was escorting a young lady by the name of Kate Sherman Billings. After some dancing, they decided to go to the buffet and get something to eat. “There, he attacked the chicken salad with such gusto that the young lady, impressed by the onslaught, asked her mother to invite him to a Sunday night supper to enjoy some more” (Austrian 5). Hollerith’s conversation with Kate’s father is allegedly what sparked the idea of using some kind of a punched card system for data processing. Two accounts have been given, one says that this conversation occurred over tea and the other says that the two men were in the Census office where they discussed this (Austrian 5). Either way, Hollerith gives credit to Billing for giving him the inspiration. In a letter dated August 7, 1919, Hollerith wrote:

“He said to me there ought to be a machine for doing the purely mechanical work of tabulating population and similar statistics...his idea was something like a type distributing machine. He thought of using cards with the description of the individual shown by notches punched in the edge...” (Austrian 5)

Dr. Billing was also quoted as saying that “there ought to be some mechanical way of doing this job, something on the principal of the Jacquard loom whereby holes in a card regulate the patterns to be woven” (Austrian 5). However, there is little documentation of

the specific suggestions that Dr. Billings gave Hollerith so the question will never be answered. Dr. Billing daughter, Kate, later wrote that her father was not an engineer and therefore all credit should go to Hollerith (Austrian 5).

In 1882, Hollerith was invited to become an instructor of mechanical engineering at the Massachusetts Institute of Technology by George F. Swain who was an instructor of civil engineering at MIT (Austrian 11). The idea of teaching students who were older may have appealed to Hollerith but he still needed to be convinced. After consulting his old professor and friend Professor Trowbridge, he decided teach at MIT (Austrian 12). However, he did not stay for more than a year there.

Hollerith's main invention was the electric tabulating machine. He applied for a patent on his invention in 1884 (Austrian 13). The main concept of his machine was that a punched card would be inserted into the machine and then the machine would read information through electric currents that were made or broken by the holes made in the card (Austrian 13). This idea was similar to the concept of the telegraph, but instead of transmitting the information, Hollerith's machine counted it (Austrian 13).

The first time his machine was used was in the City of Baltimore in 1886 in order to process mortality statistics. The early cards were punched using a hand held hole punch. The information on the card would be entered alongside the card. There were three rows on the top and three rows on the bottom. Each row contains 32 areas to be punched, meaning that the card could hold 192 positions for data entry. The data entry position allowed for a hole of a size of  $\frac{1}{4}$  Inch Square. The card itself was 3.25 inches deep and 8.625 long (Kistermann 247). Each card represents a person, and the holes would represent information about that person. The holes would represent information about the

person's reason for dying, job title, nationality, and location. The card was punched manually and entered in the machine to be counted. (Kistermann 247)

The system also had a sorting system that enabled the organization of the punched cards quickly and easily. It was basically a wooden box that sat next to the system with many compartments. A lid covered each compartment. The lid would "pop" open when the circuit closing press got an electric current indicating a certain category. For example, if the card was punched to indicate that the person was a white male, as the card goes through the machine would get an electric current where the card is punched, it would account for it, and then the appropriate lid will open up for the card to be placed in it. (Austrian 41)

While his own family was laughing at his machine, Hollerith's machine was being demanded by several government agencies (Austrian 44). The Surgeon General's Office of the War Department asked for one of his machines to be installed in their department (Austrian 45). The rent on the machine would be \$1000 a year. This system was more complex than the one used in Baltimore. Where in Baltimore it only accounted for single units of information. This new machine would be able to handle aggregates. In other words, "one hole position could stand for more than a single unit of information" (Austrian 45).

The State Health Office of New Jersey contracted Hollerith for his machine to conduct vital statistics similar to the one used in Baltimore earlier (Kistermann 248). The design of the card was identical to the one used in the City of Baltimore but the State Health Office of New Jersey required less details (Kistermann 248). The system was also used at the Bureau of Vital Statistics in the Health Department of New York City. The

system was also used to produce mortality statistics. The Department required more details than before so a fourth row had to be added on one of the sides of the card (Kistermann 249). “Perhaps it might be reasonable to suggest that the New York City test was the first true application of the punched card, while the earlier experiments were simply preliminary testing: Baltimore as a test of the complexity of the system using only a limited amount of data and New Jersey as a test of the reliability with more data but fewer details” (Kistermann 249). In 1890, the electric tabulating machine was utilized to aid in processing the 11<sup>th</sup> Census of the United States.

President Harrison appointed Robert P. Porter as superintendent for the 1890 Census (Austrian 49). Porter was a personal friend of Hollerith and also a fan of his electric tabulating machine. Porter offered Hollerith a government job at the Census office as the head of the Division of Vital Statistics for the 1890 Census. Hollerith declined the offer because he wanted to wait “until he can make a contract and he fear[ed] his having charge of any of the work might interfere with that” (Austrian 49). Hollerith even changed the title of his office from “Patent Solicitor” to “The Hollerith Tabulating Machine System” (Austrian 50). This way Hollerith could lease the machines to the government and make some money off of the whole operation.

At the same time Porter was soliciting Hollerith to work at the Census Bureau. Secretary of State for the Interior conducted an evaluation of three different systems for tabulating and processing statistical information (Kistermann 252). In the tests, the electric tabulating machine went up against a “slip” system by Mr. Hunt and the “chip” system by Mr. Charles F. Pidgin (Austrian 50). The “slip” system called for sorting and counting information by hand and transcribing data using different color slips. The “chips” system

was very similar in that information was transcribed onto cards of various colors that stood for different classes of data, which were sorted into groups and then counted. (Austrian 50). Hollerith's machine won the competition by doing the recording in almost half the time it took Hunt and Pidgin to do it and a fraction of the time for tabulation (Austrian 51). Hollerith's machine was contracted for use in the Census. Hollerith received orders for six machines for a \$1000 annual lease and by January 4<sup>th</sup> he received orders for fifty machines (Austrian 53). So, "by the start of the U.S. Census, Hollerith had succeeded to a remarkable degree. Hard work, careful preparation, friends in the Census Office, and stubborn persistence had all worked in his favor" (Austrian 57).

Hollerith's machine was a success in completing the 11<sup>th</sup> Census of the United States two years ahead of schedule and saving the bureau \$5 million in taxpayer money (Biles 605). One important innovation to his machine was the keyboard he invented to punch the holes in the cards. Almost 63 million cards were used in the census and using a regular hand-held hold punch would have been too strenuous and unpractical. Plus, with his keyboard or "Pantograph Punch" as it was called, the holes would be precisely where they should be and the machine would better read the information (Kistermann 252). The Pantograph Punch offered better alignment of holes than the regular hand punches. Also, "there was no real need for the card to have a printed surface because the invention of the key-board or pantograph punch... allowed perfect alignment and reproducible punching of the cards" (Kistermann 252).

Hollerith's machine was also used in the Austro-Hungarian Empire to conduct their census in 1890; the Canadians used the machine to conduct their census of 1891, and the Italians in 1897 (Kistermann 253). The Russians conducted their first Census using the

Hollerith machine in 1897 (Kistermann 253). The machine was also used in the railroads. This time there was a punching position reserved for zero, which was “added not simply to represent this digit but mainly to act as a check so that there would always be the possibility of checking the internal circuitry of the machine” (Kistermann 253). The first major application was at New York Central and Hudson River Railroad in 1896 (Kistermann 254). The economy was going through a crisis due to problems in obtaining the necessary information about agriculture. The Hollerith punched card system was later used in the 12<sup>th</sup> Census of the United States in 1900 with some modifications to obtain information about agriculture (Kistermann 254). Also, two different cards were used in population statistics. One card was used to represent a person, and another was used to represent a family (Kistermann 254). The Tabulating Machine Company was very successful with a capitalization of \$100,00. Not only was Hollerith the General Manager of the company, he also owned the patents in his own name for his invention (Austrian 153).

In 1905, Hollerith’s patent expired. Hollerith went to court. He sued the Census Bureau for manipulating and changing his machine. The Bureau had changed the sorting machine so it would have a continuous movement (Austrian 297). Durand, who was the Director of the Census Bureau, justified the modifications by saying that those machines that Hollerith gave them were useless and not working properly (Austrian 298). In his defense, Hollerith said that no one complained before and there were testimonies of how well the machines worked (Austrian 298). The court ruled against Hollerith saying that the modification did not change the identity of the machine and that a patent did not protect the machines when they were sold (Austrian 298). Hollerith filed for several appeals and

lawsuits. Then at the age of 51 and suffering from high blood pressure he sold his company before the final disposition of the court (Austrian 305).

In 1911, Charles R. Flint included Hollerith's Tabulating Machine Company with the Computing Scale Co. of America and the International Time Recordings Co in a merger. The combined result was a company called the Computing-Tabulating-Recordings Co., or CTR. A man named Watson ran CTR and the company later changed its name to International Business Machines, or IBM. Hollerith's company was sold for \$2,312,100 or at \$450 a share; he received \$1,210,500 for his 2,690 shares (Austrian 311).

Hollerith also invented an air pressure brake system that used electricity to make sure all cars stop at the same time in a train (Austrian 27). Hollerith is among the most influential father figures in computing history. His invention proved that technology could greatly improve the quality of life. Through better and quicker Census tabulation, legislators can serve their country better. Information has been the key element in the last century when it comes to Technological advances. Hollerith died of a heart attack on November 17<sup>th</sup> 1929 in Washington DC (O'Connor 1). The Columbia School of Mines awarded him an honorary doctorate in 1890 because of his success in the 11<sup>th</sup> Census and he also received the Franklin Institute of Philadelphia Elliot Cresson Medal in 1890 as the most distinguished inventor of the year (Biles 607).

## Bibliography

Austrian, Geoffrey D., *Herman Hollerith, Forgotten Giant of Information Processing*.  
Columbia University Press, NY, 1982.

Biles, et al, "Herman Hollerith: Inventor, Manager, Entrepreneur-A Centennial  
Remembrance," *Journal of Management*, Vol. 15, No.4, 1989.

Kistermann, F. W., "The Invention and Development of the Hollerith Punched Card: In  
Commemoration of the 130<sup>th</sup> Anniversary of the Birth of Herman Hollerith and for  
the 100<sup>th</sup> Anniversary of Large Scale Data Processing", *The Annals*, vol. 13 no.3,  
1991.

O'Connor J.J., and E. F. Robertson. "Herman Hollerith." <[http://www-groups.dcs.st-  
and.ac.uk/~history/Mathematicians/Hollerith.html](http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Hollerith.html)>(July 1999).

"The Early Years 1890-1938." The Story of IBM. <<http://www.ibm.com/ibm/history/story>>.