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Martin Campbell-Kelly

Historical Reflections
Victorian Data Processing

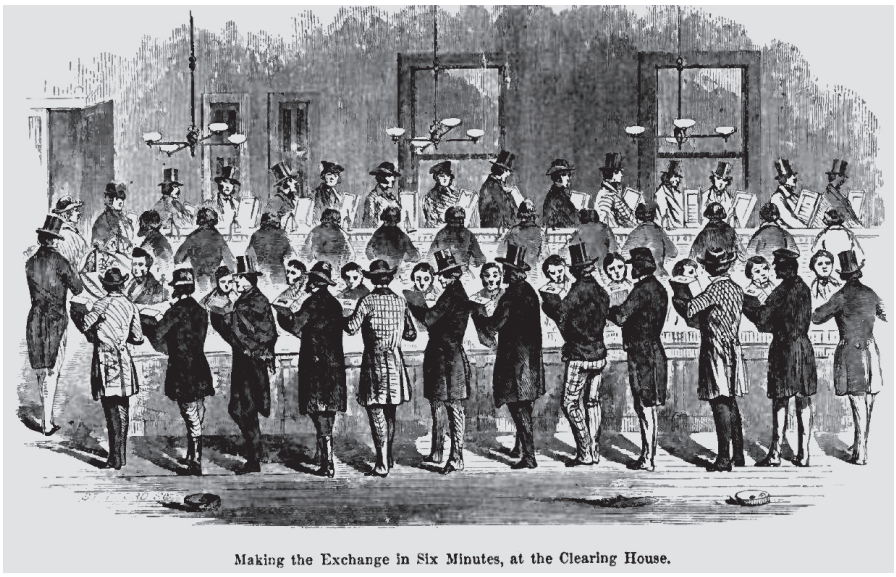
Reflections on the first payment systems.

I am one of those individuals known as a "historian of computing." Perhaps we are stuck with that appellation, but it can lead one to suppose that all the most significant and important things in information processing happened after the invention of the digital computer. Of course, we usually give a nod to Charles Babbage's calculating engines and Herman Hollerith's punched card machines. But this, too, is misleading because it suggests that machinery was always central to data processing. The fact is that the Victorian world was awash with data and with organizations that processed it; and they usually used nothing more technologically advanced than pen and paper. The Bankers' Clearing House—the first payment system—is just one of many examples.

London bankers' clerks meet at the Clearing House in Post Office Court, Lombard Street, to exchange cheques and settle accounts, circa 1830.

PHOTOGRAPH BY HULTON ARCHIVE/GETTY IMAGES

The Bankers' Clearing House was established in London in the early 1800s. Interestingly, we owe the first description of the Bankers' Clearing House to Charles Babbage. Today we think of Babbage primarily as the inventor of calculating machines, but in his lifetime he was better known as a scientist and an economist of international standing. In 1832 he published the first economic treatise on mass production, *The Economy of Machinery and Manufactures*.[1] It is there that he published his account of the Bankers' Clearing House. When Babbage wrote his book, the Bankers' Clearing House was a secretive organization that was practically unknown to the general public (not least because the organization handled very large sums of cash). It happened, however, that Babbage was on good terms with Sir John Lubbock, a partner of Lubbock's Bank and a founder of the Clearing House. Lubbock was an



The New York Clearing House circa 1853.

PHOTOGRAPH FROM J.S. GIBBONS, *THE BANKS OF NEW YORK, THEIR DEALERS, THE CLEARING HOUSE, AND THE PANIC OF 1857*. APPLETON, NEW YORK, 1864

amateur scientist in his spare time and both he and Babbage were members of the Royal Society. Using this connection, Babbage talked his way in.

Walk Clerks

The origins of the Bankers' Clearing House are obscure, but they date back to at least the late 1700s.[3] At that time, when a firm or an individual received a check (still spelled "cheque" in the U.K.), it would be deposited in the recipient's bank. It was then necessary for a clerk to physically present the check to the originating bank, exchange it for cash, and return with the money to his home bank. As the volume of checks grew, each bank employed a "walk clerk" whose job it was to take all the checks due for payment, visit each bank in turn, obtain payment, and return to his bank with a large amount of cash. Walking through the City of London with a large bag of money was, to say the least, unwise, although it went on for many years.

Around 1770, the walk clerks made an informal arrangement to abandon their walks and instead meet at an agreed time in the Five Bells public house in Lombard Street. There they could perform all their financial transactions within the safe confines of four walls. In the early 1800s, the proprietors of the banks at last recognized the merit of this arrangement and formally created the Bankers' Clearing House. When Babbage wrote his account in 1832, it had already been running for a quarter of a century. Babbage described the operation of the Bankers' Clearing House almost in terms of an algorithm—though one executed by people, not machinery. He wrote: "In a large room in Lombard Street, about 30 clerks from the several London bankers take their stations, in alphabetical order, at desks placed round the room; each having a small open box by his side, and the name of the firm to which he belongs in large characters on the wall above his head. From time to time other clerks from every house enter the room, and, passing along, drop into the box the checks due by that firm to the house from which this distributor is sent."

Thus during the day each bank dropped off the checks on which it was owed payment and received checks on which it was due to make payment. By adding up all the checks on which it owed money, and all those on which it had to pay out, a bank could calculate exactly the total amount it would have to pay out or would receive that day. At 5 P.M. precisely, the Inspector of the Clearing House took his place on a rostrum, and the debtor banks went up one-by-one to pay what they owed on the day. When this was complete, the banks that were owed money stepped up to the rostrum for payment. When the last bank had been paid, the Inspector was left with a balance of exactly zero. That, of course, assumed that no one had made an arithmetic error. A paper trail of preprinted forms completed by each bank enabled any errors to be traced—but this was a rare occurrence.

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Transaction Processing

The amount of money flowing through the Bankers' Clearing House was staggering. In the year 1839, £954 million was cleared—equivalent to $250 billion in today's currency. However, one of the benefits of the system was that the banks now needed to bring only a relatively small amount of money to the Clearing House. On any day, the totals of checks received and checks paid out would tend to cancel each other out, so that a bank needed only the difference between these two amounts. For example, on the busiest single day of 1839, when £6 million was cleared, only approximately £1/2 million in bank notes was used for the settlement. In his account of the Clearing House, Babbage noted that if the banks were to each open an account with the Bank of England, no money in the form of cash would be needed at all. All that the Clearing House would have to do would be to adjust the account that each bank held with the Bank of England at the close of the business day. This innovation was instituted in 1850, and the physical movement of money was entirely replaced by pen-strokes in an accounting ledger. It was a key moment in both fiscal and information processing history, and Babbage recognized it as such.

The U.S. quickly adopted—and improved on—the British clearing system. The first clearing house was

opened in New York in 1853, located on the fourth floor of the Bank of New York on the corner of Wall Street and William Street. One of the difficulties of the New York clearing operation was that there were over 50 banks in the city and it was realized that the exchanging of checks—as described by Babbage—would create too much confusion and foot traffic. Some nameless genius came up with the brilliant solution depicted in the image on the preceding page of this column. The New York Clearing House constructed a very large oval table, approximately 70 feet in length, with enough working space for each bank. According to a contemporary account,[2] at 10 o'clock precisely, two clerks from each bank took their places at the table—one seated inside the table and the other standing outside, facing his colleague. At the manager's signal, the clerks outside the table would take one pace forward and perform the day's transactions with the bank they now faced. The process was then repeated, the circle of clerks advancing one pace at a time to the next station "resembling in its movement a military company in lockstep."

After about six minutes the clerks were back in their original positions, the distribution process completed. After that, it was just a matter of balancing the books. If there was a failure to get a zero balance, then there was a system of checks and double-entry accounting so that the error could be detected. Another Yankee innovation, which reputedly cut down on the number of errors, was a system of fines. If an error was found quickly there was no fine, but if it was not detected within an hour a fine of two or three dollars was imposed on the offender, which doubled and quadrupled, the longer it took to find.

The New York Clearing House flourished, and other American financial centers established their own clearing houses—Boston in 1856, Philadelphia in 1858, followed by Chicago and St. Louis some years later.

Persistence of System

You might wonder what happens when you write a check today. In terms of the system, the process is not very different from that of the 19th century. Of course, the technology employed has changed beyond recognition. In the 1960s the great innovation was check-reading machines—for which MICR and OCR fonts were designed, and these still appear on the face of a check. Once data had been extracted from the check, it was transferred to magnetic tape for computer processing. It was said at the time that without banking automation it would not have been possible for millions of ordinary Americans to have checking accounts, or to write checks for very small sums of money. By the 1980s, electronic data transfer eliminated much of the physical handling of data. But again, the underlying information system was little altered.

The longevity of information systems is one of the great lessons of computer history.

The longevity of information systems is one of the great lessons of computer history. Although new layers of technology are constantly applied to information systems, making transactions faster and cheaper, the underlying systems are remarkably stable and persistent, although of course they do gently evolve over time. We may glory in today's information technology, but one day it will be swept aside—and when it is, and we have logged off for the last time, these venerable systems will survive for another generation of technology. Those Victorian office makers perhaps built better than they knew, and we should salute them. C

References

1. Babbage, C. *The Economy of Machinery and Manufactures.* Charles Knight, London, 1832.
2. Gibbons, J.S. *The Banks of New York, their Dealers, the Clearing House, and the Panic of 1857.* Appleton, New York, 1864.
3. Matthews, P.W. *The Banker's Clearing House: What it Is and What it Does.* Pitman, London, 1921.

Martin Campbell-Kelly (M.Campbell-Kelly@warwick.ac.uk) is a professor in the Department of Computer Science at the University of Warwick, where he specializes in the history of computing.

Calendar of Events

October 15–16
Consortium for Computing Sciences in Colleges (CCSC) Eastern, Huntingdon, PA, Contact: Kruse Jerry, Email: kruse@juniata.edu

October 15–16
Consortium for Computing Sciences in Colleges Rocky Mountain, Fort Collins, CO, Contact: Reeves Tim, Email: reeves@sanjuancollege.edu

October 16–20
6th Nordic Conference on Human-Computer Interaction, Reykjavik, Iceland, Contact: Ebba Hvannberg, Email: ebba@hi.is

October 17-21
The 13th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems, Bodrum, Turkey, Contact: Azzedine Boukerche, Email: boukerch@site.uottowa.ca

October 17–21
Systems Programming Languages and Applications: Software for Humanity (formerly known as OOPSLA), Reno, NV, Contact: William R Cook, Email: wcook@cs.utexas.edu

October 18–20
Symposium on Algorithmic Game Theory, Athens, Greece, Contact: Spirakis Pavlos, Email: spirakis@cti.gr

October 20–22
International Conference on Cyberworlds, Singapore, Contact: Alexei Sourin, Email: assourin@ntu.edu.sg

October 21
Workshop on Facial Analysis and Animation, Edinburgh, UK, Contact: Cosker Darren, Email: D.P.Cosker@cs.bath.ac.uk