

Double Shuffle

Herman Hollerith and James Powers both developed tabulating machines. Their rivalry dominated the world of computing for six decades



James Powers

Powers' machines were purely mechanical and dedicated to a single application. He nevertheless provided fierce competition for Hollerith



Herman Hollerith

Hollerith invented the electromechanical card reader, which was later developed into the tabulator

The machines that Herman Hollerith (see page 240) invented to process the results of the 1890 United States census developed into a range of general purpose data processing equipment known as 'tabulators'. Until the introduction of the first commercial computers in the 1950's, tabulators were essential to the growth of industry and business. In Pittsburgh in the 1930's, for example, a leading department store experimented with a system of customer accounts in which 250 terminals throughout the store were connected by telephone lines to a central bank of tabulators. Goods were priced with punched tags and the information was automatically sent to the tabulators, which then recorded the sale and prepared an invoice for the customer. When the customer's credit rating had been checked, authorisation for the sale was sent to the terminal through an 'on-line' typewriter.

Business competition, in fact, provided the initial stimulus for the development of tabulators. Hollerith's monopoly over the provision of census equipment was broken in 1910 when the Census Bureau invited James Powers to provide alternative machines. Powers offered a system of tabulators that were totally mechanical and therefore did not infringe the patents of Hollerith's electromechanical devices. The rivalry between the two men, and the two companies they later

formed, spurred on the growth of data processing machines.

In 1902, Hollerith designed a plug board (rather like a telephone cord switchboard), which could select the columns of the punched card that were to be added up and then output. In this way, Hollerith's machine had a programming capability that his rival's machines lacked; Powers always produced machines dedicated to specific applications. In 1924, Powers patented a way of representing alphanumeric data on punched cards by using a single hole in each column for a number, and a combination of holes to represent a letter. Hollerith quickly responded with his own system: the now standard 80-column card. Each column of this card contained 12 rows of holes that were 'read' by wire brushes completing an electrical circuit with a metal contact beneath the card. Some advanced systems used a light detector for this purpose.

The first tabulators could only count or accumulate totals, but later more advanced mathematical functions were provided for manipulating data. Unlike computers, which were invented by scientists for mathematical purposes, the tabulator was created to be an information processor. People were quickly inspired to work out applications for the new machines. Special tabulators were adapted for use in computing tables, in wave analysis, and in astronomy — tabulators identified the planet Pluto in 1930. Tabulators eventually became sophisticated enough to deal interactively with large amounts of data — IBM patented one that could keep records on the transactions of 10,000 bank accounts. But their greatest impact was in collating data on a scale never seen before.

Tabulator Machines

The tabulator in its heyday in the early 1950's consisted of eight separate units. Data was put onto each card by a 'card punch', which could process 200 cards an hour. A separate 'verifier' checked the accuracy of the punch operator, and when the cards became worn a 'reproducing punch' created new copies. An 'interpreter' printed an explanation of the data above each column for easy reference.

The 'tabulator' itself accumulated totals of data in the columns, and output the results at a rate of 9,000 cards per hour. This tabulator was often connected to a 'multiplying punch' that provided more sophisticated mathematical functions. The 'collator' could compare the data in two stacks of cards or merge two stacks together. Finally, the 'sorter' could take a stack of cards and sort them into 13 piles — one for each of the 12 holes, and one for a blank column.

The operation of the tabulator could be changed with control codes (in the 11th and 12th positions), and control cards were brightly coloured to mark them out in a stack. When a control card was encountered, the tabulator would begin a new operation — such as counting a different field. In census work, an example of a field would be the data relating to a house, or a street, or a city. At each change of field the tabulator would print out a subtotal — in our example this would provide the population of each house, street or city. Some of the techniques of data processing were carried over from tabulators into the early computer languages



BBC HULTON PICTURE LIBRARY